Final
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine
Clearlake Oaks, California

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Table of Contents

LIST OF FIGURES ..... **III**
LIST OF TABLES ..... **III**
LIST OF APPENDICES ..... **IV**
ACRONYMS AND ABBREVIATIONS ..... **V**

EXECUTIVE SUMMARY **ES-1**
1.0 INTRODUCTION **1-1**
2.0 BACKGROUND SITE INFORMATION **2-1**
2.1 Background Information 2-1
2.2 Land Use 2-2
2.2.1 Current Land Use 2-2
2.2.2 Reasonably Anticipated Future Land Uses 2-2
2.3 Off-Site Residential Soils Removal Actions 2-3
3.0 SUMMARY OF THE PREVIOUS HHRA AND SITE-SPECIFIC CLEANUP GOALS **3-1**
3.1 1994 Baseline Public Health Evaluation 3-1
3.1.1 Identification of Chemicals of Concern 3-1
3.1.2 Exposure Assessment 3-2
3.1.3 Toxicity Assessment 3-3
3.1.4 Risk Characterization 3-4
3.2 Site-Specific Cleanup Goals 3-4
4.0 CHEMICALS OF POTENTIAL CONCERN **4-1**
4.1 Speciation of Total Mercury 4-1
4.1.1 Mercury Speciation Background 4-1
4.1.2 Mercury Speciation Sampling 4-2
4.1.3 Mercury Speciation Results 4-2
4.1.4 Data Evaluation 4-3
5.0 SUMMARY OF SITE DATA USED IN THE HHRA **5-1**
5.1 Soil 5-1
5.1.1 Lakeside Residential Living Area 5-1
5.1.2 On-mine Area 5-2
5.1.3 Elem Indian Colony Living Area 5-5
5.1.4 Pre-mining Baseline Conditions 5-6
5.2 Sediment 5-7
5.3 Surface Water 5-11
5.4 Drinking Water 5-13
5.5 Fish Tissue 5-14
5.6 Plants and Associated Sediment 5-14
5.7 Bird Tissue and Associated Sediment 5-16
5.8 Vapor and Indoor Air 5-16
6.0 EXPOSURE ASSESSMENT **6-1**
6.1 Exposure Areas 6-1
6.2 Conceptual Site Model/Receptor Characterization 6-1
6.3 Exposure Pathways 6-2
6.3.1 Residential Exposure 6-3
6.3.2 Recreational User and Trespasser Exposures 6-3
6.3.3 Traditional Tribal Exposures 6-5
6.4 Calculation of Exposure Point Concentrations 6-6

Table of Contents (continued)

6.5 Transport and Exposure Models 6-7
6.5.1 Particulates to Ambient Air 6-7
6.5.2 Dermal Contact with Water 6-8
6.5.3 Modeled Concentration of Total Mercury in Waterfowl (Grebe) Tissue 6-9
6.6 Calculation of Daily Intakes 6-11
7.0 TOXICITY ASSESSMENT 7-1
7.1 Site-Specific and Chemical-Specific Bioavailability 7-1
7.2 Carcinogenic Toxicity Criteria 7-1
7.3 Non-Carcinogenic Toxicity Criteria 7-2
7.4 Chemical Specific Toxicity Criteria 7-4
7.4.1 Arsenic 7-4
7.4.2 Mercury 7-5
8.0 RISK CHARACTERIZATION 8-1
8.1 Estimated Risks and Hazards Detailed Results 8-1
8.1.1 Lakeside Residents 8-2
8.1.2 Recreational Users 8-3
8.1.3 Trespasser 8-3
8.1.4 Traditional Tribal Receptors 8-5
8.2 Lead Evaluation 8-7
9.0 UNCERTAINTIES 9-1
9.1 Mercury Speciation 9-1
9.2 Arsenic Bioavailability 9-3
9.3 Tribal Cultural Use Risks and Hazards 9-4
9.4 Lakeside Resident - 9-5
9.5 Evaluation of Some Receptors Using Upper Bound Values 9-5
9.6 Bioaccumulation Factors and Waterfowl Tissue Concentrations 9-5
9.7 Upland Bird Tissue Concentrations 9-6
9.8 Estimation of Mercury Concentrations in Soil at Elem Indian Colony 9-6
9.9 Omission of Some Plant Tissue Data in the Risk Assessment 9-6
9.10 Lack of Toxicity Values for Some Chemicals 9-7
9.11 Elemental Mercury Volatile Emissions 9-7
9.12 Estimation of Risks and Hazards Based on Use of Historical Data and Soil Data where the Depth is Unknown 9-7
9.13 COPCs in Surface and Subsurface Soil 9-7
9.14 Ambient Sediment Data and Impacts to the Plant Ingestion Risk Results 9-9
9.15 Incremental Risk Calculations 9-10
10.0 HHRA SUMMARY AND CONCLUSIONS 10-1
11.0 REFERENCES 11-1

List of Figures

Figure 1-1 Site Map
Figure 5-1 Soil Samples Used in the Lakeside Residential Exposure Area
Figure 5-2 Soil Samples Used in the On-Mine Exposure Area
Figure 5-3 Soil Samples Used in the Elem Indian Colony Area
Figure 5-4 Andesite Formation PMB Soil Sampling Locations
Figure 5-5 Franciscan Formation PMB Soil Sampling Locations
Figure 5-6 Sediment Samples Used for the Recreational Scenario
Figure 5-7 Surface Water Samples Used for the Recreational Scenario (Clear Lake)
Figure 5-8 Drinking Water Samples Used for the Lakeside Residential Exposure Area
Figure 5-9 Plant Tissue Samples Used for the Tribal Scenario
Figure 6-1 Conceptual Site Exposure Model

List of Tables

Table 4-1 Summary of Chemicals of Potential Concern by Media
Table 4-2 Selective Sequential Extraction Mercury Speciation Results
Table 5-1 Andesite Surface Soil ProUCL Summary of Results – Mercury (Hg, mg/kg)
Table 5-2 Franciscan Formation – Summary of UTL/UCL Mercury Analysis Pre-Mining Baseline Soils
Table 6-1 Soil/Sediment Exposure Parameters for Chemical Evaluation
Table 6-2 Surface Water Exposure Parameters for Chemical Evaluation
Table 6-3 Food Items Exposure Parameters for Chemical Evaluation
Table 7-1 Toxicity Factors for COPCs
Table 8-1 Multi-Pathway Risk/Hazard Results by Receptor
Table 8-2 Summary of Residential Cancer Risks and Noncancer Hazards – Lakeside Residents Drinking Water
Table 8-3 Summary of Residential Cancer Risks and Noncancer Hazards – Lakeside Residents Exposure to Soil
Table 8-4 Summary of Recreational/Trespasser Cancer Risks and Noncancer Hazards for Surface Water
Table 8-5 Summary of Recreational Cancer Risks and Noncancer Hazards for Sediment
Table 8-6 Summary of Recreational and Traditional Tribal Noncancer Hazards – Fish Ingestion
Table 8-7 Summary of Trespasser Cancer Risks and Noncancer Hazards – On-Mine Soil
Table 8-8 Evaluation of Hydrogen Sulfide Vapors
Table 8-9 Summary of Tribal Cancer Risks and Noncancer Hazards – EIC Living Area Soil
Table 8-10 Summary of Tribal Cancer Risks and Noncancer Hazards –Drinking Water
Table 8-11 Summary of Ceremonial Tribal Cancer Risks and Noncancer Hazards – Drinking Water
Table 8-12 Summary of Tribal Cancer Risks and Noncancer Hazards for Plant Ingestion
Table 8-13 Summary of Tribal Cancer Risks and Noncancer Hazards for Acorn Ingestion (365 Day Exposure)

List of Appendices

Appendix A List of Samples Used By Media
Appendix B Summary Statistics Tables By Media and Exposure Area
Appendix C Risk Calculation Tables
Appendix D Surface Water Dermal Absorption Factors (DA event) (CD only)
Appendix E ProUCL Output (CD only)
Appendix F Mercury Speciation Results
Appendix G Box Plot of Clark's grebe and Western grebe Blood THg Data
Appendix H Laboratory Reports for the USGS Fish Tissue Data

Acronyms and Abbreviations

µg/g	microgram(s) per gram
µg/L	microgram(s) per liter
µg/m^3	microgram(s) per cubic meter
ABSd	dermal absorption fraction
APTIM	Aptim Federal Services, LLC
ARAR	Applicable, Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BIA	Bureau of Indian Affairs
BPHE	Baseline Public Health Evaluation
CDI	Chronic Daily Intake
cm^2	square centimeters
Cal/EPA	California Environmental Protection Agency
CEC	cation exchange capacity
CEDEN	California Environmental Data Exchange.
CH2M	CH2M Hill
CLP	contract laboratory program
COC	chemical of concern
COPC	chemical of potential concern
CSEM	conceptual site exposure model
CSF	Cancer Slope Factor
DA	dose absorbed
DAevent	dose absorbed per unit body surface area per event
DTSC	Department of Toxic Substances Control
dw	dry weight
E2	E2 Consulting Engineers, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
EFGS	Eurofins Frontier Global Sciences
EIC	Elem Indian Colony
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERRS	Emergency Response and Removal Services
FFS	focused feasibility study
ft	foot or feet
GI	gastrointestinal tract
gpd	grams per day
HEAST	Health Effects Assessment Summary Tables
Hg	mercury
HHRA	human health risk assessment
HI	hazard index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
kcal	kilocalorie(s)

kg	kilogram
mg	milligram(s)
mg/d	milligram(s) per day
mg/kg	milligram(s) per kilogram
MRL	Minimum Risk Level
NCP	National Contingency Plan
ng/L	nanogram(s) per liter
$ng/m^2/hr$	nanograms per square meter per hour
NTCRA	Non-Time Critical Removal Action
NWWRP	Northwest Waste Rock Pile
OEHHA	Office of Environmental Health Hazard Assessment
ORP	oxygen reduction potential
OU	Operable Unit
PEF	particulate emissions factor
PMB	pre-mining baseline conditions
PPRTV	Provisional Peer Reviewed Toxicity Values
PRG	Preliminary Remediation Goals
QAPP	Quality Assurance Project Plan
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RBA	relative bioavailability
REL	reference exposure level
RfD	Reference Dose
RGM	reactive gaseous mercury
RME	reasonable maximum exposure
ROD	record of decision
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SBMM	Sulphur Bank Mercury Mine
Site	SBMM Superfund Site
SQL	Sample Quantitation Limit
SSE	Selective Sequential Extraction
START	Superfund Technical Assistance and Response Team
TDS	total dissolved solids
THg	total mercury
TMDL	total maximum daily load
TOC	total organic carbon
TRV	toxicity reference value
TSS	total suspended solids
UCL	upper confidence limit on the mean
VOC	volatile organic compound
Water Board	Central Valley Regional Water Quality Control Board
WRD	waste rock dam
ww	wet weight
XRF	x-ray fluorescent

EXECUTIVE SUMMARY

This sitewide Human Health Risk Assessment (HHRA) evaluates the probability and magnitude of potential adverse effects on human health associated with exposure to chemicals in environmental media at Sulphur Bank Mercury Mine Superfund Site located in Lake County, California.

Introduction

Sulphur Bank Mercury Mine (SBMM) Superfund Site (the Site) has been mined for sulphur and mercury ore from the late 1800s to 1957. The Site is on the eastern shore of the Oaks Arm of Clear Lake (Oaks Arm), approximately 100 miles north of San Francisco. It is adjacent to the Elem Indian Colony (EIC). EPA has divided the Site into two operable units (OUs): OU-1, and OU-2. OU-1 includes the property that is the inactive former SBMM, the flooded pit lake (Herman Impoundment), and the other lake-based portions of the site. Herman Impoundment is separated from Clear Lake by a waste rock pile known as the Waste Rock Dam. OU-2 includes the Clear Lake and the wetlands north of the mine property. Residential soils affected by mining waste within the EIC and Bureau of Indian Affairs Road 120 (BIA 120) area and the residential areas along Sulphur Bank Mine Road are included in this HHRA and are anticipated to be remediated along with OU-1.

As a consequence of past mining and disposal practices and natural fate and transport processes, environmental media (e.g., fish, soils, groundwater, sediments, surface water, and air) have become contaminated with metals from the mine (including naturally occurring hydrogen sulfide in air from geothermal springs). The levels of mercury in fish from the lake led the State of California to issue an advisory to limit consumption of fish.

This HHRA was prepared to conform with EPA's *Risk Assessment Guidance for Superfund, Part A* (EPA 1989)*, Part B* (EPA 1991b) and *Part E* (EPA 2004a) (Guidance referred to herein as RAGS) and supporting documents and guidelines published by the California Environmental Protection Agency (Cal/EPA) as referenced in this report. The HHRA generally follows the risk assessment approach presented in the RAGS, Volume I: Human Health Evaluation Manual (Part A) (EPA 1989) and other current EPA resources and guidance documents as noted throughout this HHRA. Specific guidance with regard to potential tribal exposures include Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual (EPA 2007) and Sulphur Bank Mercury Mine Reasonable Maximum Exposure (RME) Scenario (Harper 2018).

This HHRA characterizes the potential for current and future cancer risks and noncancer health hazards to people who may be exposed to elevated metals concentrations caused by mining activities. The exposure assumptions recommended by EPA and incorporated into this HHRA are conservative (i.e., representative of the highest exposure that is reasonably expected to occur at a site) and thus are expected not to under-estimate impacts to human health.

Chemicals of Potential Concern

Chemicals of potential concern (COPCs) are chemicals that are carried through the quantitative HHRA process (EPA 1989). The SBMM area was mined because the soil is naturally rich in minerals and metals. The COPCs in site source materials include all constituents that occur in these soils, both naturally and as a result of the influence of mining at the site (except those that are essential human nutrients, as discussed below). In areas of past mining activity, the availability of and potential for these constituents to adversely affect human health is increased for several reasons, including increased surface exposure of these constituents, changes in the topography and hydrology of the mine area that can result in increased surface water runoff, erosion and sediment transport to downstream areas and geochemical changes in the metals or other parameters (e.g., pH).

All detected chemicals were selected as COPCs, except for essential nutrients (calcium, magnesium, potassium, and sodium) and inorganic parameters with no toxicity values (i.e., alkalinity, chloride, etc). COPCs in soil, surface water, sediment, plants, and vapors are summarized in Table 4-1. Fish and bird ingestion (bird as a placeholder) exposure pathways were only evaluated for mercury because prior studies have confirmed that mercury bioaccumulation in Clear Lake fish is a public health concern and mercury bioaccumulation in birds (primarily aquatic birds such as waterfowl) is a suspected human health concern due to mercury's known potential to significantly bioaccumulate in the aquatic food chain. The inhalation of vapors pathway was evaluated for hydrogen sulfide and mercury vapors because those are the two volatile COPCs.

Summary of Site Data Used in the HHRA

This section summarizes Site data collected in 2018 and previous sampling data used in performance of the HHRA. A variety of organizations were involved in sample collection over the years. While the specific sample collection objectives varied over time and by organization, in general, samples were collected to define the nature and extent of contamination at and around the site. Media included in the performance of this risk assessment include soil (0–10 feet [ft] below ground surface [bgs]), surface sediments (0-1 ft bgs), surface water, drinking water, wild plants, fish, and vapor. Exposure groupings for each media are briefly discussed below.

Soil samples were separated into the following groupings:

- Lakeside Residential Living Area
- On-mine Area
- EIC Living Area
- Pre-mining Baseline Conditions (PMB)

Sediment samples were collected from 1990 to 2018 along the Clear Lake Shoreline. Ambient sediment samples were collected based on representative areas upstream from SBMM (e.g., approximately one mile from the Site). Sediment samples were also collected as part of the 2018 plant tissue sampling event

(collocated with tule and cattail samples) and bird tissue (placeholder: note as of this draft no bird tissue samples have been collected due to limited availability of resident waterfowl for sampling).

Surface water samples collected from a number of investigations from 2001 to 2019 were used in the HHRA. The primary investigations include the 2009 North Wetland Investigation, 2008 to 2019 Stormwater Monitoring Reports, and 2006 to 2018 groundwater monitoring reports. In addition, ambient surface water results available for performance of the risk assessment.

Drinking water samples include water supply samples were collected from April 2008 through April 2009 from selected homes along Sulphur Bank Mine Road. The water systems that were investigated draw directly from Oaks Arm to serve residences along Sulphur Bank Mine Road, southwest of SBMM.

Fish tissue data were obtained from the U.S. Geological Survey (USGS) fish study collected in June 2019 and the California Environmental Data Exchange (CEDEN) database (various collection dates). The following species were included in the data set: black crappie, bluegill sunfish, channel catfish, common carp, largemouth bass, redear sunfish, Sacramento sucker, silverside, threadfin shad, and tule perch.

Wild plants consumed by the EIC were sampled in 2018 to support the tribal plant ingestion pathway. Species selection was informed by a questionnaire responded to by the EIC Environmental Office. Plant tissue samples included acorns, tule (a bulrush plant) roots, tule stalks, cattail roots, and cattail stalks. Collocated soil samples with the acorn samples and collocated sediment samples with the cattail and tule samples were collected to support the calculation of site-specific uptake factors for metals.

Bird tissue samples have been delayed because insufficient numbers of birds have been available at two previously scheduled sampling dates. The following subareas have been identified for bird tissue sampling:

- Oaks Arm of Clear Lake Shoreline (near WRD)
- EIC Shoreline
- North Wetlands Shoreline

Vapor sampling results were evaluated as part of the HHRA. The results for seven vapor samples collected from Herman Impoundment in 1995 and analyzed for hydrogen sulfide were used to evaluated potential human exposure. In addition to the hydrogen sulfide results, EPA measured the atmospheric flux of mercury from various materials at the site.

Exposure Assessment

The Conceptual Site Exposure Model identifies the following current and future human receptors which are quantified in the HHRA:

- Traditional tribal receptors (adult and child), including tribal exposure to soil, sediment, surface water (wading and swimming in Clear Lake), potential future drinking water from Clear Lake, fishing, consumption of tules, cattails, acorns, as well as consumption of fish, waterfowl and upland birds
- Lakeside residents (adult and child), including residential exposure to soil and drinking water
- Recreational users (youth), including swimmers, waders, and sports fishers
- Trespassers (youth), including swimmers, waders in Herman Impoundment and exposure to on-mine soil

Exposure media include: soil, sediment, surface water, air, and food items (tules, cattail, acorns, fish, and waterfowl) that are assumed to bioaccumulate COPCs.

Standard default exposure assumptions for a resident were used to evaluate the Lakeside Residents exposure to soil and drinking water. Site-specific exposure assumptions were used to evaluate the recreational user and trespasser (youth age 6 to 18 years). These site-specific exposure assumptions were based on interviews with the local community (EPA 1994a). Two trespasser scenarios were evaluated for exposure to soil in the on-mine area. A trespasser who visits the site 52 days per year (twice a week over a 6-month period) and has a soil ingestion rate 100 milligrams per day. And an unauthorized tribal user who visits the site 104 days per year (twice a week over a 12-month period).

Tribal exposure assumptions (EPA 2007; Harper 2018) were used to evaluate the tribal exposure pathways. Conservative exposures for traditional tribal receptors, such as an assumption of consuming 4 liters of Clear Lake surface water per day (though EIC residents have access to municipal water), an incidental soil ingestion rate of 400 milligrams per day, and a diet based on harvesting 100 percent of food items from the SBMM-impacted areas (for 365 days per year for 70 years, for an adult, regardless of whether the site is sufficiently productive to support such harvests), were used. Risk evaluation based upon these exposures rates assumes a traditional lifestyle that may or may not be consistent with current practices but is aimed at ensuring that site remediation provides sufficient consideration to traditional tribal practices.

Toxicity Assessment

The toxicity assessment evaluates the relationship between the magnitude of exposure to a chemical from the exposure area and the likelihood of adverse health effects on potentially exposed populations. The

toxicity values (cancer slope factors/unit risks and noncancer reference doses/reference concentrations) used in this sitewide HHRA were obtained from the following sources:

- **Tier 1:** California Environmental Protection Agency
- **Tier 2:** Integrated Risk Information System (IRIS) (EPA 2019c)
- **Tier 3:** Provisional Peer Reviewed Toxicity Values (PPRTVs) as developed on a chemical-specific basis by the Office of Superfund Remediation and Technology Innovation (EPA 2019b), and as summarized on the EPA Regional Screening Levels (RSL) Table (EPA 2019a)
- **Tier 4:** Other Toxicity Values including additional EPA and non-EPA sources of toxicity information, such as the ATSDR Minimum Risk Levels (MRLs), and the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a)

Risk Characterization

Quantitative risks and hazards due to exposure to COPCs are estimated by combining chronic daily intakes and the toxicity criteria. Methods used to calculate risks and hazards follow EPA's guidance (1989).

For the purposes of this evaluation, the exposure area-specific estimates of potential risks (cancer and noncancer) are compared to the following risk thresholds:

- For chemicals with cancer-causing properties, excess lifetime cancer risk (ELCR) estimates are compared with the risk management range of 1E-06 to 1E-04. The ELCR term 1E-06 means that for every million people exposed to a carcinogen throughout their lifetime, the average incidence of cancer might increase by one case of cancer. In interpreting estimates of excess lifetime cancer risks, EPA, under the Superfund program, generally considers action to be warranted when the multichemical aggregate cancer risk for all exposure routes for a specific exposure scenario exceeds 1E-04. Action generally is not required for risks within EPA's risk management range of 1E-06 an 1E-04, however, this is judged on a case-by-case basis (EPA 1991b).
- A hazard index (the ratio of the chemical intake to the reference dose or concentration in the air to the reference concentration) is compared with the regulatory threshold of 1.

Within this section, ELCR and noncancer hazard detailed results are presented separately for each receptor group. In addition to the Site-related risks and hazards, also summarized are the background, or ambient/not site-related risks and hazards. It is important to note that background risks and hazards occasionally exceeded the Site risks and hazards.

Lakeside Residents

The total ELCR for the Lakeside Resident, including exposure to both drinking water and soil is 7E-04, which exceeds EPA's 1E-06 to 1E-04 risk management range. Background risk in this area is 5E-04. The

primary exposure pathway contributing to the cancer risk is exposure to soil and the primary chemical contributor is arsenic.

The site-related total noncancer hazard index (HI) for an adult is 39 and for a child is 107, and background HI for an adult is 33 and for a child is 83. All of the HIs are above EPA's hazard threshold of 1. The primary exposure pathway contributing to the noncancer HI is exposure to soil and the primary contributors are arsenic, antimony, and thallium.

Recreational Users

The total ELCR for the recreational user, including swimming and wading exposure to both surface water and sediment and recreational fish ingestion is 1E-05 and background risk is 8E-06. The primary exposure pathway contributor to the cancer risk is sediment exposure and the primary chemical contributor is arsenic.

The site-related total noncancer HI is 14, and background HI is 1. The primary exposure pathway is fish ingestion and the primary chemical contributor is methyl mercury.

Trespasser

The total ELCR for the trespasser, including exposure to both on-mine soil and surface water in Herman Impoundment is 4E-05, background risk is 7E-06.

The site-related total noncancer HI is 7, and background HI is 2. The exposure pathway that contributes the most to both cancer risk and noncancer hazard is exposure to soil exposure at the mine site. The primary contributor to cancer risk is arsenic and to noncancer HI is arsenic. It is important to note that swimming in Herman Impoundment is not a common occurrence and was included in the HHRA as a very conservative assumption.

Traditional Tribal Receptors

The total ELCR for the traditional tribal receptor, including exposure to soil, potential future drinking water from Clear Lake, recreational exposure to surface water and sediment, and plant, fish, and water fowl ingestion is 1E-03. Ambient or background risk for this receptor is 2E-03 .

The site-related noncancer HI is 76 for an adult and 133 for a child, and background HI is 62 for an adult and 133 for a child. The pathway primary contributor to the noncancer HI is fish ingestion.

Uncertainties

There are numerous uncertainties associated with the evaluation of risk at SBMM. Some of the more important uncertainties are discussed briefly in the following subsections.

<u>Mercury Speciation</u>

Total mercury results were assessed using speciation percentages, as certain forms (i.e., mercuric chloride) are considered much more bioavailable than other forms (i.e., mercuric sulfide). The speciation

of mercury is related to the risk discussion because some forms, such as mercuric sulfide, have very low bioavailability and thus are not expected to accumulate in the food chain or be bioavailable in the gastrointestinal tract during incidental soil ingestion, and typically are excluded as COPCs. Assumptions related to mercury speciation (and associated toxicity) add uncertainty to the HHRA. However, the assumptions used would be expected to either balance out or have a net effect of overestimating mercury hazards. This is because although methylmercury is 1.6-fold more toxic than mercuric chloride, the lower toxicity and much lower bioavailability associated with mercuric sulfide (which may be a common form of mercury contributing to elevated mercury levels in sampled media at the Site) has not been considered. In addition, the overall mercuric chloride hazards estimated for the various Site receptors are generally close to or less than 1 (except for trespasser swimming in Herman Impoundment, which is highly unlikely); therefore, relatively minor adjustments in mercury speciation assumptions for inorganic mercury at the Site would not be expected to significantly alter risk assessment conclusions.

Tribal Cultural Use Risks and Hazards

Unique exposure factors have been used in the HHRA for this sensitive receptor population (EPA 2007; Harper 2018). Many of these unique exposure factors result in elevated risks and hazards. However, as discussed previously, enhanced exposures, such as an assumption of consuming 4 liters of Clear Lake surface water per day, an incidental soil ingestion rate of 400 milligrams per day, and a diet based on harvesting 100 percent of food items from SBMM COPC-impacted areas (for 365 days per year for 70 years, for an adult), are based on a reasonable maximum exposure that assumes that a traditional tribal lifestyle, based on the resource availability of the past, is practiced full-time. In order to harvest sufficient calories to support this diet, for instance, a substantial portion of daily life would need to be committed to the practice of hunting and harvesting of wild plants. Whether sufficient resources are available within the COPC-impacted areas to support this level of harvest was not evaluated. Therefore, the estimated risks and hazards for traditional tribal receptors would most appropriately be viewed as potential. These types of potential risks and hazards are provided to bound risk and hazard estimates for SBMM. These types of bounding risk and hazard estimates may be used by risk managers and stakeholders in the decision-making process.

COPCs in Surface and Subsurface Soil

For the soil risk calculations for the lakeside residents and tribal EIC members, surface and subsurface soil data were merged. There is some uncertainty associated with the merging of COPC concentrations in surface and subsurface soil in the calculation of exposure point concentrations (EPCs) used in the HHRA. Some receptors are only expected to be exposed to COPCs in surface soils (e.g., current lakeside residents and current tribal EIC members) but were evaluated as if exposed to both surface and subsurface soil. Current lakeside residents had risks and hazards underestimated, as arsenic concentrations were found to be greater in subsurface soils compared with surface soils. Adjusting for this uncertainty for current lakeside residents, the estimated lifetime cancer risk for exposure to only surface soil resulted in a slight exceedance of EPA's risk management range of 1E-04.

Estimation of Mercury Concentrations in Soil at Elem Indian Colony

The estimation of the mercury concentration in soil at the EIC was based on merging two data sets. One data set was from non-excavated areas where mercury contamination was generally below the historical cleanup level of 80 milligrams per kilogram (mg/kg) (i.e., with a Colony-wide exposure point concentration equal to 0.66 mg/kg) and a second data set represented clean backfill (i.e., 12.87 mg/kg) that was used to fill in excavated cleanup areas. These two exposure point concentrations were combined using an 80 percent to 20 percent ratio based on the relative area of the EIC land that was excavated and backfilled (20 percent) and the area that was not excavated (80 percent). There are uncertainties associated with this approach. In particular, the 80:20 areal percentages only take into account the relative surface areas based on historical excavation footprints. In addition, there is uncertainty because the behavior and activities of tribal members relative to surface soil concentrations of COPCs is not known. It is assumed, therefore, that time spent in non-excavated areas versus backfilled areas is proportional to the areal extent of each on the EIC.

Ambient Sediment Data and Impacts to the Plant Ingestion Risk Results

The ambient sediment data were collected at locations to represent the Oaks Arm shoreline conditions at a sufficient distance from the mine. Sediment samples were collected between 1 and 2 miles from the mine. However, the arsenic concentrations found in these data (ambient sediment) were elevated in comparison to the arsenic concentrations found in the North wetland area. Studies such as Rueda et. al. (2003) suggest circulation patterns in Clear Lake may be transporting heavy metals from SBMM out into the main lake (well beyond 1 – 2 miles). Therefore, the ambient arsenic sediment concentrations may be related to releases from SBMM, and not truly representative of ambient background. As the ambient sediment data were used in the calculation of background tules and cattail plants, the incremental risks and hazards from ingestion of tules and cattails may be underestimated.

Conclusions

The HHRA was performed to evaluate the potential human health effects associated with chemicals at the SBMM. Receptors evaluated included lakeside residents, recreational users, trespassers, and traditional tribal receptors. Exposure pathways evaluated for the lakeside resident includes exposure to soil in their yards and SBMM Road and their drinking water from Clear Lake. For the recreational user, exposure pathways evaluated include recreational fishing (a low and a high ingestion rate) and exposure to sediment and surface water while swimming or wading in Clear Lake. For the trespasser, exposure pathways evaluated include exposure to on-mine soil, exposure to surface water while swimming in Herman Impoundment, and inhalation of hydrogen sulfide or mercury vapors at the Mine Site. For the traditional tribal receptors, exposure pathways evaluated include exposure to soil on the EIC, exposure to drinking water obtained from Clear Lake (though municipal water supply is currently plumbed to residences), and ingestion of fish, plants (acorns, tules, and cattails), and waterfowl (assuming 100% of calories are derived from site-influenced areas).

The total ELCR for the Lakeside Resident, including exposure to both drinking water and soil exceeds EPA's 1E-06 to 1E-04 risk management range. The primary exposure pathway contributing to the cancer risk is

exposure to soil and the primary chemical contributor is arsenic. The site-related total noncancer hazard index (HI) for an adult and for a child are above EPA's hazard threshold of 1. The primary exposure pathway contributing to the noncancer HI is exposure to soil and the primary contributors are arsenic, antimony, and thallium.

The total ELCR for the recreational user, including swimming and wading exposure to both surface water and sediment and recreational fish ingestion is within EPA's risk management range. The primary exposure pathway contributor to the cancer risk is sediment exposure and the primary chemical contributor is arsenic. The site-related total noncancer HI is exceeds the noncancer threshold of 1. The primary exposure pathway is fish ingestion and the primary chemical contributor is methyl mercury.

The total ELCR for the trespasser, including exposure to both on-mine soil and surface water in Herman Impoundment is within EPA's risk management range and the site-related total noncancer HI exceeds the noncancer threshold of 1. The exposure pathway that contributes the most to both cancer risk and noncancer hazard is exposure to on mine soil. The primary contributor to cancer risk is arsenic and to noncancer HI is arsenic. Swimming in Herman Impoundment is not a common occurrence and was included in the HHRA as a very conservative assumption.

The total ELCR for the traditional tribal receptor, including exposure to soil, potential future drinking water from Clear Lake, and plant, fish, and water fowl ingestion exceeds EPA's risk management range. The site-related total noncancer HI also exceeds the noncancer threshold. The pathway primary contributor to the noncancer HI is fish ingestion.

1.0 INTRODUCTION

E2 Consulting Engineers, Inc. (E2) and Aptim Federal Services, LLC (APTIM) prepared this Sitewide Human Health Risk Assessment (HHRA) for the Sulphur Bank Mercury Mine (SBMM) Superfund Site (the Site) in Clearlake Oaks, California for the U.S. Environmental Protection Agency (EPA) in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act , under Contract No. EP S9 13 02, Task Order Number 045.

SBMM, located on the eastern shore of the Oaks Arm of Clear Lake in Lake County, California (Figure 1-1), has been mined for sulphur and mercury ore from the late 1800s to 1957. The Site is on the eastern shore of the Oaks Arm of Clear Lake (Oaks Arm), approximately 100 miles north of San Francisco. It is adjacent to the Elem Indian Colony (EIC). EPA has divided the Site into two operable units (OUs): OU-1, and OU-2. OU-1 includes the property that is the inactive former SBMM, the flooded pit lake (Herman Impoundment) and the non-lake portion of the site. Herman Impoundment is separated from Clear Lake by a waste rock pile known as the Waste Rock Dam. OU-2 includes the Clear Lake and the wetlands north of the mine property. Off-site residential soils affected by mining waste within the EIC and Bureau of Indian Affairs Road 120 (BIA 120) area, and soils in the residential areas along Sulphur Bank Mine Road are included in this HHRA and are anticipated to be remediated along with OU-1.

As a consequence of past mining and disposal practices and natural fate and transport processes, environmental media (e.g., fish, soils, groundwater, sediments, surface water, and air) have become contaminated with metals from the mine (including naturally occurring hydrogen sulfide in air from geothermal springs). The levels of mercury in fish from the lake led the State of California to issue an advisory to limit consumption of fish.

This sitewide HHRA evaluates the probability and magnitude of potential adverse effects on human health associated with exposure to chemicals in environmental media at SBMM. This HHRA was prepared in a manner consistent with EPA's *Risk Assessment Guidance for Superfund, Part A* (EPA 1989)*, Part B* (EPA 1991b) and *Part E* (EPA 2004a) (Guidance referred to herein as RAGS) and supporting documents and guidelines published by the California Environmental Protection Agency (Cal/EPA) as referenced in this report. The HHRA generally follows the risk assessment approach presented in the RAGS, Volume I: Human Health Evaluation Manual (Part A) (EPA 1989) and other current EPA resources and guidance documents as noted throughout this HHRA. Specific guidance with regard to potential tribal exposures include Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual (EPA 2007) and Sulphur Bank Mercury Mine Reasonable Maximum Exposure (RME) Scenario (Harper 2018).

The EPA is currently preparing this sitewide HHRA with the input and support of the stakeholders, including the EIC, California Department of Toxic Substances Control (DTSC), Central Valley Water Quality Control Board (Water Board), and local residents and agencies. The purpose for conducting a sitewide HHRA include:

- An earlier baseline public health evaluation (BPHE) was done in 1994. The site conditions have changed in the last 25 year, which necessitates reevaluation of existing site conditions and the inclusion of additional available data.
- Previous human health risk studies conducted by EPA did not include tribal exposure scenarios. Hence, there was a need to evaluate risk associated with the tribal practices.
- Completion of the decision process for OU-1 requires an updated HHRA to support the extent and performance requirements for the OU-1 remedy.
- The future evaluation of OU-2 remedial alternatives requires understanding of the human health risk associated with Clear Lake.

This HHRA characterizes the potential for current and future cancer risks and noncancer health hazards to people who may be exposed to elevated metals concentrations caused by mining activities. The exposure assumptions recommended by EPA and incorporated into this HHRA are conservative (i.e., representative of the highest exposure that is reasonably expected to occur at a site) and thus are expected to over-estimate rather than under-estimate impacts to human health.

This report is organized as follows:

- **Section 1.0—Introduction:** This section provides the purpose of the sitewide HHRA.
- **Section 2.0— Background Site Information:** This section provides background information for the Site.
- **Section 3.0— Summary of the Previous Human Health Risk Assessments:** This section provides information from previous risk assessments and previously used site-specific cleanup goals.
- **Section 4.0— Chemicals of Potential Concern:** This section identifies chemicals of potential concern (COPC) and presents and discusses important mercury speciation information.
- **Section 5.0— Summary of Site Data Used in the HHRA:** This section summarizes the relevant data for soil, sediment, groundwater, surface water, air, fish tissue, plants and birds that have been used in the risk evaluation.
- **Section 6.0— Exposure Assessment:** This section identifies the potentially exposed populations (e.g., receptors) and the exposure routes and presents the exposure point concentrations (EPCs) which are calculated for the COPCs. It also presents and discusses the contaminant transport processes and exposure models. The health-protective exposure factors selected from the guidance documents (EPA 2014, 2011, 2007; Harper 2018) are used to assess the magnitude, frequency, and duration of exposure (as daily intakes) for each exposure route.

- **Section 7.0— Toxicity Assessment:** This section presents site-specific carcinogenic and noncarcinogenic toxicity criteria for COPCs.
- **Section 8.0— Risk Characterization:** This section summarizes quantitative risks and hazards by combining toxicity criteria with intakes for each exposure route for the selected receptor populations. Site-related and background risks/hazards are presented.
- **Section 9.0— Uncertainties:** This section presents potentially significant uncertainties in the models used, in the exposure parameters, and in the toxicity assessment.
- **Section 10.0— HHRA Summary and Conclusions:** This section provides a summary of HHRA results, as well as Multi-Pathway site-related and background cancer risks, and noncancer hazards for each receptor.
- **Section 11.0— References:** This section includes references cited within this HHRA.
- **Appendix A**: This appendix includes tables which contain a list of samples used by media.
- **Appendix B**: This appendix provides summary statistics tables by media and receptor.
- **Appendix C**: This appendix includes risk calculation tables.
- **Appendix D**: This appendix contains Surface Water Dermal Absorption Factors (CD only).
- **Appendix E**: This appendix includes ProUCL Output (CD only)**.**
- **Appendix F**: This appendix contains Mercury Speciation Results.
- **Appendix G:** This appendix contains a Box plot of Clark's grebe and Western grebe blood total mercury (THg) data**.**
- **Appendix H:** This appendix contains the laboratory reports for the USGS fish tissue data.

2.0 BACKGROUND SITE INFORMATION

The Site is located near Clearlake Oaks, California. Execution of work at the site is performed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Contingency Plan (NCP). EPA is the funding and lead agency. The owner of the former mine site is the Redevelopment Trust, as established by the Consent Decree (U.S. District Court Northern District of California, Civil Action No. 3:08–CV–03968 TEH, April 18, 2012) for the SBMM Superfund site. EPA, U.S. Army Corps of Engineers, the California DTSC, the Central Valley Regional Water Quality Control Board, and EIC have provided technical advice and environmental regulatory input during the execution of work at the Site.

2.1 Background Information

SBMM is located on the eastern shore of the Oaks Arm of Clear Lake (Oaks Arm), approximately 100 miles north of San Francisco. The physical site features are shown on Figure 1-1. SBMM can be accessed along the northwest side of Sulphur Bank Drive, approximately 1.5 miles southwest of its intersection with State Highway 20. SBMM is approximately 0.5 mile south of Clearlake Oaks (population 2,400) and 5 miles north of the city of Clearlake (population 15,200).

SBMM was formerly owned by the Bradley Mining Company, the last operator of the mine. In June of 2012, the property was transferred to the Redevelopment Trust, established as part of a settlement agreement for the site with the previous owners. The Redevelopment Trust manages the site parcels in accordance with EPA's remedial objectives for the site.

SBMM was placed on the National Priorities List (NPL) in August 1990. EPA has designated two operable units (OU) at the Site. OU-1 consists of the mine property which includes the flooded pit lake (Herman Impoundment) and approximately 3 million cubic yards of mercury- and arsenic-containing mine wastes at several locations on the mine property (Tetra Tech 2006). The contaminated sediment and mine waste in Clear Lake and the North Wetlands have been designated as OU-2. Residential soils affected by mining waste within the Elem Indian Colony (EIC) and Bureau of Indian Affairs Road 120 (BIA 120) areas will be designated by EPA as the OU-4.

SBMM includes the 160-acre property that is an inactive mercury mine (EPA 2002), the contaminated mine wastes derived from SBMM are present in Clear Lake sediment and in the wetlands north of the mine property (North Wetlands). Mine wastes associated with OU-4, and along the Sulphur Bank Mine Road, which are adjacent to the mine property, were removed by EPA previously during various removal actions; however, some residual wastes still remain. An analysis of the areas with residual waste is included in the OU-1 Focused Feasibility Study (FFS) (E2 2020) for consideration of further remedial action as necessary.

Herman Impoundment is separated from Oaks Arm by the Waste Rock Dam, which was constructed from mine-related waste rock. Oaks Arm is the smallest of the three arms of Clear Lake (Upper, Lower, and Oaks Arms). The Oaks Arm watershed consists of approximately 12,850 acres (less than 4 percent of the Clear Lake watershed) and includes the community of Clearlake Oaks, a portion of the community of Glenhaven, and the SBMM Superfund Site. Schindler Creek is the primary drainage in the Oaks Arm watershed.

2.2 Land Use

2.2.1 Current Land Use

The former SBMM is inactive, and current site uses extend to trespass and access to residential areas southwest of the former mining site via the Sulphur Bank Mine Road. Resources in the area of the former mine includes open space, scenic views of Clear Lake, the hydrogeothermal system beneath the former mining site, potential geologic resources, and surface water in Clear Lake.

Groundwater at the site is either of insufficient quality (due to the natural hydrothermal constituents such as boron, chloride, ammonia, and total dissolved solids) or of insufficient quantity to be considered a source of drinking water or irrigation supply without treatment.

The Elem Indian Colony is immediately adjacent (northwest) of the former mining site and includes tribal member homes and limited open space. SBMM directly abuts the Elem Indian Colony to the south (OU-1) and west (OU-2/Clear Lake). The North Wetland (included in OU-2) is east of the Elem Indian Colony and is zoned as rural and rural residential land held by the Redevelopment Trust. Additional private residential land (along Sulphur Bank Mine Road) is located adjacent to the former mining site to the south and west.

Currently, the Elem Indian Colony uses available land for subsistence hunting, fishing, and gathering as part of their traditional lifestyle. Wildlife, including deer, turkeys, quail, waterfowl, coyotes, eagles, osprey, owls, squirrels, and occasionally bears, has been observed in the area, including on the mine site. Clear Lake is a productive fishery, supporting predominantly bass and catfish fishing.

2.2.2 Reasonably Anticipated Future Land Uses

The SBMM site has a complex history and current land use, which leads to a more complex analysis of the reasonably anticipated future land uses (RAFLU). There are two resident populations, the Elem colony immediately North, and adjacent to the mine site, and the residents to the Southeast (former Bradley property) and South. A number of parcels formerly owned by the Bradley Mining Company are identified in the Consent Decree for eventual transfer to the EIC. The Consent Decree also lists parcels which are for sale by the Redevelopment Trust. The EIC has expressed a desire to purchase or acquire the parcels which are for sale by the Redevelopment Trust.

The potential future land uses are:

1. North of the BIA 120 road: This area is the north wetland and pastureland which could be transferred to the Elem colony and would be used for traditional tribal practices, or potentially residential development on portions outside the wetlands.
2. Mine site: The former mine site will have extensive remediation and permanent institutional controls, including access restrictions. There are portions north of Herman Impoundment which do not contain mine waste and could potentially be sold by the Redevelopment Trust to offset the cost of the remediation. The portions which have mine waste would have access restrictions and the only visitors would be trespassers. Wildlife could not be restricted by conventional fencing and therefore the tribal practice of harvesting local wildlife and game could involve wildlife and game which pass through or live on portions of the site which have been remediated.
3. South and Southeast of the mine site: The potential land uses for parcels south and southeast are residential and possibly livestock grazing.

2.3 Off-Site Residential Soils Removal Actions

Three non-time critical removal actions relative to off-site residential soils have been completed.

- 1997 removal of arsenic and mercury contaminated soils at the EIC
- 2007 NTCRA for further removal of mine waste from the EIC
- 2008 removal for site-influenced soils in the neighborhood off Sulphur Bank Mine Road
- 2010 Soil removal at BIA-120 and NWWRP

1997 Removal Action

In 1997, EPA completed a removal action that removed approximately 3,300 cubic yards of mine waste from within EIC (CH2M 2008c). Mine waste was excavated to a depth of approximately 18 inches below ground surface in thirteen residential lots. Mine waste was removed to approximately 6 inches below ground surface (bgs) around trees, shrubs, and flower beds. Building slabs and foundations were removed from four lots. In addition, mine waste was removed from the road between two lots.

2007 NTCRA

A non-time-critical removal action (NTCRA) was completed by the EPA at EIC in 2007 (CH2M 2008c). This removal action was based on data from 1992, 1997, and 2002 soil sampling events (CH2M 2008c), as well as investigations conducted in 2005 and 2006 by CH2M Hill (CH2M 2008c). These investigations showed that there were still mine wastes remaining in many of the lots that were excavated in 1997. The 2007 NTCRA removed over 29,500 cubic yards of mine waste, replaced seven homes, refurbished six homes, demolished and removed several dilapidated structures, reconstructed 3,700 feet of roadway and sidewalks, and reconstructed the water supply system in those areas. Mine waste and debris were hauled

to a disposal cell at SBMM. Post-excavation site restoration included placement of clean fill and enriched topsoil, hydro seeding with native flowers and grasses, and planting oak trees, fruit trees, and shrubs. During cleanup, previously determined risk-based action levels for mercury and arsenic (80 and 23 milligrams per kilogram [mg/kg], respectively) were revised (280 and 81 mg/kg, respectively) for a few specific locations to protect EIC cultural resources which were discovered during the excavation. As part of the Phase 1A excavation, mine waste was fully removed from residential lots: [redacted]. As part of Phase 1B excavation, mine waste was removed from the roadway shoulders and adjacent sections of lots along the paved road (Pomo Street and EL-EM Drive). Small amounts of mine waste were left in place, and were covered with soil covers or the roadway system to prevent direct contact exposure. This removal action was completed in a manner that provides for the protection of human health and the environment for EIC residents.

Results from the 2006 and 2007 soil sampling investigations indicated that arsenic and mercury concentrations in soil exceeded screening levels in several areas near Sulphur Bank Mine Road (CH2M 2008a). A removal action was conducted in January and February 2008 as an emergency response and time-critical removal action along the Sulphur Bank Mine Road, Ward Road, and adjacent properties (CH2M 2009a). The removal action was conducted by EPA's Emergency Response and Removal Services (ERRS) with sampling support from the EPA Superfund Technical Assistance and Response Team (START) team. The technical memorandum Sulphur Bank Mine Road Interim Removal Action Proposed Soil Removal Locations (CH2M 2008b) was used to initially plan this removal action. Several shallow soil areas, where arsenic and mercury concentrations exceeded screening levels were recommended for excavation. A total approximate volume of 3,549 cubic yards of mine waste was excavated during this removal action. Some soil with mercury concentrations exceeding cleanup goals of 80 milligrams per kilogram (mg/kg) and 23 mg/kg for mercury and arsenic, respectively, was left in place, but this soil was at least one foot below ground surface and covered with clean topsoil. A site-wide soil investigation done in 2009 concluded that there are elevated levels of arsenic or mercury along the roadway and shoulders of Sulphur Bank Mine Road, which are described in Section 5.1.1 (CH2M 2009b).

BIA 120 and Northwest Waste Rock Pile NTCRAs

A NTCRA was completed in 2010 for Bureau of Indian Affairs Route 120 (BIA 120), the main roadway used to access the EIC along the north and northeast boundary of OU-1 (ITSI 2011). A site-wide soil investigation done in 2009 concluded that there were elevated concentrations of arsenic or mercury at the roadway and shoulders of BIA 120 and the area near the intersection of BIA 120 and Sulphur Bank Drive including the east shoulder of Sulphur Bank Drive immediately south of the intersection (CH2M 2009b). Approximately 4,000 lineal feet of BIA 120 was replaced. Rather than excavate a large volume of mine waste, the profile of the roadway was raised. Mine waste that was excavated was removed from the site and placed at SBMM, and backfilled with clean fill. The final cleanup along BIA 120 included placement of at least one foot of compacted clean fill at the road's shoulder or an engineered roadway system over all mine waste, with utilities in a clean corridor.

An additional possible NTCRA is under evaluation at this time. This additional NTCRA and EE/CA are focused on evaluation of removal action alternatives for a portion of the SBMM known as the NWWRP. The EE/CA will support decision making for a Non-Time Critical Removal Action (NTCRA) to address the NWWRP. The NTCRA is one element of EPA's ongoing Superfund cleanup action for the SBMM Superfund Site. The NTCRA will constitute a portion of the cleanup action for the site in an accelerated manner, addressing the most immediate risks to human health and the environment in a manner consistent with the likely long-term remedy for the SBMM Superfund Site. For this EE/CA, the NWWRP project is divided into three primary components: the North Lobe (north of Bureau of Indian Affairs Road 120 [BIA 120]), the South Lobe (south of BIA 120), and the Northwest (NW) Pit. The entire NWWRP is estimated to have a surface area of approximately 149,000 square feet, a volume of 64,000 cubic yards, and an approximate maximum thickness of 40 feet.

Alternatives are provided in NWWRP EE/CA for removal of the NWWRP and various options for on-site consolidation or off-site disposal of this waste rock with the exception of the waste rock that remains beneath the pavement of BIA 120 and the supporting embankments. The entire area of the NWWRP is shown on Figure 1-1. The removal area and volumes of the North Lobe and South Lobe, respectively, exclude any waste rock that may remain under the BIA 120 asphalt and embankments. Waste rock on the BIA 120 side slopes (not under the asphalt) will be removed to match the adjacent road embankment slope and to maintain the existing road stability (i.e., there will not be vertical cut made adjacent to BIA 120). Then, an additional 2 feet will be excavated, backfilled with clean fill, and a new protective layer of riprap will be placed. This approach will render the soil exposure pathway incomplete by removing as much waste rock as possible, reduce infiltration by providing 2 feet of clean fill on top of the remaining waste rock present in the road embankment, maintain the original road design and stability, and provide erosion control for the 2 feet of clean soil through the use of riprap.

3.0 SUMMARY OF THE PREVIOUS HHRA AND SITE-SPECIFIC CLEANUP GOALS

This section provides a summary of the BPHE and previously proposed site-specific cleanup goals.

3.1 1994 Baseline Public Health Evaluation

A BPHE was conducted in 1994 and was included in the Remedial Investigation/Feasibility Study report prepared by EPA (EPA 1994b). The principal objective of the BPHE was to determine if human health risks are sufficiently high to warrant risk mitigation activities through corrective action or remediation at the SBMM and selection of the most appropriate remedial alternative. The BPHE focused on potential human health risks associated with exposure to chemicals in mine material (defined as soil for the purposes of the BPHE) and air. Surface water in Herman Impoundment was also evaluated. These pathways and exposure routes were evaluated using sampling and analytical data collected for the Remedial Investigation.

The following subsections presents an overview of the results presented in the BPHE (EPA 1994a), including a summary of the COPC selection, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis.

3.1.1 Identification of Chemicals of Concern

COPCs were defined as chemicals that are potentially site-related, potentially toxic, and meet data quality criteria for risk assessment. Soil, sediment, surface water, and food items (acorns, tules, cattails, fish, and waterfowl) sampling data within and near the Site were evaluated to quantify risks and identify potential hazards. Data identified as useable were used to develop media-specific concentrations relevant to human exposure (exposure concentrations).

COPCs in all media were selected by using the following two step process: (1) comparing the maximum values to a health-based action level screening criteria recommended by EPA guidance (EPA 1989) and (2) comparing average values to background levels. The results of the COPC selection process include mercury and its multiple forms (methylmercury, elemental mercury, and mercuric chloride, arsenic, and antimony in mine wastes and overburden. Beryllium and chromium, which exceeded health-based action levels, were not evaluated as COPCs because they were considered background trace metals. In addition, the water in Herman Impoundment and hydrogen sulfide vapors emitted from geothermal vents were identified as potential acute hazards requiring qualitative evaluation.

Exposure concentrations for each media were estimated based on an average concentration, using the arithmetic mean concentration and its associated 95 percent upper confidence limit on the mean (95 percent UCL). The mean and the 95 percent UCL exposure concentrations for the COPCs were combined with human intake assumptions to determine "best" and "high end" estimates of exposure.

3.1.2 Exposure Assessment

An exposure assessment included an evaluation of potential human receptors that could come in contact with site-related COPCs, as well as routes, magnitude, frequency, and duration of exposure. The exposure assessment included the following steps:

- Environmental fate and transport
- Potentially exposed populations
- Identification of exposure pathways
- Quantitative and qualitative evaluation of exposure pathways

Disposal of mine wastes in the past has been a significant source of mercury input into the environment. In turn, these deposits may act as secondary sources of heavy metals through a number of fate and transport processes. Fate and transport of mercury, arsenic, and antimony in the environment are described further in the BPHE (EPA 1994a).

Potential human receptors on site at SBMM or in surrounding residential and recreational areas were identified within the following three geographic areas: (1) SBMM, (2) adjacent residential areas, and (3) the Clear Lake study area. Each of these potential receptors was evaluated in the BPHE to determine if complete exposure pathways are present. Exposure from consumption of garden vegetables was not evaluated because at the time the report was being prepared vegetable gardening did not occur. Complete exposure pathways that bring site-related COPCs in contact with people included the following:

- Ingestion of mine soil, inhalation of airborne dust, and inhalation of volatiles by recreational trespassers on site
- Ingestion of yard soils and indoor dust, inhalation of airborne dust, and inhalation of volatiles by future residents
- Direct contact with surface water or inhalation of hydrogen sulfide gas in Herman Impoundment by recreational trespassers on site and future residents

Risk from exposure to surface water, other than acid water in Herman Impoundment, and groundwater was not evaluated in the BPHE because the pathway was not complete.

Chemical intake rates were estimated for all complete exposure pathways based on the exposure point concentrations and on the estimated magnitude of exposure to contaminated media.

Risk calculations for soil ingestion for the child and lifetime resident were based on the following assumptions:

- Average weight of child: 15 kilograms (kg)
- Average weight of adult: 70 kg

- Average weight of child-adolescent: 43 kg
- Ingestion rate of soils for child: 200 milligrams per day (mg/day)
- Ingestion rate of soils for others: 100 mg/day
- Lifetime exposure of 30 years based on the 90th percentile
- Child exposure duration of 6 years
- Frequency of exposure of 7 days and all year (except for two weeks when residents were assumed to be on vacation
- Included total dust ingested in both indoors and outdoors

Risk calculations for inhalation were based on the following assumptions:

- Inhalation rate of child: 0.66 cubic meters per hour (m^3/hr) – residential
- Inhalation rate of adult (0.83 m^3/hr) – residential
- Child-adolescent: 0.83 m^3/hr – residential
- 4.2 m^3/hr – recreational trespasser on site
- Airborne respirable dust in air was conservatively assumed to be equal to the national Ambient Air Standard for respirable dust (50 micrograms per cubic meter [µg/m^3])
- Metal concentrations in airborne dust were modeled based on metal concentrations in soil

3.1.3 Toxicity Assessment

The toxicity assessment evaluated (1) available evidence regarding the potential for particular chemicals to cause adverse effects in exposed individuals (toxicity values) and (2) the relationship between extent of exposure to an agent (exposure estimates) and the increased likelihood and/or severity of adverse effects (dose-response assessment). Both long-term carcinogenic and non-carcinogenic (or systemic) effects of chemicals were evaluated.

Two types of non-carcinogenic (or systemic) effects were evaluated in the BPHE, chronic effects and acute (or short-term) effects. Short-term toxicity, associated with accidental exposures to acid mine water and hydrogen sulfide gas on site were evaluated qualitatively by comparing on-site pH and concentrations to appropriate benchmarks of acute toxicity (for example, short-term California Ambient Air Quality Standards). Chronic effects of chemicals (defined as occurring as the result of seven years to a lifetime of exposure) are generally thought to occur only if exposure to a chemical exceeds some threshold value.

Cancer effects were evaluated by a different method. Potential carcinogenic risks were compared to the risk management range established by EPA in the NCP, 40 Code of Federal Regulations 300.430 (a risk range of 1E-06 to 1E-04).

3.1.4 Risk Characterization

Risk characterization combined the exposure and toxicity assessment to produce quantitative estimates of risk from COPCs. Both complete and potentially complete exposure pathways for current and future scenarios were evaluated. Current scenarios evaluate risk to individuals who trespass on site. Trespassers may encounter metals and potentially acute contaminants (acid mine water and hydrogen sulfide gas). Under a future land-use scenario, the BPHE also evaluates risks associated with living on site.

Hazards associated with these scenarios were described further in the BPHE. Health risks presented are for the highest exposure that is reasonably expected to occur at a site under current and future land use conditions (high-end estimate). Typical or best estimates were also presented.

3.2 Site-Specific Cleanup Goals

Results of the BPHE indicated that mercury posed a potential hazard to the most sensitive users of the site: child/adolescent recreational trespassers residing near SBMM. Although the risk assessment identified that mercury poses unacceptable risk to future on-site resident, residential use was not considered a reasonably anticipated future land use (EPA 1995). Cancer risk from exposure to arsenic to trespassers was within the acceptable range of 1E-06 to 1E-04. Preliminary guideline concentrations calculated based on the risk assessment for cleanup of mercury in soil were 80 mg/kg total mercury for residential exposure and 280 mg/kg for trespasser exposure (child/adolescent trespasser). The site-specific cleanup goal for arsenic was determined to be 23 mg/kg (EPA 1995) for residential exposure. Past removal actions (1997 through 2010) used the arsenic level of 23 mg/kg as a cleanup goal.

Considering that the most sensitive potential future land use for OU-1 could be recreational, EPA further evaluated the site-specific cleanup goal for mercury and arsenic assuming a recreational exposure scenario on site at SBMM (EPA 1995). Three different recreational scenarios were evaluated; (1) on-site recreational trespasser scenario (same as in BPHE), (2) future golf course scenario, and (3) future regional park scenario. On evaluation of scenario 1 and 2, it was determined that if off-site exposure in residential soils were addressed, on-site soils would be of marginal concern (due to reduced frequency), therefore development of cleanup goals for scenarios 1 and 2 was not warranted. The cleanup goal for the future regional park scenario was determined using probabilistic risk assessment approach. It was concluded that the non-carcinogenic hazards associated with arsenic were lower than for mercury and the arsenic levels in soil were within EPA's risk management range. The average and maximum target goals for mercury in soil were determined to be 60 and 90 mg/kg, respectively, for an exposure of 3 hours per day for 1 to 3 days per week per visit to the park.

Several evaluations were conducted after the BPHE at SBMM to determine the site-specific cleanup goals for soil (EPA 1995; EPA 2004b; and Tetra Tech 2006). Alternative cleanup goals for mercury, arsenic and antimony in soil assuming recreational land use were developed further by EPA in 2004 and 2006 (EPA 2004b; Tetra Tech 2006). The assessments were more conservative and based on the most sensitive

receptor: child (1 to 6 years) during family outings. The calculated adjusted cleanup goals for an exposure frequency of 2 days per week were determined to be:

- Mercury = 280 mg/kg,
- Arsenic = 77 mg/kg (14 mg/kg for carcinogenic risk), and
- Antimony = 110 mg/kg.

4.0 CHEMICALS OF POTENTIAL CONCERN

Chemicals of potential concern are chemicals that are carried through the quantitative HHRA process (EPA 1989). The SBMM area was mined because the soil is rich in minerals and metals, and the COPCs in site source materials include all constituents that occur naturally in the soil (except those that are essential human nutrients, as discussed below). In areas of past mining activity the availability of and potential for these constituents to adversely affect human health is increased for several reasons, including changes in the topography and hydrology of the mine area that can result in increased surface water runoff, erosion and sediment transport to downstream areas as well as geochemical changes in the metals or other parameters (e.g., pH).

All detected chemicals were selected as COPCs, except for essential nutrients (calcium, magnesium, potassium, and sodium) and inorganic parameters with no toxicity values (i.e., alkalinity, chloride, etc). COPCs in soil, surface water, sediment, plants, and vapors are summarized in Table 4-1. Fish and bird ingestion (placeholder) exposure pathways were only evaluated for mercury because prior studies have confirmed bioaccumulation in Clear Lake fish is a public health concern and mercury bioaccumulation in birds (primarily aquatic birds such as waterfowl) is a suspected human health concern due to mercury's known potential to significantly bioaccumulate in the aquatic food chain. The inhalation of vapors pathway was evaluated for hydrogen sulfide and mercury vapors because those are the two volatile COPCs.

Mercury occurs naturally in the environment and exists in several forms. These forms are categorized as: metallic (elemental) mercury, inorganic mercury, and organic mercury. Fate and transport processes determine the predominant form of mercury present in various environmental media. Metallic mercury is a shiny, silver-white metal that is a liquid at room temperature. At room temperature, some of the metallic mercury will evaporate and form mercury vapors. Metallic mercury is the elemental or pure form of mercury which historically was commonly used in thermometers. Inorganic mercury is formed when mercury combines with other elements such as sulfur or chloride. Some inorganic mercury compounds are referred to as mercury salts. When mercury combines with carbon (usually due to microbial processes), the compounds formed are organic mercury, such as methyl mercury (ATSDR 1999).

4.1 Speciation of Total Mercury

The speciation of mercury is related to the COPC discussion because some forms, such as mercuric sulfide, have very low bioavailability and thus are not expected to accumulate in the food chain and typically are excluded as COPCs. Mercury speciation uncertainties, including the assumptions related to methylmercury (an organic form of mercury), are discussed in Section 9.1.

4.1.1 Mercury Speciation Background

Total mercury was measured in the soil and sediment samples collected for the HHRA. Both mercuric chloride and mercury salts have an oral toxicity reference dose (RfD) of 0.0003 milligrams per kilogram-

day (EPA 2019c). Different forms of mercury have different toxicity values associated with them. Although mercuric sulfide toxicity is discussed in EPA (2002d), as well as in Section 9.1 (Uncertainties), this form of inorganic mercury lacks a robust toxicity value.

Mercury may be present in several different forms at the SBMM, as a result of speciation (e.g., weathering, complexation with other inorganic chemicals present in the environment, and/or microbial transformation). It was assumed the mercury at the Site is in the form (speciation) of mercuric chloride in soil, soil particulates in air from wind mobilization, sediment, plants, and surface water. It was also assumed the mercury at the Site is in the form of methylmercury in fish tissue and waterfowl tissue. Mercuric sulfide has low bioavailability and mercuric chloride has greater bioavailable. Therefore, mercuric chloride is considered the primary inorganic toxic component.

4.1.2 Mercury Speciation Sampling

Mercury speciation can be quantified by applying unique laboratory sequential extraction techniques to Site soil and/or sediment samples, as discussed by Bloom et al. (2003) and Brooks Applied Labs (2017). During the November 2018 sampling event, soil and sediment samples were collected and two soil and two sediment samples were selected for total recoverable mercury and mercury speciation (inorganic forms of mercury) using selective sequential extraction (SSE) analysis. Samples were selected to represent a range of mercury concentrations. Samples were sent to Eurofins Frontier Global Sciences (EFGS).

4.1.3 Mercury Speciation Results

EFGS provided the mercury speciation and total mercury results. The SSE and mercury analysis results were rejected by Environmental Services Assistance Teams (ESAT) in June 2019 due to issues with the mercury standard used in the analysis. Reanalysis by EFGS was performed in January 2020 (Appendix F). The following table summarizes the SSE extraction steps and their anticipated biogeochemical meaning:

Fraction	Extraction Reagent(s)	Mercury Classification (compounds expected)
Fraction F(1)	Deionized water	Water soluble mercury (i.e., mercuric chloride)
Fraction F(2)	pH2 HCl/HO Ac (represents weak acidic conditions)	Weak acid extractable mercury
Fraction F(3)	Extracted with 1N KOH (represents basic conditions)	Organo complexed mercury
Fraction F(4)	Extracted with 12N HNO3 (represents strong acidic conditions)	Strong complexed mercury
Fraction F(5)	Aqua Regia	Cinnabar, mercury selenide, mercury gold

Section 4.1.4 discusses in detail these fractions, and the inorganic mercury compounds they likely represent. For all solid samples, EFGS digested the samples for total mercury using modified Method 1631.

4.1.4 Data Evaluation

Table 4-2 presents the mercury speciation results by sample location. The F1 fraction is primarily expected to be mercuric chloride which is considered the primary inorganic toxic component. The F2 fraction is expected to contain other mercury salts, such as mercuric sulfate and mercuric oxide, which are also assumed to be toxic. The F3 fraction may also be considered to contain toxic and bioavailable components (Hagan et al 2014). Therefore, these summed three fractions (F1, F2, and F3) are presented in Table 4-2 and represent the current (2020) estimate of bioavailable and toxic mercury in SBMM soil and sediment samples. As shown in Table 4-2, this bioavailable fraction ranges from 0.6% to 52% based on the four sample results, with a mean of 15%. Due to the small sample size and the issues with the laboratory standard, a mercury bioavailability factor of 10% (Smucker 2012) has been applied to the soil and sediment ingestion risk calculations. The following lines of evidence support use of the 10% bioavailability factor at SBMM:

1. Smucker 2012 states: "*to assess oral exposures to inorganic mercury, site-specific mercury in soil is conservatively estimated at 10% $HgCl_2$ equivalence (includes mercuric chloride and mercuric oxide species) and 90 % mercuric sulfide (HgS) equivalence (includes cinnabar, metacinnabar and other mercury components sequestered within cinnabar)".*
2. *From the Carson River Mercury Site Operable Un*it 2 Human Health Risk Assessment Report (EPA, 2017): **"***A percentage of 10 percent is recommended, as this is an approximate upper-bound of the EPA (1994c) and Slowey et al. (2005) data, also taking into account the Varejao et al. (2009) results. As mercuric chloride is the most soluble form of mercury expected, it is conservative (health protective) to use an upper-bound value for this form of mercury."*
3. The SBMM geochemical model (under development) (CH2M 2016) estimates the mercuric chloride fraction to be less than 1%.

5.0 SUMMARY OF SITE DATA USED IN THE HHRA

This section summarizes Site data collected in 2018 and previous sampling data used in performance of the HHRA. COPC concentration summary statistics are presented in Appendix B. Appendix A Tables present detailed sample information, including Location (sample number), sample date, start and end sample depth (when available), and basis (e.g., dry weight; filtered or nonfiltered [total]). A variety of organizations were involved in sample collection over the years. While the specific sample collection objectives varied over time and by organization, in general, samples were collected to define the nature and extent of contamination at and around the site. Media included in the performance of this risk assessment include surface and subsurface soil (0–10 feet [ft] bgs), surface sediments (0-1 ft bgs), surface water, drinking water, wild plants, fish, and vapor. Sources of data for each media are provided in the following sections. Pre-mining ambient (background) soil data are discussed in Section 5.1.4, and are used for the incremental risk and hazard calculations. Ambient sediment and surface water data are discussed in Sections 5.2 and 5.3, and are also used for the incremental risk and hazard calculations. Summary statistics for these ambient media data sets are also included in Appendix B.

5.1 Soil

For performance of the risk assessment, soil samples were distributed into the following categories:

- Lakeside Residential Living Area
- On-mine Area
- EIC Living Area
- Pre-mining Baseline Conditions (PMB)

The sample data sets used for each area are described below.

5.1.1 Lakeside Residential Living Area

For the Lakeside Soil statistics, approximately 331 sample results are available for mercury and arsenic, 80 samples for antimony, and nine samples for the remaining metals (aluminum barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium thallium vanadium, and zinc). The samples were collected in September 2006 and May 2007. Sample depths range from surface to 10 ft bgs. A list of soil samples used in the HHRA is presented in Appendix A. Dry weight basis results are used for soil.

Soil data are available from the following documents:

- *Draft 2007 Sulphur Bank Mine Road Data Evaluation Report* (CH2M 2007a)
- *Final 2007 Sulphur Bank Mine Road Data Evaluation Report* (CH2M 2008b)

Samples locations are provided on Figure 5-1. A more detailed discussion of the data available in these reports is presented below.

A preliminary soil sampling investigation was performed in September 2006, which included portions of Sulphur Bank Mine Road, Ward Road, the driveway at [redacted] Sulphur Bank Mine Road, the property at [redacted] Sulphur Bank Mine Road, and the adjacent turnaround/parking area and boat dock. The results of the investigation are described in the *Draft Sulphur Bank Mine Road Soil Sampling Data Evaluation Report* (CH2M 2007a). Twenty continuous soil borings were drilled to develop lithologic descriptions and perform soil sampling to determine the extent of mining-related waste that was used as fill along Sulphur Bank Mine Road and Ward Road and the road shoulders.

A follow-on soil sampling investigation was performed in May 2007 in accordance with the recommendations in the *Draft Technical Memorandum Recommendations for Additional Investigation along Sulphur Bank Mine Road* (CH2M 2007b). The investigation was conducted to further delineate the nature and extent of arsenic- and mercury-contaminated soil in the Sulphur Bank Mine Road study area. Soil sampling was performed along Sulphur Bank Mine Road, Ward Road, and properties adjacent to Sulphur Bank Mine Road (south and west of the mine site). The results of the investigation are described in the *Final 2007 Sulphur Bank Mine Road Data Evaluation Report* (CH2M 2008b). Soil with elevated concentrations of antimony, arsenic, or mercury identified during the September 2006 investigation, areas potentially disturbed during mining operations (identified from historical aerial photographs), and areas identified by residential land owners were targeted for the May 2007 investigation. Eighty-six continuous soil borings were drilled in May 2007 (24 locations in and along the shoulders of Sulphur Bank Mine Road and 62 locations on the properties or driveways adjacent to Sulphur Bank Mine Road and Ward Road).

5.1.2 On-mine Area

For the on-mine Area soils statistics, approximately 49 sample results were used for samples collected in June, 1991 and analyzed for mercury and arsenic and an additional 9 results for samples collected in November/December 2018 and analyzed for mercury, arsenic, other metals and general chemistry parameters (aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, methylmercury, molybdenum, nickel, selenium, silver, sulfide, thallium, total organic carbon [TOC], vanadium, and zinc). Sample depths range from surface to 0.5 ft bgs for the 2018 samples. A sample depth for the 1991 samples is not provided but the soil samples are listed as surface soil. A list of soil samples used in the HHRA is presented in Appendix A. Dry weight basis results are used for soil.

Soil data are available from the following documents:

- *Remedial Investigation/Feasibility Study* (EPA 1994b)
- *Final Sampling and Analysis Plan for the Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California (*APTIM 2018)

Locations are provided on Figure 5-2. A more detailed discussion of the data available in these reports is presented below.

The *Remedial Investigation/Feasibility Study*, (EPA 1994b) provides data collected in support of the site investigation. Soil samples were collected to characterize mercury and arsenic contamination in the different geological matrices identified and human contact areas on site. The sample results were used in preparation of the 1994 risk assessment included in the Remedial Investigation/Feasibility Study.

The *Final Sampling and Analysis Plan for the Human Health Risk Assessment Data Gap Sampling* (APTIM 2018) and documented in the *Draft Human Health Risk Assessment Sampling Program, Technical Memorandum, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM, September 2019a) included in Appendix A to this report. The soils sample used were collocated with acorns samples collected in support of this HHRA. A total of nine samples were collected.

Figure 5-3 provides the coverage of the XRF sampling. Although the XRF data is not directly used in the risk calculations, the following discussion indicates that the concentrations detected by the XRF analysis are similar to the concentrations used in this HHRA (CLP data). Therefore, the coverage of the XRF data is applicable to the risk results. In 2000 the EPA conducted sampling of mining related rock and soil samples within the OU-1 mine site. The results were presented in detail in a technical memorandum "Mining-related Rock Sampling Technical Memorandum" July 2001. The correlation between x-ray fluorescent (XRF) results and companion lab results were presented in that report. This correlation allows the estimation of lab results from XRF results.

Metal concentrations in surface and trench samples collected from the mining-related waste piles were determined by two different techniques, XRF and the project laboratory. The XRF was used to analyze all samples collected from the various waste piles at SBMM.

A subset of the samples analyzed by XRF was sent to the project laboratory for confirmation of the results. The use of confirmation samples is intended to demonstrate the accuracy of the XRF results relative to a specific digestion method and elemental analysis procedure. Confirmation samples for this project were selected randomly at a minimum rate of 10 percent from all of the collected samples.

For this project, the QAPP selected regression analysis to evaluate accuracy. Results of XRF analysis were used as a predictor for metal analysis by the project laboratory. The results for selected analytes are summarized in the following table.

Analyte	r^2	Regression Equation
Antimony (Sb)	0.7	Lab-Sb = 0.3112*XRF-Sb – 13.079
Arsenic (As)	0.8	Lab-As = 1.0177*XRF-As – 43.457
Mercury (Hg)	0.8	Lab-Hg = 0.3877*XRF-Hg + 40.915

Analyte	r^2	Regression Equation
Lead (Pb)	0.4	Lab-Pb = 0.4437*XRF-Pb + 6.1197

The QAPP used in 2000 contemplated using XRF results as definitive data, provided the r squared value between the XRF results and the project laboratory results was greater than 0.9. If the r squared value was between 0.7 and 0.9, the XRF data could be considered screening data. Although this standard was established in the QAPP, recent communications with EPA indicate that this standard may not be applicable in all cases (EPA 2000). The Standard Operating Procedures (SOP) published by EPA for the use of the Spectrace TN9000 established an r squared value of 0.7 as sufficient for judging accuracy between XRF and analytical laboratory data. Based on this criterion, the analytical data generated using XRF would be considered definitive data, suitable for use in risk assessment, site characterization, and volume estimates.

The r squared values for antimony, arsenic and mercury were all greater than or equal to 0.7 and, therefore, the regression equations are suitable for calculating the corresponding lab concentration for those three analytes. XRF data for lead were not used to create an equivalent laboratory concentration.

The regression equation can be used to correct the XRF results based on the project laboratory results by applying the regression equation to the XRF result. It should be recognized however, that confirmatory analysis using the project laboratory is an estimate of the chemical concentration and is dependent on specific instrumentation, extraction technique, and sampling procedure. XRF is a total elemental technique. Therefore, any comparison with a referee technique must account for the possibility of variable extraction, dependent on the digestion method and its ability to dissolve the mineral form present in the collected samples.

Soil data are available from the following documents:

- *Remedial Investigation/Feasibility Study* (EPA 1994b)
- Volume 1 of the Sulphur Bank Remedial Investigation/Feasibility Study (EPA 2002a)
- *Final Sampling and Analysis Plan for the Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM 2018)

Locations are provided on Figure 5-2. A more detailed discussion of the data available in these reports is presented below.

Correcting the XRF data to equivalent lab concentrations illustrates the on mine site soils hazard can be calculated from the 1994 soil samples. The following table summarizes the average XRF and calculated lab concentrations for mercury by source area (2001 data). The average site wide concentration for the

calculated lab concentrations (2001 data) is 374 mg/kg and the average lab concentrations used in this risk assessment (1993 data) is 383 mg/kg (Appendix B-1).

A similar analysis of the XRF data could not be performed for arsenic because the XRF detection limits resulted in the vast majority of analyses being non-detect. The laboratory samples used in this HHRA for the on-mine soils had lower detection limits for the COPCs.

	Average XRF	Average Lab (Calculated)	Number of Values
East Ore Pile	1,248	525	16
West Ore Pile	1,923	786	6
Tailings Pile	424	205	62
NWWRP	846	369	11
North WRP	359	180	93
South WRP	154	101	117
West WRP	579	265	52
Disturbed Andesite	860	374	9
Disturbed Lower Lake Sediment	1,330	557	4
Total Samples			370
Sitewide Mean		374	

5.1.3 Elem Indian Colony Living Area

For the EIC Living Area soil statistics, approximately 90 sample results are available for mercury and arsenic, 69 samples for antimony and vanadium, 68 sample results for iron, and 38 samples for the remaining metals and cations (aluminum, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, and zinc) and 32 sample results for thallium. The samples were collected in June and July 2002, November 2005, and July through September 2006. Sample Depths for samples used in the risk assessment range from surface to 7.5 ft bgs. A list of soil samples used in the HHRA is presented in Appendix A. Dry weight basis results are used for soil. Soil data are available from the following documents:

- *Phase 1 Cleanup Report for the Elem Indian Colony Non-time-critical removal Action* (CH2M 2008c)
- *EPA Review Draft Elem Indian Colony Pre-Design Field Investigation Data Evaluation Report* (CH2M 2006a)

Soil sample locations for the EIC living area are shown on Figure 5-3. A more detailed discussion of the data available in these reports is presented below.

The *Phase 1 Cleanup Report for the Elem Indian Colony Non-time-critical removal Action* CH2M Hill, Inc., (2008c) describes an EIC soil sampling investigation on residential lots and paved and unpaved roads was conducted in 2002 to supplement existing data from previous investigations at EIC and more fully characterize the chemical nature, volume, and areal extent of the mine waste remaining on the residential lots following the 1997 removal action.

The *EPA Review Draft Elem Indian Colony Pre-Design Field Investigation Data Evaluation Report*, (CH2M 2006a) provides results for a pre-design field investigation at EIC and along BIA 120. After evaluating data from the 1992, 1997, and 2002 soil sampling at EIC and prior to designing the NTCRA, it was determined that additional soil investigations were necessary to more accurately estimate the volume of mine waste removal required to achieve EPA's goal of removing all mine waste at EIC. During the Phase 1 NTCRA of residential lots at EIC, to protect EIC cultural resources, EPA revised cleanup goals and excavation procedures that resulted in small amounts of mine waste left in place during the excavation of the roadways. Confirmation samples were collected in 2006 and documented in this report. Sample locations are shown on Figure 5-3.

5.1.4 Pre-mining Baseline Conditions

A sampling program to estimate the Pre-mining Baseline Conditions was planned and documented in the HHRA Sampling and Analysis Plan (SAP) (APTIM 2018). The sampling was conducted in November 2018 and intended to provide statistical and scientific rationale for sampling locations which are not influenced by mining activities to supplement the historical database and complete the estimation of PMB conditions. The sampling program is based on the following:

- The results of historical sampling of non-mining areas, including the remedial investigation, the supplemental background investigation (CH2M, 2009), and the EIC Phase II study (McGinnis and Associates, LLC, 2013).
- Technical Memorandum provided by the EIC consultant AESE, Inc., Preliminary Remedial Goals (PRGs)/Remedial Action Objectives (RAOs), Applicable, Relevant and Appropriate Requirements (ARARs), and PMB (May 29, 2018).

The PMB estimates for surface soils will be used as one of multiple lines of evidence used to determine the extent of excavation/capping. PRGs and RAOs (based on the PMB estimates as one of the lines of evidence) for surface soil will be incorporated into the Record of Decision (ROD) process for OU-1, which includes the remediation of the lands within and surrounding the SBMM site. Clear Lake is part of OU-2, and the estimation of PMB conditions within the lake sediments, if deemed necessary, would be a separate future activity.

Samples collected during this program include the following:

- Twenty surface soil samples (0 to 6-inch depth) from the Andesite geologic parent material, north of the EIC Road
- Forty surface soil samples from the Franciscan Complex geologic parent material, east of Sulphur Bank Mine Road
- Associated quality control samples (field duplicates and equipment blanks)

The sampling program was executed in accordance with the SAP and is briefly described below:

- The samples were collected from 0 to 6-inch depth from a well-mixed soil.
- The areas sampled had been impacted by the Sulphur Fire, and noticeable ash was scraped away before disturbing the soil.
- There was generally shallow rooted grass at each sample location. Given the objective of determining PMB, the roots were scraped away and the sample collected below the roots. The roots were typically less than two inches deep.
- The soils in the Andesite area had a considerable amount of rocks primarily between 2 and 6 inches in depth. The rocks were removed with a decontaminated shovel or dig bar, and field equipment blanks of the digging equipment were collected daily.

The results of the PMB estimates are summarized in Tables 5-1 and 5-2. The data set used for the PMB Andesite (comparison to on-mine and EIC soil) is shown in column 2 of Table 5-1 (modified data set). The data set used for the PMB Franciscan (comparison to Lakeside Resident soil) is shown in column 1 of Table 5-2 (full data set). The sample locations are provided on Figure 5-4 for the Andesite formation and Figure 5-5 for the Franciscan formation. The samples were analyzed for low-level mercury, arsenic, low-level metals, pH, sulfide and TOC.

Results of the program are documented in the *Draft Pre-mining Baseline Conditions for Surface Soils Sampling Program and Results Technical Memorandum* (APTIM 2019b). A sample list is included in Appendix A to this HHRA. A statistical analysis of the data (including a statistical evaluation of outliers) is included to provide the PMB estimates for surface soils that will be used in the development of PRGs and RAOs, per the request of the EIC.

5.2 Sediment

Approximately 206 sediment sample results are available for mercury. Other metal analysis vary between 133 and 175 sample results and include analysis for: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, methyl mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, and zinc. In addition, 26 samples were analyzed for lithium. Samples were collected from 1990 to 2019. A list of sediment samples used in the HHRA is presented in Appendix A. Sample depths range from surface to 2 ft bgs. The maximum depth of

2 ft is considered the depth for a surface sample therefore no subsurface samples were collected (as no exposure to COPCs in subsurface sediment is expected).

Data was compiled from the following documents:

- *Final Mine Waste and Pore Water Investigation Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California, December* (CH2M 2006b), which includes a compilation of data from multiple sources.
- *Final Data Evaluation Report, 2006 North Wetland Investigation* (CH2M 2009a)
- *Final Oaks Arm Sediment Investigation, Data Evaluation Report* (CH2M 2009b)
- *Sulphur Bank Mercury Mine, Ward Road Additional Soil and Sediment Samples* (CH2M 2008a)
- *Keys Area Sediment Investigation Data Evaluation, Clearlake Oaks, California* (CH2M 2009d)
- *Technical Memorandum, Pilot Cap Pre-Baseline Biota/Sediment Sampling Investigation Data Evaluation* (E2 2012c)
- *Final Sampling and Analysis Plan (SAP) for Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California* (APTIM 2018)
- *Draft Quality Assurance Project Plan (QAPP), Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*, (CB&I Federal Services, LLC 2017).

Sediment sample locations are shown on Figure 5-6. A more detailed discussion of the data available in these reports is presented below.

Over the past 30 years, EPA and other agencies have performed numerous studies of the contaminant sources at SBMM. The following lake sediment investigations were reviewed and incorporated into the conclusions of the *2005 Mine Waste and Pore Water Investigation* (CH2M 2006b and 2006d). Data were compiled in this study from the following sources:

- 1973 U.S. Geological Survey core study (Suchanek et al. 2008)
- Central Valley Regional Water Quality Board study (Water Board 1987)
- 1988 to 1989 Humboldt State University study (Chamberlin et al. 1990)
- 1992 to present University of California – Davis baseline and seasonal monitoring studies (Suchanek et al. 1993, 1997, 1998, 2000, and 2008b; Water Board 2002)
- 1996 and 2000 UCD coring study (Suchanek et al. 2008; Richerson et al. 2008; Osleger et al. 2008)
- UCD pore water study (Shipp 2001; Shipp and Zierenberg 2008)
- Waste Rock Dam area geophysical survey (Hammack et al. 2000 and 2003)
- EPA flocculent (floc) study (TtEMI 2004b)

- EPA OU-1 waste rock, tailings, and Herman Impoundment characterization (EPA 1994b)
- EPA surface water and groundwater monitoring data (TtEMI 2001 and 2004; EPA 2002)

The Mine Waste and Pore Water Investigation (CH2M 2006b) and Oaks Arm Sediment Investigation (2007) (CH2M 2009b) included sediment coring and sampling of the lake bottom in the Oaks Arm near the Waste Rock Dam and North Wetland. Lake sediment type is highly variable, and laterally consistent sediment layering was not observed within the study area. Sediment ranges from clay and silt, to gravel with silt, sand, and combinations of each. Sediment was typically brown, reddish-brown, dark gray, greenish-gray, or greenish-black. Low-pH areas in sediment (as determined from sediment cores) are located adjacent to the Waste Rock Dam and the area south of the Waste Rock Dam. The oxygen reduction potential (ORP) and pH trends with depth are inverse at many locations (i.e., at locations where ORP increases with depth, the pH decreases with depth).

The *Final Data Evaluation Report, 2006 North Wetland Investigation* (CH2MHILL 2009a) addresses the baseline sampling investigation conducted at North Wetland. The purpose of this report is to present the results of the June 2005, April 2006, and June 2006 sampling and analyses of sediment, detritus, surface water, and biota (i.e., aquatic fauna and plants) at North Wetland. Limited information and results of the 2004 investigation conducted by TtEMI are included in this report. This report also recommends future actions to assess changes within North Wetland This investigation was performed to determine a baseline for metals in the North Wetland. It was not intended to provide a complete characterization.

For the *Sulphur Bank Mercury Mine, Ward Road Additional Soil and Sediment Samples* (CH2M 2008a) five surface sediment samples were collected in October 2007, all from shallow water (less than 6 inches deep) along the shore of Clear Lake. These sediment samples were collected to better define mercury and metals concentrations away from waste rock dam (WRD). Samples consisted of a silty sand, well graded sand, or sand with gravel.

The Clearlake Keys Property Owners Association proposed to dredge sediment from the Keys Area to allow better boat access. The *Keys Area Sediment Investigation Data Evaluation, Clearlake Oaks, California* (CH2M 2009d) includes surface sediment sampling at locations within the planned dredging area. The main objective of the Keys Area sediment investigation was to characterize chemical and geotechnical parameters to allow preliminary evaluation of the sediment for potential use as terrestrial or subaqueous capping material. Sediment samples were collected at 12 locations and water quality and sediment field parameters were measured at 11 locations in the sampling area. surface sediment sampling and lithologic logging were performed in the Keys Area for field or laboratory analysis of pH, ORP, mercury, metals, TOC), and geotechnical parameters (grain size distribution and moisture content).

The 2011 *Pilot Cap Pre-Baseline Biota/Sediment Sampling Investigation* (E2 2012c) documents the collection of multiple grab samples were dredged from each of the eight locations. Three locations were designated in each pilot cap area and two reference locations in Oaks Arm, outside the areas of known elevated mercury and methyl mercury concentrations. The first grab sample of the sediment was

submitted for chemical analysis. The remaining grab samples collected at each location were composited and sieved through a mesh screen. These samples were then evaluated for macroinvertebrate diversity and abundance, and the macroinvertebrates were combined and immediately placed on dry ice and stored frozen until submitted for chemical analysis. With the exceptions of lead and zinc, all of the metals concentrations in each of the sediment samples exceeded their lowest sediment screening levels. All sediments exceeded the high toxicity reference value (TRV) for mercury and nickel. All sediments exceeded the low TRV for aluminum, antimony, barium, cadmium, chromium, mercury, selenium, and silver.

Nine ambient sediment sample results are available for performance of the risk assessment. These samples were collected in November 2018 as a part of the HHRA sampling program performed to support this risk assessment. Sample were analyzed for: low-level mercury, methyl mercury, metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc), pH, sulfide, TOC, and cation exchange capacity (CEC).

Ambient sediment samples were collected to determine the site-specific incremental risk for the purposes of the HHRA. The areas for collection of ambient samples were selected based on representative areas distant from SBMM and comparable to conditions for the recreational user exposure, i.e., wading and swimming in the lake. Two areas were sampled: the North shore and South shore of Clear Lake. Samples were collected in accordance with the *Final Sampling and Analysis Plan for the Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM 2018) and documented in the *Draft Human Health Risk Assessment Sampling Program, Technical Memorandum, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM 2019a). As shown on Figure 5-6, samples were collected from the EIC West shore, near the Buckeye point, and past into the North Wetlands area.

Sediment samples were also collected as part of the 2018 plant tissue and bird tissue (placeholder: note as of this draft no bird tissue samples have been collected) investigations. Samples collected included:

- Collocated sediment samples associated with Tules – 10 samples from 10 locations
- Collocated sediment samples associated with Cattails – 10 samples from 10 locations

Section 5.6 of this HHRA provides sample locations and more detail on the sampling program.

In addition, a total of six samples collected off the west shore of the EIC, beginning north of the WRD, and extending past Buckeye point on to the North Wetlands. These sediment samples are intended to be collocated with collection points for future bird tissue samples. These samples are further discussed in Section 5.7.

5.3 Surface Water

Approximately 131 surface water sample results are available for total mercury (126 for filtered mercury). Other metal analyses vary between 133 and 68 sample results and include analysis for total and filtered: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, methyl mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc. In addition, 35 samples were analyzed for lithium. Other analyses include alkalinity, dissolved organic carbon, fluoride, hardness, nitrate/nitrite, nitrogen, pH, phosphorus, sulfates, sulfides, sulphur, total dissolved solids (TDS), TOC, and total suspended solids (TSS). Samples used in this HHRA were collected from 2001 to 2018. A list of surface water samples used in the HHRA is presented in Appendix A. Sample locations are provided on Figure 5-7.

The *Final Data Evaluation Report, 2006 North Wetland Investigation*, (CH2M 2009a) was used as a source of compiled data from multiple studies, including the following 2001 and later references:

- Selected data from the EIC monitoring program, March and June 2004 sampling events (attachment to personal communication) (McGinnis 2004)
- Mercury in the Abiotic Matrices of Clear Lake, California: Human Health and Ecotoxicological Implications (Suchanek et al. 2008)
- *Storm Water Monitoring Technical Memorandum, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California.* Draft. (TtEMI 2001)
- 2002–2003 Storm Water Monitoring Technical Memorandum, Sulphur Bank Mercury Mine
- Superfund Site, Clearlake Oaks, California. Draft. (TtEMI 2003) and the 2005–2006 and 2006–2007 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California. Final. (CH2M 2007c)

This report was also a source for surface water sample data collected from 2004-2006 as a part of the North Wetland Investigation.

Other sources of data include:

- *North Area Wetland Characterization Technical Memorandum* (Tetra Tech 2001)
- *Final Mine Waste and Pore Water Investigation Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California, December* (CH2M 2006b)
- *Data Evaluation Report, 2007 North Wetland Investigation* (CH2M 2008f)
- *Final Oaks Arm Sediment Investigation, Data Evaluation Report* (CH2M 2009b)
- Department of Water Resources (DWR) Data (2006 to 2016) Clear Lake and North Wetland

- 2008-2019 stormwater monitoring reports, samples collected in Clear Lake and North Wetland (CH2M 2007c, 2008d, 2009c, and 2011d and E2 2012a, 2012d, 2017c, 2017d, 2017e, 2017f, 2017g, 2018a, and 2019a)
- 2006-2018 groundwater monitoring reports, samples collected in Clear Lake and North Wetland (CH2M 2008e, 2009e, 2011b and E2 2012b, 2013, 2015, 2017a, 2017b, 2018b, and 2019b)

A more detailed discussion of the data available in these reports is presented below.

The *Draft North Area Wetland Characterization Technical Memorandum* (Tetra Tech 2001) provides results for six surface water locations. This field investigation focused on characterization of inorganic constituents in soil, sediment, and surface water. Surface water samples were analyzed for alkalinity, fluoride, ammonia, chloride, bromide and sulfate, nitrite, nitrate, orthophosphate, and total dissolved solids. The limited study indicated that the highest impact was observed northwest of the North Waste Rock Pile.

The *Final Mine Waste and Pore Water Investigation Data Evaluation Report* (CH2M 2006b) documents the collection of one surface water in the approximate center of the sediment study investigation study area in Clear Lake. The sample was analyzed for total sediment and other metals (total).

The *Data Evaluation Report, 2007 North Wetland Investigation* (CH2M 2008f) presents the results of the September 17, 2007 sampling in the North Wetland. This sampling program was performed to fill data gaps identified during performance of the screening-level ecological risk assessment. Surface water and biota samples were collected to address these data gaps This study focused on open-water portions of the wetlands. Previous studies had concentrated on areas with a high density of tules. Samples were analyzed for methyl mercury and other metals.

The *Final Oaks Arm Sediment Investigation, Data Evaluation Report* (CH2M 2009b) documents the results of two Clear Lake surface water samples collected from one location and analyzed for mercury, other metals and general chemistry parameters (alkalinity, ammonia, nitrogen, TOC, anions, TDS, and TSS).

Ten ambient surface water results available for performance of the risk assessment. These samples were collected in November 2018 as a part of the HHRA sampling program performed to support this risk assessment. Sample were analyzed for: total and dissolved low-level mercury, total and dissolved methyl mercury, total and dissolved metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc) anions (chloride and sulfate), nitrate/nitrite, alkalinity, and ammonia.

Ambient surface water samples were collected to determine the site-specific incremental risk for the purposes of the HHRA. The areas for collection of ambient samples were selected based on representative areas distant from SBMM and comparable to conditions for the recreational users, i.e., wading and

swimming in the lake. Two areas were sampled: the North shore and South shore of Clear Lake. Samples were collected in accordance with the *Final Sampling and Analysis Plan for the Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM, October 2018) and documented in the *Draft Human Health Risk Assessment Sampling Program, Technical Memorandum, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California* (APTIM, September 2019a). As shown on Figure 5-7, samples were collected from the EIC West shore, near the Buckeye point, and past into the North Wetlands area.

5.4 Drinking Water

From April 2008 through April 2009, 82 water supply samples were collected from selected homes along Sulphur Bank Mine Road. These samples were analyzed for total and filtered metals including aluminum, antimony, arsenic, boron, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

The *Final Sulphur Bank Mine Road Water Supply Sampling Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California* (CH2M 2009f) documents the collection of these water supply samples. The water systems that were investigated draw directly from Oaks Arm to serve residences along Sulphur Bank Mine Road, southwest of SBMM. In addition to water from Oaks Arm, spring water is piped to the residences at [redacted] and [redacted] Sulphur Bank Mine Road from a spring located south of the homes. Several residents provided information regarding water supply and treatment systems. Four water supplies were identified as a part of this study:

- Water Supply System A, sourced from groundwater and surface water, and should not be used as a drinking water source. Concentrations of total and dissolved arsenic and barium exceeded primary MCLs, and concentrations of total and dissolved iron and manganese exceeded secondary MCLs. It is understood that this system is only used for irrigation water.
- Water Supply Systems B, C, and D, sourced from spring water and Clear Lake surface water, did not have any results that exceeded primary or secondary MCLs during the investigation period.
- Water Supply System E, sourced from Clear Lake surface water, did not have any results that exceeded primary or secondary MCLs during the investigation period, except for Location WSE04. Manganese exceeded the secondary MCL in four samples collected at Location WSE04, indicating potential aesthetic effects, rather than health effects (CH2M 2009d).

Because Water Supply System A is only used for irrigation, the results were not used in the HHRA, so 74 of the 84 water supply sampling results were used in the risk assessment calculations. In addition, samples of surface water from Clear Lake were used to evaluate future tribal residents. Surface water data is discussed in Section 5.3. A list of drinking water samples used in the HHRA is presented in Appendix A.

The locations used for drinking water sampling are shown on Figure 5-8. Ambient surface water samples discussed in Section 5.3 were used to determine background.

5.5 Fish Tissue

Approximately 177 fish tissue sample results are available for mercury in fish. The fish tissue data set is comprised of USGS fish tissue samples (collected in June 2019) and California Environmental Data Exchange (CEDEN) fish tissue samples (collected in September 2008 and May 2012). Laboratory results for the USGS fish tissue samples are provided in Appendix H. For the purpose of the HHRA, samples were divided into two scenarios:

- Tribal fish data set includes all species: black crappie, bluegill sunfish, channel catfish, common carp, largemouth bass, redear sunfish, Sacramento sucker, silverside, threadfin shad, and tule perch (177 samples) (EPA 2019e).
- Recreational fish data set includes black crappie, bluegill sunfish, channel catfish, largemouth bass, and redear sunfish (106 samples).

The CEDEN Fish tissue data were accessed at:

> California Environmental Data Exchange. 2019. https://www.sfei.org/projects/california-environmental-data-exchange-network-ceden#sthash.ASLmtC9g.dpbs

All fish tissue samples were collected from Clear Lake. A list of fish tissue samples used in the HHRA is presented in Appendix A.

5.6 Plants and Associated Sediment

In support of this HHRA, plants consumed by the EIC Tribe were sampled. This sampling program was performed in accordance with the following documents:

- *Final Sampling and Analysis Plan (SAP) for Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. (APTIM 2018)
- *Draft Quality Assurance Project Plan (QAPP), Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California* (CB&I Federal Services, LLC 2017).

Analytical results are provided in the *Draft Technical Memorandum, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California* (APTIM, September 2019) a list of samples is included in Appendix A to this report. Sample locations are provided on Figure 5-9.

The residents of the EIC consume plants that are grown in areas within SBMM as part of their tribal practices. For the HHRA data gap investigation, a questionnaire was developed to gather information on

the types of plants that the EIC grow or harvest. Based on the Tribe's responses to the questionnaire, the following categories of plants have been selected for sampling:

- Wetland Area Plants: Tules – stalks (eaten April and May), and roots (eaten June and July)
- Cattails – New shoots (eaten during Spring)
- Acorns from the California Black Oak for acorn mush

Sixty plant tissue, 12 collocated soil, 35 collocated sediment, and 10 surface water samples were collected between November 6 and 19, 2018. A list of samples is provided in Appendix A. Samples included:

- Tules – 10 stalks and 10 roots/rhizomes collected from 10 locations (location coordinated taken, location areas include EIC and North Westland). The sample collection process of the stalks was modified because the stalks weighed very little (stalks were dry). The stalks were not peeled. Rhizomes were cleaned using lake water to remove the sediment. Sample weight minimum was 36 grams.
- Collocated sediment samples associated with Tules – 10 samples from 10 locations. The sediment of the tules in the EIC at the lake area were wet and in the presence of roots, but the tules sediment near Buckeye island was drier.
- Cattails – 10 stalks and 10 roots collected from 10 locations (location coordinated taken, location areas include EIC near Buckeye). Sample weight minimum was 31 grams.
- Collocated sediment samples associated with Cattails – 10 samples from 10 locations. The sediment for the cattail were also dry, more like soil than sediment, and in the presence of roots, Dry leaves were removed to access the sediment.
- Acorns – 6 samples from 1 oak tree in Herman Impoundment area accessed via the upper gate, 6 samples from 1 oak tree in Herman Impoundment area accessed via the upper gate, 6 samples from 1 oak tree in Herman Impoundment area accessed via the upper gate, and 2 samples from Buckeye area (Tree Sample Location 4 on Figure 5-9) total of 20 sample and sample weight minimum was 26 grams.
- Collocated soil samples associated with Acorns – 3 samples each from the four areas of acorn collection (Tree Sample Locations 1, 2 and 3 on Figure 5-9). Total of 12 collocated soil samples. The soils for the acorn collection locations inside the Herman Impoundment were dry and rocky (Tree Sample Locations 1, 2 and 3 on Figure 5-9). Soil and sediment samples were collected from 0 to 6 inches bgs.

Tissue and soil/sediment samples were analyzed for mercury, methyl mercury, arsenic, and metals. Soil/sediment samples were also analyzed for selective sequential extraction mercury, pH, sulfide, TOC, and CEC.

5.7 Bird Tissue and Associated Sediment

<PLACEHOLDER FOR BIRD TISSUE RESULTS, SEDIMENT WRITE UP INCLUDED>

The following subareas have been identified for bird tissue sampling:

- Oaks Arm of Clear Lake Shoreline (near WRD)
- EIC Shoreline
- North Wetlands Shoreline

Before mobilizing, it was decided by the EPA and E2 team that the WRD area had enough sediment samples from prior investigations, and the six samples could be spread along the other areas. In addition, the EIC environmental coordinator requested the distance from the EIC shoreline be at least 100 feet for any sediment samples due to the potential of encountering cultural artifacts. Samples were collected from the EIC West shore, near the Buckeye point and past into the North Wetlands area. Sample locations are provided on Figure 5-9. Sediment samples were analyzed for mercury, methyl mercury, arsenic, selective sequential extraction mercury, pH, sulfide, TOC, and CEC.

5.8 Vapor and Indoor Air

Vapor and indoor air were evaluated as part of the HHRA. The results for seven vapor samples collected from Herman Impoundment in 1995 and analyzed for hydrogen sulfide were used to evaluated potential human exposure. Mercury vapors have been sampled in homes and on site. Mercury vapors were not detected in any of the indoor air samples collected in EIC homes. For the risk assessment, the maximum on-site concentration (0.035 mg/m^3) found by the Air Quality Management District was used to evaluate a trespasser. These results are available in the following:

- *Baseline Public Health Evaluation, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California* (Smucker USEPA Region 9 1994a)
- *Summary Report for the Gaseous Spring Sampling Activities, Sulphur Bank Mercury Mine, Clearlake California* (ICF Technology 1996a)
- *Emissions Conversions, Gaseous Spring Sampling, Sulphur Bank Mercury Mine* (ICF Kaiser Engineers 1996b)
- *Remedial Investigation and Feasibility Study for Operable Unit 1, Sulphur Bank Mercury Mine, Clearlake California* (Tetra Tech/EPA 2002)

The *Remedial Investigation and Feasibility Study for Operable Unit 1* (Tetra Tech/EPA 2002) provides a summary of the indoor air and outdoor vapor historical data. The 1994 *BPHE* (EPA 1994a) summarizes historical studies for sampling of elemental mercury vapor. This report indicates that mercury was sampled in homes as documented in: *Sulphur Bank Mine Analytical Report (House and Air Sampling)* (EPA 1993).

The *Summary Report for the Gaseous Spring Sampling Activities* (ICF Technology 1996a) and *Emissions Conversions, Gaseous Spring Sampling* (ICF Kaiser Engineers 1996) provide hydrogen sulfide data from surface vents and submerged vents of varying depths. The hydrogen sulfide data used in the HHRA were collected from gaseous bubbles being released from the subsurface (i.e., subsurface vents below the surface of Herman Impoundment, ranging from 4 ft to 59 ft) using a special collection apparatus (inverted funnel or similar). This gas was being released to the atmosphere. The goal of the investigation was to measure the existing gas releases and predict the increase if Herman Impoundment was dewatered and exposed the subsurface vents directly to the air. The presence of the overlying water mitigated the releases to the atmosphere due to assimilation of a portion of the gases into the water column. If this overlying water were to be removed, the gases released to the atm would likely increase significantly.

To ensure that a potentially significant migration pathway for mercury at SBMM was not overlooked, EPA measured the atmospheric flux of mercury from various materials at the site (EPA TetraTech 2002). Measurements of the total mercury flux were made from each type of material present at SBMM including:

- Disturbed and Native geologic units (Andesite, Franciscan Complex, and lake sediments)
- Waste rock
- Tailings
- Ore

Estimates of mercury flux from SBMM soils and mine waste are approximately 9.3 to 20.7 pounds per year (approximately 127 to 283 nanograms per square meter per hour [ng/m^2/hr] over an area of 890 acres). In general, mercury emissions were higher in areas that had been disturbed by mining practices, and mercury emissions increased as a function of substrate concentration. For comparison, scaled atmospheric mercury flux measurements from soils and mine wastes from two other mercury districts, the New Idria district in California and the Ivanhoe District in Nevada are 9.47 to 15.40 ng/m^2/hr (over an area of 47,000acres) and 17.1 ng/m^2/hr (over an area of 145,000 acres), respectively (Engle and others 2001). In addition to the flux from mine wastes, the amount of mercury released to the atmosphere from hydrothermal gas was investigated and found it to be less than 0.80 lbs/yr.

In addition to total mercury emissions, concentrations of reactive gaseous mercury (RGM) were measured at several locations. RGM represents that portion of the airborne mercury that is thought to interact immediately with solid or liquid matter such as plant material, dust, or water and thus remains in the immediate watershed. Remaining mercury is thought to be relatively inert and once airborne remains in the atmosphere where it is transported on a global scale.

Concentrations of RGM were found to be up to 30 percent of the total mercury concentration in air at SBMM, although 2 to 5 percent was more typical. Some of the highest levels of RGM ever measured in the environment were detected. RGM concentrations measured with annular denuders were lowest

above Franciscan Complex sediments (average 0.48 +/- 0.10 nanograms per cubic meter [ng/m^{-3}]; number of samples [n]= 4), and highest above tailings (average 52.73 +/- 2.01 ng/ m^{-3}; n=6).

A useful comparison for the mercury flux measured at SBMM is the California Office of Environmental Health Hazard Assessment Chronic Reference Exposure Level (REL) for mercury. The mercury exposure from SBMM wastes are extremely low compared to the chronic REL value of 0.03 $\mu g/m^3$, based on correcting the highest flux estimate to a concentration (283 $ng/m^2/hr$ = 0.000079 $\mu g/m^3$), and using a very conservative assumption of chronic exposure without dilution (i.e., the estimated surface concentration is the exposure concentration).

6.0 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of exposures to the COPCs (EPA 1989) present at, or migrating from, the Site. The exposure assessment also identifies the receptors that might be exposed; the routes by which these individuals might become exposed; and the magnitude, frequency, and duration of potential exposures. When combined with chemical-specific toxicity information summarized in the toxicity assessment Section 7.0, these exposures produce estimations of potential risks and hazards.

This section includes segregation of the site into exposure areas (Section 6.1), development of a Conceptual Site Model and receptor characterization details (Section 6.2), identification of exposure pathways (Section 6.3), calculation of exposure point concentrations (Section 6.4), transport and exposure models (Section 6.5), and calculation of daily intakes (Section 6.6).

6.1 Exposure Areas

Identification of exposure areas (geographic areas over which data were aggregated for the purposes of risk computation) for soil, surface water, and sediment at the Site or in surrounding areas are described in this section. Several exposure areas have been identified based on the various exposure media and receptors at the Site. Figure 1-1 shows the labeled features and exposure areas within SBMM, such as the Lakeside Residential (non-tribal), EIC areas (tribal), the Mine site, Clear Lake, and the Herman Impoundment. This approach has been taken to subdivide the Site into smaller subareas and to reflect differing patterns of the nature and extent of COPCs. The various exposure areas by media and receptor groups evaluated are summarized as follows:

6.2 Conceptual Site Model/Receptor Characterization

The Conceptual Site Exposure Model (CSEM) is presented on Figure 6-1 for current and future exposure scenarios. This figure present receptors, exposure routes, and exposure pathways. Section 6.3 presents the detailed rationale for the selection (or non-selection) of current and/or future receptor populations quantified in the HHRA. General background information for the Site was previously presented in Section 2.

The CSEM identifies the following current and future human receptors which are quantified in the HHRA:

- Traditional tribal receptors (adult and child), including tribal exposure to soil, surface water, sediment, potential future drinking water from Clear Lake, fishing, consumption of tules, cattails, acorns, as wells as consumption of fish, waterfowl and upland birds
- Lakeside residents (adult and child), including residential exposure to soil and drinking water
- Recreational users, including swimmers (youth), waders (youth), and sports fishers (adult and child)

- Trespassers (youth), including swimmers, waders in Herman Impoundment and exposure to on-mine soil

Exposure media include: soil, sediment, surface water, air, and food items (tules, cattail, acorns, fish, and waterfowl) that are assumed to bioaccumulate COPCs.

Receptor Groups

Lakeside Resident Receptors: Residents live primarily in the areas designated as lakeside communities (see Figure 1-1 for labeled areas). Residents were evaluated for their exposure to soil in and around their homes. SBMM road and properties that were included in the removal action lie within areas that were potentially disturbed during the period of active mining (before 1957) or by the subsequent placement of mine waste used as fill material. Several Lakeside residents receive their household water from a water supply system with intakes in Clear Lake. However, these residents have reported that they do not use this water as their drinking water source.

Recreational Receptors: Recreational users may swim, wade, or fish in Clear Lake.

Trespasser Receptors: Trespassers may visit Herman Impoundment and on-mine areas; however, parents of the EIC children have stated that they do not allow their children to swim in Herman Impoundment.

Traditional Tribal Receptors: EIC is located on approximately 60 acres of Elem Pomo tribal lands that are in trust status. EIC is bounded to the north and west by Oaks Arm of Clear Lake, to the south and southeast by SBMM, and to the northeast by North Wetland. EIC is Tribal land with residential housing for approximately 50 Tribal members (Takata 2006). When the BIA constructed housing in the 1970s, mine waste from SBMM was used as fill material on residential lots located throughout EIC, and as base material for paved and unpaved roads throughout EIC (CH2M 2009g). In October 1997, a removal action was conducted at EIC to remove mine waste from specific residential lots (occupied and unoccupied). EPA contractors removed mine waste from 13 residential lots.

The EIC do not currently use the water from Clear Lake as their drinking water source. They use a Clear Lake Oaks municipal water supply. However, this pathway was evaluated as a potential future scenario. In addition, a ceremonial scenario was evaluated which involves tribal members drinking from the lake once a week.

6.3 Exposure Pathways

This subsection presents and discusses some details on specific receptor and media exposure pathways; however, all exposure factors are summarized in exposure factor tables presented in Tables 6-1 through 6-3. References are provided in the footnotes in each table.

Media exposure pathways are summarized as follows (and discussed in more detail in subsections of Section 6.3):

Soil exposure pathway: The soil exposure pathway for human receptors is considered to be complete for soil. Exposure is possible for three exposure routes (ingestion, dermal contact, and inhalation). Passive (wind erosion) and intrusive activities by human activities are possible release mechanisms.

Sediment exposure pathway: As previously discussed in Section 6.1, sediment is considered as a potentially complete pathway for recreational exposures (swimming and wading) associated with Clear Lake.

Surface water exposure pathway: The surface water exposure pathway for human receptors is considered to be complete. Recreational exposure to surface water is complete for two primary exposure routes (incidental ingestion and dermal contact). Surface water ingestion (using Clear Lake as a water supply) is also considered to be complete for future tribal members and current/future lakeside residents.

Air exposure pathway: Mercury vapors and hydrogen sulfide gas are evaluated for inhalation of vapors for trespassers.

Food items exposure pathway: Food items exposure from plants (acorns, tules, and cattails), waterfowl, and upland birds is considered complete for tribal members. Ingestion of fish is a complete pathway for tribal members and recreational users. Recreational fishers consist of an adult and accompanying child. Species selected for this exposure pathway were informed by a questionnaire answered by the EIC Tribal Environmental Office in 2018.

The section below presents the rationale details for the selection (or non-selection) of current and/or future receptor populations and the exposure pathways quantified in the HHRA. It should be noted that soil and/or sediment results are presented in the HHRA on a dry weight basis. However, estimated concentrations in food items are presented on a wet weight basis (equivalent to "as consumed") to match the wet weight basis used for the food intake rates discussed below.

6.3.1 Residential Exposure

Standard exposure factors from the EPA (2014) are used for adult and child residential receptors for the Lakeside residents. Exposure factors for these receptor groups are summarized in Table 6-1 (soil) and 6-2 (drinking water). The water systems that were investigated draw directly from Oaks Arm to serve residences along Sulphur Bank Mine Road. Lakeside residents are conservatively assumed to drink water from Clear Lake, although they have reported that they do not use this water for drinking. The intake for adult residents is 2.5 liters per day and children drink 0.78 liters per day.

6.3.2 Recreational User and Trespasser Exposures

Exposure factors for recreational and trespasser receptors are summarized in Tables 6-1 (sediment) and 6-2 (surface water). Recreational users are adolescents that swim or wade in Clear Lake. An adolescent (ages 6 to 18), instead of a younger child, is selected because an adolescent is more likely to be actively involved in the exposures quantified in the HHRA, including swimming and wading. Recreational users are

exposed to surface water and sediments at Clear Lake through dermal contact and incidental ingestion from wading and swimming.

Trespassers may be exposed to on-mine soil 52 days per year (twice a week over a 6-month period). Trespassers are youths that could potentially wade and swim in the Herman Impoundment which is located in the on-mine area. A future trespasser scenario was also evaluated that considers exposures to modeled future groundwater concentrations at the Herman Impoundment (Table 3 of CH2M 2016, updated December 2019).

For the recreational receptors evaluated for a wading scenario (adolescents), the incidental intake rate for surface water is set at 0.137 liters per event (at 52 events per year). This value is from EPA (2019) and represents the upper 97th percentile child ingestion rate of surface water while swimming. For receptors assumed to have direct contact with surface water (i.e., recreational users at Clear Lake and trespassers at Herman Impoundment), the incidental intake rate is 0.137 liters per day and is presented in the exposure factor tables (Table 6-2).

Dermal contact with surface water requires a designation of exposure time (in hours) and this time, as well as other factors (Table 6-2), are used to estimate the dermal dose. The exposure time for recreational and trespasser youths is two hours per day, for 52 days per year of trespassing. This exposure time is based on best professional judgment (EPA 1994a) and accounts for the typical activities associated with the receptor and the receptor's age. Exposure factors for adolescents are from EPA's Exposure Factors Handbook: 2011 Edition (2011), specifically the average body weight of 44.3 kg for a 6- to <11-year old and an 11- to <16-year old. For a youth wading in surface water, the average body surface area of 0.98 square meters (m^2) or 9,800 square centimeters (cm^2) is used for a 6- to <11-year old and an 11- to <16-year old, based on assumed arms, hands, legs, and feet (95th percentile values) contacting the water.

For a youth exposed to sediment, an average body surface area of 4,065 cm^2 is used for a 6- to <11-year old and an 11- to <16-year old, based on application of a ratio of 0.674 to the EPA (2014b) recommended default residential skin area of 6,032 cm^2 for soil exposure. This ratio of 0.674 is the ratio of total skin area of a 6- to < 16-year old to an adult (21- to < 60-year old), based on data from Table ES-1 Chapter 7 in EPA (2011) (1.335 m^2/1.98 m^2). This average exposure area assumes that exposed body parts consist of the head, forearms, hands, and lower legs (EPA 2014b).

Recreational fishers include adult and an accompanying child receptor. Edible fish for recreational receptors includes black crappie, bluegill sunfish, channel catfish, largemouth bass, and redear sunfish. Exposure factors for fish consumption are provided in Table 6-3. The adult recreational fishing intake rate of 42 grams per day (gpd) is recommended because it represents the 95th percentile freshwater recreational intake rate for a western state, it is near the upper end of the ranges for statewide recreational surveys and river fishing, and it is considerably above the upper end of the range for lake fishing. A child intake rate of 29 gpd is also recommended, as it represents the 95th percentile freshwater recreational intake rate for a western state. For the high-end ingestion rate for the recreational angler, a

rate of 142 gpd was used (Shilling et al, 2014). This represents four to five fish meals per week and is the 99th percentile consumption rate identified in a national food intake survey and recommended by EPA for subsistence anglers and their families.

6.3.3 Traditional Tribal Exposures

Exposure factors for this receptor group are summarized in Tables 6-1 (soil), 6.2 (drinking water), and 6.3 (food items). The receptor-specific traditional tribal exposure factors are from the Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual (EPA 2007) and Sulphur Bank Mercury Mine Reasonable Maximum Exposure (RME) Scenario (Harper 2018).

Conservative exposures for traditional tribal receptors, such as an assumption of consuming 4 liters of Clear Lake surface water per day (though EIC residents have access to municipal water), an incidental soil ingestion rate of 400 milligrams per day, and a diet based on harvesting 100 percent of food items from the SBMM-impacted areas (for 365 days per year for 70 years, for an adult, regardless of whether the site is sufficiently productive to support such harvests), were used. Risk evaluation based upon these exposures rates assumes a traditional lifestyle that may or may not be consistent with current practices but is aimed at ensuring that site remediation provides sufficient consideration to traditional tribal practices.

For the drinking water pathway, tribal residents currently receive their household water from a municipal system. However, in the future, they could potentially use Clear Lake as their drinking water source; therefore, this pathway was evaluated in this HHRA. The primary exposure pathways are via ingestion and dermal exposures from bathing or showering. As part of this HHRA, a ceremonial scenario was added to consider traditional activities 1 day per week (or 52 days per year). Off gassing of COPCs from the use of Lake water for household purposes, followed by inhalation exposure, was not quantified in the HHRA because none of the COPCs in water are considered volatile enough to be a health concern.

The receptor-specific traditional tribal food intake exposure factors are from Harper (2018). Plant intake is 120 gpd for acorns, 333 gpd for tule stalks (April/May), 275 gpd for tule roots (June/July), 333 gpd for cattail stalks (Spring), and 275 gpd for cattail roots. The EIC identified these plant species in a site-specific questionnaire (EIC 2018), and an EIC guide helped the sampling team select plant sampling locations. Adult tribal receptors are assumed to consume plants for 60 days per year for 70 years and child tribal receptors are assumed to consume plants for 60 days per year for 6 years. For acorns, an additional scenario was evaluated where it is assumed the traditional tribal receptor consumes stored acorns for 365 days per year for 70 years as an adult and 6 years as a child.

Edible tribal fish include black crappie, bluegill sunfish, channel catfish, common carp, largemouth bass, redear sunfish, Sacramento sucker, silverside, threadfin shad, and tule perch. For the tribal receptor, two types of homesteaders are considered, both land- and lake-intensive receptors. The land-intensive homesteader ingestion rate of freshwater fish is 220 gpd while the lake-intensive homesteader intake is assumed to be 500 gpd.

The 2007 Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual bases the tribal ingestion rates on an average body weight of 70 kg and an average kilocalories (kcal) per day intake of 2000. EPA updated the average body weight to 80 kg in 2014. Barbara Harper's 2018 Sulphur Bank Mercury Mine RME Scenario Technical Memorandum updated the average body weight to 80 kg and an average kcal per day of 2,285. The ingestion rates for fish (from 200 to 220 gpd) and roots (from 250 to 275 gpd) were updated based on these revised values.

6.4 Calculation of Exposure Point Concentrations

EPCs are estimated chemical concentrations that a receptor might contact, and are specific to each exposure medium. The EPCs for soil, sediment, surface water, and food items are calculated using the best statistical estimate of an upper bound on the average exposure concentrations in accordance with EPA recommendations for statistical analysis of monitoring data (EPA 2002a, 2015). The EPC is considered the upper-bound estimate of the concentration to which a receptor could be exposed. Calculation of the EPC incorporates sampling results from the entire exposure area rather than just one sample location. The objective of the HHRA is to evaluate risks for the RME receptors based on likely land use conditions (EPA 1989).

To calculate intakes, a 95 percent (%) statistical UCL of the mean concentration (95% UCL) for each COPC is used as a conservative estimate of the average concentration in a given environmental medium to which a receptor could be exposed. The 95% UCL is used rather than the mean concentration to account for uncertainty when estimating EPCs from sample data (EPA 1989). Methods used to calculate 95% UCLs are based on guidance provided in EPA (2002b) and ProUCL Version 5.1 User Guide (EPA 2015).

In general, the method used to calculate a 95% UCL depends on the following:

- The prevalence of non-detects
- The data distribution (e.g., normal, gamma, lognormal, or nonparametric)
- Number of samples

Non-detect results introduce uncertainty in the data set because the true concentration may be between zero to just below the detection limit. Therefore, distributional assumptions are difficult to ascertain for COPCs with a high rate of non-detects. The EPA (2015) ProUCL Version 5.1 statistical program was used to estimate 95% UCL values for all the COPC data sets. For data sets with non-detects, ProUCL uses the Kaplan-Meier estimation method to derive a recommended 95% UCL. Where ProUCL recommends the results of more than one statistical approach, the most conservative (highest) 95% UCL value was used in the HHRA. When there are less than three samples with detections, ProUCL does not recommend a 95% UCL value. For these cases, the maximum detected concentration was conservatively used as the EPC.

In some cases where between three and nine samples had detected results, ProUCL issues a warning that states, "This is not enough to compute meaningful or reliable statistics and estimates." However, as

ProUCL did provide a 95% UCL estimate in these situations, and these results are based on bootstrap or other statistical techniques (Efron 1982; Efron and Tibshirani 1993), these 95% UCL results were used in the HHRA for these situations. For a few data sets where the estimated 95% UCL exceeded the maximum detected concentration, the maximum has been used.

The 95% UCL EPCs for selected COPCs in soil, sediment, surface water, plant tissue, and fish are presented in Appendix B. The statistical output from the EPA (2016) ProUCL Version 5.100 (95% UCLs) is presented in Appendix E.

Background 95% UCLs have also been calculated so that incremental risks and hazards may be estimated (Section 9.15). Incremental risks are site risks minus ambient (background) risks, and incremental hazards are site hazards risks minus ambient (background) hazards.

In the 58.8-acre EIC living area, a removal action that covered 15.1 acres or approximately 20% of the total area (58.8 + 15.1 acres) was conducted. For this area, the EPCs were calculated using concentrations from locations that remained (areas not included in the excavations). A second set of EPCs were calculated from concentrations detected in the fill which came from excavated cleanup areas. These two EPCs were combined by using a 80% to 20% ratio. Uncertainties associated with the EIC EPCs are discussed in Section 9.

An outlier test was performed on the mercury data in the ambient sediment. The outlier test indicated that the highest mercury concentration (216 mg/kg) in the ambient sediment data set is a statistical outlier. This value was excluded from the data set and the UCL calculation was recomputed. The recomputed UCL for mercury is 40 mg/kg, which is well below the UCL computed for the site sediment data (170 mg/kg).

6.5 Transport and Exposure Models

This section presents transport and exposure models used in the HHRA, including particulates mobilized to ambient air (Section 6.5.1), dermal contact with water (Section 6.5.2), and bioaccumulation in food (Section 6.5.3).

6.5.1 Particulates to Ambient Air

Exposures to fugitive dusts were evaluated for metals in soil, for the residential, recreational, trespasser, and traditional tribal receptors. The particulate emission factor (PEF) relates the concentration of a contaminant in soil with the concentration of dust particles in the air. The dust particles are considered "fugitive" because they are not discharged in a confined flow stream. The PEFs used to calculate inhalation daily intakes associated with soil were based on procedures described in the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (EPA 2002b) and estimated using EPA's on-line calculator (EPA 2019b).

To derive the EPCs for exposures to COPCs in air, the PEF was applied to concentrations in soil for each of the exposure areas:

$$C_{air} = (C_S) \cdot (1/PEF)$$

where:

C_{air} = concentration of COPC in air (milligrams per cubic meter [mg/m^3])
Cs = concentration of COPC in water (mg/kg)
PEF = particulate emission factor (m^3/kg)

6.5.2 Dermal Contact with Water

For exposures to dissolved COPCs in surface water via dermal contact, the amount of chemical in water absorbed through the skin must be estimated in order to calculate the dose used in the intake formula. Concentrations of dissolved COPCs in surface water were used in the HHRA, as compared with unfiltered (total) surface water results, because the suspended solids fraction in total surface water samples would not be expected to readily cross the skin layer.

The dose absorbed per unit area per event (DA_{event}) is a function of the chemical concentration in water, the permeability coefficient for that chemical from water through the skin, and exposure time. Unlike the methodologies for estimating inhaled or ingested dose of COPCs, which quantify the dose presented to the barrier membrane (the pulmonary or gastrointestinal mucosa, respectively), dermal dose is estimated as the dose that crosses the skin and is systemically absorbed. For this reason, dermal toxicity values are also based on absorbed dose.

The average dermally absorbed dose (DAD) of a chemical is estimated from the following equation (EPA 2004):

$$DAD = \frac{(DA_{event})(EV)(FI)(SA)(EF)(ED)}{(BW)(AT)}$$

where:

DAD = average dermally absorbed dose of COPC (mg/kg-day, calculated)
DA_{event} = dose absorbed per unit body surface area per event (milligrams per square centimeter per event [mg/cm^2-event], calculated)
EV = event frequency (events/day)
FI = fraction of exposure attributed to site medium of interest (unitless)
SA = surface area of skin available for contact with the medium of interest (cm^2)
EF = exposure frequency (days/year)
ED = exposure duration (years)
BW = body weight (kg)
AT = averaging time (days)

Quantification of dermal uptake of metals from surface water is relevant for the residential, recreational, trespasser, and traditional tribal receptors. Quantification of dermal uptake of constituents from water depends on permeability coefficient (K_p), which describes the rate of movement of a constituent from water across the dermal barrier to the systemic circulation. For inorganic chemicals, dose absorbed (DA) is calculated from the following equation:

$$DA_{event} = (C_w)(K_p)(ET_w)(CF_4)$$

where:

DA_{event}	=	dose absorbed per unit body surface area per event (mg/cm^2-event, calculated)
C_w	=	concentration of COPC in water (mg/L)
K_p	=	permeability coefficient (centimeter per hour [cm/hour])
ET_w	=	time of exposure (hours/event)
CF_4	=	conversion factor (0.001 liters per cubic centimeter [L/cm^3])

Following EPA (2004) guidance, receptor-specific DA values were calculated for surface water using EPA's worksheet (2001) and chemical-specific parameters. The time of exposure (ET) in hours is specific to each receptor. These exposure times are described in Section 6.3.2. The DA values for all subarea COPCs are provided in Appendix D.

6.5.3 Modeled Concentration of Total Mercury in Waterfowl (Grebe) Tissue

The EIC identified coots (as well as mallards) in a site-specific questionnaire as the more common waterfowl species they actually hunt and consume (EIC 2018). Harper and Kirschner (2018) also note that wild waterfowl were recommended for SBMM sampling to be used in the RME risk assessment scenario and may include American coot, Canada goose, mallard, and/or common merganser.

As discussed in Section 5.7, collection and sampling of American coot tissue (for total mercury [THg] chemical analysis) is planned. As these results are not yet available, the modeling approach presented herein is being used as a placeholder. Assuming site-specific measured THg results are available for coot tissue, they will replace the modeled results presented herein.

THg in waterfowl bird muscle tissue (dry weight [dw]) was modeled using the average measured THg concentration in site-specific grebe blood (wet weight [ww]), based on the following regression equation from Ackerman et al. (2016):

$$\text{Natural log (ln) (Blood THg}_{\mu g/g\ ww}) = 1.080 \times \ln(\text{Bird Muscle THg}_{\mu g/g\ dw}) - 1.024$$

It should be noted that this regression equation has an R^2 value of 0.90, which is statistically significant at a probability level of $p_{0.01}$ (Steel and Torrie 1980) for the sample size of 600 on which it is based (Ackerman et al. 2016). An arithmetic average THg concentration in grebe blood (1.27 µg/g ww) was used as input to this regression equation, based on 11 Clark's grebe (*Aechmophorus clarkia*) results and 27 Western grebe (*Aechmophorus occidentalis*) results collected May 14–17, 2012 from the SBMM area of Clear Lake (from

the data base collectively known as the CEDEN data set). THg concentrations in grebe blood ranged from 0.31 to 9.55 µg/g. An average THg concentration was used, as compared with a 95% UCL on the mean because the grebe is a very conservative (health protective) surrogate for the coot, due to the grebe feeding at a higher trophic level than the coot (i.e., piscivorous guild vs. omnivorous guild, respectively). Use of a 95% UCL concentration would likely have resulted in an overall extreme upper-bound result inappropriate for the exposure scenario being evaluated.

Using the regression equation, the estimated THg concentration in grebe tissue was 3.2 µg/g dw. This THg tissue concentration was converted to ww using an assumed bird tissue moisture content of 70%, from Ackerman et al. (2016), as the SBMM Tribal receptors bird ingestion rate is in units of ww, not dw. Thus, 3.2 µg/g dw × (1-0.70) results in a ww THg concentration of 0.96 µg/g.

Therefore, a THg concentration of 0.96 µg/g (0.96 mg/kg) is used in the SBMM HHRA to conservatively estimate coot ingestion exposure associated with a Traditional Tribal lifestyle that includes hunting and consuming this waterfowl species.

Uncertainties with Modeled Concentration of Total Mercury in Waterfowl (Grebe) Tissue, as Surrogate for Traditional Tribal Consumption of Coot

There are several uncertainties with using the above approach to estimate THg concentrations in coot tissue using grebe blood as a surrogate.

First and foremost, as grebes feed at a higher trophic level (piscivorous guild) than coots (omnivorous guild), their use as a surrogate for coots overestimates the THg concentrations expected in coot tissue because mercury is a known bioaccumulator in the aquatic food chain. As shown in Ackerman et al. (2016), the average THg in Clark's and Western grebes' blood (0.63 µg/g ww) was approximately 5-fold greater than that in the American coot (0.12 µg/g ww), based on combined bird data collected across the western US (modeled from measured tissue concentrations; with at least 60 samples used per species). In addition, based on relative THg waterfowl tissue data collected from a large (200 square kilometers) mercury-impacted wetland system, the average muscle concentration in great cormorants (a piscivore) was 226-fold greater than in coots (2.26 vs. 0.01 µg/g ww; based on sample sizes of 15; Aazami et al. [2012]).

Second, the blood to tissue regression equation used herein was based on data from four bird species (American avocets, black-necked stilts, Caspian terns, and Forester's terns) in the order Charadriiiformes (shorebirds) (Eagles-Smith et al. 2008) and may not be representative of grebes (a diving duck in the order Podicipediformes). However, as modeled THg blood concentrations in these four shorebird species bracket the modeled THg blood concentrations in both Clark's and Western grebes (Ackerman et al. 2016), this uncertainty appears to be minor.

Third, the grebe blood THg data set had several high-end outliers (two for the Clark's grebe and three for the Western grebe, see box plot in Appendix G), and this may have contributed a high bias to the average concentration used herein. If these five data outliers were not used, the average THg concentration in grebe blood would drop from 1.27 µg/g ww to 0.75 µg/g ww. However, the outlier results may be

important for the Site and could reflect older individuals that had accumulated more THg than younger birds and/or individuals that were present year-round and not migratory.

Fourth, as THg in Clear Lake fish has been decreasing over recent years, current and likely future concentrations in piscivorous waterfowl would be expected to be lower compared with 2012 (the date of grebe blood collection).

Fifth, some grebes collected from the SBMM area in May of 2012 may have recently arrived at the Site and, therefore, they may not have had adequate time for their blood levels to equilibrate with existing THg concentrations in their site-specific fish diet. However, as there is a resident (year-round) population of Western and Clark's grebes in most of California (including the Clear Lake area) (Cornell Laboratory of Ornithology 2019), this uncertainty is likely minor. In addition, the inclusion of outlier results in the SBMM THg data set (see previous discussion) may have compensated for this uncertainty.

Overall, uncertainties discussed previously suggest that THg exposure associated with EIC consumption of coots has been overestimated, rather than underestimated. The overestimation may range from approximately 5-fold to 226-fold. Additional uncertainties with this modeling approach are discussed in Section 9.

6.6 Calculation of Daily Intakes

For each receptor and exposure pathway, chronic daily intake (CDI), expressed as milligrams of COPC per kilogram body weight per day for each COPC, is estimated by combining the 95% UCL EPC with exposure parameters such as ingestion rate, frequency of contact, duration, and frequency of exposure. In addition, intake parameters have been selected so the combination of intake variables results in an estimate of the RME for that pathway (EPA 1989).

As discussed previously, exposure parameters and chemical-specific parameters for each of the receptors, are provided in Tables 6-1 through 6-3.

7.0 TOXICITY ASSESSMENT

Health effects were classified using methodology recommended by EPA procedures for health effects from exposure to chemicals (EPA 2019a, b). The health effects analysis considers chronic (long-term) exposures. As the Site is in the state of California, CalEPA toxicity guidance was the first choice, and then the following hierarchy from EPA (2003) was used:

Tier 1: California Environmental Protection Agency (Cal/EPA 2019a, 2019b)

Tier 2: Integrated Risk Information System (IRIS) (EPA 2019c).

Tier 3: Provisional Peer Reviewed Toxicity Values (PPRTVs) as developed on a chemical-specific basis by the Office of Superfund Remediation and Technology Innovation (EPA 2019b), and as summarized on the EPA Regional Screening Levels (RSL) Table (EPA 2019a).

Tier 4: Other Toxicity Values including additional EPA and non-EPA sources of toxicity information, such as the ATSDR Minimum Risk Levels (MRLs), and the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a).

Dermal toxicity factors were estimated from oral toxicity data using chemical-specific oral to dermal adjustment factors recommended by the EPA (2019a), as presented in Table 7-1.

7.1 Site-Specific and Chemical-Specific Bioavailability

Site-specific and/or chemical-specific chemical bioavailability are important components related to chemical toxicity. These components are discussed in more detail in Section 7.4. Unless otherwise noted, bioavailability is conservatively assumed to be 100%. Oral bioavailability is a measure of the amount of a constituent that is absorbed into the body after ingestion exposure. Some constituents are absorbed almost completely (i.e., 100 percent bioavailability) when ingested in their pure, soluble form. Other constituents may pass through the body largely unabsorbed. The oral bioavailability of soil-bound arsenic largely depends on the rate at which it dissociates from the soil matrix in the gastrointestinal (GI) tract.

7.2 Carcinogenic Toxicity Criteria

For carcinogens, the EPA estimates the excess lifetime cancer risks associated with various levels of exposure by developing cancer slope factors (CSFs) and unit risks. For this HHRA, the only chemical with a CSF carcinogenic health endpoint is arsenic. CSFs are expressed in terms of reciprocal dose, as units of (mg chemical/kg body weight-day)$^{-1}$, which describes the upper-bound increase in an individual's risk of developing cancer over a 70-year lifetime per unit of exposure. Unit risks are expressed either as a reciprocal air concentration, in units of (micrograms per cubic meter [$\mu g/m^3$])$^{-1}$, Similarly, they are defined as the excess probability of an individual developing cancer over a 70-year lifetime as a result of exposure to one unit of concentration in air or water. For this HHRA, the only chemicals with an air unit risk carcinogenic health endpoint are arsenic, beryllium, cadmium, cobalt, and nickel. CSFs and unit risks are

derived using conservative assumptions because regulatory efforts are conducted to be protective of public health, including even the most sensitive members of the population.

CSFs and unit risks are derived from the results of human epidemiological studies or chronic animal bioassays. Usually, animal studies must be conducted using relatively high doses to detect possible adverse effects. Because humans are expected to be exposed to doses lower than those used in the animal studies, the potential cancer risks at lower doses are estimated by using mathematical models. Data from animal studies are typically fitted to the linearized multistage model to obtain a dose-response relationship. Generally, after the data are fit to the dose-response model, the 95% UCL of the slope of the resulting dose-response relationship at low doses is calculated. This upper-bound limit is subjected to various adjustments, and an interspecies scaling factor is applied to derive the slope factor or unit risk for humans. Thus, the actual risks associated with a given intake of a potential carcinogen quantitatively evaluated based on animal data are generally regarded as not likely to exceed the risks estimated using these CSFs or unit risks, and they may be as low as zero (EPA 1986). Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves. These models provide rough, but plausible estimates of the upper limits on lifetime risk. The CSFs and unit risks based on human epidemiological data are derived using conservative assumptions and, as such, they are unlikely to underestimate risks for a given level of exposure.

Weight-of-evidence categories represent an assessment of the amount and quality of the data, which support the finding that specific chemicals and elements can cause cancer in humans. The EPA's guidelines for carcinogen risk assessment (EPA 2005) now provide a weight-of-evidence narrative. While the EPA has been applying these guidelines and updating the weight-of-evidence, as needed, the original alphanumeric classification remains in effect for many chemicals. Under the existing guidelines (EPA 1986), chemicals are classified as either Group A, Group B1, Group B2, Group C, Group D, or Group E. Group A includes substances for which high-quality studies have demonstrated a relationship between the exposure to the substance in question and the development of cancer in human populations. Groups B1, B2, and C represent chemicals with limited (B1) or insufficient (B2) human evidence of carcinogenicity, and sufficient (B1, B2) or insufficient (C) animal data. Group D substances are those for which there is insufficient or no evidence of carcinogenicity in humans or animals, while Group E substances are those for which no evidence of carcinogenicity is available in adequate human or animal studies.

Toxicity criteria used to quantify carcinogenic risks (cancer slope factors – CSFs and inhalation unit risks – [IURs]) is presented for all sites in Table 7-1. Dermal toxicity factors were estimated from oral toxicity data using chemical-specific oral to dermal adjustment factors recommended in EPA (2019a), as presented in Table 7-1.

7.3 Non-Carcinogenic Toxicity Criteria

For noncarcinogenic effects, the body's protective mechanisms must be overcome before an adverse effect is manifested. If exposure is high enough and these protective mechanisms (or thresholds) are exceeded, adverse health effects can occur. EPA attempts to identify the upper bound of this tolerance

range in the development of noncancer toxicity values. Health effects criteria for chemicals exhibiting noncarcinogenic effects are generally developed using verified risk reference doses (RfDs) and reference concentrations (RfCs). These are developed by the EPA and listed in IRIS (EPA 2019c), or can be obtained from HEAST (EPA 1997a). The RfD is expressed in units of dose (mg chemical/kg body weight-day) and is usually derived either from human studies involving workplace exposures or from animal studies. The RfDs are estimates (with uncertainty spanning perhaps several orders of magnitude) of the daily exposure to the human population (including sensitive subpopulations) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfD is used as a reference point for gauging the potential effects of exposures. Usually, exposures (as chemical intakes or doses) that are less than the RfD are not likely to be associated with adverse health effects. As the frequency and/or magnitude of the exposures exceeding the RfD increase, the probability of adverse effects in a human population increases.

RfDs are developed for both chronic and subchronic exposures. Chronic RfDs are presented in IRIS or HEAST and are intended for use in evaluating exposures of durations greater than 7 years. Subchronic RfDs are developed by EPA's National Center for Environmental Assessment (NCEA) and are used to characterize the potential for the occurrence of noncarcinogenic effects associated with short-term exposures (2 weeks to 7 years as defined by EPA 1989). The subchronic RfDs are developed similarly to chronic RfDs, and are typically equal to chronic RfDs, or are one order of magnitude greater (less stringent). The subchronic RfDs are presented in HEAST, but they are no longer being reviewed and updated in the same manner as IRIS. Chronic RfDs have been used in this HHRA because there is greater uncertainty associated with the subchronic RfDs, and because none of the SBMM receptors (excluding a child) have an exposure duration of 7 years or less.

The RfDs are derived using uncertainty factors that reflect scientific judgment regarding the various types of data used to estimate the RfD. RfDs are typically estimated from no observable adverse effect levels (NOAELs) or lowest observable adverse effect levels (LOAELs) in human or animal studies. Uncertainty factors, generally 10-fold factors, are intended to account for:

- variation in sensitivity among members of the human population;
- uncertainty in extrapolating animal data to the case of humans;
- uncertainty in extrapolating from data obtained in a study that is less-than-lifetime exposure;
- uncertainty in using LOAEL data, when necessary, rather than NOAEL data; and
- inability of a single study to adequately address every possible adverse outcome in humans.

To derive RfDs, NOAELs or LOAELs are divided by one or more uncertainty factors, as appropriate. When taken together, these uncertainty factors may confer an extra margin of safety of up to a factor of 10,000 below a LOAEL. In some cases, modifying factors are also applied to RfDs to consider other uncertainties in the toxicity database and reflect the professional judgment of those reviewing the database. The net

result is that RfDs are generally considered to provide a conservative estimate of the likelihood of adverse noncarcinogenic effects.

Toxicity criteria used to quantify non-carcinogenic hazards (oral reference doses – RfDs and inhalation reference concentrations – RfCs) are presented in Table 7-1. Dermal toxicity factors were estimated from oral toxicity data using chemical-specific oral to dermal adjustment factors recommended in EPA (2019a), as presented in Table 7-1.

7.4 Chemical Specific Toxicity Criteria

This section presents and discusses chemical-specific toxicity criteria associated with two of the selected COPCs (Section 4.0). There was no COPC selection process before quantitative risks and hazards were evaluated (and presented in Section 8). The risk and hazard calculations were performed on all COPCs.

7.4.1 Arsenic

EPA's guidance regarding the assessment of bioavailability of arsenic in soil and sediment (EPA 2012) has led to incorporating a bioavailability factor into the risk calculations. Bioavailability studies conducted in animal models show that the bioavailability of arsenic in soil is typically less than that of highly water-soluble forms of arsenic (e.g., sodium arsenate dissolved in water). These results suggest that bioavailability of arsenic in soil will typically be less than that of arsenic dissolved in drinking water, resulting in relative bioavailability (RBA) of soil/water less than 100%. The EPA (2012) reviewed data regarding the RBA of arsenic in contaminated soil compared with sodium arsenate as the reference material. Sodium arsenate was chosen as a highly water-soluble compound to reflect the bioavailability of arsenic in drinking water, which is the vehicle from which the oral toxicity values for arsenic were developed. Three different but compatible bioavailability assays were used. Highest RBA factors were measured for swine, followed in order by mice and monkeys. Arithmetic mean, 50th percentile and 95th percentile values for RBA of 0.345, 0.370 and 0.609 were determined for swine. The EPA (2019a) rounds the 95th percentile value to 0.6 for developing RSLs for exposure to arsenic in soil. Based on this information, an oral RBA of 60% is now assumed in the derivation of the RSL for the ingestion of soil and sediment. Likewise, the intake equations for arsenic were adjusted by a factor of 0.6 or 60%. At Region 9 mine sites, arsenic bioavailability is approximately 20% or less (Bradham et al. 2011).

The RBA for arsenic can be applied in HHRAs in either the exposure assessment or the toxicity assessment (Strategic Environmental Research and Development Program [SERDP] and Environmental Security Technology Certification Program [ESTCP], 2016). For this HHRA, the intake equation adjusted for bioavailability by including the RBA (0.6). The RBA was applied to intake equations for evaluating the incidental ingestion of arsenic in soil and sediment in both site and PMB/ambient calculations. It is noted that the RBA does not apply to dermal exposures to arsenic in soil and sediment for which the absorbed dose is calculated using a dermal absorption fraction (ABS_d) of 0.03 (EPA 2019b; EPA 2004).

7.4.2 Mercury

Soil, sediment, and surface water samples were primarily analyzed for total mercury, although surface water samples were also generally analyzed for methylmercury. The mercury at the Site is from historical mining activities for borax, sulphur, and mercury ore, it is expected to be primarily in a complexed form. As a common complexed form of mercury (mercuric chloride) has readily available and robust toxicity data, this form of mercury has been used as a surrogate for total mercury for toxicity purposes. The bioavailability of some other forms of inorganic mercury are very low (e.g., mercury sulfide) and if present at the SBMM, could be considered to be essentially nontoxic due to immobility in aquatic and/or terrestrial food chains and could pass through the human gastrointestinal (GI) tract intact due to its relatively low GI absorption factor. The uncertainties associated with mercury toxicity are discussed in more detail in Section 9.1.

Results of a site-specific mercury speciation study using SBMM abiotic samples are presented in Section 4.1.

The predominant forms of mercury currently assumed at the SBMM currently include mercuric chloride and methylmercury. The corresponding toxicity values for these species are provided in Table 7-1.

8.0 RISK CHARACTERIZATION

Quantitative risks and hazards due to exposure to COPCs are estimated by combining CDIs (Section 6.6) and the toxicity criteria (Section 7.0). Methods used to calculate risks and hazards follow EPA's guidance (1989). Calculation of risks and hazards due to exposure to COPCs are provided in Appendix C for the various receptor scenarios.

For exposures to potential carcinogens, the individual upper-bound excess lifetime cancer risk was calculated by multiplying the estimated CDI by the CSF, or by multiplying the inhalation exposure concentration by the IUR. In order to assess the individual excess lifetime cancer risks associated with simultaneous exposure to COPCs, the risks derived from the individual chemicals are summed within each exposure pathway. For the residential, recreational user (non-tribal), and traditional tribal receptor scenarios, carcinogenic risk was evaluated for the "lifetime receptor" by adding together estimated cancer risks for adult and child, or adult and youth receptor, as appropriate.

Non-carcinogenic adverse health effects were calculated by dividing the CDI of each COPC by its RfD, or by dividing the inhalation exposure concentration by the RfC, thus resulting in a hazard quotient (HQ). HQs with a value greater than one (1.0) indicate the potential for adverse health effects. To estimate non-carcinogenic adverse health effects due to simultaneous exposure from multiple exposure pathways, HQs for individual pathways were summed resulting in a HI. As with HQs, HIs that are greater than 1.0 indicate potential adverse health effects. Although almost all of the identified COPCs have non-carcinogenic effects, some of these adverse effects are for different target organs (Table 7-1); therefore, some hazards from these COPCs are not considered to be additive. Non-carcinogenic hazards were evaluated for child, youth, and adult receptors independently.

Excess lifetime cancer risks derived in this HHRA were compared with EPA's risk management range of 1E-06 to 1E-04 for Superfund sites (EPA 1989). In addition, EPA's Office of Solid Waste and Emergency Response issued a directive (EPA 1991a) clarifying the role of the HHRA in the Superfund process. The directive states, if the cumulative carcinogenic risk to a receptor (based on reasonable maximum exposure for both current and future land use) is less than 1E-04 and the non-carcinogenic HI is equal to or less than 1, action generally is not warranted unless adverse environmental effects are likely. Final determination of the acceptable target risk within the 1E-06 to 1E-04 risk management range is a risk management decision to be reached by stakeholders.

8.1 Estimated Risks and Hazards Detailed Results

Within this section, risk and hazard detailed results are presented separately for each receptor group and also by exposure media. In addition to the Site-related risks and hazards summarized in each section, the background risks and hazards are also summarized in this section (see Table 8-1). At the end of each section, a multi-pathway summary (from Table 8-1) for each receptor is presented.

8.1.1 Lakeside Residents

The estimated risk and hazard results for lakeside residents are summarized by exposure media in the following subsections.

Drinking Water

The lakeside residents who had their tap water sampled have stated that they do not use the water from their tap as their source of drinking water. Therefore, the risks and hazards of this evaluation are overestimated. Though not part of this evaluation, it should be noted that giardia and cyanogens are present in the lake water, which would make it hazardous for household use. For site-related exposures, the total excess lifetime cancer risks for lakeside residents from drinking water is 5E-04 which exceeds EPA's risk management range; (5.8E-05 for adults and 1.3E-04 for children) (Table 8-2). The total noncancer hazard indices for lakeside residents from drinking water are 34 for adults and 56 for children which exceeds EPA's target threshold.

Background cancer risk and hazards are based on ambient surface water concentrations. The background cancer risks from drinking water is 4E-04 (2.8E-04 for adults and 1.4E-04 for children). The noncancer hazards are 30 and 50 for adults and children, respectively. Arsenic is the primary contributor to both cancer risk and the noncancer hazard.

Soil

For site-related exposures, the total excess lifetime cancer risks for lakeside residents from soil exposures is 2E-04 (6E-05 for adults and 1E-04 for children) (Table 8-3). The noncancer HIs are 5 and 51 for lakeside resident adults and children, respectively, which exceed EPA's target threshold of 1.0.

Background risks were based on the PMB Franciscan soil dataset because the lakeside residential area is predominantly located over the Franciscan formation. Background cancer risks from soil exposures is 1E-04 (3E-05 and 7E-05 for adults and children, respectively). The background noncancer hazard indices are 3 for adults and 33 for children.

Arsenic is the primary contributor to the cancer risk. The primary contributors to the total hazard are arsenic (92%), antimony (4%), and thallium (4%).

Multi-Pathway Results for the Lakeside Resident

The total excess lifetime cancer risk for the Lakeside Resident, including exposure to both drinking water and soil is 7E-04, background risk is 5E-04. The primary exposure pathway contributing to the cancer risk is exposure to soil and the primary chemical contributor is arsenic. The site-related total noncancer HI for an adult is 39 and for a child is 107, background HI for an adult is 33 and for a child is 83. The primary exposure pathway contributing to the noncancer HI is exposure to soil and the primary chemical contributors are arsenic, antimony, and thallium.

8.1.2 Recreational Users

The estimated risk and hazard results for recreational users are summarized by exposure media as follows.

Surface Water

The total excess lifetime cancer risks for recreational users is 2E-06 from recreational exposures to surface water from Clear Lake. The noncancer hazard is 1 from swimming and wading in surface water at Clear Lake. Recreational background risk was based on the ambient surface water data for Clear Lake. The background cancer risk for recreational receptors is 2E-06 and a noncancer HI of 0.4. Site-related, background, and incremental risks for recreational exposure to surface water are presented in Table 8-4.

Sediment

For site-related exposures, the total excess lifetime cancer risk for recreational users from exposures to sediment from Clear Lake is 9E-06 and the total noncancer HI is 2. Background risk for sediment exposure was based on ambient sediment data. Background cancer risk is 6E-06 and the HI is 1 for the recreational exposure to sediment.

The primary contributor to cancer risk and noncancer hazard index in Clear Lake sediment is arsenic. Site-related, background, and incremental risks for recreational exposure to sediment are presented in Table 8-5.

Fish Ingestion

For this pathway, only mercury data were evaluated for recreational receptors and assumed to be in the form of methylmercury. The noncancer HIs for recreational receptors is 5 for an adult and 6 for a child game fisher (high-end ingestion rate) and 2 for an adult and 4 for a child game fisher (low-end ingestion rate), and exceeds EPA's noncancer threshold of 1. Background and incremental risk from fish ingestion was not calculated because fish are mobile and there would be considerable uncertainty associated with determining which fish are site-related and which are background. Noncancer hazards for the ingestion of fish exposure pathway for both recreational ingestion rates are presented in Table 8-6.

Multi-Pathway Results for the Recreational User

The total excess lifetime cancer risk for the recreational user, including swimming and wading exposure to both surface water and sediment and recreational fish ingestion is 1E-05, and background risk is 8E-06, which is within EPA's risk management range of 1E-06 to 1E-04. The primary exposure pathway contributor to the cancer risk is sediment exposure and the primary chemical contributor is arsenic. The noncancer HI is 14 and background HI is 1. The primary exposure pathway is fish ingestion and the primary chemical contributor is mercury.

8.1.3 Trespasser

Surface Water

Swimming in the Herman Impoundment is not a common occurrence. However, this scenario was evaluated for an occasional trespassing swimmer. The unauthorized trespasser who swims or wades in

Herman Impoundment is conservatively assumed to visit once a month. As shown in Table 8-4, the total excess lifetime cancer risk from unauthorized trespasser exposure to surface water at Herman Impoundment is 8E-07 and the noncancer hazard is 0.6. Herman Impoundment background risk is based on geothermal well data (MW-11D, MW-16D, MW-17D, and MW-19D). For the unauthorized trespasser, the background cancer risk is 3E-06 and the noncancer hazard is 1.2.

A hypothetical future unauthorized trespasser was also evaluated based on modeled future groundwater (CH2M 2016 updated 2019) that accounts for 5 percent surface water runoff. The site-related cancer risk is 2E-07 and the noncancer HI is less than 1. The background cancer risk and hazard are 1E-05 and less than 1, respectively.

Soil

Two trespasser scenarios were evaluated for exposure to on-mine soil. The trespasser who is similar to the recreational receptor who visits the site 52 days per year or twice a week over a 6-month period. And a unauthorized tribal user who visits the site 104 days per year or twice a week over a 12-month period and ingests soil at the tribal rate of 100 mg/day. As shown in Table 8-7, for site-related soil exposure for the 52 day per year trespasser, the cancer risk for unauthorized trespassers is 4E-05 and the noncancer HI is 6. Unauthroized trespasser background risks are based on PMB Andesite dataset as the on-mine area is predominantly located over the Andesite formation. The background cancer risk is 4E-06 and the background HI is 0.8. Based on incremental risk results, arsenic is the primary contributor to both cancer risk and noncancer hazard.

For site-related soil exposure for the 104 days per year unauthorized tribal user, the cancer risk is 7E-05 and the noncancer HI is 13. The background cancer risk is 8E-06 and the background HI is 2. Arsenic is the primary contributor to both cancer risk and noncancer hazard.

Vapors

Unauthorized trespassers may encounter hydrogen sulfide vapors released from geothermal springs. Most likely, these close-up encounters would be brief (less than 1 hour) and infrequent. Hydrogen sulfide data collected in 1996 from the 2002 RI Report (Tetra Tech 2002) indicate concentrations from around Herman Impoundment (mostly from wells and vents) range from 0.022 mg/m^3 to 5E+06 mg/m^3. There would be considerable dispersion as these hydrogen sulfide vapors migrated from the wells or vents to downwind receptors. Seven of the hydrogen sulfide results were collected from above the surface of Herman Impoundment. As shown in Table 8-7, acute HQs from exposures from concentrations of hydrogen sulfide range from 0.0066 to 73. Three results exceed an acute hazard threshold of 1. Chronic inhalation exposure is not assessed herein because chronic exposure is not expected for a trespasser visiting the area where these samples were collected.

Mercury vapors were sampled from EIC homes and in the on-mine area. Mercury vapors were not detected in any of the indoor air samples collected in EIC homes. For the risk assessment, the maximum

on-site concentration (0.035 mg/m^3) found by the Air Quality Management District (Section 5.8) was used to evaluate a trespasser. The HQ for a trespasser exposed to mercury vapors on-mine is 0.0007.

Multi-Pathway Results for the Trespasser

The total excess lifetime cancer risk for the trespasser, including exposure to both on-mine soil and surface water in Herman Impoundment is 4E-05 and background risk is 7E-06. The site-related total noncancer HI is 7, and the background HI is 2. The exposure pathway that contributes the most to both cancer risk and noncancer hazard is exposure to onmine soil. The primary contributor to cancer risk is arsenic and to noncancer HI is arsenic.

8.1.4 Traditional Tribal Receptors

The estimated risk and hazard results for traditional tribal receptors are summarized by exposure media in the following subsection.

EIC Soil Exposure

As noted previously, a soil removal action has been conducted in the EIC living area. The risk calculations were based on a data set consisting of existing soil concentrations (from unexcavated areas)(80%) and fill material (20%). As shown in Table 8-9, total site-related cancer risks for traditional tribal receptors from soil exposures is 2E-04 (lifetime exposure – 70 years). Noncancer HIs for the traditional tribal receptor are 5 for adults and 28 for children.

Tribal soil exposure background risk is based on PMB Andesite soil data set because the EIC is located predominantly located over the Andesite formation. The background cancer risk is 4E-04. The background noncancer hazard is 9 for an adult and 47 for a child.

Based on these soil risk/hazard results, a gardening scenario was not evaluated because the background risks and hazard exceeded the site-related results, therefore, modeling uptake to garden vegetables would produce similar results.

Drinking Water

Currently, the EIC community receives their drinking water from municipal sources. This pathway was evaluated in case of future lake water use as drinking water. As noted previously, the presence of giardia and cyanogens in lake water makes it unacceptable for drinking. For site-related exposures, the total excess lifetime cancer risks for tribal receptors from drinking water from Clear Lake are 1E-03 for adults as shown in Table 8-10. The noncancer HIs for the traditional tribal receptor are 46 for adults and 74 for children. The traditional tribal drinking water ingestion rate of 4 liters per day for adults and 1.2 liters per day are used (per recommendations in Harper 2018), and conservatively assumes that all drinking water sources are from Clear Lake (which is not currently occurring).

Tribal drinking water background risks are based on ambient surface water concentrations. The adult background cancer is 2E-03. The adult background noncancer hazard is 48 and the child background

hazard is 77. Background risks and hazards were greater than or equal to site-related risks and hazards. Both the site-related and background risks were elevated due to the presence of arsenic. If arsenic was removed from the calculation, the incremental noncancer HI would be 12 due to elevated concentrations of boron, lithium, and manganese in the lake water.

A ceremonial tribal scenario was also evaluated to consider traditional, ceremonial activities that may occur from drinking water exposures at Clear Lake for 1 day per week or 52 days per year. As shown in Table 8-11, for site-related exposures, the total excess lifetime cancer risks for the ceremonial scenario are 2E-04 for adults. Total noncancer HIs for the ceremonial scenario are 7 for adults and 12 for children. The adult background cancer is 2E-04. The adult background noncancer hazard is 7 and the child background hazard is 11. Background cancer results exceeded or are equal to site-related risks.

Plant Ingestion

For this HHRA, acorns, tules (stalks and roots) and cattails (stalks and roots) were collected to represent vegetation harvested and ingested by the tribe. A guide from the tribe assisted the sampling crew in selecting locations that are actually harvested by the tribe for plant consumption. For site-related exposures, the total excess lifetime cancer risks for the tribal receptor from ingestion of plants range from 1E-04 to 4E-04, with the highest risk from cattail roots (Table 8-12). Total noncancer HIs for adults range from 9 to 14, and for children range from 12 to 17 with the highest HI from cattail roots.

For background results, uptake factors were calculated for each COPC using 2018 collocated plant/soil or plant/sediment ratios. The calculated uptake factor was applied to the ambient sediment (for cattails and tules) or PMB soil (andesite) (for acorns) concentration to produce an ambient plant concentration. Plant ingestion risk calculations were performed using the calculated background plant concentrations to produce a background risk. Background cancer risks from ingestion of plants range from 4E-05 to 3E-03 with the highest risk from cattail roots. Background noncancer HIs for adults range from 4 to 56 and for children range from 6 to 97. Background risks were then subtracted from site-related risks to produce incremental risks.

For the cattail stalks and roots ingestion results, background risk and hazard results were greater than site-related risk and hazards; therefore, incremental risks were not calculated.

In the event that the tribe stores their acorns year-round, an additional scenario was evaluated that represents acorn ingestion at 365 days per year. The incremental risk and hazard results for this scenario is 6E-04 and 34 for an adult and 46 for a child. (See Table 8-13 for site-related, background and incremental risk/hazard results for year-round ingestion of acorns.)

Fish Ingestion

Similar to the recreational receptors, only mercury data were evaluated for the fish ingestion pathway for the tribal receptors. The mercury in the fish tissue is assumed to be in the form of methylmercury. Two ingestion rates were recommended in Harper 2018, including a rate for a land-intensive homesteader

(220 gpd for an adult and 41 gpd for a child) and a lake-intensive homesteader (500 gpd for an adult and 94 gpd for a child). As shown in Table 8-6, the noncancer HIs for the tribal land-intensive homesteader scenario is 8 for an adult and 8 for a child, and the tribal lake-intensive homesteader scenario is 18 for an adult and 18 for a child.

Waterfowl Ingestion

Modeled mercury in bird tissue is being used to represent the waterfowl ingestion pathway. The modeled grebe mercury tissue concentration would be 3.2 µg/g dry weight using the average grebe blood concentration of 1.27 µg/g wet weight (n=38) from the CEDEN database. The average concentration was used because the grebe is a very conservative surrogate for the coot (i.e., the grebe would tend to have higher mercury concentration in blood compared with a coot, due to its diet). Using an average bird tissue moisture content of 70% (Ackerman et al. 2016), 3.2 µg/g dry weight would be 0.96 µg/g wet weight. The estimated hazard quotient for a tribal member consuming 100 gpd of bird tissue with 0.96 µg/g mercury is 4 for an adult and 4 for a child, which are both above EPA's target hazard threshold of 1.

Multi-Pathway Results for the Traditional Tribal Receptor

The total excess lifetime cancer risk for the traditional tribal receptor, including exposure to soil, potential future drinking water from Clear Lake, and plant, fish, and water fowl ingestion is 2E-03, background risk is 2E-03. The site-related total noncancer HI is 83 for an adult and 136 for a child, background HI is 61 for an adult and 129 for a child. All noncancer HIs exceed the noncancer threshold of 1. The pathway that contributes the most to the noncancer HI is fish ingestion.

8.2 Lead Evaluation

EPA does not publish toxicity values for lead, a COPC known to cause adverse noncancer health effects. The potential for health effects from exposure to lead was addressed in this Sitewide HHRA by comparing EPCs for each area to the risk-based RSLs (EPA 2012a) for lead in soil for residential scenarios (400 milligrams per kilogram [mg/kg]) and the Cal/EPA residential lead screening level of 80 mg/kg.

The following discussion compares lead PMB concentrations in soil, and ambient surface water, and sediment data to Site data. The background threshold values are based on a calculated 95% upper confidence limit. The sources of the background data set for the various exposure media are discussed in detail in Section 5.0.

In lakeside residence soil, lead was detected at concentrations ranging from 5.9 to 25.6 mg/kg and 33% of the samples exceeded the lead PMB level (Franciscan) of 12.6 mg/kg. Lead concentrations in lakeside residence soils are well below EPA's residential lead screening level of 400 mg/kg and the Cal/EPA residential lead screening level of 80 mg/kg.

In the EIC, lead was detected at concentrations ranging from 2.9 to 21.3 mg/kg and only one of the sample results exceed the lead PMB level (Andesite) of 14.5 mg/kg. Lead concentrations in the EIC soil are well below both residential lead screening levels.

In the on-mine area, lead was detected at concentrations ranging from 5.5 to 26 mg/kg and 33% of the samples exceeded the lead PMB level (Andesite) of 14.5 mg.kg. Lead concentrations in the on-mine area are well below both residential lead screening levels.

For surface water, lead was not detected in any of the background surface water samples. Although lead was detected in 98% of the Site total water and 99% of the filtered water samples, the lead 95 UCLs of 3.1 µg/L and 0.02 µg/L for total and filtered surface water, respectively, are well below EPA's surface water (tap water) lead MCL of 15 µg/L.

Lastly, the Site lead concentrations in sediment (95UCL of 10 mg/kg) does not exceed the lead background level in sediment (20.1 mg/kg), and both of these concentrations are well below the residential soil lead screening levels. Lead was detected in 83% of the Site sediment samples.

As lead concentrations are below hazard-based screening levels, no quantitative calculations (e.g., using the Integrated Exposure Uptake Biokinetic Model or Adult Lead Model) have been performed.

9.0 UNCERTAINTIES

There are numerous uncertainties associated with the SBMM HHRA. These are discussed in detail in the following subsections.

9.1 Mercury Speciation

The speciation of mercury is related to the risk discussion because some forms, such as mercuric sulfide, have very low bioavailability and thus are not expected to accumulate in the food chain and typically are excluded as COPCs. Mercury may be present in several different forms at the SBMM, as a result of speciation (e.g., weathering, complexation with other inorganic chemicals present in the environment, and/or microbial transformation). Total mercury results (i.e., nonspeciated) were generally much more prevalent for the Site. It was assumed the mercury at the Site is in the form (speciation) of mercuric chloride in soil, soil particulates in air from wind mobilization, sediment, plants, and surface water. It was also assumed that mercury at the Site is in the form of methylmercury in fish tissue and waterfowl tissue. An assumption that total mercury in fish tissue is 100% methylmercury is supported by EPA (1997b). By analogy, methylmercury is also assumed in waterfowl tissue, as this receptor is also in close association with the aquatic environment.

Some methylmercury results were available for wild plant tissue samples, and when available, these results were used if the basis (wet weight or dry weight) was known. Some methylmercury results were also available for surface water samples, and when available, these results were used. In general, as shown below, an evaluation of the relative methylmercury to total mercury concentrations in the same plant tissue samples demonstrated that methylmercury was a low component of total mercury in plants. This finding supports the assumption that the mercury form in plant tissues would more likely be mercuric chloride and not methylmercury (when a speciation decision is needed to quantify toxicity for total mercury results).

Plant Species and Mercury Results	Average Concentration (mg/kg)	Relative Methylmercury Percentage
Acorns (2018) n =20		
Methylmercury	0.0014	8.2%
Total mercury	0.017	
Tule Stalks (2018) n = 10		
Methylmercury	0.0026	29%
Total mercury	0.0091	
Tule Roots (2018) n = 10		
Methylmercury	0.0040	27%
Total mercury	0.015	

Plant Species and Mercury Results	Average Concentration (mg/kg)	Relative Methylmercury Percentage
Tule Stalks (2006) n = 12		
Methylmercury	0.026	7.9%
Total mercury	0.33	
Cattail Rhizomes (2018) n = 10		
Methylmercury	0.0031	0.86%
Total mercury	0.36	

Note:
mg/kg = milligram(s) per liter

Some methylmercury results were also available for surface water samples, and when available, these results were used. In general, as shown below, an evaluation of the relative methylmercury to total mercury concentrations in the same surface water samples demonstrated that methylmercury was a low component of total mercury in surface water. This finding support as assumption that the mercury form in surface water would more likely be mercuric chloride and not methylmercury (when a speciation decision is needed to quantify toxicity for total mercury results).

Surface Water (Unfiltered Mercury Results)	Average Concentration	Relative Methylmercury Percentage
2004 North Wetland Study		
Methylmercury	1.37 ng/L	1.2%
Total mercury	0.11 µg/L	
2005 North Wetland Study		
Methylmercury	0.41 ng/L	0.87%
Total mercury	0.047 µg/L	
2006 April North Wetland Study		
Methylmercury	1.0 ng/L	2.2%
Total mercury	0.045 µg/L	
2006 June North Wetland Study		
Methylmercury	0.63 ng/L	0.93%
Total mercury	0.068 µg/L	
2007 Sentinel Species Study		
Methylmercury	0.55 ng/L	2.8%
Total mercury	0.020 µg/L	

Notes:
mg/kg = milligram(s) per liter
ng/L = nanogram(s) per liter

As mercury is expected to weather over time in the soil and sediment environment, it would likely complex in these matrices with common ions such as chloride and form mercuric chloride. This, in turn, would result is mercuric chloride being mobilized as soil particles to ambient air (for inhalation exposure), runoff to aquatic environments, and uptake by plants.

There are differences in methylmercury and mercuric chloride toxicity. Methylmercury has an oral RfD of 1.0E-4 mg/kg-day, while mercuric chloride's RfD is 1.6E-4 mg/kg-day (and thus 1.6-fold less toxic). Mercuric chloride has an inhalation RfC of 3.0E-5 mg/m^3, while methylmercury does not have a published RfC and is not considered to be an inhalation concern.

However, there are other possible forms of mercury, including but not limited to elemental mercury, mercury salts (besides mercuric chloride), and mercuric sulfide, which is common in cinnabar that would be expected at former mercury mines) (Varejao et al. 2009). Elemental mercury (that has an RfC of 3.0E-4 mg/m^3) is not expected at the Site due to the fact that this form of mercury is typically not found at former mercury mines. Mercury salts have recommended toxicity values equal to mercuric chloride (EPA 2019a).

Mercuric sulfide has a provisional RfD of 3.0E-03 mg/kg-day (EPA 2002d), and is thus 19-fold less toxic than mercuric chloride and 30-fold less toxic than methylmercury. The presence of mercuric sulfide at the Site would be very important, as this form of mercury has an extremely low bioavailability (Brooks Applied Labs, 2017) and would not be expected to bioaccumulate in aquatic or terrestrial food chains, and could pass through the human gastrointestinal tract (GI) intact due to its relatively low GI absorption factor.

Mercury speciation can be quantified by applying unique laboratory sequential extraction techniques to Site soil and/or sediment samples, as discussed by Bloom et al. (2003) and Brooks Applied Labs (2017). Although the site-specific mercury speciation has been performed and summarized in Section 4.1.4, a bioavailability factor of 10% recommended by Smucker (2012) and others was used in the risk calculations.

In summary, assumptions related to mercury speciation (and associated toxicity) add uncertainty to the HHRA. However, the assumptions used would be expected to either balance out or have a net effect of overestimating mercury hazards. This is because although methylmercury is 1.6-fold more toxic than mercuric chloride, the lower toxicity and much lower bioavailability associated with mercuric sulfide (which could be common at the Site) has not been considered. In addition, the overall mercuric chloride hazards estimated for the various Site receptors are generally close to or less than 1; therefore, relatively minor adjustments in mercury speciation assumptions for inorganic mercury at the Site would not be expected to significantly alter risk assessment conclusions.

9.2 Arsenic Bioavailability

As discussed in Section 7.4.1, an arsenic RBA of 60% was applied to the soil and sediment ingestion intake equations based on arsenic bioavailability studies presented in EPA 2012. At multiple mines sites in Region 9, the arsenic bioavailability has been shown to be much lower than 60% (20% or less) (Bradham et al. 2011). The arsenic contribution to risk and hazard is significant in this risk assessment. It is the primary

contributor in all of the scenarios evaluated. A comparison of risks/hazards from exposure to arsenic using the 60% RBA and a 20% RBA is presented below:

Receptor	Arsenic RBA 60%	Arsenic RBA 20%	Arsenic RBA 80%
Cancer Risk			
Lakeside Resident (adult plus child) Exposure to Soil	2.1E-04	8.0E-05	2.5E-04
Recreational User (youth) Exposure to Sediment	9.3E-06	6.2E-06	1.0E-05
Trespasser (youth) Exposure to OnMine Soil	3.2E-05	1.7E-05	4.0E-05
Tribal (adult plus child) Exposure to Soil in the EIC	1.9E-04	6.8E-05	2.4E-04
Noncancer Hazard (Child or Youth)			
Lakeside Resident (child) Exposure to Soil	51	21	67
Recreational User (youth) Exposure to Sediment	1.6	1.1	1.9
Trespasser (youth) Exposure to OnMine Soil	5.7	3.0	7.1
Tribal (child) Exposure to Soil in the EIC	24	9	32

9.3 Tribal Cultural Use Risks and Hazards

As discussed in Section 6.3.3, unique exposure factors have been used in the HHRA for this sensitive receptor population (EPA 2007; Harper 2018). Many of these unique exposure factors result in elevated risks and hazards (Tables 6-1, 6-2, and 6-3). However, as discussed previously, enhanced exposures, such as an assumption of consuming 4 liters of Clear Lake surface water per day, an incidental soil ingestion rate of 400 milligrams per day, and a diet based on harvesting 100 percent of food items from SBMM COPC-impacted areas (for 365 days per year for 70 years, for an adult), would typically be considered reasonably protective. Therefore, the estimated risks and hazards for traditional tribal receptors would most appropriately be viewed as potential. These types of potential risks and hazards are provided to bound risk and hazard estimates for SBMM (for example, on the high end). These types of bounding risk and hazard estimates may be used by risk managers and stakeholders in the decision-making process (for example, in the SBMM Feasibility Study).

9.4 Lakeside Resident -

Some lakeside residents may be exposed to lake sediment and surface water through recreational activities and ingestion of fish from Clear Lake. These additional exposure pathways are evaluated in this section to provide cumulative risk and hazards to the lakeside residents.

Receptor	Pathway	Cancer Risk	Hazard Index
Lakeside Resident	Residential Drinking Water (adult + child)	5E-04	--
	Residential Drinking Water (adult)	--	34
	Residential Drinking Water (child)	--	56
	Residential Soil Exposure (adult + child)	2E-04	--
	Residential Soil Exposure (adult)	--	5.3
	Residential Soil Exposure (child)	--	51
	Recreational Sediment Exposure (adult+child)	3E-05	--
	Recreational Sediment Exposure (adult)	--	0.7
	Recreational Sediment Exposure (child)	--	3.9
	Recreation Surface Water Exp (adult +child)	8E-06	--
	Recreational Surface Water Exposure (adult)	--	1.7
	Recreational Surface Water Exposure (child)	--	2.0
	Fishing (high end ingestion rate) - adult	--	5.5
	Fishing (high end ingestion rate) – child	--	5.8
Total Cancer Risk		7E-04	
Total Adult Hazard			47
Total Child Hazard			118

9.5 Evaluation of Some Receptors Using Upper Bound Values

In order to bound the estimated risks and hazards for some receptor populations (such as a trespasser visiting the Mine Site itself and tribal members using Clear Lake surface water for ceremonial drinking water purposes), upper bound exposure parameters were used. There is uncertainty associated with this approach because the precise exposure frequency is not known, and the use of a proxy upper bound value (such as doubling the baseline exposure frequency) may result in a considerable overestimate of COPC risk and hazard. However, to provide additional information to risk managers, these upper bound results have been quantified and are presented in the risk assessment.

9.6 Bioaccumulation Factors and Waterfowl Tissue Concentrations

Mercury concentrations in American coots (a species identified by the EIC as a common waterfowl bird hunted and consumed by some Tribal members) were estimated using a modeling approach based on a published blood to tissue concentration regression equation (Ackerman et al. 2016) and SBMM-specific mercury concentrations measured in grebe blood (Section 6.5.3). There are numerous uncertainties associated with this approach, as previously discussed in Section 6.5.3. Overall, uncertainties suggest that mercury exposure (and estimated hazards) associated with EIC consumption of coots have been

overestimated, rather than underestimated. The overestimation may range from approximately 5-fold to 226-fold.

9.7 Upland Bird Tissue Concentrations

Mercury concentrations in upland birds, such as turkey or quail (species that the EIC indicated that they do not consume when responding to the 2018 Tribal Questionnaire, but later identified as potentially hunted and consumed by some Tribal members) are not available. Methodologies to estimate these concentrations from measured mercury concentrations in soil and/or upland plants such as acorns are highly uncertain and not reliable. Therefore, mercury concentrations in upland birds using waterfowl as a surrogate (see above) may be used as a conservative approach, as mercury is known to bioaccumulate more in the aquatic environmental compared to the terrestrial environment (EPA 1997). There is considerable uncertainty in this approach, as the relative difference in mercury concentrations in waterfowl compared with upland birds is not readily available. However, as the estimated hazard associated with waterfowl ingestion by Tribal hunters is relatively low (hazard of 8; Section 8.1.4, and as previously discussed above this estimate is expected to be an overestimate, the hazard associated with Tribal ingestion of upland birds is expected to be acceptable.

9.8 Estimation of Mercury Concentrations in Soil at Elem Indian Colony

The estimation of the mercury concentration in soil at the EIC was based on merging two data sets. One data set was from non-excavated areas where mercury contamination was generally below the historical cleanup level of 80 mg/kg (i.e., with a site-wide exposure point concentration equal to 12.87 mg/kg) and a second data set represented clean backfill (i.e., 0.66 mg/kg) that was used to fill in excavated cleanup areas. These two exposure point concentrations were combined using an 80 percent to 20 percent ratio based on the relative area of the EIC land that was excavated and backfilled (20 percent) and the area that was not excavated (80 percent). There are uncertainties associated with this approach. In particular, the 80:20 areal percentages only take into account the relative surface areas based on historical excavation footprints. In addition, there is uncertainty because the behavior and activities related to surface soils for the tribal members is not known, so it is only assumed that the majority of time these receptors are in non-excavated areas and only 20 percent of the time in backfilled areas.

9.9 Omission of Some Plant Tissue Data in the Risk Assessment

Results of the 2006 sampling of tule tissue (wild plants) were not used in the risk assessment because the basis of the sample results (wet weight basis or dry weight basis) was not reported in historical documents and was not otherwise readily available. As the COPC concentrations must be in a wet weight basis for use in the wild plant ingestion equation, it was deemed too uncertain to use these data when this factor was not known. The 2006 tule data included 6 stalk sample results for chromium, iron, manganese, nickel, and zinc and 12 stalk sample results for mercury and methylmercury.

As more recent tule tissue results were available (2018, 20 tule stalk samples, 20 tule root samples, 26 metals analyzed) and were used in the risk calculations, this uncertainty is deemed relatively minor.

9.10 Lack of Toxicity Values for Some Chemicals

Some limited chemical analytical results were available for three forms of arsenic (arsenate, arsenite, and inorganic arsenic) from historical sampling performed at SBMM. However, readily-available toxicity data were not found for three forms of arsenic. There is some uncertainty associated with not quantifying the toxicity of these three forms of arsenic in the risk assessment. However, as an abundance of total arsenic data were available and used, and estimated cancer risks and noncancer hazards were quite elevated for arsenic, it is unlikely overall arsenic risk and hazards were significantly underestimated.

9.11 Elemental Mercury Volatile Emissions

Mercury, if present in the form of elemental mercury, would have some volatility. However, the amount of volatile elemental mercury emissions from impacted media to ambient air is expected to be biologically insignificant. Elemental mercury, if present at SMBB, would be expected to be part of a chemical complex with other compounds, and therefore, not as volatile as pure elemental mercury. Even if pure elemental mercury were present in some small areas within SBMM, volatilization to ambient air would not be expected to result in concentrations that would be associated with adverse inhalation hazards.

9.12 Estimation of Risks and Hazards Based on Use of Historical Data and Soil Data where the Depth is Unknown

Risks and hazards may be over or underestimated based on use of older data and use of soil data where the depth is unknown. Although use of this data creates a fair amount of uncertainty, it was considered more appropriate to use than to ignore this older, unclassified soil data.

9.13 COPCs in Surface and Subsurface Soil

There is some uncertainty associated with the merging of COPC concentrations in surface (0-2 ft bgs) and subsurface soil (2-10 ft bgs) for EPCs used in the HHRA. Some receptors that would only be expected to be exposed to COPCs in surface soils (e.g., current tribal EIC members and current Lakeside Residents) might have risks and/or hazards overestimated if concentrations were greater in subsurface soils compared with surface soils, or underestimated if concentrations were greater in surface soils compared with subsurface soils. It should be noted that on-mine trespassers were modeled in the HHRA to only be exposed to surface soil COPCs, as no subsurface disturbance or intrusive activities are planned for this area).

A comparison of surface, subsurface, and total concentrations statistics are provided below, for EIC soils, for two key HHRA COPC drivers (arsenic and mercury):

Parameter	Number of Samples	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Arithmetic Mean	Upper Confidence Limit on the Mean (95% UCL)
EIC Surface Soil (0 to 2 ft)							
Arsenic	62	100	mg/kg	0.54	55.3	4.04	4.45

Parameter	Number of Samples	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Arithmetic Mean	Upper Confidence Limit on the Mean (95% UCL)
Mercury	62	100	mg/kg	0.39	53.6	11.7	14.3
EIC Subsurface Soil (2 to 10 ft)							
Arsenic	28	86	mg/kg	0.72	52.2	4.11	5.90
Mercury	28	100	mg/kg	0.14	114	7.49	25.0
EIC Soil Used in Risk Calculations (0 to 10 ft)							
Arsenic	90	94	mg/kg	0.54	55.3	4.06	4.49
Mercury	90	100	mg/kg	0.14	114	10.3	12.8

Note:
mg/kg = milligram(s) per liter

This comparison shows that the differences in arsenic and mercury concentrations in surface and total soil (particularly the 95% UCLs) are slight, and the use of total soil EPCs in the HHRA is not expected to have imparted significant bias to the risk and/or hazard results.

In addition, the incremental risk and hazard calculations (Section 9.4) subtracted ambient (background) risks from Site risks, and the ambient soil data set consisted of surface soil samples only, while the Site data set included surface and subsurface soil. This mismatch in depth intervals might have contributed considerable uncertainty to the results of the incremental calculations. However, as shown above, the differences in Site surface and total soil concentrations (particularly 95% UCLs) are slight. Furthermore, ambient concentrations of arsenic and mercury in surface soil are not expected to be significantly different from deeper soils (2-10 ft bgs). Therefore, the uncertainty associated is deemed minor for these two COPCs incremental risk and hazard estimates for exposure to surface soil only for the EIC Tribal members.

Similarly, a comparison of surface, subsurface, and total concentrations statistics are provided below, for Lakeside Resident soils, for two key HHRA COPC drivers (arsenic and mercury):

Parameter	Number of Samples	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Arithmetic Mean	Upper Confidence Limit on the Mean (95% UCL)
Lakeside Resident Surface Soil (0 to 2 ft)							
Arsenic	156	94	mg/kg	0.53	222	13.9	24.0
Mercury	156	100	mg/kg	0.23	494	42.1	59.1
Lakeside Resident Subsurface Soil (2 to 10 ft)							
Arsenic	175	97	mg/kg	0.65	139	2.2	19.5
Mercury	175	99	mg/kg	0.07	273	0.22	43.2

Parameter	Number of Samples	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Arithmetic Mean	Upper Confidence Limit on the Mean (95% UCL)
Lakeside Resident Soil Used in Risk Calculations (0 to 10 ft)							
Arsenic	331	95	mg/kg	0.53	222	12.84	19.0
Mercury	331	99	mg/kg	0.055	494	33.86	47.0

Note:
mg/kg = milligram(s) per liter

This comparison shows that the differences in arsenic and mercury concentrations in surface and total soil (particularly the 95% UCLs) are not insignificant, and the use of total soil EPCs in the HHRA appears to have underestimated surface soil risks and hazards by approximately 1.26-fold for arsenic and for mercury (24/19 and 59.1/47, respectively).

In addition, the incremental risk and hazard calculations (Section 9.4) subtracted ambient (background) risks from Site risks, and the ambient soil data set consisted of surface soil samples only, while the Site data set included surface and subsurface soil. This mismatch in depth contributed some uncertainty to the results of the incremental risk and hazard calculations. As shown above, surface soil concentrations were 1.26-fold greater than total soil concentrations (based on 95% UCLs). In addition, ambient concentrations of arsenic and mercury in surface soil are not expected to be significantly different from deeper soils (2-10 ft bgs), or from total soil (0-10 ft bgs).

If the Site total soil risks for arsenic were adjusted upwards by 1.26-fold (to reflect a surface soil 95% UCL), the resultant incremental adult and child risks in Table 8-3 would be approximately 4.3E-05 and 9.9E-05, respectively, for a combined lifetime risk of 1.4E-04. This estimated lifetime cancer risk slightly exceeds EPA's risk management range of 1E-04. Therefore, the uncertainty associated with arsenic's incremental risk estimate for exposure to surface soil only for the Lakeside resident is significant.

If the Site total soil hazards for mercury were adjusted upwards by 1.26-fold (to reflect a surface soil 95% UCL), the resultant incremental adult and child hazards in Table 8-3 would be approximately 4 and 24, respectively. These estimated noncancer hazards exceed EPA's hazard threshold of 1; however, this is the same finding prior to this adjustment. Therefore, the uncertainty associated with mercury's incremental hazard estimate is deemed minor for exposure to surface soil only for the Lakeside resident.

9.14 Ambient Sediment Data and Impacts to the Plant Ingestion Risk Results

The ambient sediment data were collected at locations to represent the Oaks Arm shoreline conditions at a sufficient distance from the mine. Sediment samples were collected between 1 and 2 miles from the mine. However, the arsenic concentrations found in these data (ambient sediment) were elevated in comparison to the arsenic concentrations found in the North wetland area. In addition, a review of the

ambient locations of the highest and lowest arsenic concentrations indicated no correlation between concentration and distance to the mine site. Studies such as Rueda et. al. (2003) suggest circulation patterns in Clear Lake may be transporting heavy metals from SBMM out into the main lake (well beyond 1 – 2 miles). Therefore, the ambient arsenic sediment concentrations may be related to releases from SBMM, and not truly representative of ambient background.

Site-specific graphical plots of arsenic in sediment to cattail root BAFs (supplemented with arsenic in soil to acorn BAFs) show a decline in the BAF with increasing concentrations in both sediment and soil. Consequently, the use of a single-value plant BAF (for each species) appears to have over-estimated arsenic uptake for the higher "ambient" concentrations in sediment. As the ambient sediment data were used in the calculation of background tules and cattail plants, the incremental risks and hazards from ingestion of aquatic plants may be overestimated.

9.15 Incremental Risk Calculations

This HHRA presents cancer risk (risk) or non-cancer hazard (hazard index) associated with exposure to site concentrations as well as risks and hazards associated with exposure to background concentrations. This HHRA also presents the cumulative risks faced by each receptor from all exposure pathways. For risk management purposes, this report estimates an incremental excess lifetime cancer risk or hazard index from the site COPCs in all environmental media. Incremental risks and hazards for the site are not related to background levels of COPCs, rather they are calculated by subtracting the background risks and hazards from the site risks and hazards. There are some uncertainties associated with the incremental calculations.

Results of the incremental risk calculations are presented in the Section 8 tables and are summarized in the conclusions (Section 10).

Incremental risks and hazards were estimated by subtracting the ambient (background) risks and hazards from the risks and hazards estimated for each exposure area. For risk management purposes, estimated incremental risks and hazards by receptor are reported in Table 8-1. Background risks and hazards for each receptor population are also summarized in Table 8-1. The background risks and hazards were estimated using a background soil 95% UCL concentration, background wild plant 95% UCL (estimated from background soil 95% UCL), background surface water 95% UCL, and background sediment 95% UCL (Section 6.4).

As shown in Table 8-1, there are no incremental risk and hazard results for several exposure pathways as indicated by "NR," or no incremental risk and/or hazard identified. This occurs when the background risks and hazards exceed the Site risks and hazards. For other receptors, the estimated risks and hazards were reduced as a result of this incremental calculation; however, the reduction did not reduce any total site receptor cancer risks to less than 1E-06 or any total site receptor noncancer hazards to less than 1 (EPA's target risk and hazard thresholds, respectively). As also shown in Table 8-1, there are some background hazards that were not available (N/A), including recreational fishing, vapors from geothermal vents, tribal

fish ingestion, and waterfowl ingestion. This occurred because no readily available background data exist for these exposure pathways.

The incremental calculations were performed primarily for the risk driver arsenic, but also for chemicals with noncancerous health endpoints such as antimony, boron, lithium, mercury, manganese, and thallium. Ambient included pre-mining background soil, including wild plants growing in these soils and assumed to be consumed by Tribal members, and also ambient surface water.

There are several uncertainties associated with these calculations.

The results of the incremental risk calculations are particularly important because for some receptors exposure pathways there are no incremental risk when the ambient risk exceeded the Site risk. Examples included the following :

- Tribal residents using Clear Lake as a drinking water supply
- Tribal residents using Clear Lake water for ceremonial consumption purposes
- Recreational user exposed to Clear Lake water
- Tribal residents consuming wild plants (cattail roots)
- Tribal residents exposed to EIC soil

Risks and/or hazards were also significantly reduced (although not to zero) for some other receptors and exposure pathways as a result of the incremental risk calculations.

One uncertainty in the incremental risk calculation is related to the data distribution of each COPC's data set (i.e., ambient and SBMM concentrations). The data distribution (e.g., normal, gamma, log normal, undefined) dictates the statistical approach used to estimate the 95 percent UCL exposure point concentration, which is directly related to the estimated risk and/or hazard. A COPC might have dissimilar 95 percent UCL exposure point concentrations due solely to it having two different data distributions. For example, mercury in EIC soil had a gamma data distribution (and an estimated 95 percent UCL exposure point concentration of 12.9 mg/kg), while mercury in pre-mining ambient soil had a normal data distribution (and an estimated 95 percent UCL exposure point concentration of 13.7 mg/kg). The ambient concentration was greater than the Site concentration.

Another uncertainty is related to how ambient wild plant tissue concentrations were estimated. As no ambient plants (e.g., cattails, tules, acorns) were collected and analyzed, the COPC concentrations in ambient plants were estimated using Site soil-to-plant and sediment-to-plant bioaccumulation factors based on collocated soil or sediment and wild plant sample results, and applying these factors to ambient soil or sediment concentrations. This multi-step process may have amplified uncertainties present at each step, resulting in an overall uncertainty that imparted a low bias (i.e., zero risk and hazard) to the estimated incremental risks and hazards for Tribal residents consuming wild plants. In addition, ambient

sediment samples may have been collected in areas of little to no tule or cattail vegetation, and therefore would not have been comparable with collocated soil and terrestrial plant sample locations.

10.0 HHRA SUMMARY AND CONCLUSIONS

The HHRA was performed to evaluate the potential human health effects associated with chemicals at the SBMM. Receptors evaluated included lakeside residents, recreational users, trespassers, and traditional tribal receptors. Exposure pathways evaluated for the lakeside resident includes exposure to soil in their yards and SBMM Road and their drinking water from Clear Lake. For the recreational user, exposure pathways evaluated include recreational fishing (a low and a high ingestion rate), and exposure to sediment and surface water while swimming or wading in Clear Lake. For the trespasser, exposure pathways evaluated include exposure to on-mine soil, exposure to surface water while swimming in Herman Impoundment, and inhalation of hydrogen sulfide or mercury vapors at the Mine Site. For the traditional tribal receptors, exposure pathways evaluated include exposure to soil in their yards, exposure to drinking water if they were to obtain it from Clear Lake (which they presently do not), ingestion of fish, plants (acorns, tules, and cattails), and waterfowl.

Lakeside Residents

The total ELCR for the Lakeside Resident, including exposure to both drinking water and soil is 7E-04, which exceeds EPA's 1E-06 to 1E-04 risk management range. Background risk in this area is 5E-04. The primary exposure pathway contributing to the cancer risk is exposure to soil and the primary chemical contributor is arsenic.

The site-related total noncancer hazard index (HI) for an adult is 39 and for a child is 107, and background HI for an adult is 33 and for a child is 83. All of the HIs are above EPA's hazard threshold of 1. The primary exposure pathway contributing to the noncancer HI is exposure to soil and the primary contributors are arsenic, antimony, and thallium.

Recreational Users

The total ELCR for the recreational user, including swimming and wading exposure to both surface water and sediment and recreational fish ingestion is 1E-05 and background risk is 8E-06. The primary exposure pathway contributor to the cancer risk is sediment exposure and the primary chemical contributor is arsenic.

The site-related total noncancer HI is 14, and background HI is 1. The primary exposure pathway is fish ingestion and the primary chemical contributor is methyl mercury.

Trespasser

The total ELCR for the trespasser, including exposure to both on-mine soil and surface water in Herman Impoundment is 4E-05, background risk is 7E-06.

The site-related total noncancer HI is 7, and background HI is 2. The exposure pathway that contributes the most to both cancer risk and noncancer hazard is exposure to soil exposure at the mine site. The primary contributor to cancer risk is arsenic and to noncancer HI is arsenic. It is important to note that

swimming in Herman Impoundment is not a common occurrence and was included in the HHRA as a very conservative assumption.

Traditional Tribal Receptors

The total ELCR for the traditional tribal receptor, including exposure to soil, potential future drinking water from Clear Lake, recreational exposure to surface water and sediment, and plant, fish, and water fowl ingestion is 1E-03. Ambient or background risk for this receptor is 2E-03 .

The site-related noncancer HI is 76 for an adult and 133 for a child, and background HI is 62 for an adult and 133 for a child. The pathway primary contributor to the noncancer HI is fish ingestion.

For risk management purposes, presentation of incremental risks are provided in Table 8-1 Incremental cancer risks may be within EPA's risk management range, above the risk management range (>1E-04), or below the risk management range (<1E-06). These results may be interpreted as follows:

- Estimated cancer risks below and outside EPA's risk management range (i.e., <1E-06, such as 1E-07) are acceptable.
- Estimated risks above and outside EPA's risk management range (i.e., >1E-04, such as 5E-04 or 1E-03) are unacceptable.
- Estimated risks within EPA's risk management range (i.e., 1E-06 ≤ x ≤ 1E-04 such as 1E-05) may or may not be acceptable.

Based on this, incremental cancer risks for the lakeside resident, recreational user, and traditional tribal receptor are estimated to be within EPA's risk management range. Based on a detailed evaluation in the uncertainty section, if a surface soil EPC is used for arsenic in total soil, the incremental cancer risk for current lakeside residents would be slightly above EPA's risk management range.

One uncertainty of note regarding the incremental risk from ingestion of wetland plants is the higher concentrations in ambient sediment than the sediment samples that were collocated with the tules and cattails. Because the background concentrations of tules and cattails were calculated using the ambient sediment concentrations and calculated uptake factors, and the ambient arsenic sediment concentrations may be related to releases from SBMM, and not truly representative of ambient background, incremental risk from ingestion of wetland plants may be underestimated.

As discussed previously, enhanced exposures for traditional tribal receptors, such as an assumption of consuming 4 liters of Clear Lake surface water per day, an incidental soil ingestion rate of 400 milligrams per day, and a diet based on harvesting 100 percent of food items from the SBMM-impacted areas (for 365 days per year for 70 years, for an adult regardless of whether the site is sufficiently productive to support such harvests), were used. Risk evaluation based upon these exposures rates assumes a traditional lifestyle that may or may not be consistent with current practices but is aimed at ensuring that site remediation provides sufficient consideration to traditional tribal practices.

Currently the tribe is not using the lake for their drinking water as they are on a municipal water system. Therefore, the estimated risks and hazards for traditional tribal receptors and drinking water would most appropriately be viewed as potential. These types of potential risks and hazards are provided to bound risk and hazard estimates for SBMM. These types of bounding risk and hazard estimates may be used by risk managers and stakeholders in the decision-making process.

11.0 REFERENCES

Aazami, J., Esmaili-Saria, A., Bahramifar, N., Savabieasfahani, M. 2012, Total and organic mercury in liver, kidney, and muscle of waterbirds from wetlands in the Caspian Sea, Iron, Bulletin of Environmental Contamination and Toxicology, 89, 96-101.

Ackerman, J.T., C.A. Eagles-Smith, M.P. Herzog, C.A. Hartman, S.H. Peterson, D.C. Evers, A.K. Jackson, J.E. Elliott, S.S. Vander Pol, C.E. Bryan. 2016. Avian mercury exposure and toxicological risk across western North America: A synthesis, Science of the Total Environment, 568: 749-769.

Aptim Federal Services, LLC (APTIM) and E2 Consulting Engineers, Inc. E2). 2018. *Final Sampling and Analysis Plan for Human Health Risk Assessment Data Gap Sampling, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. October.

APTIM. 2019a. *Draft Human Health Risk Assessment Sampling Program, Technical Memorandum, Sulphur Bank Mercury Fund Site, Clearlake Oaks, California.* September.

APTIM. 2019b*. Draft Pre-mining Baseline Conditions for Surface Soils Sampling Program and Results Technical Memorandum.*

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological Profile for Mercury. U.S. Department of Health and Human Services Public Health Service. March.

ATSDR. 2003. Health Consultation, Analysis of the Human Exposure Pathway via Surface Water, Sediment, and Biota in Churchill County, Nevada, Fallon Leukemia Project, prepared by Jane Zhu, Brian Kaplan, and Gail Scogin.

ATSDR. 2007. Toxicological profile for arsenic, Atlanta: US Department of Health and Human Services. August.

Bloom, N.S., E. Preus, J. Katon, and M. Hiltner. 2003. Selective extractions to assess the biogeochemically relevant fractionation of inorganic mercury in sediments and soils, Analytica Chimica Acta 479, 233–248.

Bradham, Karen D.; Scheckel, Kirk G.; Nelson, Clay M.; Searles, Paul E.; Lee, Grace E.; Hughes, Michael F.; Mille, Bradley W.; Yeow, Aaron; Gilmore, Thomas; Serda, Sophia M.; Harper, Sharon, Thomas, David J. 2011. Relative Bioavailability and Bioaccessibility and Speciation of Arsenic in Contaminated Soils. Environmental Health Perspectives. Volume 119, Issue 11.

Brooks Applied Labs (BAL). 2017. Mercury Speciation in Soils, Sediments, and other Solids (5-Step Selective Sequential Extraction), provided by Elizabeth Madonick, Technical Services Specialist, BAL, Bothel, Washington, provided to Mark Weisberg, Aptim Federal Services. August 31.

California Environmental Data Exchange. 2019. https://www.sfei.org/projects/california-environmental-data-exchange-network-ceden#sthash.ASLmtC9g.dpbs

California EPA (Cal/EPA). 2019a. HERO HHRA Note 3, DTSC-modified Screening Levels, April, https://www.dtsc.ca.gov/assessingrisk/humanrisk2.cfm

California EPA. 2019b. HERO HHRA Note 10, Toxicity Criteria as promulgated by the Toxicity Criteria Rule, https://dtsc.ca.gov/wp-content/uploads/sites/31/2019/02/HHRA-Note-10-2019-02-25.pdfCalifornia Office of Environmental Health Hazard Assessment (OEHHA). 2006. *Evaluation of Bioaccumulation Factors and Translators for Methylmercury*. OEHHA and Office of Pesticide and Environmental Toxicology Section, California EPA. March.

OEHHA. 2014. Fish Consumption Guidelines for Clear Lake. https://oehha.ca.gov/advisories/clear-lake

CB&I Federal Services, LLC and E2 Consulting Engineers, Inc. 2017. *Draft Quality Assurance Project Plan, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. October.

CH2M Hill (CH2M). 2006a. *EPA Review Draft Elem Indian Colony Pre-Design Field Investigation Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California.* May.

CH2M. 2006b. *Final Mine Waste and Pore Water Investigation Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. December.

CH2M. 2007a. *Draft Sulphur Bank Mine Road Soil Sampling Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*.

CH2M. 2007b. *Draft Technical Memorandum, Recommendations for Additional Investigation along Sulphur Bank Mine Road*. January.

CH2M. 2007c. *2005–2006 and 2006–2007 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final.

CH2M. 2008a. *Sulphur Bank Mercury Mine, Ward Road Additional Soil and Sediment Samples*. January.

CH2M. 2008b. *Final 2007 Sulphur Bank Mine Road Data Evaluation Report for Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California.* January.

CH2M. 2008c. *Phase 1 Cleanup Report for the Elem Indian Colony Non time critical Removal Acton, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. March.

CH2M. 2008d. *2007–2008 Storm Water Monitoring Report for Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. June.

CH2M. 2008e. *2006 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. November.

CH2M. 2008f. *Data Evaluation Report 2007 North Westland Investigation for Sulphur Bank Mercury Mine.* December.

CH2M. 2009a. *Final Data Evaluation Report, 2006 North Wetland Investigation, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. February.

CH2M. 2009b. *Final Oakes Arm Sediment Investigation, Data Evaluation Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. March.

CH2M. 2009c. *2008–2009 Storm Water Monitoring Report for Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. June.

CH2M. 2009d. *Keys Area Sediment Investigation Data Evaluation, Clearlake Oaks, California*. July.

CH2M. 2009e. *2007–2008 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. July.

CH2M. 2009f. *Final Sulphur Bank Mine Road Water Supply Sampling Data Evaluation Report for Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. August.

CH2M. 2009g. Public Comment Engineering Evaluation/ Cost Analysis Mine Waste Removal Action Bureau of Indian Affairs Road 120 Sulphur Bank Mercury Mine Superfund Site Clearlake Oaks, California. August.

CH2M. 2011a. *2009–2010 Storm Water Monitoring Report for Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. April.

CH2M. 2011b. *2009-2010 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. June.

CH2M. 2016. *Operable Unit 1 Focused Feasibility Study Geochemical Mixing Modeling, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Updated December 2019.

CH2M. 2018. 2018-2019 Reuse Assessment Meeting Slides. December 11.

Cornell Laboratory of Ornithology, 2019, https://birdsna.org/Species-Account/bna/species/wesgre/introduction

Eagles-Smith, C.A., J.T. Ackerman, J.T., T.L. Adelsbach, J.Y. Takekawa, A.K. Miles, R.A. Keister. 2008. Mercury correlations among six tissues for four waterbird species breeding in San Francisco Bay, California, USA. Environ. Toxicol. Chem. 27, 2136–2153. http://dx.doi.org/10.1897/08-038.1.

Efron, B. 1982. "The Jackknife, the Bootstrap, and Other Resampling Plans," *Society of Industrial and Applied Mathematics*, Philadelphia.

Efron, B. and R.J. Tibshirani. 1993. *An Introduction to the Bootstrap*, Chapman and Hall, New York.

Elem Indian Colony (EIC). 2018. Site-Specific SBMM Questionnaire to Elem Tribe.

E2 Consulting Engineers, Inc. (E2). 2012a. *2010 2011 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. March.

E2. 2012b. *2010-2011 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Draft. March.

E2. 2012c. *Technical Memorandum, Pilot Cap Pre-Baseline Biota/Sediment Sampling Investigation Data Evaluation*. April.

E2. 2012d. *2011 2012 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. October.

E2. 2013. *2011-2012 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Draft. January.

E2. 2015. *2012-2013 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. September.

E2. 2020. *Operable Unit 1 Focused Feasibility Study. Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. December.

E2. 2017a. *2013-2014 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. January.

E2. 2017b. *2014-2015 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. January.

E2. 2017c. *2012 2013 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. January.

E2. 2017d. *2013 2014 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. June.

E2. 2017e. *2014 2015 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. June.

E2. 2017f. *Storm Water Pollution Prevention Plan, Sulphur Bank Mercury Mine, Clear Lake, California*. Final. August.

E2. 2017g. *2015 2016 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. October.

E2. 2018a. *2016 2017 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*. Final. July.

E2. 2018b. *2015-2016 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Final. September.

E2. 2019a. *2017 2018 Storm Water Monitoring Report, Sulphur Bank Mercury Mine Superfund Site. Clearlake Oaks, California*.

E2. 2019b. *2016-2017 Annual Groundwater Monitoring Report, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*.

Food and Drug Administration (FDA). 1993. *Guidance Document for Arsenic in Shellfish, Center for Food Safety and Applied Nutrition.* January.

Hagan, N., N. Robins, R.D.E Gonzales, and H Hsu-Kim, 2014, Speciation and Bioaccessibility of Mercury in Adobe Bricks and Dirt Floors in Huancavelica, Peru, Environ Geochem Health, published online August 29.

Harper, Barbara. 2005. Washoe Tribe Human Health Risk Assessment Exposure Scenario for the Leviathan Mine Superfund Site, Prepared for the Washoe Tribe of Nevada and California, Prepared by Dr. Harper, AESE, Inc., March 17.

Harper, Barbara, Anna K. Harding, Therese Waterhouse, and Stuart G. Harris. 2007. Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual. August.

Harper, B., and F.E. Kirschner. 2018. Memorandum prepared by AESE, Inc. for EPA (Gary Riley and Carter Jessup), Sulphur Bank Mercury Mine Reasonable Maximum Exposure (RME) Scenario. May 24.

Harper, B., and F.E. Kirschner. 2018. *Preliminary Remedial Goals (PRGs)/Remedial; Action Objectives (RAOs), Applicable, Relevant, and Appropriate Requirements (ARARs), and Pre-Mining Baseline (PMB).* May 29.

ICF Technology. 1996a. *Summary Report for the Gaseous Spring Sampling Activities, Sulphur Bank Mercury Mine, Clearlake California*. February.

ICF Kaiser Engineers. 1996b. *Emissions Conversions, Gaseous Spring Sampling, Sulphur Bank Mercury Mine*. July.

Innovative Technical Solutions, Inc. (ITSI). 2011. *After Action Report for BIA 120 Non-Time-Critical Removal Action.* June.

Maine Bureau of Health. 2001. Bureau of Health Fish Tissue Action Levels, February 20 Update, Website: https://www1.maine.gov/dhhs/mecdc/environmental-health/eohp/fish/documents/action-levels-writeup.pdf.

McGinnis and Associates, LLC. 2013. *Phase II Environmental Site Assessment, Parcel Numbers 010-002-57, 010-002-58 and 010-002-33, Lake County California, September*. Prepared for BIA Pacific Regional Office.

Rueda, F.J., Schladow, S.G., Monismith, S.G., Stacy, M.T., 2003, Dynamics of Large Polymictic Lake. I: Field Observations, Journal of Hydraulic Engineering, February, pp. 81-91.

Shilling, Fraser, April Negrette, Lori Biondini, and Susana Cardenas. 2014. California Tribes Fish-Use: Final Report, A Report for the State Water Resources Control Board and the US Environmental Protection Agency, Agreement # 11-146-250 between SWRCB and UC Davis. July 2014.

Slowey, A.J., J.J. Rytuba, and G.E. Brown, Jr., 2005. Speciation of Mercury and Mode of Transport from Placer Gold Mine Tailings, Environ. Sci. Technol., 39: 1547-1554.

Smucker, Stanford J., PhD/U.S. Environmental Protection Agency, Region 9. 2012. Memorandum to Tom Dunkelman/Action Level for Mercury in Soil (McDermitt, Nevada). March.

Steel, R.G.D. and J.H. Torrie. 1980. *Principles and Procedures of Statistics, A Biomedical Approach*, Second Edition, McGraw-Hill Book Company, New York.

Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP). 2016. "Bioavailability of Contaminants of Concern in Soils at DoD–Impacted Sites", SERDP and ESTCP Webinar Series (#44), PowerPoint Presentation, November 3. Website: https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/11-03-2016.

Takata, Keith A./U.S. Environmental Protection Agency, Director, Superfund Division. 2006. Letter to Robert S. Kroll/ U.S. Department of Housing and Urban Development, Deputy administrator, Southwest Office of Native American Programs, regarding EPA's mine waste removal action at EIC. November 22.

Tetra Tech, Inc. (Tetra Tech). 2001. *Draft North Area Wetland Characterization Technical Memorandum Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. August.

Tetra Tech, Inc. (Tetra Tech). 2002. *Draft Remedial Investigation and Feasibility Study for Operable Unit 1 Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. February.

Tetra Tech. 2006. Public Review *Draft Remedial Investigation and Feasibility Study for Operable Unit 1 Volume 2 of 2: Feasibility Study*. August.

United States Environmental Protection Agency (EPA). 1986. *Guidelines for Carcinogen Risk Assessment*. Fed. Reg. 51:33992-34003.

EPA. 1989. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A)*. Interim Final. Office of Emergency and Remedial Response, Washington, D.C., EPA/540/1-89/002.

EPA. 1991a. Memo from Don R. Clay, Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions, OSWER Directive 9355.0-30, April 22.

EPA. 1991b. *Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual. (Part B, Development of Risk-Based Preliminary Remediation Goal)* Publication 9285.7-01B. December. OSWER, Washington D.C. NTIS PB92-963333.

EPA. 1993. Sulphur Bank Mine Analytical Report (House Dust and Air Sampling). January.

EPA. 1994a. Region 9, Smucker, Stanford. *Baseline Public Health Evaluation, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. January.

EPA. 1994b. *Remedial Investigation/Feasibility Study, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. August.

EPA. 1994c. *Revised Draft Human Health Risk Assessment and Remedial Investigation Report Carson River Mercury Site*, prepared by Sean Hogan, EPA Region 9 EPA Project Manager and Stan Smucker, EPA Region 9 Toxicologist, December.

EPA. 1995. *Determination of Site-Specific Cleanup Goals for Soils at Sulphur Bank Mine*. October.

EPA. 1997a. Human Health Effects Assessment Summary Tables (HEAST). Office of Health and Environmental Assessment, Environmental Assessment and Criteria Office, Cincinnati, Ohio. Prepared for Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response, Washington, D.C.

EPA. 1997b. Mercury Study Report to Congress, Volume III: Fate and Transport of Mercury in the Environment, Office of Air Quality Planning and Standards and Office of Research and Development.

EPA. 2001. Worksheets to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media. On-line: www.epa.gov/sites/production/files/2015-09/inorg04_01.xls. Latest version: April 2001; Accessed: November 17, 2016.

EPA. 2002a. *Remedial Investigation for Operable Unit 1, Sulphur Bank Mercury Mine Superfund Site, Clearlake Oaks, California*. Draft. February.

EPA. 2002b. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. OSWER 9355.4-24, December.

EPA. 2002c. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, Office of Emergency and Remedial Response.* OSWER 9285.6-10, Washington, D.C. December.

EPA. 2002d, Provisional Peer Reviewed Toxicity Values for Mercuric Sulfide, Derivation of a Chronic Oral RfD, Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development, September 25.

EPA. 2003a. Human Health Toxicity Values in Superfund Risk Assessments. OSWER Directive 9285.7-53. Memo from Michael B. Cook. December 5, 2003.

EPA 2004. *Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Interim. Office of Emergency and Remedial Response, Washington, D.C. EPA/540/R/99/005. July.

EPA. 2005. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001F. March.

EPA 2006. Preliminary Remediation Goals for Recreational Land Use, Sulphur Bank Mercury Mine Superfund Site.

EPA. 2007. *Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual*. Grant No. EPA-STAR-J1-R831046. August.

EPA. 2011. Exposure Factors Handbook: 2011 Edition, Office of Research and Development, EPA/600/R-090/052F. September.

EPA. 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil. OSWER 9200.1-113. December.

EPA. 2014. OSWER Directive, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER 9200.1-120, February 6.

EPA. 2015. ProUCL Version 5.1.002 User Guide, *Statistical Software Applications for Data Sets with and without Nondetect Observations*, EPA/600/R-07/041, October. Website: https://www.epa.gov/land-research/proucl-software.

EPA. 2016a. Statistical Software ProUCL 5.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations. Website: https://www.epa.gov/land-research/proucl-software

EPA. 2017. *Final Carson River Mercury Site Operable Unit 2 Remedial Investigation Report, Carson City, Nevada*, including Human Health Risk Assessment (Appendix B) prepared by CB&I Federal Services LLC, April.

EPA. 2019a. Regional Screening Levels (RSL) Table. Developed by Oak Ridge National Laboratory under Interagency Agreement with EPA. Dated November 18, 2019. Website: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

EPA. 2019b. Provisional Peer-Reviewed Toxicity Values Database. Website: http://hhpprtv.ornl.gov.

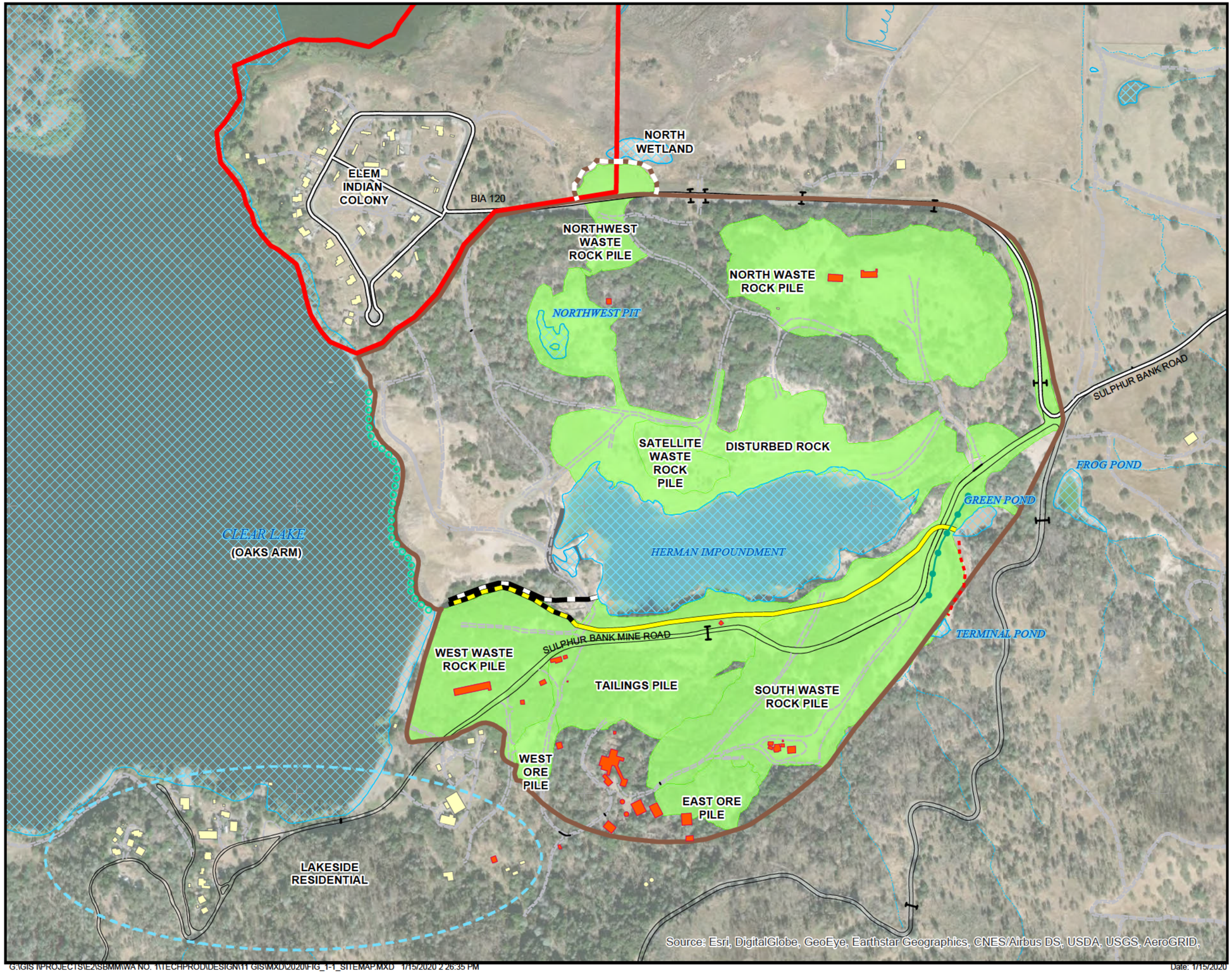
EPA. 2019c. Integrated Risk Information System (IRIS). Accessed December 2019. Website: http://cfpub.epa.gov/ncea/iris/index.cfm.

EPA. 2019d. Regional Screening Levels (RSL) Table. RSL Calculator. Accessed December 2019. Website: https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

EPA. 2019e. Meeting between EPA, the EIC, and their consultants. September.

Varejao, E.V.V., C.R. Bellato, and M.P.F. Fontes. 2009. Mercury fractionation in stream sediments from the Quadrilatero Ferrifero gold mining region, Minas Gerais State, Brazil, Environ. Monit. Assess., 157:125-135.

Figures



LEGEND

- EIC BOUNDARY
- MINE SITE
- MINING OPERATION RELATED BUILDINGS
- BUILDING
- EARTH DAM
- WATER
- SOURCE AREAS
- LAKESIDE RESIDENTIAL AREA
- ROADS
- DIRT ROAD
- STREAM
- CULVERTS
- RIPRAP WITH BOULDERS
- DRAINAGE DITCH
- RIPRAP CHANNEL

ESTIMATED LOCATION OF STORMWATER/ OVERFLOW DIVERSION SYSTEM

- ONE 30-INCH-DIAMETER HDPE PIPELINE, BELOWGROUND
- TWO 24-INCH-DIAMETER HDPE PIPELINES, ABOVEGROUND
- ONE 30-INCH-DIAMETER HDPE PIPELINE, ABOVEGROUND

N

0 500 1,000 FEET

1 inch = 500 feet

FIGURE 1-1
SITE MAP
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

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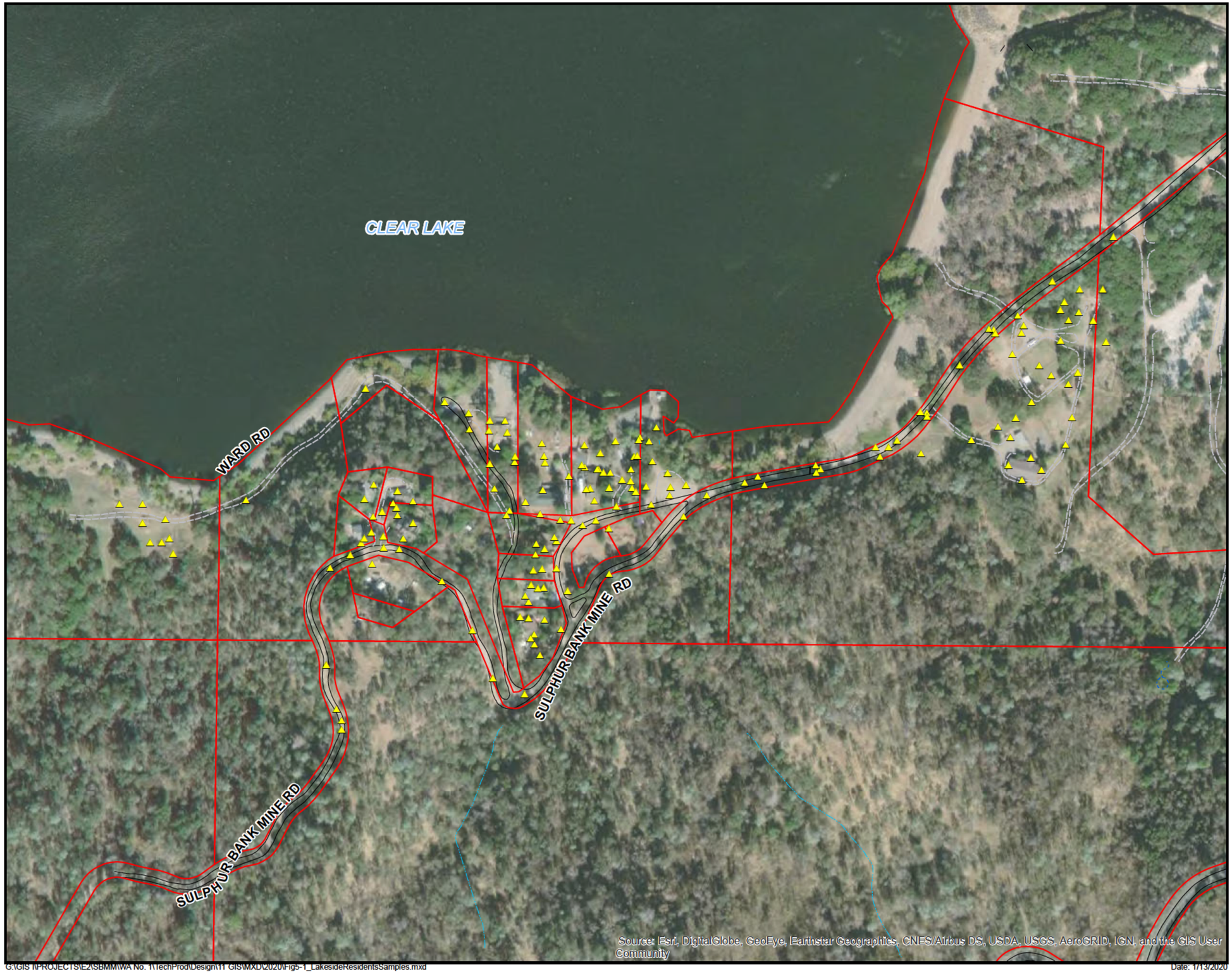

LEGEND

- SOIL SAMPLING LOCATIONS
- PROPERTY BOUNDARY
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM

N

0 150 300

FEET

1 inch = 250 feet

FIGURE 5-1
SOIL SAMPLES USED IN THE LAKESIDE RESIDENTIAL EXPOSURE AREA

SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

LEGEND

- SSG SAMPLES FROM 1994 BPHE (45)
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM
- SIDEWALK
- PAVED ROAD
- GRID
- LAKE
- WATER FEATURES

N

0 500 1,000 FEET

1 inch = 500 feet

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FIGURE 5-2
SOIL SAMPLES USED IN THE ON-MINE EXPOSURE AREA
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

LEGEND

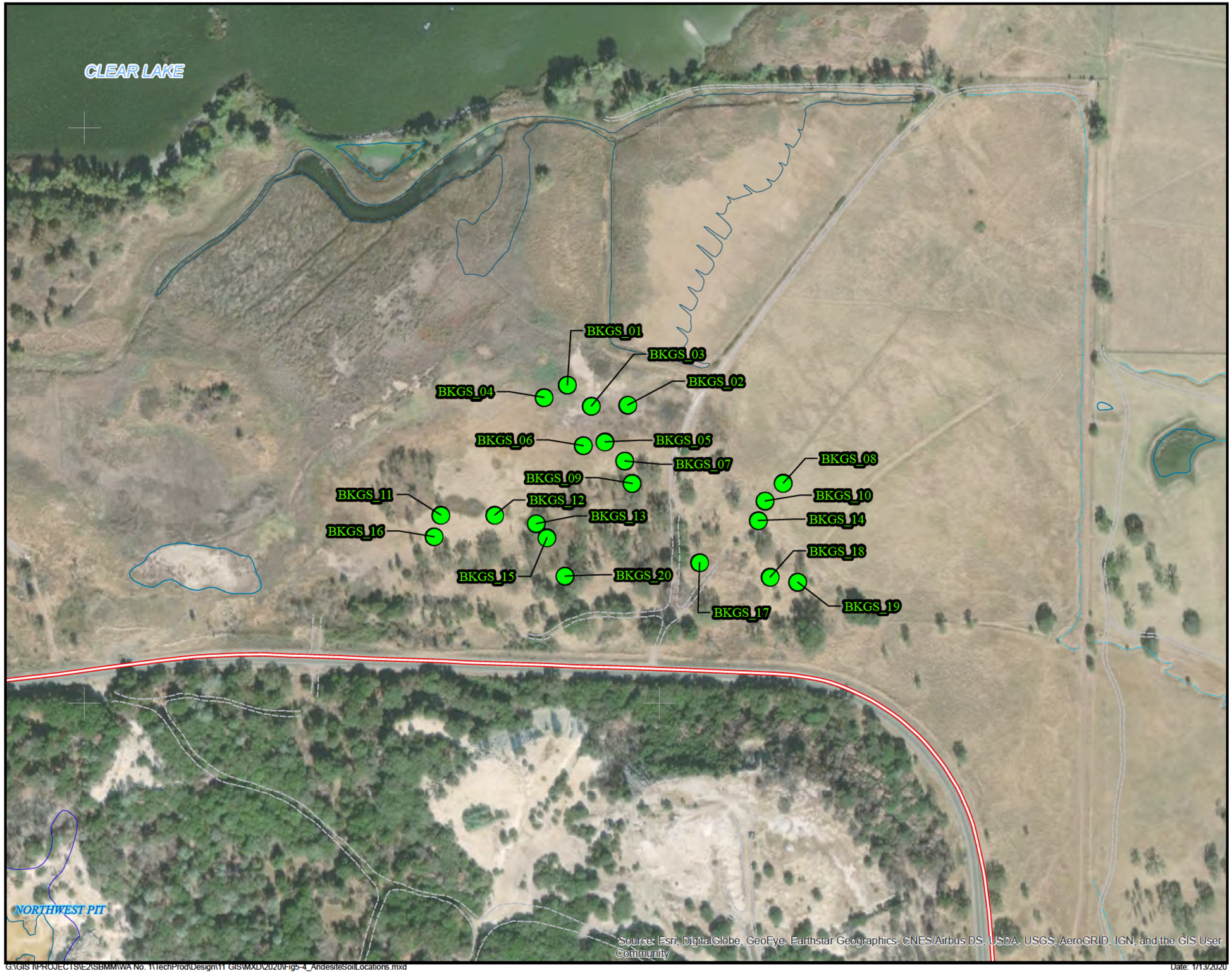
- ELEM INDIAN COLONY SAMPLE LOCATIONS
- EIC BOUNDARY
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SIDEWALK
- GRID
- LAKE
- EIC PARCEL BOUNDARY
- PH1A EXCAVATION BOUNDARY
- PH1B EXCAVATION BOUNDARY
- WATER FEATURES

N

0 100 200 FEET

1 inch = 175 feet

FIGURE 5-3
SOIL SAMPLES USED IN THE ELEM INDIAN COLONY AREA
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE



LEGEND

- ANDESITE SOIL LOCATIONS
- DEPRESSION
- PAVED ROAD
- DIRT ROAD
- STREAM
- GRID
- LAKE
- WATER FEATURES

N

0 200 400 FEET

1 inch = 250 feet

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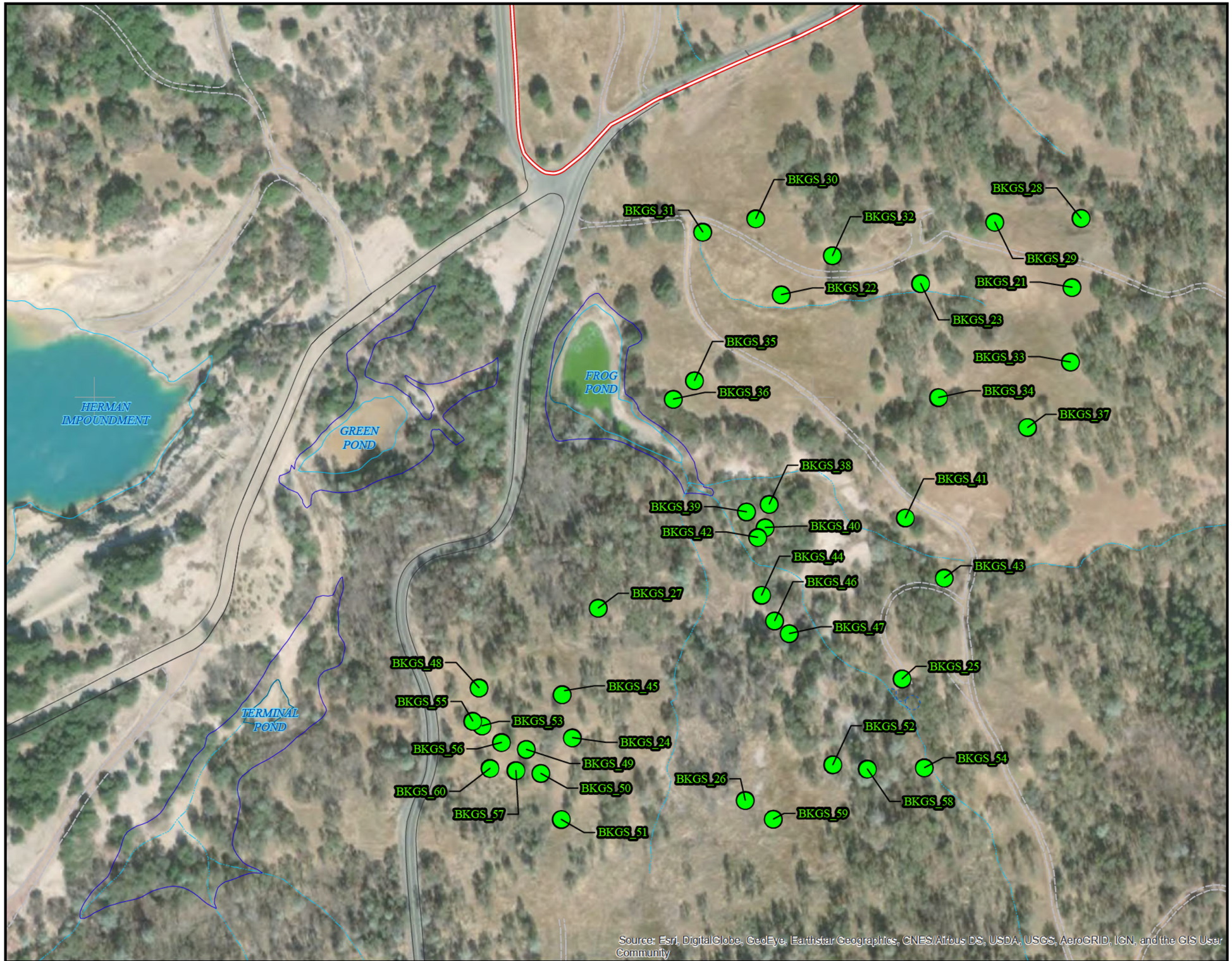
Date: 1/13/2020

FIGURE 5-4
ANDESITE FORMATION PMB SOIL SAMPLING LOCATIONS
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE



LEGEND

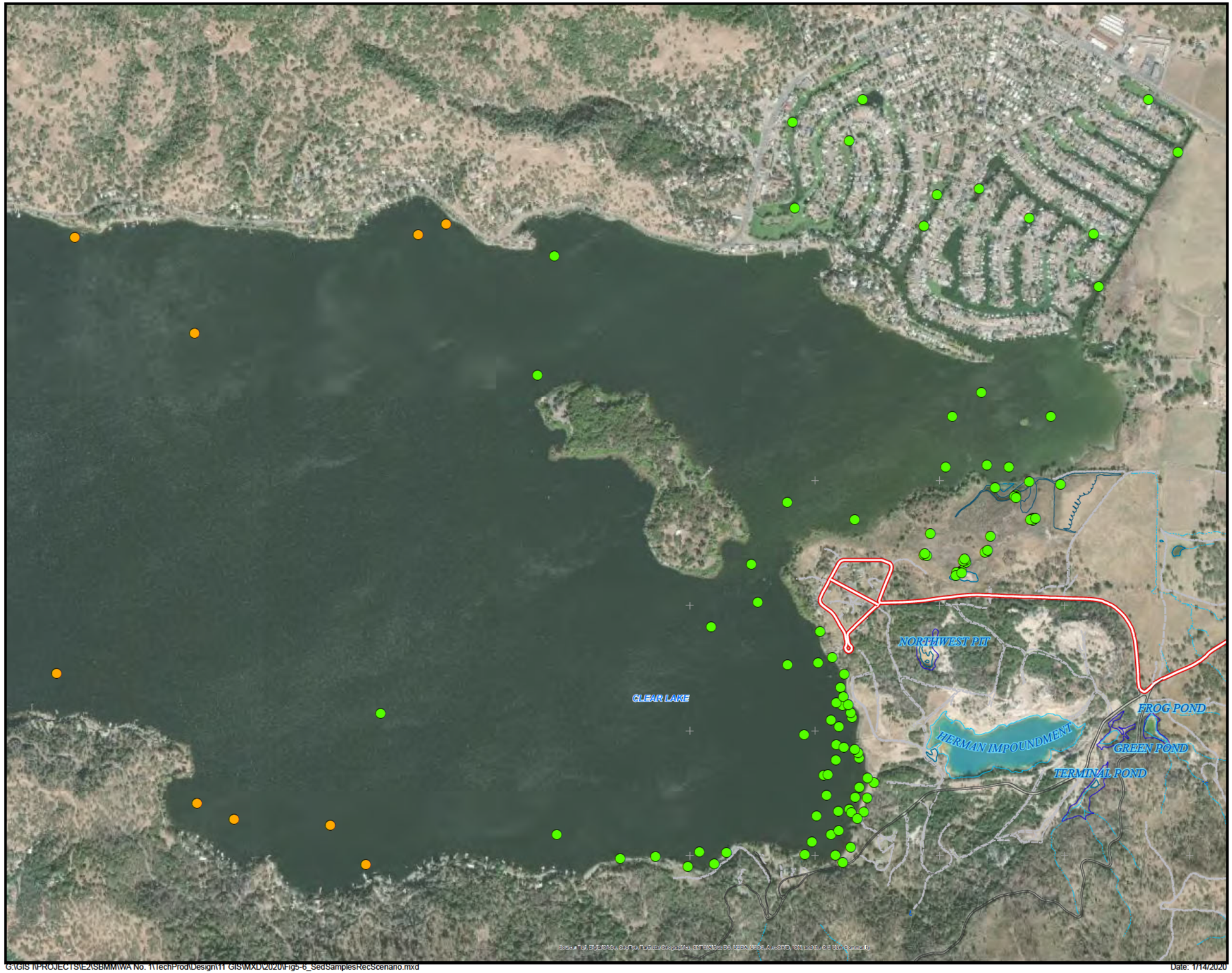
- FRANCISCAN SOIL LOCATIONS
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM
- PAVED ROAD
- GRID
- LAKE
- WATER FEATURES

N

0 200 400 FEET

1 inch = 200 feet

FIGURE 5-5
FRANCISCAN FORMATION PMB SOIL SAMPLING LOCATIONS
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE



LEGEND

- AMBIENT SEDIMENT LOCATIONS
- SITE RELATED LOCATIONS
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM
- SIDEWALK
- PAVED ROAD
- GRID
- LAKE
- WATER FEATURES

N

0 1,000 2,000 FEET

1 inch = 1,150 feet

FIGURE 5-6
SEDIMENT SAMPLES USED FOR THE RECREATIONAL SCENARIO
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

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Date: 1/14/2020

LEGEND

- SITE-RELATED (31)
- AMBIENT SURFACE WATER LOCATIONS (10)
- LOCATIONS USED TO REPRESENT BACKGROUND FOR HERMAN IMPOUNDMENT.(4)
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM
- WATER FEATURES

N

0 1,000 2,000 FEET

1 inch = 1,000 feet

FIGURE 5-7
SURFACE WATER SAMPLES USED FOR THE RECREATIONAL SCENARIO (CLEAR LAKE)
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

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Date: 1/14/2020

G:\GIS 1\PROJECTS\E2\SBMM\WA No. 1\TechProd\Design\11 GIS\MXD\2020\Fig5-8_DrinkingWaterSamplesLakeside.mxd

Date: 1/14/2020

LEGEND

- HOUSEHOLD, DRINKING, AND/OR IRRIGATION WATER (14)
- IRRIGATION WATER ONLY (1)
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SPRING
- STREAM
- WATER FEATURES

N

0 500 1,000 FEET

1 inch = 600 feet

FIGURE 5-8
DRINKING WATER SAMPLES USED FOR THE LAKESIDE RESIDENTIAL EXPOSURE AREA

SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE

LEGEND

- 2006 TULE SAMPLES
- ACORN/SOIL
- CATTAIL/SEDIMENT
- CLEAR LAKE SEDIMENTS
- TULE/SEDIMENT
- DEPRESSION
- PAVED ROAD
- UNPAVED ROAD
- DIRT ROAD
- SIDEWALK
- GRID
- LAKE
- WATER FEATURES

N

0 250 500 FEET

1 inch = 300 feet

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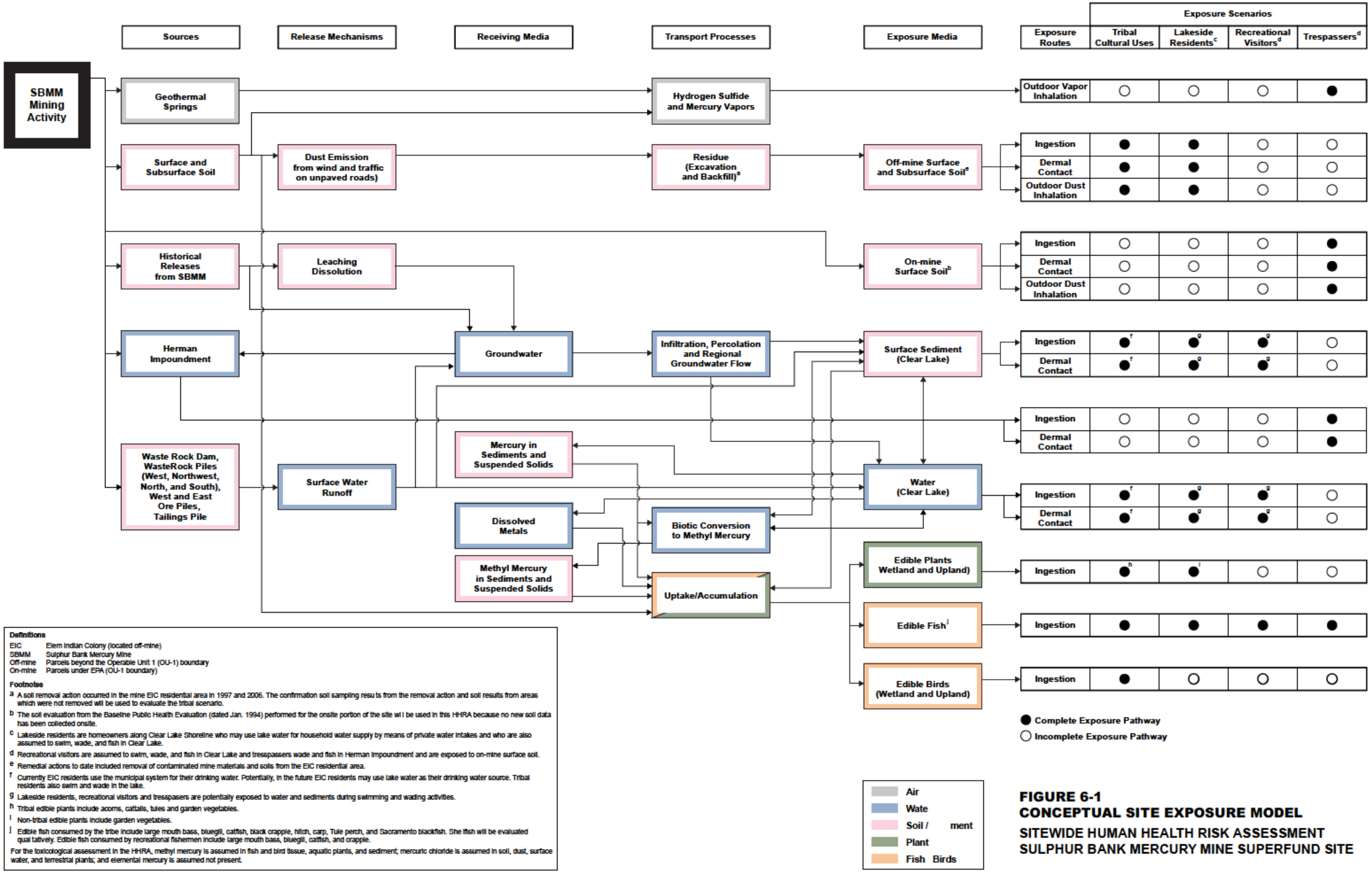
Date: 1/14/2020

FIGURE 5-9
PLANT TISSUE SAMPLES USED FOR THE TRIBAL SCENARIO
SITEWIDE HUMAN HEALTH RISK ASSESSMENT SULPHUR BANK MERCURY MINE SUPERFUND SITE



Definitions

EIC	Elem Indian Colony (located off-mine)
SBMM	Sulphur Bank Mercury Mine
Off-mine	Parcels beyond the Operable Unit 1 (OU-1) boundary
On-mine	Parcels under EPA (OU-1 boundary)

Footnotes

[a] A soil removal action occurred in the mine EIC residential area in 1997 and 2006. The confirmation soil sampling results from the removal action and soil results from areas which were not removed will be used to evaluate the tribal scenario.

[b] The soil evaluation from the Baseline Public Health Evaluation (dated Jan. 1994) performed for the onsite portion of the site will be used in this HHRA because no new soil data has been collected onsite.

[c] Lakeside residents are homeowners along Clear Lake Shoreline who may use lake water for household water supply by means of private water intakes and who are also assumed to swim, wade, and fish in Clear Lake.

[d] Recreational visitors are assumed to swim, wade, and fish in Clear Lake and tresspassers wade and fish in Herman Impoundment and are exposed to on-mine surface soil.

[e] Remedial actions to date included removal of contaminated mine materials and soils from the EIC residential area.

[f] Currently EIC residents use the municipal system for their drinking water. Potentially, in the future EIC residents may use lake water as their drinking water source. Tribal residents also swim and wade in the lake.

[g] Lakeside residents, recreational visitors and tresspasers are potentially exposed to water and sediments during swimming and wading activities.

[h] Tribal edible plants include acorns, cattails, tules and garden vegetables.

[i] Non-tribal edible plants include garden vegetables.

[j] Edible fish consumed by the tribe include large mouth bass, bluegill, catfish, black crappie, hitch, carp, Tule perch, and Sacramento blackfish. Shellfish will be evaluated qualitatively. Edible fish consumed by recreational fishermen include large mouth bass, bluegill, catfish, and crappie.

For the toxicological assessment in the HHRA, methyl mercury is assumed in fish and bird tissue, aquatic plants, and sediment; mercuric chloride is assumed in soil, dust, surface water, and terrestrial plants; and elemental mercury is assumed not present.

FIGURE 6-1
CONCEPTUAL SITE EXPOSURE MODEL
SITEWIDE HUMAN HEALTH RISK ASSESSMENT
SULPHUR BANK MERCURY MINE SUPERFUND SITE

Tables

Table 4-1
Summary of Chemicals of Potential Concern by Media
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Soil					Drinking Water		Plants			Surface Water			Sediment	
COPC	On-Mine	Lakeside Residential	EIC	PMB - Andesite	PMB - Franciscan	Lakeside Residential	Clear Lake (Tribal)	Acorns	Cattails	Tules	Clear Lake	Herman Impoundment	Ambient	Clear Lake	Ambient
Aluminum	O	O	O	O	O	X	X	X	X	X	X	O	X	O	O
Antimony	O	X	X	X	X	X	X	X	X	X	X	X	X	X	O
Arsenic	O	X	X	X	X	X	X	X	X	X	X	X	O	X	O
Barium	O	O	O	O	O	O	X	O	O	O	X	O	O	X	O
Beryllium	X	O	X	O	X	X	X	X	X	X	X	O	X	X	O
Boron	X	--	--	O	X	O	O	O	X	X	O	O	O	O	X
Cadmium	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chromium	O	O	O	O	O	X	X	X	X	O	X	X	X	X	O
Cobalt	O	O	X	O	O	X	X	O	X	X	X	O	X	X	O
Copper	O	O	O	O	O	X	X	O	O	O	X	X	X	X	O
Iron	O	O	O	O	O	X	X	O	O	O	X	O	X	O	O
Lead	O	O	X	O	O	X	X	X	X	X	X	X	X	X	O
Lithium	X	--	--	O	O	X	X	X	O	X	X	O	O	O	O
Manganese	O	O	O	O	O	X	X	O	O	O	X	O	X	O	O
Mercury	O	X	O	O	X	X	X	O	X	O	X	X	O	X	O
Methyl Mercury	X	--	--	--	--	--	X	X	X	X	X	--	X	X	O
Molybdenum	X	--	--	X	O	X	X	X	O	X	X	X	X	X	X
Nickel	O	O	X	O	O	O	X	O	X	O	X	X	O	X	O
Selenium	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X
Silver	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Thallium	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Vanadium	O	O	O	O	O	X	X	X	X	X	X	X	X	X	O
Zinc	O	O	X	O	O	X	X	O	O	O	X	O	X	O	O

Notes:

X = Detected

O = Not Detected

-- = Not analyzed for

Table 4-2
Selective Sequential Extraction Mercury Speciation Results
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

		Units ng/g dry						
Sample ID	Sample Type	F-1	F-2	Total	Percentage of F-1 and F-2	F-3	F-4	F-5
PLNT02-11SS-1118	Sediment (collocated with cattail)	351	63.2	6070	6.8%	2770	898	1990
PLNT01_15SS_1118	Soil (collocated with acorn)	3630	1020	1080000	0.4%	1580	38600	1030000
AMBSI_07_1118	Sediment (background)	3680	170	312000	1.2%	15700	57300	235000
PLNT01_01SS_1118	Soil (collocated with acorn)	3460	9260	1060000	1.2%	3820	34300	1010000
				Average	2.4%			

Notes:

ng/g = nanogram per gram

Table 5-1
Andesite Surface Soil ProUCL Summary of Results – Mercury (Hg, mg/kg)
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Parameter	Full Data Set	Modified Full Set	New (2018) Data	Modified New Data	Prior Data
N (number of results)	47	42	20	15	27
Minimum	0.65	0.65	4.71	4.71	0.65
Maximum	89.6	28.8	89.6	28.8	26.2
Mean	17.17	11.75	25.92	13.65	10.69
Std Deviation	17.96	7.45	23.79	7.42	7.4
Q-Q Summary					
Slope	15.59	7.46	22.18	7.51	7.43
Intercept	17.17	11.75	25.92	13.65	10.69
Correlation R	0.851	0.979	0.898	0.966	0.975
UCL Gamma Dist.					
Gamma at 5% Significance Level	Yes	Yes, and approximate Normal	Yes	Yes, and approximate Normal	Yes, and approximate Normal
95% Adj Gamma UCL (use when N<50)	21.88	14.41	38.08	18.41	14.43
95% GROS Approximate Gamma UCL	33.98				
UCL Normal Dist.					
Normal at 5% Significance Level	No	Yes	No	Yes	Yes
95% Student's-t UCL	21.57	13.68	35.11	17.03	13.12
Upper Limits/BTVs Normal Dist.					
Data Normal Dist at 5% Significance	No	Yes	No	Yes	Yes
95% UTL w/95% Coverage (Normal)	54.41	27.43	82.91	32.7	27.41
Upper Limits/BTVs Gamma Dist.					
Data Gamma Dist at 5% Significance	Yes	Yes	Yes	Yes	Yes
95% Wilson Hilferty Approx. Gamma UTL with 95% Coverage	60.67	35.64	104.5	40.23	38.38

Table 5-2
Franciscan Formation – Summary of UTL/UCL Mercury Analysis Pre-Mining Baseline Soils
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Parameter	Full Data Set	Modified Full Set	New (2018) Data	Modified New Data	Prior Data
N (number of results)	96	92	40	15	27
Minimum	0.023	0.023	7.71	4.71	0.65
Maximum	205	76.7	205	28.8	26.2
Mean	26.57	22.4	39.12	13.65	10.69
Std Deviation	28.85	18.56	35.56	7.42	7.4
Q-Q Summary					
Slope	15.59	17.93	30.04	15.97	17.14
Intercept	17.17	22.4	39.12	29.86	17.61
Correlation R	0.852	0.955	0.826	0.969	0.907
UCL Gamma Dist.					
Gamma at 5% Significance Level	Yes	No	Yes	Yes, and approximate | Normal	Yes
95% Adj Gamma UCL (use when N<50)	32.32	27.09	48.18	35.25	23.59
UCL Normal Dist.					
Normal at 5% Significance Level	No	No	No	Yes	No
95% Student's-t UCL	31.46	25.62	45.89	34.39	21.76
Upper Limits/BTVs Normal Distribution					
Data Normal Dist at 5% Significance	No	No	No	Yes	No
95% UTL w/95% Coverage (Normal)	82.25	58.34	114.4	64.42	55.37
Upper Limits/BTVs Gamma Distribution					
Data Gamma Dist at 5% Significance	Yes	No	Yes	Yes	Yes
95% Wilson Hilferty Approx. Gamma UTL with 95% Coverage	97.91	80.38	117.1	74.17	75.99

Table 6-1
Soil/Sediment Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

			Tribal (exposed to Off-Mine Soil)				Residential (exposed to Off-Mine Soil)				Recreational (Wading Scenario exposure to sediments)		Unauthorized Trespasser and Unauthorized Tribal User (exposed to On-Mine Soil)	
Exposure Parameter	**Acronym**	**Units**	**Adult**	**Reference**	**Child**	**Reference**	**Adult**	**Reference**	**Child**	**Reference**	**Adolescent**	**Reference**	**Adolescent**	**Reference**
Exposure Frequency	EF	day/year	365	EPA 2007	365	EPA 2007	350	EPA 2014	350	EPA 2014	52[a]	Site-specific assumption	52/104[a]	Site-specific assumption
Exposure Duration (Cancer)	EDc	year	70	EPA 2007	6	Harper 2018	20[b]	EPA 2014	6[b]	EPA 2014	12	Site-specific assumption (ages 6 to 18)	12	Site-specific assumption (ages 6 to 18)
Exposure Duration (Non-Cancer)	EDnc	year	70	EPA 2007	6	Harper 2018	26	EPA 2014	6	EPA 2014	12	EPA 2011	12	EPA 2011
Body Weight	BW	kg	80	EPA 2014	15	EPA 2014	80	EPA 2014	15	EPA 2011	44.3[c]	EPA 2011	44.3[c]	EPA 2011
Averaging Time (Cancer)	ATc	days	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014
Averaging Time (Non-Cancer)	ATnc	days	25,550	Based on ED	2,190	Based on ED	9,490	Based on ED	2,190	Based on ED	4,380	Based on ED	4,380	Based on ED
Soil Ingestion Rate	IRS	mg/day	400	Harper 2018 EPA 2007	400	Harper 2018 EPA 2007	100	EPA 2014	200	EPA 2014	NA	NA	NA	NA
Incidental Soil/Sediment Ingestion Rate	IRS	mg/day	NA	NA	NA	NA	NA	NA	NA	NA	100[d]	EPA 2011	100	EPA 2011
Particulate Emission Factor	PEF	m^3/kg	1.36E+09	EPA 2002	1.36E+09	EPA 2002	1.36E+09	EPA 2002	1.36E+09	EPA 2002	1.36E+09	EPA 2002	1.36E+09	EPA 2002
Chemical Specific Skin Absorption Defaults	ABS													
Arsenic	ABSas	Unit-less	0.03	EPA 2004	0.03	EPA 2004	0.03	EPA 2004	0.03	EPA 2004	0.03	EPA 2004	0.03	EPA 2004
Cadmium	ABScd	Unit-less	0.001	EPA 2004	0.001	EPA 2004	0.001	EPA 2004	0.001	EPA 2004	0.001	EPA 2004	0.001	EPA 2004
Other Metals	ABSin	Unit-less	0	EPA 2004	0	EPA 2004	0	EPA 2004	0	EPA 2004	0	EPA 2004	0	EPA 2004
Skin Surface Area (Soil Contact; 1 event per day)	SA	cm^2/day (soil)	6,032[e]	EPA 2011	2,373[f]	EPA 2011	6,032[e]	EPA 2011	2,373[f]	EPA 2011	5,172[g]	EPA 2011	5,172[g]	EPA 2011
Adherence Factor	AF	mg/cm^2	0.07	EPA 2002 (Exhibit 1-2)	0.2	EPA 2002 (Exhibit 1-2)	0.07	EPA 2002 (Exhibit 1-2)	0.2	EPA 2002 (Exhibit 1-2)	0.2	EPA 2002 (Exhibit 1-2)	0.2	EPA 2002 (Exhibit 1-2)

Table 6-1
Soil/Sediment Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Notes:

[a] Assumes that a recreational user is exposed to sediment twice a week over a 6-month period for 12 years.

[b] Lifetime resident = adult resident cancer risk plus child resident cancer risk.

[c] Assumes mean body weight of a 6- to 16-year-old child.

[d] Assumes soil and dust ingestion for a 6 to <21 year old (EFH 2011, Table 5-1).

[e] Assumes weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, 21+ years) (forearm and lower leg-specific data used for males and female lower leg; ratio of male forearm to arm applied to female arm data) Tables 7-2 and 7-12.

[f] Assumes weighted average of mean values for head, hands, forearms, lower legs, and feet (male and female, birth to < 6 years) (forearm and lower leg-specific data used when available; ratios for nearest available age group used elsewhere). Tables 7-2 and 7-8

[g] Assumes the adolescent recreator contacts sediment in Clear Lake and adolescent trespasser contacts soil (on-mine). Assumes 38.6% of total skin surface area for a 6 to <16 year old (13,400 cm^2) which includes head, lower arms, lower legs, hands and feet..

cm^2	square centimeter	m^3/kg	cubic meter per kilogram	m^3/day	cubic meter per day
cm^2/day	square centimeter per day	mg/cm^2	milligram per square centimeter		
EPA	U.S. Environmental Protection Agency	mg/day	milligram per day		
kg	kilogram	NA	not applicable		

References:

U.S. Environmental Protection Agency (EPA). 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24

EPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005. Office of Solid Waste and Emergency Response, Washington, DC. PB99-963312. July.

EPA. 2007. Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual, Grant No. EPA-STAR-J1-R831046, August.

EPA. 2011. Exposure Factors Handbook: 2011 Edition, EPA/600/R-090/052F.

EPA. 2014. OSWER Directive, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER 9200.1-120

Harper. 2018. Sulphur Bank Mercury Mine RME Scenario.

Table 6-2
Surface Water Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

			Tribal (Drinking water)[a]				Residential (Drinking water)				Recreational (Swimming and Wading in Clear Lake)		Trespasser (Swimming and Wading in Herman Impoundment)	
Exposure Parameter	**Acronym**	**Units**	**Adult**	**Reference**	**Child**	**Reference**	**Adult**	**Reference**	**Child**	**Reference**	**Adolescent**	**Reference**	**Adolescent**	**Reference**
Exposure Frequency	EF	day/year	365	EPA 2007	365	EPA 2007	350	EPA 2014	350	EPA 2014	52[b]	Site-specific assumption	12[c]	Site-specific assumption
Exposure Duration (Cancer)	EDc	year	70	EPA 2007	6	Harper 2018	20[c]	EPA 2014	6[d]	EPA 2014	12	Site-specific assumption (ages 6 to 18)	12	Site-specific assumption (ages 6 to 18)
Exposure Duration (Non-Cancer)	EDnc	year	70	EPA 2007	6	Harper 2018	26	EPA 2014	6	EPA 2014	12	EPA 2011	12	EPA 2011
Body Weight	BW	kg	80	EPA 2014	15	EPA 2014	80	EPA 2014	15	EPA 2011b	44.3[e]	EPA 2011 (ages 6 - <16)	44.3[e]	EPA 2011 (ages 6 - <16)
Averaging Time (Cancer)	ATc	days	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014	25,550	EPA 2014
Averaging Time (Non-Cancer)	ATnc	days	25,550	Based on ED	2,190	Based on ED	9,490	Based on ED	2,190	Based on ED	4,380	Based on ED	4,380	Based on ED
Ingestion Rate (Drinking Water)	IRS	L/day	4	Harper 2018	1.2[f]	EPA 2007	2.5	EPA 2014	0.78	EPA 2014	--	--	--	--
Ingestion Rate (Incidental ingestion for Recreator while swimming/wading)	IRS	L/day	--	--	--	--	--	--	--	--	0.137	EPA 2019	0.137	EPA 2019
Dose Absorbed per Unit Area per Event	DA	mg/cm^2-event	Chemical-Specific	EPA 2004	Chemical-Specific	EPA 2004	Chemical-Specific	EPA 2004	Chemical-Specific	EPA 2004	Chemical-Specific	EPA 2004	Chemical-Specific	EPA 2004
Dose Absorbed Event Time	ETevent	hours/event	0.71	Site-Specific	0.54	Site-Specific	0.71	Site-Specific	0.54	Site-Specific	1	Site-Specific	1	Site-Specific
Skin Surface Area (Water Contact; 1 event per day)	SA	cm^2/day (soil)	20,900[g]	EPA 2014	6,378[h]	EPA 2014	20,900[g]	EPA 2014	6,378[h]	EPA 2014	13,400[i]	EPA 2011	13,400[i]	EPA 2011
Event Frequency	EV	Event/day	1	Site-Specific	1	Site-Specific	1	Site-Specific	1	Site-Specific	1	Site-Specific	1	Site-Specific

Notes:

[a] Currently the EIC residents drinking water comes from the municipal system. In the future, EIC residents may use lake water as their drinking water source.

[b] Assumes that a recreational user is exposed to lake water twice a week over a 6-month period.

[c] Assumes that a trespasser is exposed to Herman Impoundment water once a month.

[d] Lifetime resident = adult resident cancer risk plus child resident cancer risk.

[e] Assumes mean body weight of a 6 to <16 -year-old youth (adolescent).

[f] Assumes tribal child ingestion rate of 1.2 L/day is scaled from adult rate (4.0 L/day) using ratio of residential child to adult rate (0.78/2.5) = 4 x 0.31 =1.2 L/day.

[g] Weighted average of mean values for adults, male and female 21+.

[h] Weighted average of mean values for children <6 years.

Table 6-2
Surface Water Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Notes:

[i] Assumes the adolescent recreator swims in Clear Lake. Assumes average of surface area for 6 to <16 year olds, males and females.

cm^2	square centimeter	mg/cm^2	milligram per square centimeter	m^3/kg	cubic meter per kilogram
cm^2/day	square centimeter per day	mg/day	milligram per day		
EPA	U.S. Environmental Protection Agency	--	not applicable		
kg	kilogram	hr/hr	hour per hour		
m^3/day	cubic meter per day				

References:

U.S. Environmental Protection Agency (EPA). 2007. Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual, Grant No. EPA-STAR-J1-R831046, August.

EPA. 2011. Exposure Factors Handbook: 2011 Edition, EPA/600/R-090/052F.

EPA. 2014. OSWER Directive, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER 9200.1-120

Harper. 2018. Sulphur Bank Mercury Mine RME Scenario.

EPA 2019. Update for Chapter 3 of the Exposure Factors Handbook. Ingestion of Water and Other Select Liquids. February.

Table 6-3
Food Items Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Parameter	Acronym	Units	Tribal Cultural Use				Residential				Recreational/Trespasser	
			Adult	Reference	Child	Reference	Adult	Reference	Child	Reference	Adolescent	Reference
Fish												
Exposure Frequency	EF	day/year	365	EPA 2007	365	EPA 2007	350	EPA 2014	350	EPA 2014	350	EPA 2014
Exposure Duration – cancer	EDc	year	70	EPA 2007	6	EPA 2007	20[b]	EPA 2014	6[b]	EPA 2014	12	Site-specific assumption (ages 6 to 18)
Exposure Duration - noncancer	EDnc	year	70	EPA 2007	6	EPA 2007	26	EPA 2014	6	EPA 2014	12	EPA 2011
Body Weight	BW	kg	80	Harper 2018	15	EPA 2011	80	EPA 2014	15	EPA 2014	44.3	EPA 2011 (ages 6 - <16)
Averaging Time for Carcinogens	ATc	year	70	EPA 2007	70	EPA 2007	70	EPA 2014	70	EPA 2014	70	EPA 2014
Averaging Time for Noncarcinogens	ATnc	year	70	Based on ED	6	Based on ED	26	Based on ED	6	Based on ED	12	Based on ED
Land-intensive Homesteader Tribal Fish Ingestion Rate	IRfish_land	g/day	220	Harper 2018	41	EPA 2007[a]	--	--	--	--	--	--
Lake-intensive Homesteader Tribal Fish Ingestion Rate	IRfish_lake	g/day	500	Harper 2018	94	EPA 2007[a]	--	--	--	--	--	--
Game Fish Ingestion Rate	IRfish_game	g/day	--	--	--	--	42[c]/142[e]	EPA 2011	10/27[c]	EPA 2011	29 [c]	EPA 2011
Plants												
Exposure Frequency	EF	day/year	60	Site-Specific	60	Site-Specific	--	--	--	--	--	--
Exposure Duration	ED	year	70	Harper 2018	6	Harper 2018	--	--	--	--	--	--
Body Weight	BW	kg	80	Harper 2018	15	Harper 2018	--	--	--	--	--	--
Averaging Time for Carcinogens	ATc	year	70	EPA 2007	70	EPA 2007	--	--	--	--	--	--
Averaging Time for Noncarcinogens	ATnc	year	70	EPA 2007	6	EPA 2007	--	--	--	--	--	--
Acorn Ingestion Rate	IRacorn	g/day	120	Harper 2018	30	EPA 2007[a]	--	--	--	--	--	--
Tule Stalk Ingestion Rate (April/May)	IRtule_stalk	g/day	333	Harper 2018	85	EPA 2007[a]	--	--	--	--	--	--
Tule Root Ingestion Rate (June/July)	IRtule_root	g/day	275	Harper 2018	65	EPA 2007[a]	--	--	--	--	--	--
Cattail Stalk Ingestion Rate (Spring)	IRcattail	g/day	333	Harper 2018	85	EPA 2007[a]					--	--
Cattail Root Ingestion Rate (Spring)	IRcattail	g/day	275	Harper 2018	65	EPA 2007[a]	--	--	--	--	--	--

Table 6-3
Food Items Exposure Parameters for Chemical Evaluation
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Parameter	Acronym	Units	Tribal Cultural Use				Residential				Recreational/Trespasser	
			Adult	Reference	Child	Reference	Adult	Reference	Child	Reference	Adolescent	Reference
Water Fowl												
Exposure Frequency	EF	day/year	120	Site-Specific	120	Site-Specific	--	--	--	--	--	--
Exposure Duration	ED	year	70	Harper 2018	6	Harper 2018	--	--	--	--	--	--
Body Weight	BW	kg	80	Harper 2018	15	Harper 2018	--	--	--	--	--	--
Averaging Time for Carcinogens	ATc	year	70	EPA 2007	70	EPA 2007	--	--	--	--	--	--
Averaging Time for Noncarcinogens	ATnc	year	70	EPA 2007	6	EPA 2007	--	--	--	--		
Water fowl Ingestion Rate	IRbird	g/day	100[f]	Harper 2018	19	EPA 2007[a]	--	--	--	--		

Notes:
[a] Ingestion rates for tribal children were scaled from the adult forage rates using an adult body weight of 80 kg and a child body weight of 15 kg (EPA 2007).
[b] Lifetime resident = adult resident cancer risk plus child resident cancer risk.
[c] Based on EPA 2011, recreational fish intake for the only western state in the survey 95th percentile.
[d] A low- and high-fish ingestion rate for the recreational fisherman/resident is provided to show a range of risks for this receptor.
[e] High-end fish ingestion rate from U.C. Davis 2014.
[f] Assumes half of 200 grams per day ingestion rate of upland (land birds) and lake (water fowl) game.

g/day	grams per day
kg	kilogram
--	Not applicable

References:
U.C. Davis. 2014. California Tribes Fish-Use: Final Report. July.
EPA. 2007. Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual, Grant No. EPA-STAR-J1-R831046, August.
EPA. 2011. Exposure Factors Handbook: 2011 Edition, EPA/600/R-090/052F.
EPA. 2014. OSWER Directive, Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER 9200.1-120
Harper. 2018. Sulphur Bank Mercury Mine RME Scenario.

Table 7-1
Toxicity Values for COPCs
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Chemical of Potential Concern[1]	CAS#	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference	Inhalation Unit Risk $(\mu g/m^3)$	Reference	Weight of Evidence/ Cancer Guideline Description	Chronic Oral Reference Dose (mg/kg-day)	Reference	Chronic Inhalation Reference Concentration (mg/m^3)	Reference	Subchronic Oral Reference Dose (mg/kg-day)	Reference	Subchronic Inhalation Reference Concentration (mg/m^3)	Reference	Primary Target Organs	Dermal Absorption Fraction	GI Absorption Fraction (ABS)
Aluminum	7429-90-5	--	--	--	--	--	1.00E+00	P	5.00E-03	P	1.00E+00	A	--	--	Developing Fetus	0	1
Antimony	7440-36-0	--	--	--	--	--	4.00E-04	I	--	--	4.00E-04	P	4.00E-04	P	Whole Body	0	0.15
Arsenic	7440-38-2	9.50E+00	C	4.30E-03	I	Group A	3.50E-06	C	1.50E-05	C	3.00E-04	H	--	--	Skin	0.03	1
Barium	7440-39-3	--	--	--	--	--	2.00E-01	I	5.00E-04	H	2.00E-01	A	5.00E-03	H	Kidney	0	0.07
Beryllium	7440-41-7	--	--	2.40E-03	I	Group B1	2.00E-04	C	7.00E-03	C	5.00E-03	H	--	--	Gastrointestinal system	0	0.007
Boron	7440-42-8	--	--	--	--	--	2.00E-01	I	2.00E-02	H	2.00E-01	A	2.00E-02	H	Developmental	0	1
Cadmium	7440-43-9	--	--	4.20E-03	C	Group B1	1.00E-03	I	1.00E-05	C	5.00E-04	A	9.00E-04	P	Kidney	0.001	0.025
Chromium	16065-83-1						1.50E+00	I	--	--	--	--	--	--	None	0	0.025
Cobalt	7440-48-4	--	--	9.00E-03	P	NE	3.00E-04	P	6.00E-06	P	3.00E-03	P	2.00E-05	P	Thyroid	0	1
Copper	7440-50-8	--	--	--	--	--	4.00E-02	H	--	--	1.00E-02	A	--	--	Gastrointestinal system	0	1
Iron	7439-89-6	--	--	--	--	--	7.00E-01	P	--	--	7.00E-01	P	--	--	Gastrointestinal system	0	1
Lead	7439-92-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	1
Lithium	7439-93-2	--	--	--	--	--	2.00E-03	P	--	--	--	--	--	--	Adverse effects in several organs and systems	0	1
Manganese	7439-96-5	--	--	--	--	--	1.40E-01	I	5.00E-05	I	1.40E-01	H	--	--	Nervous system	0	0.04
Mercury	7487-94-7	--	--	--	--	--	1.60E-04	C	3.00E-05	C	5.00E-03	H	3.00E-05	C	Immunological system	0	0.07
Methyl Mercury	22967-92-6	--	--	--	--	--	1.00E-04	I	--	--	1.50E+00	H	--	--	Developmental	0	1
Molybdenum	7439-98-7	--	--	--	--	--	5.00E-03	I	--	--	5.00E-03	H	--	--	Kidney	0	1
Nickel	7440-02-0	--	--	2.60E-04	C	NE	1.10E-02	C	1.40E-05	C	2.00E-02	H	2.00E-04	A	Whole Body	0	0.04
Selenium	7782-49-2	--	--	--	--	--	5.00E-03	I	2.00E-02	C	5.00E-03	H	2.00E-02	C	Skin	0	1
Silver	7440-22-4	--	--	--	--	--	5.00E-03	I	--	--	5.00E-03	H	--	--	Skin	0	0.04
Thallium	7440-28-0	--	--	--	--	--	1.00E-05	X	--	--	4.00E-05	P	--	--	Skin	0	1
Vanadium	7440-62-2	--	--	--	--	--	5.00E-03	S	1.00E-04	A	7.00E-04	P	--	--	Kidney	0	0.026
Zinc	7440-66-6	--	--	--	--	--	3.00E-01	I	--	--	3.00E-01	A	--	--	Blood	0	1

Notes:

[2] Lead will be evaluated per Integrated Exposure Uptake Biokinetic (IEUBK) Model

Surrogates: Cadmium (diet) for cadmium, manganese (non-diet) for manganese, mercuric chloride for mercury, nickel soluble salts for nickel, thallium soluble salts for thallium

Source:

United States Environmental Protection Agency (EPA) Regional Screening Level Table, May, 2012.

Acronyms:

A = Agency for Toxics Substances and Disease Registry (ATSDR) Minimum Risk Levels, 2012.

C = Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database. Accessed November 2019.

H = Health Effect Assessment Summary Tables (HEAST), 2011.

I = Integrated Risk Information System (IRIS) Database, Accessed November 2019.

J = New Jersey value as listed on EPA RSL Table (November 2019)

M = Mutagen

P = Provisional Peer Reviewed Toxicity values (PPTRV), 2008.

S = The RIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet.

X = PPRTV Screening Level

Vanadium RfD is based on the RIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight of the oxide ion.

Table 8-1
Multi-Pathway Risk/Hazard Results by Receptor
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine Superfund Site

		Site		Background (Ambient)		Incremental		
Receptor	Pathway	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Primary Contributors[a]
Lakeside Resident	Residential Drinking Water (adult + child)	5E-04	--	4E-04	--	5E-05	--	Arsenic
	Residential Drinking Water (adult)	--	34	--	30	--	3	Arsenic
	Residential Drinking Water (child)	--	56	--	50	--	6	Arsenic
	Residential Soil Exposure (adult + child)	2E-04	--	1E-04	--	9E-05	--	Arsenic
	Residential Soil Exposure (adult)	--	5.3	--	2.7	--	2.6	Arsenic
	Residential Soil Exposure (child)	--	51	--	33	--	18	Arsenic, antimony, thallium
Total Cancer Risk		7E-04		5E-04		1E-04		
Total Adult Hazard			39		33		7	
Total Child Hazard			107		83		24	

Receptor	Pathway	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Primary Contributors[a]
Recreational User	Surface Water (swimming/wading)	2E-06	1.3	2E-06	0.4	NR	0.8	Arsenic
	Sediment (swimming/wading)	9E-06	1.7	6E-06	1.0	4E-06	0.7	Arsenic
	Recreational Fishing (high end ingestion rate) - adult	NC	5.5	NC	N/A	NC	5	Methyl mercury
	Recreational Fishing (high end ingestion rate) - child	NC	5.8	NC	N/A	NC	6	Methyl mercury
Total		1E-05	14	8E-06	1.5	4E-06	13	

Receptor	Pathway	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Primary Contributors[a]
Unauthorized Trespassers	On-Site Mine Soil Exposure	3E-05	6	4E-06	0.8	3E-05	5	Arsenic
	On-Site Unauthorized Tribal User Soil Exp.	7E-05	13	8E-06	1.6	6E-05	11	Arsenic
	Herman Impoundment (swimming)	8E-07	0.6	3E-06	1.2	NR	NR	
	Vapors (from geothermal vents)	NC	0.0007	NC	N/A	NC	0.0007	
Total		3E-05	7	7E-06	2	3E-05	5	

Receptor	Pathway	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Primary Contributors[a]
Tribal	EIC Soil Exposure (adult + child)	2E-04	--	4E-04	--	NR	NR	Arsenic
	EIC Soil Exposure (adult)	--	5	--	9	--	NR	Arsenic
	EIC Soil Exposure (child)	--	28	--	47	--	NR	Arsenic, Thallium
	Drinking Water (Clear Lake)(adult + child)	1E-03		2E-03		NR		Arsenic
	Drinking Water (adult)		46		48		NR	Arsenic
	Drinking Water (child)		74		77		NR	Arsenic
	Recreational Sediment Exposure (adult + child)	3E-05		2E-05		1E-05		Arsenic
	Recreational Sediment Exposure (adult)		0.7		0.4		0.3	None
	Recreational Sediment Exposure (child)		3.9		2.4		1.5	Arsenic

Table 8-1
Multi-Pathway Risk/Hazard Results by Receptor
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine Superfund Site

		Site		Background (Ambient)		Incremental		
Receptor	Pathway	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index	Primary Contributors[a]
Tribal (cont'd)	Recreational Surface Water Exposure (adult + child)	8E-06		1E-05		NR		Arsenic
	Recreational Surface Water Exposure (adult)		1.7		0.6		1.1	Arsenic
	Recreational Surface Water Exposure (child)		2.0		1.2		0.8	Arsenic
	Plant Ingestion [acorn] (adult + child)	2E-04	--	5E-05	--	1E-04	--	Arsenic
	Plant Ingestion [acorn] (adult)	--	9	--	4	--	6	Arsenic, Thallium
	Plant Ingestion [acorn] (child)	--	12	--	5	--	8	Arsenic, Thallium
	Fish Ingestion - Lake Intensive Homesteader (adult)	NC	9	NC	N/A	NC	9	Methyl mercury
	Fish Ingestion - Lake Intensive Homesteader (child)	NC	9	NC	N/A	NC	9	Methyl mercury
	Water Fowl Ingestion (adult)	NC	4	NC	N/A	NC	4	Methyl mercury
	Water Fowl Ingestion (child)	NC	4	NC	N/A	NC	4	Methyl mercury
Total Cancer Risk		2E-03		2E-03		1E-04		
Total Adult Hazard			76		62		20	
Total Child Hazard			133		133		23	

Notes:

NC = Not calculated because only mercury was evaluated for these media

NR= No incremental risk and/or hazard is identified due to ambient risk/hazard being greater than site risk/hazard

N/A = Not available

-- = For cancer risk, adult + child risks are presented

For noncancer hazards, adult and child hazard estimates are presented separately

[a] Primary contributor(s) are chemicals that contribute greater than 1E-06 to risk or greater than 1 to hazard. Primary contributor(s) are listed for incremental risk and/or hazard results. However, if the incremental risk or hazard is "NR" then the primary contributor(s) are listed using the Site risk and/or hazard results

Table 8-2
Summary of Residential Cancer Risks and Noncancer Hazards – Lakeside Residents Drinking Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Lakeside Resident Drinking Water		Ambient Residential Drinking Water		Incremental Residential Drinking Water	
Receptor	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
Adult	3.1E-04	34	2.8E-04	30	3.2E-05	3
Child	1.6E-04	56	1.4E-04	50	1.6E-05	6
Total	**5E-04**		**4E-04**		**5E-05**	

Table 8-3
Summary of Residential Cancer Risks and Noncancer Hazards – Lakeside Residents Exposure to Soil
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Lakeside Resident Soil Exposure		Ambient Residential Soil Exposure		Incremental Residential Soil Exposure	
Receptor	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
Adult	5.8E-05	5	3.0E-05	3	2.8E-05	3
Child	1.3E-04	51	6.9E-05	32	6.4E-05	18
Total	**2E-04**	**56**	**1E-04**	**35**	**9E-05**	**21**

Table 8-4
Summary of Recreational/Trespasser Cancer Risks and Noncancer Hazards for Surface Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Recreational/ Trespasser Exposure Surface Water		Ambient Recreational/ Trespasser Exposure Surface Water		Incremental Recreational/ Trespasser Exposure Surface Water	
Exposure Area	Cancer Risk	Hazard	Cancer Risk	Hazard	Cancer Risk	Hazard
Clear Lake	1.8E-06	1	2.4E-06	0.4	NR	0.8
Herman Impoundment	7.8E-07	0.6	3.0E-06	1.2	NR	NR

Note:

NR = No incremental risk and/or hazard is identified due to ambient risk/hazards being greater than site risk/hazard

Table 8-5
Summary of Recreational Cancer Risks and Noncancer Hazards for Sediment
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Exposure		Exposure		Sediment Exposure	
Exposure Area	Cancer Risk	Hazard	Cancer Risk	Hazard	Cancer Risk	Hazard
Clear Lake	9E-06	1.7	6E-06	1.0	4E-06	0.7

Table 8-6
Summary of Recreational and Traditional Tribal Noncancer Hazards – Fish Ingestion
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Receptor	Ingestion Rate Adult/Child (g/day)	Mercury EPC (mg/kg)	Noncancer Hazards Adult	Noncancer Hazards Child
Recreational - Game Fisherman - High	142/27	0.322	5	6
Recreational - Game Fisherman - Low	42/10	0.322	2	4
Tribal - Lake Intensive Homesteader	500/94	0.287	18	18
Tribal - Land Intensive Homesteader	220/41	0.287	8	8

Table 8-7
Summary of Trespasser/Unauthorized Tribal User Cancer Risks and Noncancer Hazards – On-Mine Soil
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Trespasser/Unauthorized Tribal User On-Mine Soil Exposure		Ambient Trespasser/ Unauthorized Tribal User On-Mine Soil Exposure		Incremental Trespasser/Unauthorized Tribal User On-Mine Soil Exposure	
Exposure Area	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
On-Mine (52 days/year exposure)	3E-05	6	4E-06	0.8	3E-05	5.3
On-Mine (104 days/year exposure)	7E-05	13	8E-06	2	6E-05	11

Note:

Exposure frequency of 104 days/year represents a unauthorized tribal user scenario.

Table 8-8
Evaluation of Hydrogen Sulfide Vapors
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Year	Hydrogen Sulfide (Mole %)	H_2S (Mole Fraction)	H_2S (ppmv)	H_2S (mg/m^3)	H_2S ($\mu g/m^3$)	1-Hour Acute REL ($\mu g/m^3$)	Acute HQ
Herman Impoundment	1996	0.00022	0.0000022	2.2	3	3068	42	73
Herman Impoundment	1996	3.10E-07	3.1E-09	0.0031	0.0043	4.3	42	0.10
Herman Impoundment	1996	0.000036	3.60E-07	0.36	0.50	502	42	12
Herman Impoundment	1996	0.000008	8.00E-08	0.08	0.11	112	42	2.7
Herman Impoundment	1996	***2.00E-08***	2E-10	0.0002	0.00028	0.28	42	0.0066
Herman Impoundment	1996	***2.00E-08***	2E-10	0.0002	0.00028	0.28	42	0.0066
Herman Impoundment	1996	5.40E-08	5.4E-10	0.00054	0.00075	0.75	42	0.018
Herman Impoundment	1996	***2.00E-08***	2E-10	0.0002	0.00028	0.28	42	0.0066

Notes:

H_2S gas concentrations from Table 2-3, Summary of Gas Analytical Results from Vents and Wells, SBMM (Tetra Tech Draft RI, 2002).

ppmv x H2S MWt (34.1 g/mole)/24.45 = mg/m3

H_2S 1-Hour Reference Exposure Level (REL) from OEHHA Website (nervous system effects). https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary

Non-detect results in bold.

H_2S - Hydrogen Sulfide

REL - Reference Exposure Level

ppmv - parts per million by volume

mg/m^3 - milligrams per cubic meter

mg/m^3 - micrograms per cubic meter

HQ - hazard quotient

Table 8-9
Summary of Tribal Cancer Risks and Noncancer Hazards – EIC Living Area Soil
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine Superfund Site

	Tribal Soil Exposure		Ambient Tribal Soil Exposure		Incremental Tribal Soil Exposure	
Receptor	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
Adult	1.3E-04	5.4	2.6E-04	9.0	NR	NR
Child	5.8E-05	28	1.2E-04	47	NR	NR
Total	**2E-04**	**34**	**4E-04**	**56**	**NR**	**NR**

Note:

NR = No incremental risk and/or hazard is identified due to ambient risk/hazard being greater than site risk/hazard

Table 8-10
Summary of Tribal Cancer Risks and Noncancer Hazards – Drinking Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Traditional Tribal Drinking Water		Ambient Tribal Drinking Water		Incremental Tribal Drinking Water	
Tribal Resident	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
Adult	1.3E-03	46	1.6E-03	48	NR	NR
Child	1.8E-04	74	2.2E-04	77	NR	NR
Total	**1E-03**	**120**	**2E-03**	**126**	**NR**	**12***

Note:

* Without arsenic as a contributor to site-related and background (ambient) hazard, the incremental HI is 12 with boron, lithium and manganese as the primary contributors

Table 8-11
Summary of Ceremonial Tribal Cancer Risks and Noncancer Hazards – Drinking Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

	Traditional Tribal Drinking Water		Ambient Tribal Drinking Water		Incremental Tribal Drinking Water	
Tribal Resident	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**	**Cancer Risk**	**Hazard**
Adult	2E-04	7.3	2E-04	7.2	NR	0.2
Child	3E-05	11.9	3E-05	11.4	NR	0.4

Note:

NR= No incremental risk and/or hazard is identified due to ambient risk/hazard being greater than site risk/hazard

Table 8-12
Summary of Tribal Cancer Risks and Noncancer Hazards for Plant Ingestion
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Plant Ingested	Tribal Exposure Cancer Risks	Tribal Exposure Noncancer Hazards	Ambient Tribal Cancer Risks	Ambient Tribal Noncancer Hazards	Incremental Tribal Cancer Risks	Incremental Tribal Noncancer Hazards
Acorn (adult + child)	1.6E-04	--	4.5E-05	--	1E-04	--
Acorns (adult)	--	9.3	--	3.6	--	5.7
Acorns (child)	--	12.4	--	4.8	--	7.6
Tules - Stalks (adult + child)	3.9E-04	--	1.9E-03	--	NR	--
Tules - Stalks (adult)	--	12	--	40	--	NR
Tules - Stalks (child)	--	16	--	51	--	NR
Tules - Roots (adult + child)	3.3E-04	--	1.5E-03	--	NR	--
Tules - Roots (adult)	--	10	--	52	--	NR
Tules - Roots (child)	--	13	--	71	--	NR
Cattails - Stalks (adult + child)	3.3E-04	--	2.1E-03	--	NR	--
Cattails - Stalks (adult)	--	11	--	56	--	NR
Cattails - Stalks (child)	--	15	--	77	--	NR
Cattails - Roots (adult + child)	4.2E-04	--	1.0E-02	--	NR	--
Cattails - Roots (adult)	--	14	--	25	--	NR
Cattails - Roots (child)	--	17	--	34	--	NR

Notes:

NR= No incremental risk and/or hazard is identified due to ambient risk/hazards being greater than site risk/hazards

-- = For cancer risk, adult + child risks are presented

For noncancer hazards, adult and child hazard estimates are presented separately

Table 8-13
Summary of Tribal Cancer Risks and Noncancer Hazards for Acorn Ingestion (365 Day Exposure)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Plant Ingested	Tribal Exposure Cancer Risks	Tribal Exposure Noncancer Hazards	Ambient Tribal Cancer Risks	Ambient Tribal Noncancer Hazards	Incremental Tribal Cancer Risks	Incremental Tribal Noncancer Hazards
Acorns - Adult plus Child	8.6E-04	--	2.5E-04	--	6.2E-04	--
Acorns - Adult	--	56	--	22	--	34
Acorns - Child	--	75	--	29	--	46

Appendices

Appendix A
List of Samples Used By Media

TABLE A1.1
Samples Used in the On-Mine Area Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
PLNT01_01	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_02	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_03	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_07	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_08	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_09	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_13	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_14	Soil	11/9/2018	0	6	in bgs	Dry
PLNT01_15	Soil	11/9/2018	0	6	in bgs	Dry
SSG-1	Soil	6/1/1991	NA	NA	NA	NA
SSG-2	Soil	6/1/1991	NA	NA	NA	NA
SSG-3	Soil	6/1/1991	NA	NA	NA	NA
SSG-4	Soil	6/1/1991	NA	NA	NA	NA
SSG-5	Soil	6/1/1991	NA	NA	NA	NA
SSG-6	Soil	6/1/1991	NA	NA	NA	NA
SSG-7	Soil	6/1/1991	NA	NA	NA	NA
SSG-8	Soil	6/1/1991	NA	NA	NA	NA
SSG-9	Soil	6/1/1991	NA	NA	NA	NA
SSG-10	Soil	6/1/1991	NA	NA	NA	NA
SSG-11	Soil	6/1/1991	NA	NA	NA	NA
SSG-12	Soil	6/1/1991	NA	NA	NA	NA
SSG-13	Soil	6/1/1991	NA	NA	NA	NA
SSG-14	Soil	6/1/1991	NA	NA	NA	NA
SSG-15	Soil	6/1/1991	NA	NA	NA	NA
SSG-16	Soil	6/1/1991	NA	NA	NA	NA
SSG-17	Soil	6/1/1991	NA	NA	NA	NA
SSG-18	Soil	6/1/1991	NA	NA	NA	NA
SSG-19	Soil	6/1/1991	NA	NA	NA	NA
SSG-20	Soil	6/1/1991	NA	NA	NA	NA
SSG-21	Soil	6/1/1991	NA	NA	NA	NA
SSG-22	Soil	6/1/1991	NA	NA	NA	NA
SSG-23	Soil	6/1/1991	NA	NA	NA	NA
SSG-24	Soil	6/1/1991	NA	NA	NA	NA
SSG-25	Soil	6/1/1991	NA	NA	NA	NA
SSG-26	Soil	6/1/1991	NA	NA	NA	NA
SSG-27	Soil	6/1/1991	NA	NA	NA	NA
SSG-28	Soil	6/1/1991	NA	NA	NA	NA
SSG-29	Soil	6/1/1991	NA	NA	NA	NA
SSG-30	Soil	6/1/1991	NA	NA	NA	NA
SSG-31	Soil	6/1/1991	NA	NA	NA	NA
SSG-32	Soil	6/1/1991	NA	NA	NA	NA

TABLE A1.1
Samples Used in the On-Mine Area Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
SSG-33	Soil	6/1/1991	NA	NA	NA	NA
SSG-34	Soil	6/1/1991	NA	NA	NA	NA
SSG-35	Soil	6/1/1991	NA	NA	NA	NA
SSG-36	Soil	6/1/1991	NA	NA	NA	NA
SSG-37	Soil	6/1/1991	NA	NA	NA	NA
SSG-38	Soil	6/1/1991	NA	NA	NA	NA
SSG-39	Soil	6/1/1991	NA	NA	NA	NA
SSG-40	Soil	6/1/1991	NA	NA	NA	NA
SSG-41	Soil	6/1/1991	NA	NA	NA	NA
SSG-42	Soil	6/1/1991	NA	NA	NA	NA
SSG-43	Soil	6/1/1991	NA	NA	NA	NA
SSG-44	Soil	6/1/1991	NA	NA	NA	NA
SSG-45	Soil	6/1/1991	NA	NA	NA	NA
SSG-46	Soil	6/1/1991	NA	NA	NA	NA
SSG-47	Soil	6/1/1991	NA	NA	NA	NA
SSG-48	Soil	6/1/1991	NA	NA	NA	NA
SSG-49	Soil	6/1/1991	NA	NA	NA	NA

Notes:
in bgs = inches below ground surface
NA = not available

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA01	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA01	Soil	9/5/2006	0.6	0.8	ft bgs	Dry
RA01	Soil	9/5/2006	1.5	2	ft bgs	Dry
RA02	Soil	9/5/2006	0	0.6	ft bgs	Dry
RA02	Soil	9/5/2006	1	1.5	ft bgs	Dry
RA02	Soil	9/5/2006	7.5	8	ft bgs	Dry
RA03	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA03	Soil	9/5/2006	2.5	3	ft bgs	Dry
RA03	Soil	9/5/2006	7	7.5	ft bgs	Dry
RA04	Soil	9/5/2006	4.5	5	ft bgs	Dry
RA05	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA05	Soil	9/5/2006	2	2.5	ft bgs	Dry
RA05	Soil	9/5/2006	5	5.5	ft bgs	Dry
RA05	Soil	9/5/2006	6.6	7	ft bgs	Dry
RA06	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA06	Soil	9/5/2006	2	2.5	ft bgs	Dry
RA06	Soil	9/5/2006	5.5	6	ft bgs	Dry
RA07	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA07	Soil	9/5/2006	1.7	2.3	ft bgs	Dry
RA07	Soil	9/5/2006	5.2	5.6	ft bgs	Dry
RA07	Soil	9/5/2006	7.5	8	ft bgs	Dry
RA08	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA08	Soil	9/5/2006	3	3.7	ft bgs	Dry
RA08	Soil	9/5/2006	7.5	8	ft bgs	Dry
RA09	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA09	Soil	9/5/2006	2	2.5	ft bgs	Dry
RA10	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA10	Soil	9/5/2006	2	2.5	ft bgs	Dry
RA10	Soil	9/5/2006	5.5	6	ft bgs	Dry
RA100	Soil	5/21/2007	1	2	ft bgs	Dry
RA101	Soil	5/21/2007	0	1	ft bgs	Dry
RA101	Soil	5/21/2007	3	4	ft bgs	Dry
RA102	Soil	5/22/2007	2	3	ft bgs	Dry
RA103	Soil	5/22/2007	2	3	ft bgs	Dry
RA104	Soil	5/22/2007	0	1	ft bgs	Dry
RA104	Soil	5/22/2007	7	8	ft bgs	Dry
RA105	Soil	5/22/2007	0	0.5	ft bgs	Dry
RA105	Soil	5/22/2007	6	6.5	ft bgs	Dry
RA106	Soil	5/22/2007	1	2	ft bgs	Dry
RA106	Soil	5/22/2007	3	4	ft bgs	Dry
RA106	Soil	5/22/2007	9	10	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA11	Soil	9/6/2006	1.5	2	ft bgs	Dry
RA11	Soil	9/6/2006	5.5	6	ft bgs	Dry
RA12	Soil	9/6/2006	0	0.6	ft bgs	Dry
RA12	Soil	9/6/2006	3	3.5	ft bgs	Dry
RA12	Soil	9/6/2006	5	5.5	ft bgs	Dry
RA13	Soil	9/6/2006	0	0.5	ft bgs	Dry
RA13	Soil	9/6/2006	2.5	3	ft bgs	Dry
RA13	Soil	9/6/2006	6.5	6.8	ft bgs	Dry
RA14	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA14	Soil	9/5/2006	3	3.5	ft bgs	Dry
RA14	Soil	9/5/2006	7	7.5	ft bgs	Dry
RA15	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA15	Soil	9/5/2006	2.5	3	ft bgs	Dry
RA15	Soil	9/5/2006	7	7.5	ft bgs	Dry
RA16	Soil	9/5/2006	2.25	2.7	ft bgs	Dry
RA16	Soil	9/5/2006	6.5	7	ft bgs	Dry
RA17	Soil	9/5/2006	0	0.5	ft bgs	Dry
RA17	Soil	9/5/2006	1.5	2	ft bgs	Dry
RA18	Soil	9/6/2006	5.5	6	ft bgs	Dry
RA18	Soil	9/6/2006	7.5	8	ft bgs	Dry
RA19	Soil	9/6/2006	0	0.8	ft bgs	Dry
RA19	Soil	9/6/2006	1.5	2	ft bgs	Dry
RA19	Soil	9/6/2006	5	5.5	ft bgs	Dry
RA19	Soil	9/6/2006	7	7.5	ft bgs	Dry
RA20	Soil	9/6/2006	0.2	0.7	ft bgs	Dry
RA20	Soil	9/6/2006	4.5	5	ft bgs	Dry
RA20	Soil	9/6/2006	6.8	7.25	ft bgs	Dry
RA21	Soil	5/15/2007	2	3	ft bgs	Dry
RA21	Soil	5/15/2007	6	7	ft bgs	Dry
RA21	Soil	5/15/2007	8	9	ft bgs	Dry
RA22	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA22	Soil	5/15/2007	2	3	ft bgs	Dry
RA22	Soil	5/15/2007	4	5	ft bgs	Dry
RA23	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA23	Soil	5/15/2007	2	3	ft bgs	Dry
RA23	Soil	5/15/2007	4	5	ft bgs	Dry
RA24	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA24	Soil	5/15/2007	2	3	ft bgs	Dry
RA24	Soil	5/15/2007	6	6.5	ft bgs	Dry
RA25	Soil	5/15/2007	0	1	ft bgs	Dry
RA25	Soil	5/15/2007	2	3	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA25	Soil	5/15/2007	6	7	ft bgs	Dry
RA26	Soil	5/15/2007	0	1	ft bgs	Dry
RA26	Soil	5/15/2007	2	3	ft bgs	Dry
RA26	Soil	5/15/2007	5	6	ft bgs	Dry
RA27	Soil	5/15/2007	0	0.75	ft bgs	Dry
RA27	Soil	5/15/2007	2	2.5	ft bgs	Dry
RA27	Soil	5/15/2007	4	5	ft bgs	Dry
RA28	Soil	5/15/2007	0	0.75	ft bgs	Dry
RA28	Soil	5/15/2007	2	2.25	ft bgs	Dry
RA28	Soil	5/15/2007	2.5	3	ft bgs	Dry
RA29	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA29	Soil	5/15/2007	1	2	ft bgs	Dry
RA29	Soil	5/15/2007	4	5	ft bgs	Dry
RA30	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA30	Soil	5/15/2007	2	3	ft bgs	Dry
RA30	Soil	5/15/2007	4	5	ft bgs	Dry
RA31	Soil	5/14/2007	0.5	1	ft bgs	Dry
RA31	Soil	5/14/2007	4	5	ft bgs	Dry
RA31	Soil	5/14/2007	6	7	ft bgs	Dry
RA32	Soil	5/14/2007	0	1	ft bgs	Dry
RA32	Soil	5/14/2007	2	3	ft bgs	Dry
RA32	Soil	5/14/2007	6	7	ft bgs	Dry
RA33	Soil	5/14/2007	0	1	ft bgs	Dry
RA33	Soil	5/14/2007	2	3	ft bgs	Dry
RA33	Soil	5/14/2007	4	5	ft bgs	Dry
RA34	Soil	5/14/2007	2	3	ft bgs	Dry
RA34	Soil	5/14/2007	4	5	ft bgs	Dry
RA35	Soil	5/14/2007	0	1	ft bgs	Dry
RA35	Soil	5/14/2007	2	3	ft bgs	Dry
RA35	Soil	5/14/2007	4	5	ft bgs	Dry
RA36	Soil	5/14/2007	1	1.5	ft bgs	Dry
RA36	Soil	5/14/2007	2	3	ft bgs	Dry
RA37	Soil	5/14/2007	0	1	ft bgs	Dry
RA37	Soil	5/14/2007	2	3	ft bgs	Dry
RA37	Soil	5/14/2007	4	5	ft bgs	Dry
RA38	Soil	5/15/2007	2.5	3	ft bgs	Dry
RA38	Soil	5/15/2007	4	5	ft bgs	Dry
RA39	Soil	5/15/2007	2	3	ft bgs	Dry
RA40	Soil	5/15/2007	2	3	ft bgs	Dry
RA41	Soil	5/15/2007	0	0.5	ft bgs	Dry
RA41	Soil	5/15/2007	2	3	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA41	Soil	5/15/2007	4	5	ft bgs	Dry
RA42	Soil	5/15/2007	4	5	ft bgs	Dry
RA43	Soil	5/15/2007	2	3	ft bgs	Dry
RA43	Soil	5/15/2007	4	5	ft bgs	Dry
RA44	Soil	5/15/2007	0	1	ft bgs	Dry
RA44	Soil	5/15/2007	2	3	ft bgs	Dry
RA44	Soil	5/15/2007	4	5	ft bgs	Dry
RA45	Soil	5/15/2007	0	1	ft bgs	Dry
RA45	Soil	5/15/2007	2	3	ft bgs	Dry
RA45	Soil	5/15/2007	4	5	ft bgs	Dry
RA46	Soil	5/15/2007	0	1	ft bgs	Dry
RA46	Soil	5/15/2007	2	3	ft bgs	Dry
RA46	Soil	5/15/2007	4	5	ft bgs	Dry
RA47	Soil	5/15/2007	0	1	ft bgs	Dry
RA47	Soil	5/15/2007	2	3	ft bgs	Dry
RA47	Soil	5/15/2007	4	5	ft bgs	Dry
RA48	Soil	5/15/2007	0	1	ft bgs	Dry
RA48	Soil	5/15/2007	2	3	ft bgs	Dry
RA48	Soil	5/15/2007	4	5	ft bgs	Dry
RA49	Soil	5/15/2007	2	3	ft bgs	Dry
RA49	Soil	5/15/2007	4	5	ft bgs	Dry
RA50	Soil	5/14/2007	0	1	ft bgs	Dry
RA50	Soil	5/14/2007	2	3	ft bgs	Dry
RA50	Soil	5/14/2007	4	5	ft bgs	Dry
RA51	Soil	5/15/2007	0	1	ft bgs	Dry
RA51	Soil	5/15/2007	2	3	ft bgs	Dry
RA51	Soil	5/15/2007	4	5	ft bgs	Dry
RA52	Soil	5/15/2007	0	1	ft bgs	Dry
RA52	Soil	5/15/2007	2	3	ft bgs	Dry
RA52	Soil	5/15/2007	4.5	5	ft bgs	Dry
RA53	Soil	5/15/2007	0	1	ft bgs	Dry
RA53	Soil	5/15/2007	2	3	ft bgs	Dry
RA53	Soil	5/15/2007	4	5	ft bgs	Dry
RA54	Soil	5/15/2007	0	1	ft bgs	Dry
RA54	Soil	5/15/2007	2	3	ft bgs	Dry
RA54	Soil	5/15/2007	4	5	ft bgs	Dry
RA55	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA55	Soil	5/16/2007	2	3	ft bgs	Dry
RA55	Soil	5/16/2007	4	5	ft bgs	Dry
RA56	Soil	5/16/2007	0	1	ft bgs	Dry
RA56	Soil	5/16/2007	2	3	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA56	Soil	5/16/2007	4.5	5	ft bgs	Dry
RA57	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA57	Soil	5/16/2007	2	3	ft bgs	Dry
RA57	Soil	5/16/2007	6	7	ft bgs	Dry
RA58	Soil	5/16/2007	2	3	ft bgs	Dry
RA58	Soil	5/16/2007	4	5	ft bgs	Dry
RA59	Soil	5/16/2007	2	3	ft bgs	Dry
RA59	Soil	5/16/2007	6	7	ft bgs	Dry
RA60	Soil	5/16/2007	2	3	ft bgs	Dry
RA60	Soil	5/16/2007	4	5	ft bgs	Dry
RA61	Soil	5/16/2007	6	7	ft bgs	Dry
RA62	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA62	Soil	5/16/2007	2	3	ft bgs	Dry
RA62	Soil	5/16/2007	9	10	ft bgs	Dry
RA63	Soil	5/16/2007	4	5	ft bgs	Dry
RA63	Soil	5/16/2007	7	8	ft bgs	Dry
RA64	Soil	5/16/2007	0	1	ft bgs	Dry
RA64	Soil	5/16/2007	2	3	ft bgs	Dry
RA65	Soil	5/16/2007	9	10	ft bgs	Dry
RA66	Soil	5/21/2007	0.5	1	ft bgs	Dry
RA66	Soil	5/21/2007	1	3	ft bgs	Dry
RA67	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA67	Soil	5/16/2007	2	3	ft bgs	Dry
RA67	Soil	5/16/2007	4	5	ft bgs	Dry
RA68	Soil	5/14/2007	2	3	ft bgs	Dry
RA68	Soil	5/14/2007	4	5	ft bgs	Dry
RA69	Soil	5/14/2007	2	3	ft bgs	Dry
RA69	Soil	5/14/2007	3	4	ft bgs	Dry
RA70	Soil	5/14/2007	0	1	ft bgs	Dry
RA70	Soil	5/14/2007	2	4	ft bgs	Dry
RA70	Soil	5/14/2007	4	5	ft bgs	Dry
RA71	Soil	5/14/2007	0	1	ft bgs	Dry
RA71	Soil	5/14/2007	2	3	ft bgs	Dry
RA71	Soil	5/14/2007	4	5	ft bgs	Dry
RA72	Soil	5/14/2007	2	3	ft bgs	Dry
RA72	Soil	5/14/2007	4	5	ft bgs	Dry
RA73	Soil	5/14/2007	0	1	ft bgs	Dry
RA73	Soil	5/14/2007	2	3	ft bgs	Dry
RA73	Soil	5/14/2007	3	4	ft bgs	Dry
RA74	Soil	5/16/2007	0	1	ft bgs	Dry
RA74	Soil	5/16/2007	2	3	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA74	Soil	5/16/2007	4	5	ft bgs	Dry
RA75	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA75	Soil	5/16/2007	2	3	ft bgs	Dry
RA75	Soil	5/16/2007	4	5	ft bgs	Dry
RA76	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA76	Soil	5/16/2007	4	5	ft bgs	Dry
RA76	Soil	5/16/2007	7	8	ft bgs	Dry
RA77	Soil	5/16/2007	2	3	ft bgs	Dry
RA78	Soil	5/16/2007	0	0.3	ft bgs	Dry
RA78	Soil	5/16/2007	1	2	ft bgs	Dry
RA79	Soil	5/16/2007	0	0.3	ft bgs	Dry
RA79	Soil	5/16/2007	1	2	ft bgs	Dry
RA80	Soil	5/16/2007	2	3	ft bgs	Dry
RA81	Soil	5/16/2007	0	1	ft bgs	Dry
RA81	Soil	5/16/2007	2	2.5	ft bgs	Dry
RA81	Soil	5/16/2007	2.75	3	ft bgs	Dry
RA82	Soil	5/16/2007	0	0.5	ft bgs	Dry
RA82	Soil	5/16/2007	2	3	ft bgs	Dry
RA83	Soil	5/21/2007	0	0.5	ft bgs	Dry
RA83	Soil	5/21/2007	1	2	ft bgs	Dry
RA84	Soil	5/21/2007	1	3	ft bgs	Dry
RA85	Soil	5/21/2007	1	2	ft bgs	Dry
RA86	Soil	5/21/2007	0	0.5	ft bgs	Dry
RA86	Soil	5/21/2007	0.5	1	ft bgs	Dry
RA86	Soil	5/21/2007	2	3	ft bgs	Dry
RA87	Soil	5/21/2007	2	3	ft bgs	Dry
RA88	Soil	5/21/2007	0.5	1.5	ft bgs	Dry
RA88	Soil	5/21/2007	3	4	ft bgs	Dry
RA89	Soil	5/21/2007	1	2	ft bgs	Dry
RA89	Soil	5/21/2007	4	5	ft bgs	Dry
RA90	Soil	5/21/2007	0	1	ft bgs	Dry
RA90	Soil	5/21/2007	3	4	ft bgs	Dry
RA91	Soil	5/21/2007	0	1	ft bgs	Dry
RA91	Soil	5/21/2007	3	4	ft bgs	Dry
RA92	Soil	5/21/2007	0	1	ft bgs	Dry
RA92	Soil	5/21/2007	2	3	ft bgs	Dry
RA93	Soil	5/21/2007	7	8	ft bgs	Dry
RA94	Soil	5/21/2007	2	3	ft bgs	Dry
RA94	Soil	5/21/2007	6	7	ft bgs	Dry
RA95	Soil	5/21/2007	0	0.5	ft bgs	Dry
RA95	Soil	5/21/2007	7	8	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RA96	Soil	5/21/2007	0	0.5	ft bgs	Dry
RA96	Soil	5/21/2007	1	2	ft bgs	Dry
RA97	Soil	5/21/2007	0	0.5	ft bgs	Dry
RA97	Soil	5/21/2007	5	6	ft bgs	Dry
RA98	Soil	5/21/2007	2	3	ft bgs	Dry
RA99	Soil	5/21/2007	2	3	ft bgs	Dry
RASS01	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS02	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS03	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS04	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS05	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS06	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS07	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS08	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS09	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS10	Soil	9/6/2006	0	0.5	ft bgs	Dry
RASS11	Soil	5/17/2007	0	1	ft bgs	Dry
RASS12	Soil	5/15/2007	0	1	ft bgs	Dry
RASS13	Soil	5/17/2007	0	0.3	ft bgs	Dry
RASS14	Soil	5/17/2007	0	1	ft bgs	Dry
RASS18	Soil	5/14/2007	0	1	ft bgs	Dry
RASS19	Soil	5/14/2007	0	0.5	ft bgs	Dry
RASS20	Soil	5/14/2007	0	0.5	ft bgs	Dry
RASS22	Soil	5/17/2007	0	1	ft bgs	Dry
RASS24	Soil	5/17/2007	0	1	ft bgs	Dry
RASS25	Soil	5/17/2007	0	1	ft bgs	Dry
RASS26	Soil	5/17/2007	0	1	ft bgs	Dry
RASS27	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS28	Soil	5/17/2007	0	1	ft bgs	Dry
RASS29	Soil	5/17/2007	0	0.8	ft bgs	Dry
RASS30	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS31	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS32	Soil	5/17/2007	0	1	ft bgs	Dry
RASS33	Soil	5/17/2007	0	1	ft bgs	Dry
RASS34	Soil	5/17/2007	0	1	ft bgs	Dry
RASS35	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS36	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS37	Soil	5/17/2007	0	1	ft bgs	Dry
RASS38	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS41	Soil	4/12/2007		NA	ft bgs	Dry
RASS42	Soil	4/12/2007	0	0.3	ft bgs	Dry

TABLE A1.2
Samples Used in the Lakeside Residential Area
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
RASS43	Soil	4/12/2007	0	0.3	ft bgs	Dry
RASS44	Soil	4/12/2007	0	1	ft bgs	Dry
RASS45	Soil	4/12/2007	0	1	ft bgs	Dry
RASS46	Soil	4/12/2007	0	1	ft bgs	Dry
RASS47	Soil	4/12/2007	0	0.3	ft bgs	Dry
RASS48	Soil	4/12/2007	0	1	ft bgs	Dry
RASS49	Soil	4/12/2007	0	1	ft bgs	Dry
RASS50	Soil	5/17/2007	0	1	ft bgs	Dry
RASS51	Soil	5/17/2007	0	1	ft bgs	Dry
RASS52	Soil	5/17/2007	0	1	ft bgs	Dry
RASS53	Soil	5/17/2007	0	1	ft bgs	Dry
RASS54	Soil	5/17/2007	0	0.5	ft bgs	Dry
RASS55	Soil	5/17/2007	0	1	ft bgs	Dry
RASS56	Soil	5/17/2007	0	1	ft bgs	Dry
RASS57	Soil	5/17/2007	0	0.6	ft bgs	Dry
RASS58	Soil	5/17/2007	0	1	ft bgs	Dry
RASS62	Soil	5/22/2007	0	1	ft bgs	Dry
RASS63	Soil	5/22/2007	0	1	ft bgs	Dry
RASS64	Soil	5/29/2007	0	0.4	ft bgs	Dry
RASS64	Soil	5/29/2007	0.4	1	ft bgs	Dry
RASS67	Soil	5/29/2007	0	0.3	ft bgs	Dry
RASS67	Soil	5/29/2007	0.3	1	ft bgs	Dry
RASS68	Soil	12/11/2007	NA	NA	NA	Dry
RASS70	Soil	12/11/2007	NA	NA	NA	Dry
RASS71	Soil	12/11/2007	NA	NA	NA	Dry
RASS72	Soil	12/11/2007	NA	NA	NA	Dry
RASS73	Soil	12/11/2007	NA	NA	NA	Dry
RASS74	Soil	12/11/2007	NA	NA	NA	Dry
RASS75	Soil	12/11/2007	NA	NA	NA	Dry
RASS76	Soil	12/11/2007	NA	NA	NA	Dry
RASS77	Soil	12/11/2007	NA	NA	NA	Dry

Notes:
ft bgs = feet below ground surface
NA = not available

TABLE A1.3
Samples Used in the Elem Indian Colony (Unexcavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
1+000-SW02	Soil	9/12/2006	0	0.5	ft bgs	NA
1+500-SW04	Soil	8/25/2006	0	0.5	ft bgs	NA
1+550-FLR01	Soil	9/11/2006	0	0.5	ft bgs	NA
1+550-SW02	Soil	9/11/2006	0	0.5	ft bgs	NA
1+600-FLR01	Soil	9/11/2006	0	0.5	ft bgs	NA
1+750-SW04	Soil	8/28/2006	0	0.5	ft bgs	NA
EIC43	Soil	11/7/2005	1	1.5	ft bgs	NA
EIC43	Soil	11/7/2005	3.5	4	ft bgs	NA
EIC51	Soil	11/7/2005	1.3	2	ft bgs	NA
EIC51	Soil	11/7/2005	3.5	4	ft bgs	NA
EIC54	Soil	11/8/2005	0.5	1.5	ft bgs	NA
EIC54	Soil	11/8/2005	2.5	3	ft bgs	NA
EIC55	Soil	11/8/2005	1.5	2	ft bgs	NA
EIC55	Soil	11/8/2005	2.7	3.2	ft bgs	NA
EIC56	Soil	11/8/2005	2	2.8	ft bgs	NA
EIC56	Soil	11/8/2005	4	5	ft bgs	NA
EIC57	Soil	11/8/2005	0.5	1	ft bgs	NA
EIC57	Soil	11/8/2005	1.7	2.25	ft bgs	NA
EIC59	Soil	11/7/2005	1	1.5	ft bgs	NA
EIC59	Soil	11/7/2005	2	2.5	ft bgs	NA
EIC60	Soil	11/7/2005	0.5	1	ft bgs	NA
EIC60	Soil	11/7/2005	1.5	2	ft bgs	NA
EIC61	Soil	11/7/2005	0.5	1.5	ft bgs	NA
EIC62	Soil	11/7/2005	1	1.5	ft bgs	NA
EIC62	Soil	11/7/2005	1.5	2	ft bgs	NA
EIC64	Soil	11/8/2005	0.6	1	ft bgs	NA
EIC64	Soil	11/8/2005	3	3.5	ft bgs	NA
EIC65	Soil	11/7/2005	3	4	ft bgs	NA
EIC65	Soil	11/7/2005	5	6	ft bgs	NA
EIC69	Soil	11/8/2005	1.7	2.2	ft bgs	NA
EIC70	Soil	11/8/2005	0.5	1	ft bgs	NA
EIC70	Soil	11/8/2005	3	3.5	ft bgs	NA
EIC75	Soil	11/10/2005	0	0.5	ft bgs	NA
EIC75	Soil	11/10/2005	3	3.5	ft bgs	NA
EIC77	Soil	11/10/2005	0.25	1	ft bgs	NA
EIC77	Soil	11/10/2005	1.1	1.6	ft bgs	NA
[redacted]	Soil	7/29/2006	0	0.5	ft bgs	NA
	Soil	7/29/2006	0	0.5	ft bgs	NA
	Soil	7/29/2006	0	0.5	ft bgs	NA
	Soil	7/31/2006	0	0.5	ft bgs	NA
	Soil	7/12/2006	0	0.5	ft bgs	NA

TABLE A1.3
Samples Used in the Elem Indian Colony (Unexcavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
[redacted]	Soil	7/15/2006	0	0.5	ft bgs	NA
	Soil	7/15/2006	0	0.5	ft bgs	NA
	Soil	7/15/2006	0	0.5	ft bgs	NA
	Soil	7/17/2006	0	0.5	ft bgs	NA
	Soil	7/18/2006	0	0.5	ft bgs	NA
	Soil	7/18/2006	0	0.5	ft bgs	NA
	Soil	7/25/2006	0	0.5	ft bgs	NA
	Soil	7/25/2006	0	0.5	ft bgs	NA
	Soil	7/24/2006	0	0.5	ft bgs	NA
	Soil	7/24/2006	0	0.5	ft bgs	NA
	Soil	7/29/2006	0	0.5	ft bgs	NA
EIC-UPRG02	Soil	7/29/2006	0	0.5	ft bgs	NA
EIC-UPRG06	Soil	7/29/2006	0	0.5	ft bgs	NA
EIC-UPRG07	Soil	7/29/2006	0	0.5	ft bgs	NA
EIC-UPRG08	Soil	7/29/2006	0	0.5	ft bgs	NA
EIC-UPRG24	Soil	7/31/2006	0	0.5	ft bgs	NA
ETCN001	Soil	6/17/2002	0.5	1	ft bgs	NA
ETCN001	Soil	6/17/2002	3.5	4	ft bgs	NA
ETCN002	Soil	7/3/2002	1.5	2	ft bgs	NA
ETCP001	Soil	6/18/2002	3	3.5	ft bgs	NA
ETCP001	Soil	6/18/2002	6	7	ft bgs	NA
ETCP002	Soil	7/1/2002	0	1.5	ft bgs	NA
ETCP002	Soil	7/1/2002	5	5.5	ft bgs	NA
ETCR004	Soil	6/19/2002	0	1.5	ft bgs	NA
ETCR006	Soil	6/20/2002	3.5	4	ft bgs	NA
ETCR008	Soil	7/3/2002	0.75	1.5	ft bgs	NA
ETCR008	Soil	7/3/2002	3.5	4	ft bgs	NA
ETCR009	Soil	7/3/2002	1	2.1	ft bgs	NA
ETCR009	Soil	7/3/2002	3.5	4	ft bgs	NA
ETCY001	Soil	6/18/2002	0.5	1.5	ft bgs	NA
ETCY001	Soil	6/18/2002	2.5	3	ft bgs	NA
ETCY003	Soil	6/21/2002	0	1	ft bgs	NA
ETCY003	Soil	6/21/2002	2	2.5	ft bgs	NA
ETCY006	Soil	7/2/2002	1	1.5	ft bgs	NA
ETCY006	Soil	7/2/2002	3	3.5	ft bgs	NA
ETCY008	Soil	7/2/2002	1	2	ft bgs	NA
ETCY008	Soil	7/2/2002	3.5	4	ft bgs	NA
ETCY009	Soil	7/2/2002	1.75	2.5	ft bgs	NA
ETCY009	Soil	7/2/2002	7.5	8	ft bgs	NA
ETCY010	Soil	7/2/2002	1.5	2	ft bgs	NA
ETCY010	Soil	7/2/2002	3.5	4	ft bgs	NA

TABLE A1.3
Samples Used in the Elem Indian Colony (Unexcavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
ETCY027	Soil	7/3/2002	6	6.5	ft bgs	NA
ETCY028	Soil	7/3/2002	1.5	2	ft bgs	NA
[redacted]	Soil	7/3/2002	3	3.5	ft bgs	NA
	Soil	9/25/2006	0	0.5	ft bgs	NA
	Soil	9/25/2006	0	0.5	ft bgs	NA
	Soil	9/25/2006	0	0.5	ft bgs	NA
	Soil	9/21/2006	0	0.5	ft bgs	NA
	Soil	9/11/2006	0	0.5	ft bgs	NA

Notes:
ft bgs = feet below ground surface
NA = not available

TABLE A1.4
Samples Used in the Elem Indian Colony (Excavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
EICCLL03	Soil	7/26/2006	0	0.5	ft bgs	NA
EICCLL04	Soil	7/26/2006	0	0.5	ft bgs	NA
EICCLL05	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-EPID01	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-EPID02	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-EPID03	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-EPID04	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-EPID05	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-TRUCK04	Soil	7/25/2006	0	0.5	ft bgs	NA
EIC-TRUCK04	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-TRUCK04	Soil	7/27/2006	0	0.5	ft bgs	NA
EIC-TRUCK04	Soil	7/28/2006	0	0.5	ft bgs	NA
EIC-TRUCK20	Soil	7/25/2006	0	0.5	ft bgs	NA
EIC-TRUCK20	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-TRUCK20	Soil	7/27/2006	0	0.5	ft bgs	NA
EIC-TRUCK20	Soil	7/28/2006	0	0.5	ft bgs	NA
EIC-TRUCK40	Soil	7/25/2006	0	0.5	ft bgs	NA
EIC-TRUCK40	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-TRUCK40	Soil	7/27/2006	0	0.5	ft bgs	NA
EIC-TRUCK40	Soil	7/28/2006	0	0.5	ft bgs	NA
EIC-TRUCK52	Soil	7/28/2006	0	0.5	ft bgs	NA
EIC-TRUCK60	Soil	7/25/2006	0	0.5	ft bgs	NA
EIC-TRUCK60	Soil	7/26/2006	0	0.5	ft bgs	NA
EIC-TRUCK60	Soil	7/27/2006	0	0.5	ft bgs	NA
[redacted]	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
	Soil	11/17/2006	0	0.5	ft bgs	NA
	Soil	10/25/2006	0	0.5	ft bgs	NA
QB-1	Soil	9/14/2006	0	0.5	ft bgs	NA
QB-2	Soil	9/14/2006	0	0.5	ft bgs	NA

TABLE A1.4
Samples Used in the Elem Indian Colony (Excavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
QB-3	Soil	9/14/2006	0	0.5	ft bgs	NA
[redacted]	Soil	9/26/2006	0	0.5	ft bgs	NA
	Soil	9/21/2006	0	0.5	ft bgs	NA
	Soil	9/20/2006	0	0.5	ft bgs	NA
	Soil	8/14/2006	0	0.5	ft bgs	NA
	Soil	8/16/2006	0	0.5	ft bgs	NA
	Soil	8/16/2006	0	0.5	ft bgs	NA
	Soil	8/15/2006	0	0.5	ft bgs	NA
	Soil	9/26/2006	0	0.5	ft bgs	NA
	Soil	9/8/2006	0	0.5	ft bgs	NA
	Soil	9/22/2006	0	0.5	ft bgs	NA
	Soil	7/26/2006	0	0.5	ft bgs	NA
	Soil	7/27/2006	0	0.5	ft bgs	NA
	Soil	8/9/2006	0	0.5	ft bgs	NA
	Soil	9/12/2006	0	0.5	ft bgs	NA
	Soil	9/19/2006	0	0.5	ft bgs	NA
	Soil	9/23/2006	0	0.5	ft bgs	NA
	Soil	9/7/2006	0	0.5	ft bgs	NA
	Soil	9/8/2006	0	0.5	ft bgs	NA
	Soil	9/11/2006	0	0.5	ft bgs	NA
	Soil	9/14/2006	0	0.5	ft bgs	NA
	Soil	9/15/2006	0	0.5	ft bgs	NA
	Soil	7/27/2006	0	0.5	ft bgs	NA
	Soil	8/11/2006	0	0.5	ft bgs	NA
	Soil	8/15/2006	0	0.5	ft bgs	NA
	Soil	9/20/2006	0	0.5	ft bgs	NA
	Soil	9/22/2006	0	0.5	ft bgs	NA
	Soil	9/25/2006	0	0.5	ft bgs	NA
	Soil	9/7/2006	0	0.5	ft bgs	NA
	Soil	9/13/2006	0	0.5	ft bgs	NA
	Soil	9/11/2006	0	0.5	ft bgs	NA
	Soil	7/25/2006	0	0.5	ft bgs	NA
	Soil	7/28/2006	0	0.5	ft bgs	NA
	Soil	8/11/2006	0	0.5	ft bgs	NA
	Soil	8/16/2006	0	0.5	ft bgs	NA
	Soil	8/17/2006	0	0.5	ft bgs	NA
	Soil	9/14/2006	0	0.5	ft bgs	NA
	Soil	9/15/2006	0	0.5	ft bgs	NA
	Soil	9/23/2006	0	0.5	ft bgs	NA
	Soil	7/28/2006	0	0.5	ft bgs	NA
	Soil	9/12/2006	0	0.5	ft bgs	NA

TABLE A1.4
Samples Used in the Elem Indian Colony (Excavated Areas) Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
[redacted]	Soil	9/21/2006	0	0.5	ft bgs	NA
	Soil	7/25/2006	0	0.5	ft bgs	NA
	Soil	7/26/2006	0	0.5	ft bgs	NA
	Soil	8/14/2006	0	0.5	ft bgs	NA
	Soil	8/17/2006	0	0.5	ft bgs	NA
	Soil	9/13/2006	0	0.5	ft bgs	NA
	Soil	9/19/2006	0	0.5	ft bgs	NA
	Soil	9/25/2006	0	0.5	ft bgs	NA
	Soil	8/9/2006	0	0.5	ft bgs	NA

Notes:
ft bgs = feet below ground surface
NA = not available

TABLE A1.5
Samples Used in the PMB Andesite Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
26 *	Soil	11/19/2012	1	NA	ft bgs	NA
27 *	Soil	11/19/2012	1	NA	ft bgs	NA
28 *	Soil	11/19/2012	1	NA	ft bgs	NA
84 *	Soil	2/18/2013	1	NA	ft bgs	NA
85 *	Soil	2/18/2013	3	NA	ft bgs	NA
87 *	Soil	2/18/2013	3	NA	ft bgs	NA
88 *	Soil	2/18/2013	1	NA	ft bgs	NA
89 *	Soil	2/18/2013	3	NA	ft bgs	NA
90 *	Soil	2/18/2013	1	NA	ft bgs	NA
91 *	Soil	2/18/2013	1	NA	ft bgs	NA
93 *	Soil	2/18/2013	1	NA	ft bgs	NA
94 *	Soil	2/18/2013	1	NA	ft bgs	NA
95 *	Soil	2/18/2013	3	NA	ft bgs	NA
96 *	Soil	2/19/2013	1	NA	ft bgs	NA
97 *	Soil	2/19/2013	3	NA	ft bgs	NA
98 *	Soil	2/19/2013	1	NA	ft bgs	NA
99 *	Soil	2/19/2013	1	NA	ft bgs	NA
BKGD06	Soil	8/4/2009	0	0.25	ft bgs	NA
BKGD07	Soil	8/4/2009	0	0.25	ft bgs	NA
BKGD08	Soil	8/4/2009	0	0.25	ft bgs	NA
BKGD09	Soil	8/4/2009	0	0.25	ft bgs	NA
BKGD10	Soil	8/4/2009	0	0.25	ft bgs	NA
BKGS_01	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_02	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_03	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_04	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_05	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_06	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_07	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_08	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_09	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_10	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_13	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_14	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_15	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_17	Soil	11/6/2018	0	0.5	ft bgs	Dry
BKGS_18	Soil	11/6/2018	0	0.5	ft bgs	Dry
BPN14-3	Soil	8/5/2009	0.75	1	ft bgs	NA
BPN14-3R	Soil	8/5/2009	0.75	1	ft bgs	NA
S3	Soil	5/10/2001	0	0.5	ft bgs	NA
V2	Soil	5/8/2001	0	0.75	ft bgs	NA

TABLE A1.5
Samples Used in the PMB Andesite Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
V2	Soil	5/9/2001	0	0.5	ft bgs	NA

Notes:
* = Soil sample number
ft bgs = feet below ground surface
NA = not available
PMB = pre-mining baseline

TABLE A1.6
Samples Used in the PMB Franciscan Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
29 *	Soil	11/19/2012	1	NA	ft bgs	NA
31 *	Soil	11/19/2012	1	NA	ft bgs	NA
66 *	Soil	2/7/2013	1	NA	ft bgs	NA
100 *	Soil	3/12/2013	1	NA	ft bgs	NA
101 *	Soil	3/12/2013	1	NA	ft bgs	NA
102 *	Soil	3/12/2013	1	NA	ft bgs	NA
103 *	Soil	3/12/2013	1	NA	ft bgs	NA
104 *	Soil	3/12/2013	1	NA	ft bgs	NA
105 *	Soil	3/12/2013	1	NA	ft bgs	NA
106 *	Soil	3/12/2013	1	NA	ft bgs	NA
107 *	Soil	3/12/2013	1	NA	ft bgs	NA
108 *	Soil	3/12/2013	1	NA	ft bgs	NA
109 *	Soil	3/12/2013	1	NA	ft bgs	NA
110 *	Soil	3/12/2013	1	NA	ft bgs	NA
111 *	Soil	3/12/2013	1	NA	ft bgs	NA
112 *	Soil	3/12/2013	1	NA	ft bgs	NA
113 *	Soil	3/12/2013	1	NA	ft bgs	NA
114 *	Soil	3/12/2013	1	NA	ft bgs	NA
115 *	Soil	3/12/2013	1	NA	ft bgs	NA
116 *	Soil	3/12/2013	1	NA	ft bgs	NA
117 *	Soil	3/12/2013	1	NA	ft bgs	NA
118 *	Soil	3/12/2013	1	NA	ft bgs	NA
119 *	Soil	3/12/2013	1	NA	ft bgs	NA
121 *	Soil	3/12/2013	1	NA	ft bgs	NA
122 *	Soil	3/12/2013	1	NA	ft bgs	NA
123 *	Soil	3/12/2013	1	NA	ft bgs	NA
133 *	Soil	3/26/2013	1	NA	ft bgs	NA
134 *	Soil	3/26/2013	3	NA	ft bgs	NA
135 *	Soil	3/26/2013	1	NA	ft bgs	NA
136 *	Soil	3/26/2013	3	NA	ft bgs	NA
137 *	Soil	3/26/2013	1	NA	ft bgs	NA
138 *	Soil	3/26/2013	3	NA	ft bgs	NA
139 *	Soil	3/26/2013	1	NA	ft bgs	NA
140 *	Soil	3/26/2013	3	NA	ft bgs	NA
141 *	Soil	3/26/2013	1	NA	ft bgs	NA
142 *	Soil	3/26/2013	3	NA	ft bgs	NA
143 *	Soil	3/27/2013	1	NA	ft bgs	NA
149 *	Soil	3/27/2013	3	NA	ft bgs	NA
BKGD11	Soil	8/2/2009	0	0.25	ft bgs	NA
BKGD12	Soil	8/2/2009	0	0.25	ft bgs	NA
BKGD13	Soil	8/2/2009	0	0.25	ft bgs	NA

TABLE A1.6
Samples Used in the PMB Franciscan Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
BKGD14	Soil	8/2/2009	0	0.25	ft bgs	NA
BKGD15	Soil	8/2/2009	0	0.25	ft bgs	NA
BKGD16	Soil	8/6/2009	0	0.25	ft bgs	NA
BKGS_21	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_22	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_23	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_24	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_25	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_26	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_27	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_28	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_29	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_30	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_31	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_32	Soil	11/7/2018	0	0.5	ft bgs	Dry
BKGS_33	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_34	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_35	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_36	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_37	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_38	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_39	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_40	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_41	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_42	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_43	Soil	11/8/2018	0	0.5	ft bgs	Dry
BKGS_44	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_45	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_46	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_47	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_48	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_49	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_50	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_51	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_52	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_53	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_54	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_55	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_56	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_57	Soil	11/11/2018	0	0.5	ft bgs	Dry
BKGS_58	Soil	11/9/2018	0	0.5	ft bgs	Dry

TABLE A1.6
Samples Used in the PMB Franciscan Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
BKGS_59	Soil	11/9/2018	0	0.5	ft bgs	Dry
BKGS_60	Soil	11/11/2018	0	0.5	ft bgs	Dry
BPE01	Soil	8/2/2009	0	0.25	ft bgs	NA
BPE01	Soil	8/2/2009	0.75	1	ft bgs	NA
BPE04	Soil	8/2/2009	0	0.25	ft bgs	NA
BPE04	Soil	8/2/2009	0.75	1	ft bgs	NA
BPE05-1	Soil	9/10/2009	0	0.25	ft bgs	NA
BPE05-1	Soil	9/10/2009	0.75	1	ft bgs	NA
BPE06-5	Soil	8/3/2009	0	0.25	ft bgs	NA
BPE06-5	Soil	8/3/2009	0.75	1	ft bgs	NA
BPE06-6	Soil	9/10/2009	0	0.25	ft bgs	NA
BPE06-6	Soil	9/10/2009	0.75	1	ft bgs	NA
BPE07	Soil	8/3/2009	0	0.25	ft bgs	NA
BPE07	Soil	8/3/2009	0.75	1	ft bgs	NA

Notes:
* = Soil sample number
ft bgs = feet below ground surface
NA = not available
PMB = pre-mining baseline

TABLE A1.7
Samples Used in the Lakeside Residential Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
WSB01	Drinking Water	4/29/2008	Filtered
WSB01	Drinking Water	4/29/2008	Total
WSB01	Drinking Water	6/25/2008	Filtered
WSB01	Drinking Water	6/25/2008	Total
WSB01	Drinking Water	8/27/2008	Filtered
WSB01	Drinking Water	8/27/2008	Total
WSB01	Drinking Water	10/29/2008	Filtered
WSB01	Drinking Water	10/29/2008	Total
WSB01	Drinking Water	12/23/2008	Filtered
WSB01	Drinking Water	12/23/2008	Total
WSB01	Drinking Water	2/23/2009	Filtered
WSB01	Drinking Water	2/23/2009	Total
WSB01	Drinking Water	4/29/2009	Filtered
WSB01	Drinking Water	4/29/2009	Total
WSC01	Drinking Water	4/29/2008	Filtered
WSC01	Drinking Water	4/29/2008	Total
WSC01	Drinking Water	6/25/2008	Filtered
WSC01	Drinking Water	6/25/2008	Total
WSC01	Drinking Water	8/27/2008	Filtered
WSC01	Drinking Water	8/27/2008	Total
WSC01	Drinking Water	10/29/2008	Filtered
WSC01	Drinking Water	10/29/2008	Total
WSC02	Drinking Water	4/29/2008	Filtered
WSC02	Drinking Water	4/29/2008	Total
WSC02	Drinking Water	6/25/2008	Filtered
WSC02	Drinking Water	6/25/2008	Total
WSC02	Drinking Water	8/27/2008	Filtered
WSC02	Drinking Water	8/27/2008	Total
WSC02	Drinking Water	10/29/2008	Filtered
WSC02	Drinking Water	10/29/2008	Total
WSC02	Drinking Water	12/23/2008	Filtered
WSC02	Drinking Water	12/23/2008	Total
WSC02	Drinking Water	2/23/2009	Filtered
WSC02	Drinking Water	2/23/2009	Total
WSC03	Drinking Water	12/23/2008	Filtered
WSC03	Drinking Water	12/23/2008	Total
WSC03	Drinking Water	2/23/2009	Filtered
WSC03	Drinking Water	2/23/2009	Total
WSC03	Drinking Water	4/29/2009	Filtered
WSC03	Drinking Water	4/29/2009	Total
WSD01	Drinking Water	4/29/2008	Filtered

TABLE A1.7
Samples Used in the Lakeside Residential Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
WSD01	Drinking Water	4/29/2008	Total
WSD01	Drinking Water	6/25/2008	Filtered
WSD01	Drinking Water	6/25/2008	Total
WSD01	Drinking Water	8/27/2008	Filtered
WSD01	Drinking Water	8/27/2008	Total
WSD01	Drinking Water	10/29/2008	Filtered
WSD01	Drinking Water	10/29/2008	Total
WSD01	Drinking Water	12/23/2008	Filtered
WSD01	Drinking Water	12/23/2008	Total
WSD01	Drinking Water	2/23/2009	Filtered
WSD01	Drinking Water	2/23/2009	Total
WSD01	Drinking Water	4/29/2009	Filtered
WSD01	Drinking Water	4/29/2009	Total
WSD02	Drinking Water	4/29/2008	Filtered
WSD02	Drinking Water	4/29/2008	Total
WSD03	Drinking Water	4/29/2008	Filtered
WSD03	Drinking Water	4/29/2008	Total
WSD03	Drinking Water	6/25/2008	Filtered
WSD03	Drinking Water	6/25/2008	Total
WSD03	Drinking Water	8/27/2008	Filtered
WSD03	Drinking Water	8/27/2008	Total
WSD03	Drinking Water	10/29/2008	Filtered
WSD03	Drinking Water	10/29/2008	Total
WSD03	Drinking Water	12/23/2008	Filtered
WSD03	Drinking Water	12/23/2008	Total
WSD03	Drinking Water	2/23/2009	Filtered
WSD03	Drinking Water	2/23/2009	Total
WSD04	Drinking Water	4/29/2008	Filtered
WSD04	Drinking Water	4/29/2008	Total
WSD04	Drinking Water	6/25/2008	Filtered
WSD04	Drinking Water	6/25/2008	Total
WSD04	Drinking Water	10/28/2008	Filtered
WSD04	Drinking Water	10/28/2008	Total
WSD04	Drinking Water	2/23/2009	Filtered
WSD04	Drinking Water	2/23/2009	Total
WSD05	Drinking Water	4/29/2008	Filtered
WSD05	Drinking Water	4/29/2008	Total
WSD05	Drinking Water	6/25/2008	Filtered
WSD05	Drinking Water	6/25/2008	Total
WSD05	Drinking Water	8/27/2008	Filtered
WSD05	Drinking Water	8/27/2008	Total

TABLE A1.7
Samples Used in the Lakeside Residential Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
WSD05	Drinking Water	10/29/2008	Filtered
WSD05	Drinking Water	10/29/2008	Total
WSD05	Drinking Water	12/23/2008	Filtered
WSD05	Drinking Water	12/23/2008	Total
WSD05	Drinking Water	2/23/2009	Filtered
WSD05	Drinking Water	2/23/2009	Total
WSE01	Drinking Water	4/29/2008	Filtered
WSE01	Drinking Water	4/29/2008	Total
WSE01	Drinking Water	6/25/2008	Filtered
WSE01	Drinking Water	6/25/2008	Total
WSE01	Drinking Water	8/27/2008	Filtered
WSE01	Drinking Water	8/27/2008	Total
WSE01	Drinking Water	10/29/2008	Filtered
WSE01	Drinking Water	10/29/2008	Total
WSE01	Drinking Water	12/23/2008	Filtered
WSE01	Drinking Water	12/23/2008	Total
WSE01	Drinking Water	2/23/2009	Filtered
WSE01	Drinking Water	2/23/2009	Total
WSE01	Drinking Water	4/29/2009	Filtered
WSE01	Drinking Water	4/29/2009	Total
WSE02	Drinking Water	4/29/2008	Filtered
WSE02	Drinking Water	4/29/2008	Total
WSE02	Drinking Water	6/25/2008	Filtered
WSE02	Drinking Water	6/25/2008	Total
WSE02	Drinking Water	8/27/2008	Filtered
WSE02	Drinking Water	8/27/2008	Total
WSE02	Drinking Water	10/29/2008	Filtered
WSE02	Drinking Water	10/29/2008	Total
WSE02	Drinking Water	12/23/2008	Filtered
WSE02	Drinking Water	12/23/2008	Total
WSE02	Drinking Water	2/23/2009	Filtered
WSE02	Drinking Water	2/23/2009	Total
WSE03	Drinking Water	4/29/2008	Filtered
WSE03	Drinking Water	4/29/2008	Total
WSE03	Drinking Water	6/25/2008	Filtered
WSE03	Drinking Water	6/25/2008	Total
WSE03	Drinking Water	8/27/2008	Filtered
WSE03	Drinking Water	8/27/2008	Total
WSE03	Drinking Water	10/29/2008	Filtered
WSE03	Drinking Water	10/29/2008	Total
WSE03	Drinking Water	12/23/2008	Filtered

TABLE A1.7
Samples Used in the Lakeside Residential Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
WSE03	Drinking Water	12/23/2008	Total
WSE03	Drinking Water	2/23/2009	Filtered
WSE03	Drinking Water	2/23/2009	Total
WSE04	Drinking Water	4/29/2008	Filtered
WSE04	Drinking Water	4/29/2008	Total
WSE04	Drinking Water	8/27/2008	Filtered
WSE04	Drinking Water	8/27/2008	Total
WSE04	Drinking Water	10/29/2008	Filtered
WSE04	Drinking Water	10/29/2008	Total
WSE04	Drinking Water	12/23/2008	Filtered
WSE04	Drinking Water	12/23/2008	Total
WSE04	Drinking Water	2/23/2009	Filtered
WSE04	Drinking Water	2/23/2009	Total
WSE05	Drinking Water	10/29/2008	Filtered
WSE05	Drinking Water	10/29/2008	Total
WSE05	Drinking Water	12/23/2008	Filtered
WSE05	Drinking Water	12/23/2008	Total
WSE05	Drinking Water	2/23/2009	Filtered
WSE05	Drinking Water	2/23/2009	Total
WSE06	Drinking Water	8/27/2008	Filtered
WSE06	Drinking Water	8/27/2008	Total
WSE06	Drinking Water	10/29/2008	Filtered
WSE06	Drinking Water	10/29/2008	Total
WSE06	Drinking Water	12/23/2008	Filtered
WSE06	Drinking Water	12/23/2008	Total

TABLE A1.8
Samples Used in the Tribal Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
5A	Surface Water	4/26/2004	Filtered
5A	Surface Water	4/26/2004	Total
5A	Surface Water	6/8/2004	Filtered
5A	Surface Water	6/8/2004	Total
5A	Surface Water	6/29/2005	Filtered
5A	Surface Water	6/29/2005	Total
5A	Surface Water	4/19/2006	Filtered
5A	Surface Water	4/19/2006	Total
5A	Surface Water	6/7/2006	Filtered
5A	Surface Water	6/7/2006	Total
5B	Surface Water	4/26/2004	Filtered
5B	Surface Water	4/26/2004	Total
5B	Surface Water	6/8/2004	Filtered
5B	Surface Water	6/8/2004	Total
5B	Surface Water	6/29/2005	Filtered
5B	Surface Water	6/29/2005	Total
5B	Surface Water	4/19/2006	Filtered
5B	Surface Water	4/19/2006	Total
5B	Surface Water	6/7/2006	Filtered
5B	Surface Water	6/7/2006	Total
5C	Surface Water	4/26/2004	Filtered
5C	Surface Water	4/26/2004	Total
5C	Surface Water	6/8/2004	Filtered
5C	Surface Water	6/8/2004	Total
5C	Surface Water	6/29/2005	Filtered
5C	Surface Water	6/29/2005	Total
5C	Surface Water	4/19/2006	Filtered
5C	Surface Water	4/19/2006	Total
5C	Surface Water	6/7/2006	Filtered
5C	Surface Water	6/7/2006	Total
6B	Surface Water	4/26/2004	Filtered
6B	Surface Water	4/26/2004	Total
6B	Surface Water	6/8/2004	Filtered
6B	Surface Water	6/8/2004	Total
6B	Surface Water	6/28/2005	Filtered
6B	Surface Water	6/28/2005	Total
6B	Surface Water	4/19/2006	Filtered
6B	Surface Water	4/19/2006	Total
6B	Surface Water	6/6/2006	Filtered
6B	Surface Water	6/6/2006	Total
6C	Surface Water	4/26/2004	Filtered

TABLE A1.8
Samples Used in the Tribal Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
6C	Surface Water	4/26/2004	Total
6C	Surface Water	6/8/2004	Filtered
6C	Surface Water	6/8/2004	Total
6C	Surface Water	6/28/2005	Filtered
6C	Surface Water	6/28/2005	Total
6C	Surface Water	4/19/2006	Filtered
6C	Surface Water	4/19/2006	Total
6C	Surface Water	6/6/2006	Filtered
6C	Surface Water	6/6/2006	Total
Clear Lake	Surface Water	1/8/2002	Filtered
Clear Lake	Surface Water	1/8/2002	Total
Clear Lake	Surface Water	5/14/2003	Filtered
Clear Lake	Surface Water	12/18/2003	Filtered
Clear Lake	Surface Water	12/18/2003	Total
Clear Lake	Surface Water	6/23/2005	Filtered
Clear Lake	Surface Water	6/23/2005	Total
Clear Lake	Surface Water	5/24/2006	Filtered
Clear Lake	Surface Water	5/24/2006	Total
Clear Lake	Surface Water	5/5/2008	Filtered
Clear Lake	Surface Water	5/5/2008	Total
Clear Lake	Surface Water	5/5/2009	Filtered
Clear Lake	Surface Water	5/5/2009	Total
Clear Lake	Surface Water	5/18/2011	Filtered
Clear Lake	Surface Water	5/18/2011	Total
Clear Lake	Surface Water	5/19/2012	Filtered
Clear Lake	Surface Water	5/19/2012	Total
Clear Lake	Surface Water	9/17/2013	Filtered
Clear Lake	Surface Water	9/17/2013	Total
Clear Lake	Surface Water	5/22/2014	Filtered
Clear Lake	Surface Water	5/22/2014	Total
Clear Lake	Surface Water	5/8/2015	Filtered
Clear Lake	Surface Water	5/8/2015	Total
Clear Lake	Surface Water	5/23/2016	Filtered
Clear Lake	Surface Water	5/23/2016	Total
Clear Lake	Surface Water	10/7/2017	Filtered
Clear Lake	Surface Water	10/7/2017	Total
D5S	Surface Water	5/10/2001	Total
D6	Surface Water	5/10/2001	Total
MI14	Surface Water	9/20/2005	Total
PW06	Surface Water	9/20/2005	Filtered
PW06	Surface Water	9/20/2005	Total

TABLE A1.8
Samples Used in the Tribal Drinking Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
TS-SW-C	Surface Water	10/21/2007	Filtered
TS-SW-C	Surface Water	10/21/2007	Total
TS-SW-D	Surface Water	10/21/2007	Filtered
TS-SW-D	Surface Water	10/21/2007	Total

TABLE A1.9
Samples Used in the Acorn Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
PLNT01_01	Plant	11/9/2018	Wet
PLNT01_02	Plant	11/9/2018	Wet
PLNT01_03	Plant	11/9/2018	Wet
PLNT01_04	Plant	11/9/2018	Wet
PLNT01_05	Plant	11/9/2018	Wet
PLNT01_06	Plant	11/9/2018	Wet
PLNT01_07	Plant	11/9/2018	Wet
PLNT01_08	Plant	11/9/2018	Wet
PLNT01_09	Plant	11/9/2018	Wet
PLNT01_10	Plant	11/9/2018	Wet
PLNT01_11	Plant	11/9/2018	Wet
PLNT01_12	Plant	11/9/2018	Wet
PLNT01_13	Plant	11/9/2018	Wet
PLNT01_14	Plant	11/9/2018	Wet
PLNT01_15	Plant	11/9/2018	Wet
PLNT01_16	Plant	11/9/2018	Wet
PLNT01_17	Plant	11/9/2018	Wet
PLNT01_18	Plant	11/9/2018	Wet
PLNT01_19	Plant	11/12/2018	Wet
PLNT01_20	Plant	11/12/2018	Wet

TABLE A1.10
Samples Used in the Cattail Stalk Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
PLNT02_05	Plant	11/8/2018	Wet
PLNT02_06	Plant	11/8/2018	Wet
PLNT02_07	Plant	11/12/2018	Wet
PLNT02_08	Plant	11/12/2018	Wet
PLNT02_09	Plant	11/12/2018	Wet
PLNT02_10	Plant	11/12/2018	Wet
PLNT02_11	Plant	11/12/2018	Wet
PLNT02_12	Plant	11/12/2018	Wet
PLNT02_13	Plant	11/12/2018	Wet
PLNT02_14	Plant	11/12/2018	Wet

TABLE A1.11
Samples Used in the Cattail Root Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
PLNT02_05	Plant	11/8/2018	Wet
PLNT02_06	Plant	11/8/2018	Wet
PLNT02_07	Plant	11/12/2018	Wet
PLNT02_09	Plant	11/12/2018	Wet
PLNT02_10	Plant	11/12/2018	Wet
PLNT02_11	Plant	11/12/2018	Wet
PLNT02_12	Plant	11/12/2018	Wet
PLNT02_13	Plant	11/12/2018	Wet
PLNT02_14	Plant	11/12/2018	Wet

TABLE A1.12
Samples Used in the Tules Stalk Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
PLNT03_01	Plant	11/6/2018	Wet
PLNT03_02	Plant	11/6/2018	Wet
PLNT03_03	Plant	11/6/2018	Wet
PLNT03_04	Plant	11/6/2018	Wet
PLNT03_05	Plant	11/6/2018	Wet
PLNT03_06	Plant	11/6/2018	Wet
PLNT03_07	Plant	11/7/2018	Wet
PLNT03_08	Plant	11/7/2018	Wet
PLNT03_09	Plant	11/7/2018	Wet
PLNT03_10	Plant	11/7/2018	Wet

TABLE A1.13
Samples Used in the Tules Root Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
PLNT03_01	Plant	11/6/2018	Wet
PLNT03_02	Plant	11/6/2018	Wet
PLNT03_03	Plant	11/6/2018	Wet
PLNT03_04	Plant	11/6/2018	Wet
PLNT03_05	Plant	11/6/2018	Wet
PLNT03_06	Plant	11/6/2018	Wet
PLNT03_07	Plant	11/7/2018	Wet
PLNT03_08	Plant	11/7/2018	Wet
PLNT03_09	Plant	11/7/2018	Wet
PLNT03_10	Plant	11/7/2018	Wet

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
1A	Surface Water	4/26/2004	Filtered
1A	Surface Water	4/26/2004	Total
1A	Surface Water	4/27/2004	Filtered
1A	Surface Water	6/8/2004	Filtered
1A	Surface Water	6/8/2004	Total
1A	Surface Water	6/27/2005	Filtered
1A	Surface Water	6/27/2005	Total
1A	Surface Water	4/17/2006	Filtered
1A	Surface Water	4/17/2006	Total
1A	Surface Water	6/6/2006	Filtered
1A	Surface Water	6/6/2006	Total
1B	Surface Water	4/26/2004	Filtered
1B	Surface Water	4/26/2004	Total
1B	Surface Water	6/8/2004	Filtered
1B	Surface Water	6/8/2004	Total
1B	Surface Water	6/27/2005	Filtered
1B	Surface Water	6/27/2005	Total
1B	Surface Water	4/17/2006	Filtered
1B	Surface Water	4/17/2006	Total
1B	Surface Water	6/6/2006	Filtered
1B	Surface Water	6/6/2006	Total
1C	Surface Water	4/26/2004	Filtered
1C	Surface Water	4/26/2004	Total
1C	Surface Water	6/8/2004	Filtered
1C	Surface Water	6/8/2004	Total
1C	Surface Water	6/27/2005	Filtered
1C	Surface Water	6/27/2005	Total
1C	Surface Water	4/17/2006	Filtered
1C	Surface Water	4/17/2006	Total
1C	Surface Water	6/6/2006	Filtered
1C	Surface Water	6/6/2006	Total
2A	Surface Water	4/26/2004	Filtered
2A	Surface Water	4/26/2004	Total
2A	Surface Water	6/8/2004	Filtered
2A	Surface Water	6/8/2004	Total
2A	Surface Water	6/27/2005	Filtered
2A	Surface Water	6/27/2005	Total
2A	Surface Water	4/17/2006	Filtered
2A	Surface Water	4/17/2006	Total
2A	Surface Water	6/6/2006	Filtered
2A	Surface Water	6/6/2006	Total

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
2B	Surface Water	4/26/2004	Filtered
2B	Surface Water	4/26/2004	Total
2B	Surface Water	6/8/2004	Filtered
2B	Surface Water	6/8/2004	Total
2B	Surface Water	6/27/2005	Filtered
2B	Surface Water	6/27/2005	Total
2B	Surface Water	4/17/2006	Filtered
2B	Surface Water	4/17/2006	Total
2B	Surface Water	6/6/2006	Filtered
2B	Surface Water	6/6/2006	Total
2C	Surface Water	4/26/2004	Filtered
2C	Surface Water	4/26/2004	Total
2C	Surface Water	6/8/2004	Filtered
2C	Surface Water	6/8/2004	Total
2C	Surface Water	6/27/2005	Filtered
2C	Surface Water	6/27/2005	Total
2C	Surface Water	4/17/2006	Filtered
2C	Surface Water	4/17/2006	Total
2C	Surface Water	6/6/2006	Filtered
2C	Surface Water	6/6/2006	Total
3A	Surface Water	4/26/2004	Filtered
3A	Surface Water	4/26/2004	Total
3A	Surface Water	6/8/2004	Filtered
3A	Surface Water	6/8/2004	Total
3A	Surface Water	6/28/2005	Filtered
3A	Surface Water	6/28/2005	Total
3A	Surface Water	4/17/2006	Filtered
3A	Surface Water	4/17/2006	Total
3A	Surface Water	6/6/2006	Filtered
3A	Surface Water	6/6/2006	Total
3B	Surface Water	4/26/2004	Filtered
3B	Surface Water	4/26/2004	Total
3B	Surface Water	6/8/2004	Filtered
3B	Surface Water	6/8/2004	Total
3B	Surface Water	6/28/2005	Filtered
3B	Surface Water	6/28/2005	Total
3B	Surface Water	4/17/2006	Filtered
3B	Surface Water	4/17/2006	Total
3B	Surface Water	6/6/2006	Filtered
3B	Surface Water	6/6/2006	Total
3C	Surface Water	4/26/2004	Filtered

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
3C	Surface Water	4/26/2004	Total
3C	Surface Water	6/8/2004	Filtered
3C	Surface Water	6/8/2004	Total
3C	Surface Water	6/28/2005	Filtered
3C	Surface Water	6/28/2005	Total
3C	Surface Water	4/17/2006	Filtered
3C	Surface Water	4/17/2006	Total
3C	Surface Water	6/6/2006	Filtered
3C	Surface Water	6/6/2006	Total
4A	Surface Water	4/26/2004	Filtered
4A	Surface Water	4/26/2004	Total
4A	Surface Water	6/8/2004	Filtered
4A	Surface Water	6/8/2004	Total
4A	Surface Water	6/28/2005	Filtered
4A	Surface Water	6/28/2005	Total
4A	Surface Water	4/20/2006	Filtered
4A	Surface Water	4/20/2006	Total
4A	Surface Water	6/7/2006	Filtered
4A	Surface Water	6/7/2006	Total
4B	Surface Water	4/26/2004	Filtered
4B	Surface Water	4/26/2004	Total
4B	Surface Water	6/8/2004	Filtered
4B	Surface Water	6/8/2004	Total
4B	Surface Water	6/28/2005	Filtered
4B	Surface Water	6/28/2005	Total
4B	Surface Water	4/18/2006	Filtered
4B	Surface Water	4/18/2006	Total
4B	Surface Water	6/7/2006	Filtered
4B	Surface Water	6/7/2006	Total
4C	Surface Water	4/26/2004	Filtered
4C	Surface Water	4/26/2004	Total
4C	Surface Water	6/8/2004	Filtered
4C	Surface Water	6/8/2004	Total
4C	Surface Water	6/28/2005	Filtered
4C	Surface Water	6/28/2005	Total
4C	Surface Water	4/20/2006	Filtered
4C	Surface Water	4/20/2006	Total
4C	Surface Water	6/7/2006	Filtered
4C	Surface Water	6/7/2006	Total
5A	Surface Water	4/26/2004	Filtered
5A	Surface Water	4/26/2004	Total

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
5A	Surface Water	6/8/2004	Filtered
5A	Surface Water	6/8/2004	Total
5A	Surface Water	6/29/2005	Filtered
5A	Surface Water	6/29/2005	Total
5A	Surface Water	4/19/2006	Filtered
5A	Surface Water	4/19/2006	Total
5A	Surface Water	6/7/2006	Filtered
5A	Surface Water	6/7/2006	Total
5B	Surface Water	4/26/2004	Filtered
5B	Surface Water	4/26/2004	Total
5B	Surface Water	6/8/2004	Filtered
5B	Surface Water	6/8/2004	Total
5B	Surface Water	6/29/2005	Filtered
5B	Surface Water	6/29/2005	Total
5B	Surface Water	4/19/2006	Filtered
5B	Surface Water	4/19/2006	Total
5B	Surface Water	6/7/2006	Filtered
5B	Surface Water	6/7/2006	Total
5C	Surface Water	4/26/2004	Filtered
5C	Surface Water	4/26/2004	Total
5C	Surface Water	6/8/2004	Filtered
5C	Surface Water	6/8/2004	Total
5C	Surface Water	6/29/2005	Filtered
5C	Surface Water	6/29/2005	Total
5C	Surface Water	4/19/2006	Filtered
5C	Surface Water	4/19/2006	Total
5C	Surface Water	6/7/2006	Filtered
5C	Surface Water	6/7/2006	Total
6	Surface Water	9/17/2007	Filtered
6	Surface Water	9/17/2007	Total
6A	Surface Water	4/26/2004	Filtered
6A	Surface Water	4/26/2004	Total
6A	Surface Water	6/8/2004	Filtered
6A	Surface Water	6/8/2004	Total
6A	Surface Water	6/28/2005	Filtered
6A	Surface Water	6/28/2005	Total
6A	Surface Water	4/19/2006	Filtered
6A	Surface Water	4/19/2006	Total
6A	Surface Water	6/6/2006	Filtered
6A	Surface Water	6/6/2006	Total
6B	Surface Water	4/26/2004	Filtered

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
6B	Surface Water	4/26/2004	Total
6B	Surface Water	6/8/2004	Filtered
6B	Surface Water	6/8/2004	Total
6B	Surface Water	6/28/2005	Filtered
6B	Surface Water	6/28/2005	Total
6B	Surface Water	4/19/2006	Filtered
6B	Surface Water	4/19/2006	Total
6B	Surface Water	6/6/2006	Filtered
6B	Surface Water	6/6/2006	Total
6C	Surface Water	4/26/2004	Filtered
6C	Surface Water	4/26/2004	Total
6C	Surface Water	6/8/2004	Filtered
6C	Surface Water	6/8/2004	Total
6C	Surface Water	6/28/2005	Filtered
6C	Surface Water	6/28/2005	Total
6C	Surface Water	4/19/2006	Filtered
6C	Surface Water	4/19/2006	Total
6C	Surface Water	6/6/2006	Filtered
6C	Surface Water	6/6/2006	Total
Clear Lake	Surface Water	1/8/2002	Filtered
Clear Lake	Surface Water	1/8/2002	Total
Clear Lake	Surface Water	5/14/2003	Filtered
Clear Lake	Surface Water	12/18/2003	Filtered
Clear Lake	Surface Water	12/18/2003	Total
Clear Lake	Surface Water	6/23/2005	Filtered
Clear Lake	Surface Water	6/23/2005	Total
Clear Lake	Surface Water	5/24/2006	Filtered
Clear Lake	Surface Water	5/24/2006	Total
Clear Lake	Surface Water	5/5/2008	Filtered
Clear Lake	Surface Water	5/5/2008	Total
Clear Lake	Surface Water	5/5/2009	Filtered
Clear Lake	Surface Water	5/5/2009	Total
Clear Lake	Surface Water	5/18/2011	Filtered
Clear Lake	Surface Water	5/18/2011	Total
Clear Lake	Surface Water	5/19/2012	Filtered
Clear Lake	Surface Water	5/19/2012	Total
Clear Lake	Surface Water	9/17/2013	Filtered
Clear Lake	Surface Water	9/17/2013	Total
Clear Lake	Surface Water	5/22/2014	Filtered
Clear Lake	Surface Water	5/22/2014	Total
Clear Lake	Surface Water	5/8/2015	Filtered

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
Clear Lake	Surface Water	5/8/2015	Total
Clear Lake	Surface Water	5/23/2016	Filtered
Clear Lake	Surface Water	5/23/2016	Total
Clear Lake	Surface Water	10/7/2017	Filtered
Clear Lake	Surface Water	10/7/2017	Total
Clear Lake	Surface Water	6/29/2019	Filtered
Clear Lake	Surface Water	6/29/2019	Total
D1	Surface Water	5/10/2001	Total
D2S	Surface Water	5/17/2001	Total
D3	Surface Water	5/10/2001	Total
D4S	Surface Water	5/10/2001	Total
D5S	Surface Water	5/10/2001	Total
D6	Surface Water	5/10/2001	Total
D7S	Surface Water	5/10/2001	Total
MI14	Surface Water	9/20/2005	Total
NW	Surface Water	3/1/2001	Total
NW	Surface Water	3/13/2001	Filtered
NW	Surface Water	3/13/2001	Total
NW	Surface Water	12/1/2005	Total
NW	Surface Water	12/27/2005	Filtered
NW	Surface Water	12/27/2005	Total
NW	Surface Water	3/1/2006	Total
NW	Surface Water	3/16/2006	Filtered
NW	Surface Water	3/16/2006	Total
NW	Surface Water	12/21/2006	Filtered
NW	Surface Water	12/21/2006	Total
NW	Surface Water	1/4/2008	Filtered
NW	Surface Water	1/4/2008	Total
NW	Surface Water	2/22/2009	Filtered
NW	Surface Water	2/22/2009	Total
NW	Surface Water	3/23/2011	Filtered
NW	Surface Water	3/23/2011	Total
NW	Surface Water	5/18/2011	Filtered
NW	Surface Water	5/18/2011	Total
NW	Surface Water	3/15/2012	Filtered
NW	Surface Water	3/15/2012	Total
NW	Surface Water	5/17/2012	Filtered
NW	Surface Water	5/17/2012	Total
NW	Surface Water	12/18/2014	Total
NW	Surface Water	5/6/2015	Filtered
NW	Surface Water	5/6/2015	Total

TABLE A1.14
Samples Used in the Surface Water Clear Lake Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
NW	Surface Water	1/18/2016	Total
NW	Surface Water	4/20/2016	Filtered
NW	Surface Water	4/20/2016	Total
NW	Surface Water	12/21/2016	Total
NW	Surface Water	6/20/2017	Filtered
NW	Surface Water	6/20/2017	Total
NW	Surface Water	4/18/2018	Total
NW	Surface Water	1/21/2019	Filtered
NW	Surface Water	1/21/2019	Total
NW	Surface Water	4/23/2019	Filtered
NW	Surface Water	4/23/2019	Total
PW06	Surface Water	9/20/2005	Filtered
PW06	Surface Water	9/20/2005	Total
TS-SW-C	Surface Water	10/21/2007	Filtered
TS-SW-C	Surface Water	10/21/2007	Total
TS-SW-D	Surface Water	10/21/2007	Filtered
TS-SW-D	Surface Water	10/21/2007	Total

TABLE A1.15
Samples Used in the Surface Water Herman Impoundment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
Herman Impoundment	Surface Water	9/17/2013	Total
Herman Impoundment	Surface Water	5/22/2014	Total
Herman Impoundment	Surface Water	5/8/2015	Total
Herman Impoundment	Surface Water	7/20/2015	Total
Herman Impoundment	Surface Water	5/20/2016	Total
Herman Impoundment	Surface Water	10/7/2017	Total
Herman Impoundment	Surface Water	6/28/2019	Total
HI	Surface Water	12/19/2018	Total
HI-Mid-D	Surface Water	9/13/2013	Total
HI-Mid-S	Surface Water	9/13/2013	Total
HINW	Surface Water	4/24/2019	Total

TABLE A1.16
Samples Used in the Ambient Surface Water Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Basis
AMBSW_01	Surface Water	11/14/2018	Filtered
AMBSW_01	Surface Water	11/14/2018	Total
AMBSW_02	Surface Water	11/14/2018	Filtered
AMBSW_02	Surface Water	11/14/2018	Total
AMBSW_03	Surface Water	11/15/2018	Filtered
AMBSW_03	Surface Water	11/15/2018	Total
AMBSW_04	Surface Water	11/15/2018	Filtered
AMBSW_04	Surface Water	11/15/2018	Total
AMBSW_05	Surface Water	11/16/2018	Filtered
AMBSW_05	Surface Water	11/16/2018	Total
AMBSW_06	Surface Water	11/16/2018	Filtered
AMBSW_06	Surface Water	11/16/2018	Total
AMBSW_07	Surface Water	11/16/2018	Filtered
AMBSW_07	Surface Water	11/16/2018	Total
AMBSW_08	Surface Water	11/16/2018	Filtered
AMBSW_08	Surface Water	11/16/2018	Total
AMBSW_09	Surface Water	11/16/2018	Filtered
AMBSW_09	Surface Water	11/16/2018	Total
AMBSW_10	Surface Water	11/16/2018	Filtered
AMBSW_10	Surface Water	11/16/2018	Total

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
1A	Sediment	4/27/2004	0	0	ft bgs	NA
1A	Sediment	6/9/2004	0	0	ft bgs	NA
1A	Sediment	6/27/2005	0	0.5	ft bgs	NA
1A	Sediment	4/17/2006	0	1	ft bgs	NA
1ABC	Sediment	6/27/2005	0	0.3	ft bgs	NA
1ABC	Sediment	4/17/2006	0	0.5	ft bgs	NA
1B	Sediment	4/27/2004	0	0	ft bgs	NA
1B	Sediment	6/9/2004	0	0	ft bgs	NA
1B	Sediment	6/27/2005	0	0.5	ft bgs	NA
1B	Sediment	4/17/2006	0	1	ft bgs	NA
1C	Sediment	4/27/2004	0	0	ft bgs	NA
1C	Sediment	6/9/2004	0	0	ft bgs	NA
1C	Sediment	6/27/2005	0	0.5	ft bgs	NA
1C	Sediment	4/17/2006	0	1	ft bgs	NA
2A	Sediment	4/27/2004	0	0	ft bgs	NA
2A	Sediment	6/9/2004	0	0	ft bgs	NA
2A	Sediment	6/28/2005	0	0.5	ft bgs	NA
2A	Sediment	4/17/2006	0	1	ft bgs	NA
2ABC	Sediment	6/28/2005	0	0.3	ft bgs	NA
2ABC	Sediment	4/17/2006	0	0.5	ft bgs	NA
2B	Sediment	4/27/2004	0	0	ft bgs	NA
2B	Sediment	6/9/2004	0	0	ft bgs	NA
2B	Sediment	6/28/2005	0	0.5	ft bgs	NA
2B	Sediment	4/17/2006	0	1	ft bgs	NA
2C	Sediment	4/27/2004	0	0	ft bgs	NA
2C	Sediment	6/28/2005	0	0.5	ft bgs	NA
2C	Sediment	4/17/2006	0	1	ft bgs	NA
3A	Sediment	4/27/2004	0	0	ft bgs	NA
3A	Sediment	6/9/2004	0	0	ft bgs	NA
3A	Sediment	6/29/2005	0	0.5	ft bgs	NA
3A	Sediment	4/18/2006	0	1	ft bgs	NA
3ABC	Sediment	6/29/2005	0	0.3	ft bgs	NA
3ABC	Sediment	4/18/2006	0	0.5	ft bgs	NA
3B	Sediment	4/27/2004	0	0	ft bgs	NA
3B	Sediment	6/29/2005	0	0.5	ft bgs	NA
3B	Sediment	4/18/2006	0	1	ft bgs	NA
3C	Sediment	4/27/2004	0	0	ft bgs	NA
3C	Sediment	6/29/2005	0	0.5	ft bgs	NA
3C	Sediment	4/18/2006	0	1	ft bgs	NA
4A	Sediment	4/28/2004	0	0	ft bgs	NA
4A	Sediment	6/9/2004	0	0	ft bgs	NA

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
4A	Sediment	6/28/2005	0	0.5	ft bgs	NA
4A	Sediment	4/18/2006	0	1	ft bgs	NA
4ABC	Sediment	6/28/2005	0	0.3	ft bgs	NA
4ABC	Sediment	4/18/2006	0	0.5	ft bgs	NA
4B	Sediment	4/28/2004	0	0	ft bgs	NA
4B	Sediment	6/9/2004	0	0	ft bgs	NA
4B	Sediment	6/28/2005	0	0.5	ft bgs	NA
4B	Sediment	4/18/2006	0	1	ft bgs	NA
4C	Sediment	4/28/2004	0	0	ft bgs	NA
4C	Sediment	6/28/2005	0	0.5	ft bgs	NA
4C	Sediment	4/18/2006	0	1	ft bgs	NA
5A	Sediment	4/28/2004	0	0	ft bgs	NA
5A	Sediment	6/9/2004	0	0	ft bgs	NA
5A	Sediment	6/29/2005	0	0.5	ft bgs	NA
5A	Sediment	4/19/2006	0	1	ft bgs	NA
5ABC	Sediment	6/29/2005	0	0.3	ft bgs	NA
5ABC	Sediment	4/19/2006	0	0.5	ft bgs	NA
5B	Sediment	4/28/2004	0	0	ft bgs	NA
5B	Sediment	6/9/2004	0	0	ft bgs	NA
5B	Sediment	6/29/2005	0	0.5	ft bgs	NA
5B	Sediment	4/19/2006	0	1	ft bgs	NA
5C	Sediment	4/28/2004	0	0	ft bgs	NA
5C	Sediment	6/9/2004	0	0	ft bgs	NA
5C	Sediment	6/29/2005	0	0.5	ft bgs	NA
5C	Sediment	4/19/2006	0	1	ft bgs	NA
6A	Sediment	4/28/2004	0	0	ft bgs	NA
6A	Sediment	6/10/2004	0	0	ft bgs	NA
6A	Sediment	6/30/2005	0	0.5	ft bgs	NA
6A	Sediment	4/18/2006	0	1	ft bgs	NA
6ABC	Sediment	6/30/2005	0	0.3	ft bgs	NA
6ABC	Sediment	4/18/2006	0	0.5	ft bgs	NA
6B	Sediment	4/28/2004	0	0	ft bgs	NA
6B	Sediment	6/10/2004	0	0	ft bgs	NA
6B	Sediment	6/30/2005	0	0.5	ft bgs	NA
6B	Sediment	4/18/2006	0	1	ft bgs	NA
6C	Sediment	4/28/2004	0	0	ft bgs	NA
6C	Sediment	6/10/2004	0	0	ft bgs	NA
6C	Sediment	6/30/2005	0	0.5	ft bgs	NA
6C	Sediment	4/18/2006	0	1	ft bgs	NA
BT01_01	Sediment	11/15/2018	0	2	in bgs	Dry
BT01_03	Sediment	11/15/2018	0	2	in bgs	Dry

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
BT01_04	Sediment	11/14/2018	0	2	in bgs	Dry
BT01_05	Sediment	11/15/2018	0	2	in bgs	Dry
BT01_07	Sediment	11/15/2018	0	2	in bgs	Dry
BT01_09	Sediment	11/15/2018	0	2	in bgs	Dry
D1	Sediment	5/10/2001	0	0.5	ft bgs	NA
D2S	Sediment	5/10/2001	0	0.5	ft bgs	NA
D3	Sediment	5/10/2001	0	0.5	ft bgs	NA
D4S	Sediment	5/10/2001	0	0.5	ft bgs	NA
D5S	Sediment	5/10/2001	0	0.5	ft bgs	NA
D6	Sediment	5/10/2001	0	0.5	ft bgs	NA
D7S	Sediment	5/10/2001	0	0.5	ft bgs	NA
KI-01	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-02	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-03	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-04	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-05	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-06	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-07	Sediment	11/11/2008	0	0.5	ft bgs	NA
KI-08	Sediment	11/10/2008	0	0.5	ft bgs	NA
KI-09	Sediment	11/11/2008	0	0.5	ft bgs	NA
KI-10	Sediment	11/11/2008	0	0.5	ft bgs	NA
KI-11	Sediment	11/11/2008	0	0.5	ft bgs	NA
KI-12	Sediment	11/11/2008	0	0.5	ft bgs	NA
LS1	Sediment	9/19/1990	0	0.5	ft bgs	Dry
LS1	Sediment	9/19/1990	0	0.5	ft bgs	NA
LS2	Sediment	9/19/1990	0	0.5	ft bgs	Dry
LS2	Sediment	9/19/1990	0	0.5	ft bgs	NA
MI01	Sediment	9/9/2005	0	0.5	ft bgs	NA
MI02	Sediment	9/9/2005	0	0.5	ft bgs	NA
MI03	Sediment	9/11/2005	0	0.5	ft bgs	NA
MI04	Sediment	9/11/2005	0	0.5	ft bgs	NA
MI05	Sediment	9/10/2005	0	0.9	ft bgs	NA
MI06	Sediment	9/9/2005	0	0.6	ft bgs	NA
MI06	Sediment	9/9/2005	0	0.5	ft bgs	NA
MI13	Sediment	9/15/2005	0	0.9	ft bgs	NA
MI14	Sediment	9/10/2005	0	1	ft bgs	NA
MI20	Sediment	9/14/2005	0	1	ft bgs	NA
MI21	Sediment	9/14/2005	0	1	ft bgs	NA
MI26	Sediment	9/17/2005	0	0.3	ft bgs	NA
MI27	Sediment	9/17/2005	0	0.3	ft bgs	NA
MI28	Sediment	9/11/2005	0	0.5	ft bgs	NA

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
MI30	Sediment	9/10/2005	0	0.5	ft bgs	NA
MI31	Sediment	9/16/2005	0	1	ft bgs	NA
O-1	Sediment	9/15/1992	0	0.5	ft bgs	NA
O-1	Sediment	9/16/1992	0	0.5	ft bgs	NA
O-1	Sediment	5/1/2003	0	0.5	ft bgs	NA
O-1	Sediment	10/1/2003	0	0.5	ft bgs	NA
O-7	Sediment	9/15/1992	0	0.5	ft bgs	NA
O-7	Sediment	9/16/1992	0	0.5	ft bgs	NA
O-7	Sediment	5/1/2003	0	0.5	ft bgs	NA
O-7	Sediment	10/1/2003	0	0.5	ft bgs	NA
OA-F	Sediment	8/1/1996	0	0	ft bgs	NA
OA-F	Sediment	10/1/1996	0	0	ft bgs	NA
OA-F	Sediment	11/1/1996	0	0	ft bgs	NA
OA-F	Sediment	2/1/1997	0	0	ft bgs	NA
OA-F	Sediment	5/1/1997	0	0	ft bgs	NA
OA-F	Sediment	8/1/1997	0	0	ft bgs	NA
OA-F	Sediment	2/1/1998	0	0	ft bgs	NA
OA-F	Sediment	3/1/1998	0	0	ft bgs	NA
OA-F	Sediment	4/1/1998	0	0	ft bgs	NA
OA-F	Sediment	6/1/1998	0	0	ft bgs	NA
OA-F	Sediment	7/1/1998	0	0	ft bgs	NA
OA-F	Sediment	8/1/1998	0	0	ft bgs	NA
OA-F	Sediment	10/1/1998	0	0	ft bgs	NA
OA-F	Sediment	11/1/1998	0	0	ft bgs	NA
OA-F	Sediment	1/1/1999	0	0	ft bgs	NA
OA-F	Sediment	6/1/1999	0	0	ft bgs	NA
PLNT02_05	Sediment	11/8/2018	0	6	in bgs	Dry
PLNT02_06	Sediment	11/8/2018	0	6	in bgs	Dry
PLNT02_07	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_08	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_09	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_10	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_11	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_12	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_13	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT02_14	Sediment	11/12/2018	0	6	in bgs	Dry
PLNT03_01	Sediment	11/6/2018	0	6	in bgs	Dry
PLNT03_02	Sediment	11/6/2018	0	6	in bgs	Dry
PLNT03_03	Sediment	11/6/2018	0	6	in bgs	Dry
PLNT03_04	Sediment	11/6/2018	0	6	in bgs	Dry
PLNT03_05	Sediment	11/6/2018	0	6	in bgs	Dry

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
PLNT03_06	Sediment	11/6/2018	0	6	in bgs	Dry
PLNT03_07	Sediment	11/7/2018	0	6	in bgs	Dry
PLNT03_08	Sediment	11/7/2018	0	6	in bgs	Dry
PLNT03_09	Sediment	11/7/2018	0	6	in bgs	Dry
PLNT03_10	Sediment	11/7/2018	0	6	in bgs	Dry
RC11-1	Sediment	11/5/1986	0	0.5	ft bgs	Dry
RS12	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS14	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS15	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS16	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS17	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS18	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS201	Sediment	5/8/1990	0	0.5	ft bgs	Dry
RS201	Sediment	5/8/1990	0	0.5	ft bgs	NA
RS202	Sediment	5/8/1990	0	0.5	ft bgs	Dry
RS202	Sediment	5/8/1990	0	0.5	ft bgs	NA
RS203	Sediment	5/8/1990	0	0.5	ft bgs	Dry
RS203	Sediment	5/8/1990	0	0.5	ft bgs	NA
RS22	Sediment	3/1/1984	0	0.5	ft bgs	Dry
RS589	Sediment	5/8/1990	0	0.5	ft bgs	Dry
RS589	Sediment	5/8/1990	0	0.5	ft bgs	NA
RS903	Sediment	9/19/1990	0	0.5	ft bgs	Dry
RS903	Sediment	9/19/1990	0	0.5	ft bgs	NA
SI-01	Sediment	10/17/2007	0	0.5	ft bgs	NA
SI-02	Sediment	10/18/2007	0	0.5	ft bgs	NA
SI-02-02	Sediment	10/23/2007	0	0.5	ft bgs	NA
SI-04	Sediment	10/19/2007	0	0.5	ft bgs	NA
SI-05	Sediment	10/17/2007	0	0.5	ft bgs	NA
SI-09	Sediment	10/16/2007	0	0.5	ft bgs	NA
SI-10	Sediment	10/16/2007	0	0.5	ft bgs	NA
SI-11	Sediment	10/16/2007	0	0.5	ft bgs	NA
SI-12	Sediment	10/17/2007	0	0.5	ft bgs	NA
SI-13	Sediment	10/19/2007	0	0.5	ft bgs	NA
SI-14	Sediment	10/18/2007	0	0.5	ft bgs	NA
SI-15	Sediment	10/18/2007	0	0.5	ft bgs	NA
SI-16	Sediment	10/18/2007	0	0.5	ft bgs	NA
SI-19	Sediment	10/23/2007	0	0.5	ft bgs	NA
SI-27	Sediment	10/19/2007	0	0.5	ft bgs	NA
SI-28	Sediment	10/22/2007	0	0.5	ft bgs	NA
SI-32	Sediment	10/20/2007	0	0.5	ft bgs	NA
SI-33	Sediment	10/25/2007	0	0.75	ft bgs	NA

TABLE A1.17
Samples Used in the Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
SI-34	Sediment	10/25/2007	0	1	ft bgs	NA
SI-35	Sediment	10/25/2007	0	1	ft bgs	NA
SI-36	Sediment	10/25/2007	0	1	ft bgs	NA
SI-37	Sediment	10/25/2007	0	1	ft bgs	NA
SI-38	Sediment	10/25/2007	0	1	ft bgs	NA
SI-39	Sediment	10/24/2007	0	1	ft bgs	NA
SI-40	Sediment	10/24/2007	0	1	ft bgs	NA
SI-41	Sediment	10/24/2007	0	1	ft bgs	NA
SI-42	Sediment	10/19/2007	0	0.5	ft bgs	NA
SI-43	Sediment	10/23/2007	0	0.5	ft bgs	NA
SI-45	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-46	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-47	Sediment	10/23/2007	0	0.5	ft bgs	NA
SI-48	Sediment	10/23/2007	0	0.5	ft bgs	NA
SI-52	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-53	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-54	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-55	Sediment	10/24/2007	0	0.5	ft bgs	NA
SI-56	Sediment	10/24/2007	0	0.5	ft bgs	NA
UCD-2	Sediment	7/24/1995	0	0.5	ft bgs	Dry
UCD-2	Sediment	8/14/1995	0	0.5	ft bgs	Dry
UCD-2	Sediment	8/14/1995	0	0.5	ft bgs	NA
UCD-3	Sediment	3/6/1996	0	0.5	ft bgs	Dry
UCD-3	Sediment	3/6/1996	0	0.5	ft bgs	NA
UCD-4	Sediment	4/24/1996	0	0.5	ft bgs	Dry
UCD-4	Sediment	4/24/1996	0	0.5	ft bgs	NA

Notes:
in bgs = inches below ground surface
ft bgs = feet below ground surface
NA = not available

TABLE A1.18
Samples Used in the Ambient Sediment Data Set
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Location	Sample Matrix	Sample Date	Start Depth	End Depth	Depth Units	Basis
AMBSI_01	Sediment	11/14/2018	0	6	in bgs	Dry
AMBSI_02	Sediment	11/14/2018	0	6	in bgs	Dry
AMBSI_04	Sediment	11/15/2018	0	6	in bgs	Dry
AMBSI_05	Sediment	11/16/2018	0	6	in bgs	Dry
AMBSI_06	Sediment	11/16/2018	0	6	in bgs	Dry
AMBSI_07	Sediment	11/16/2018	0	6	in bgs	Dry
AMBSI_08	Sediment	11/16/2018	0	6	in bgs	Dry
AMBSI_09	Sediment	11/16/2018	0	6	in bgs	Dry
AMBSI_10	Sediment	11/16/2018	0	6	in bgs	Dry

Notes:
in bgs = inches below ground surface

Appendix B
Summary Statistics Tables
By Media and Exposure Area

Appendix B Table of Contents
Summary Statistics by Media and Exposure Area
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Table No.	Title
Table B1-1	Summary Statistics for On-Mine Soil
Table B1-2	Summary Statistics for Lakeside Residents and SBMM Road
Table B1-3	Summary Statistics for Elem Indian Colony (Unexcavated Areas)
Table B1-4	Summary Statistics for Elem Indian Colony (Fill Areas)
Table B1-5	Summary Statistics for PMB - Andesite
Table B1-6	Summary Statistics for Franciscan (PMB)
Table B1-7	Summary Statistics for Lakeside Residents Drinking Water
Table B1-8	Summary Statistics for Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam)
Table B1-9	Summary Statistics for Acorns
Table B1-10	Summary Statistics for Cattail Stalks
Table B1-11	Summary Statistics for Cattail Roots
Table B1-12	Summary Statistics for Tule Stalks
Table B1-13	Summary Statistics for Tule Roots
Table B1-14	Summary Statistics for Surface Water (Clear Lake)
Table B1-15	Summary Statistics for Surface Water (Herman Impoundment)
Table B1-16	Summary Statistics for Ambient Surface Water
Table B1-17	Summary Statistics for Sediment
Table B1-18	Summary Statistics for Ambient Sediment
Table B1-19	Summary Statistics for Fish Tissue

Table B1.1
Summary Statistics for On-Mine Soil
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	9	9	100.00	mg/kg	1960	9630	N/A	N/A	4947	2921	6757	95% Student's-t UCL
Antimony	9	9	100.00	mg/kg	3	240	N/A	N/A	61.98	83.64	223.3	95% Adjusted Gamma UCL
Arsenic	58	58	100.00	mg/kg	0.53	316	N/A	N/A	54.14	68.93	73.84	95% Approximate Gamma UCL
Barium	9	9	100.00	mg/kg	120	312	N/A	N/A	205.3	58.24	241.4	95% Student's-t UCL
Beryllium	7	9	77.78	mg/kg	0.022	0.29	0.42	0.44	0.145	0.109	0.18	95% KM (t) UCL
Boron	1	9	11.11	mg/kg	8.2	8.2	8	8.8	4.628	1.349	8.2	Maximum concentration
Cadmium	9	9	100.00	mg/kg	0.019	0.098	N/A	N/A	0.0462	0.0305	0.0651	95% Student's-t UCL
Chromium	9	9	100.00	mg/kg	8	35.3	N/A	N/A	19.73	10.14	26.02	95% Student's-t UCL
Cobalt	9	9	100.00	mg/kg	0.089	5.6	N/A	N/A	2.088	1.899	3.264	95% Student's-t UCL
Copper	9	9	100.00	mg/kg	8.2	38.2	N/A	N/A	19.64	11.72	26.91	95% Student's-t UCL
Iron	9	9	100.00	mg/kg	11700	58000	N/A	N/A	31167	17255	41862	95% Student's-t UCL
Lead	9	9	100.00	mg/kg	5.5	26	N/A	N/A	13.58	5.892	17.23	95% Student's-t UCL
Lithium	4	9	44.44	mg/kg	0.5	1.8	1.2	1.3	0.864	0.479	1.14	95% KM (t) UCL
Manganese	9	9	100.00	mg/kg	2.2	208	N/A	N/A	52.4	66.73	164.4	95% Adjusted Gamma UCL
Mercury	58	58	100.00	mg/kg	5.9	2530	N/A	N/A	383.1	576.8	629.1	95% H-UCL
Methyl Mercury	7	9	77.78	mg/kg	0.0025	0.00763	0.00121	0.00121	0.0043	0.00262	0.00596	95% KM (t) UCL
Molybdenum	0	9	0.00	mg/kg	N/A	N/A	1.5	1.8	0.839	0.0546	N/A	Maximum concentration
Nickel	9	9	100.00	mg/kg	0.24	26.6	N/A	N/A	8.37	8.756	13.8	95% Student's-t UCL
Selenium	3	9	33.33	mg/kg	0.22	0.29	1.9	2.3	0.807	0.42	0.29	Maximum concentration
Silver	9	9	100.00	mg/kg	0.055	0.089	N/A	N/A	0.0736	0.00946	0.0794	95% Student's-t UCL
Thallium	2	9	22.22	mg/kg	0.94	1.6	0.39	0.45	0.446	0.496	0.849	95% KM (t) UCL
Vanadium	9	9	100.00	mg/kg	10.5	34.8	N/A	N/A	21.82	8.107	26.85	95% Student's-t UCL
Zinc	9	9	100.00	mg/kg	2.6	21.1	N/A	N/A	8.656	6.053	12.41	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.2
Summary Statistics for Lakeside Residents and SBMM Road
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	9	9	100	mg/kg	9570	13700	N/A	N/A	11908	1592	12895	95% Student's-t UCL
Antimony	49	80	61.25	mg/kg	0.49	679	6	7.6	17.57	80.89	56.48	95% KM (Chebyshev) UCL
Arsenic	316	331	95.47	mg/kg	0.53	222	1.1	1.4	12.84	25.84	19.03	95% KM (Chebyshev) UCL
Barium	9	9	100	mg/kg	104	350	N/A	N/A	178	100.5	324	95% Chebyshev (Mean, Sd) UCL
Beryllium	9	9	100	mg/kg	0.45	0.62	N/A	N/A	0.539	0.0631	0.578	95% Student's-t UCL
Cadmium	0	9	0	mg/kg	0.02	0.27	0.04	0.54	0.129	0.112	0.27	Maximum concentration
Chromium	9	9	100	mg/kg	48	96.4	N/A	N/A	70.6	18.41	82.01	95% Student's-t UCL
Cobalt	9	9	100	mg/kg	11.2	19.2	N/A	N/A	14.71	2.994	16.57	95% Student's-t UCL
Copper	9	9	100	mg/kg	26.2	57.8	N/A	N/A	36.83	10.36	43.26	95% Student's-t UCL
Iron	9	9	100	mg/kg	21100	28500	N/A	N/A	24722	2704	26398	95% Student's-t UCL
Lead	9	9	100	mg/kg	5.9	25.6	N/A	N/A	12.08	6.184	15.91	95% Student's-t UCL
Manganese	9	9	100	mg/kg	491	803	N/A	N/A	646	116.3	718.1	95% Student's-t UCL
Mercury	330	331	99.70	mg/kg	0.055	494	0.11	0.11	33.86	60.22	47.02	KM H-UCL
Nickel	9	9	100	mg/kg	63.4	126	N/A	N/A	91.57	21.06	104.6	95% Student's-t UCL
Selenium	0	9	0	mg/kg	1.9	2.2	3.8	4.4	1.983	0.1	2.2	Maximum concentration
Silver	0	9	0	mg/kg	0.55	0.65	1.1	1.3	0.572	0.0363	0.65	Maximum concentration
Thallium	0	9	0	mg/kg	1.35	1.6	2.7	3.2	1.417	0.0829	1.6	Maximum concentration
Vanadium	9	9	100	mg/kg	31.9	41.3	N/A	N/A	36.49	3.482	38.65	95% Student's-t UCL
Zinc	9	9	100	mg/kg	47.9	131	N/A	N/A	72.82	25.48	88.61	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.3
Summary Statistics for Elem Indian Colony (Unexcavated Areas)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	75	75	100.00	mg/kg	5480	30100	N/A	N/A	16653	4217	17464	95% Student's-t UCL
Antimony	35	88	39.77	mg/kg	0.27	7.6	6	6	2.503	1.459	2.044	95% KM (Chebyshev) UCL
Arsenic	73	91	80.22	mg/kg	0.29	7.2	1	1	2.112	2.327	3.166	95% KM (Chebyshev) UCL
Barium	75	75	100.00	mg/kg	32.2	362	N/A	N/A	112.8	59.61	124.6	95% Modified-t UCL
Beryllium	49	75	65.33	mg/kg	0.07	7.3	0.5	0.5	0.418	0.832	0.824	95% KM (Chebyshev) UCL
Cadmium	14	75	18.67	mg/kg	0.08	0.84	0.5	0.5	0.256	0.0838	0.218	95% GROS Approximate Gamma UCL
Chromium	75	75	100.00	mg/kg	5.7	134	N/A	N/A	36.4	36.3	54.67	95% Chebyshev (Mean, Sd) UCL
Cobalt	70	75	93.33	mg/kg	1.4	49.3	5	5	8.316	7.763	12.2	95% KM (Chebyshev) UCL
Copper	75	75	100.00	mg/kg	4	55.2	N/A	N/A	16.43	14.55	23.76	95% Chebyshev (Mean, Sd) UCL
Hexavalent Chromium	8	16	50.00	mg/kg	0.88	23	11	55	10.63	10.6	10.04	95% KM (Chebyshev) UCL
Iron	75	75	100.00	mg/kg	4350	42800	N/A	N/A	16677	9893	21656	95% Chebyshev (Mean, Sd) UCL
Lead	75	75	100.00	mg/kg	1.4	28.3	N/A	N/A	5.176	4.125	7.252	95% Chebyshev (Mean, Sd) UCL
Manganese	75	75	100.00	mg/kg	90	1930	N/A	N/A	353.9	296.1	503	95% Chebyshev (Mean, Sd) UCL
Mercury	83	91	91.21	mg/kg	0.04	9.3	0.1	0.1	0.219	0.969	0.661	95% KM (Chebyshev) UCL
Nickel	75	75	100.00	mg/kg	2.8	194	N/A	N/A	37.82	55.27	65.64	95% Chebyshev (Mean, Sd) UCL
Selenium	7	75	9.33	mg/kg	0.34	1.1	3.5	3.5	1.652	0.327	0.935	95% KM (t) UCL
Silver	29	75	38.67	mg/kg	0.09	0.14	1	1	0.348	0.193	0.112	95% KM (t) UCL
Thallium	16	75	21.33	mg/kg	0.87	3.1	2.5	2.5	1.478	0.522	1.309	95% KM (t) UCL
Vanadium	75	75	100.00	mg/kg	8.8	121	N/A	N/A	32.11	16.87	35.45	95% Modified-t UCL
Zinc	75	75	100.00	mg/kg	5.7	167	N/A	N/A	30.04	32.76	46.53	95% Chebyshev (Mean, Sd) UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.4
Summary Statistics for Elem Indian Colony (Fill Areas)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	38	38	100.00	mg/kg	104	73100	N/A	N/A	24346	14350	29942	95% Adjusted Gamma UCL
Antimony	43	69	62.32	mg/kg	0.41	55.6	0.45	6	3.21	7.159	3.204	KM H-UCL
Arsenic	85	90	94.44	mg/kg	0.54	55.3	0.54	1.2	4.064	7.86	4.494	KM H-UCL
Barium	38	38	100.00	mg/kg	78.4	576	N/A	N/A	242.3	104.6	274.2	95% Adjusted Gamma UCL
Beryllium	16	38	42.11	mg/kg	0.18	0.81	0.07	0.65	0.319	0.202	0.306	95% KM (t) UCL
Cadmium	23	38	60.53	mg/kg	0.12	0.85	0.07	0.42	0.279	0.225	0.327	95% KM (t) UCL
Chromium	38	38	100.00	mg/kg	3.6	183	N/A	N/A	62.84	31.38	85.03	95% Chebyshev (Mean, Sd) UCL
Cobalt	36	38	94.74	mg/kg	0.49	19.5	0.23	5	7.353	4.887	8.666	95% KM (t) UCL
Copper	38	38	100.00	mg/kg	5.2	237	N/A	N/A	67.49	52.02	85.31	95% Adjusted Gamma UCL
Iron	68	68	100.00	mg/kg	4260	43600	N/A	N/A	21486	9286	23616	95% Approximate Gamma UCL
Lead	37	39	94.87	mg/kg	2.9	54.7	2.2	2.4	14.41	9.507	17.6	95% GROS Adjusted Gamma UCL
Manganese	38	38	100.00	mg/kg	1.1	1370	N/A	N/A	458.8	318.7	546	95% Student's-t UCL
Mercury	90	90	100.00	mg/kg	0.14	114	N/A	N/A	10.38	15.12	12.87	95% Approximate Gamma UCL
Nickel	37	38	97.37	mg/kg	1.7	108	0.29	0.29	21.09	20.67	28.49	95% KM Adjusted Gamma UCL
Selenium	20	39	51.28	mg/kg	0.48	1.1	0.46	3.5	0.934	0.552	0.742	95% KM (t) UCL
Silver	9	38	23.68	mg/kg	0.09	0.17	0.1	0.2	0.0786	0.0301	0.0767	95% KM (t) UCL
Thallium	15	32	46.88	mg/kg	0.46	7.1	0.45	2.5	1.752	1.62	2.013	95% KM (t) UCL
Vanadium	69	69	100.00	mg/kg	1.5	186	N/A	N/A	83.79	34.62	90.74	95% Student's-t UCL
Zinc	38	39	97.44	mg/kg	4.4	219	3.5	3.5	42.46	39.49	56.39	95% GROS Adjusted Gamma UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.5
Summary Statistics for PMB - Andesite
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	21	21	100.00	mg/kg	9480	38100	N/A	N/A	20760	8574	23987	95% Student's-t UCL
Antimony	24	42	58.14	mg/kg	0.07	7 9	1.2	7.4	1.885	1.725	1 803	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Arsenic	32	42	76.74	mg/kg	1.2	30	1.2	15	6.593	6.561	8.714	KM H-UCL
Barium	24	24	100.00	mg/kg	98.5	489	N/A	N/A	244	87	274.5	95% Student's-t UCL
Beryllium	24	24	100.00	mg/kg	0.41	3.29	N/A	N/A	1.072	0.693	1 688	95% Chebyshev (Mean, Sd) UCL
Boron	15	15	100.00	mg/kg	5.9	324	N/A	N/A	59.49	101.8	174.1	95% Chebyshev (Mean, Sd) UCL
Cadmium	19	24	80.00	mg/kg	0.04	0.7	0.07	0.35	0.167	0.143	0 233	95% KM Adjusted Gamma UCL
Chromium	24	24	100.00	mg/kg	22.5	77.2	N/A	N/A	48.4	13.35	53.08	95% Student's-t UCL
Cobalt	24	24	100.00	mg/kg	6.39	32	N/A	N/A	14.62	6.063	16.74	95% Student's-t UCL
Copper	24	24	100.00	mg/kg	16.1	78.6	N/A	N/A	28.79	13.96	33.76	95% Adjusted Gamma UCL
Iron	21	21	100.00	mg/kg	8290	40600	N/A	N/A	24233	7900	27206	95% Student's-t UCL
Lead	24	24	100.00	mg/kg	5.75	25	N/A	N/A	12.89	4.725	14.54	95% Student's-t UCL
Lithium	15	15	100.00	mg/kg	11	109	N/A	N/A	25.33	26.5	55.15	95% Chebyshev (Mean, Sd) UCL
Manganese	24	24	100.00	mg/kg	135	1910	N/A	N/A	995.7	559.4	1191	95% Student's-t UCL
Mercury	42	42	100.00	mg/kg	0.65	28.8	N/A	N/A	11.75	7.455	13.68	95% Student's-t UCL
Molybdenum	15	18	84.21	mg/kg	0.082	0.799	0.12	0.18	0.319	0.239	0.417	95% KM (t) UCL
Nickel	24	24	100.00	mg/kg	13.5	121	N/A	N/A	36.06	22.12	43.92	95% Adjusted Gamma UCL
Selenium	19	24	80.00	mg/kg	0.7	12.8	0.35	1	2.654	3.092	6.484	KM H-UCL
Silver	22	24	92.00	mg/kg	0.036	0.49	0.11	0.21	0.117	0.106	0.15	KM H-UCL
Thallium	18	24	75.00	mg/kg	0.057	0.336	2.4	2.7	0.439	0.507	0.184	95% KM Adjusted Gamma UCL
Vanadium	24	24	100.00	mg/kg	12.5	130	N/A	N/A	56.75	29.3	67	95% Student's-t UCL
Zinc	24	24	100.00	mg/kg	30.5	127	N/A	N/A	76.73	26.91	86.14	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.6
Summary Statistics for Franciscan (PMB)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	52	52	100.00	mg/kg	3510	16600	N/A	N/A	9108	3095	9827	95% Student's-t UCL
Antimony	63	96	65 63	mg/kg	0.037	8	0.59	7.4	1 666	1.519	1.756	95% GROS Approximate Gamma UCL
Arsenic	71	96	73 96	mg/kg	1.59	78	0.59	15	6 361	8.569	9.852	95% KM (Chebyshev) UCL
Barium	52	52	100.00	mg/kg	50	316	N/A	N/A	141	69.34	157.7	95% Approximate Gamma UCL
Beryllium	47	52	90 38	mg/kg	0.04	0.909	0.21	0.45	0.411	0.192	0.45	95% KM (t) UCL
Cadmium	42	52	80.77	mg/kg	0.012	0.34	0.036	0.54	0.081	0.067	0.086	KM H-UCL
Chromium	52	52	100.00	mg/kg	10.7	97.7	N/A	N/A	40.45	20.93	45.45	95% Approximate Gamma UCL
Cobalt	52	52	100.00	mg/kg	0.522	37.3	N/A	N/A	13.73	9.177	16.61	95% Approximate Gamma UCL
Copper	52	52	100.00	mg/kg	12.2	53.3	N/A	N/A	28.29	9.119	30.41	95% Student's-t UCL
Iron	52	52	100.00	mg/kg	1990	37900	N/A	N/A	22820	8028	24685	95% Student's-t UCL
Lead	52	52	100.00	mg/kg	4 6	46.7	N/A	N/A	11.24	5.584	12.62	95% Modified-t UCL
Lithium	40	40	100.00	mg/kg	1.13	17.4	N/A	N/A	9.536	4 231	10.66	95% Student's-t UCL
Manganese	52	52	100.00	mg/kg	11.4	2470	N/A	N/A	780.4	534.4	904.6	95% Student's-t UCL
Mercury	92	96	95 83	mg/kg	0.49	205	0.023	0.032	27.73	29.93	33.98	95% GROS Approximate Gamma UCL
Molybdenum	40	40	100.00	mg/kg	0.047	0.686	N/A	N/A	0 328	0.146	0.367	95% Student's-t UCL
Nickel	52	52	100.00	mg/kg	4.36	127	N/A	N/A	40.19	23.7	45.7	95% Student's-t UCL
Selenium	49	52	94 23	mg/kg	0.71	4.13	0.95	1.1	1.414	0 678	1.586	95% KM Approximate Gamma UCL
Silver	46	52	88.46	mg/kg	0.023	0.257	0.104	1.1	0.0964	0.135	0.0857	95% KM (Chebyshev) UCL
Thallium	40	52	76 92	mg/kg	0.04	0.117	1.8	2.7	0 329	0.486	0.0724	95% KM (t) UCL
Vanadium	52	52	100.00	mg/kg	15.2	71.8	N/A	N/A	36.8	11.52	39.47	95% Student's-t UCL
Zinc	52	52	100.00	mg/kg	2 8	92.5	N/A	N/A	49.9	21.19	54.82	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.7
Summary Statistics for Lakeside Residents Drinking Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Dissolved	19	74	25.68	ug/L	10	60	20	20	11.08	6.318	12.33	95% KM (t) UCL
Antimony	Dissolved	0	74	0	ug/L	N/A	N/A	1	1	0.5	0		N/A
Arsenic	Dissolved	67	74	90 54	ug/L	0.78	6.7	1	1	2.766	2.047	3.804	95% KM (Chebyshev) UCL
Barium	Dissolved	74	74	100	ug/L	27	180	N/A	N/A	69.65	23.73	74.33	95% Modified-t UCL
Beryllium	Dissolved	0	74	0	ug/L	N/A	N/A	0 5	0.5	0.25	0		N/A
Boron	Dissolved	74	74	100	ug/L	80	2700	N/A	N/A	986.6	373.6	1176	95% Chebyshev (Mean, Sd) UCL
Cadmium	Dissolved	0	74	0	ug/L	N/A	N/A	1	1	0.5	0		N/A
Chromium	Dissolved	0	74	0	ug/L	N/A	N/A	1	1	0.5	0		N/A
Cobalt	Dissolved	1	74	1 35	ug/L	0.27	0.27	0.5	0.5	0.25	0.00232	0.27	Maximum Concentration
Copper	Dissolved	63	74	85.14	ug/L	1	120	1 2	8.5	9.395	22.12	20.54	95% KM (Chebyshev) UCL
Iron	Dissolved	0	74	0	ug/L	N/A	N/A	100	100	50	0		N/A
Lead	Dissolved	3	74	4.05	ug/L	1.1	1.7	2	2	1.018	0.0998	1.041	95% KM (t) UCL
Lithium	Dissolved	73	74	98.65	ug/L	12	36	10	10	19.42	3.712	20.42	KM H-UCL
Manganese	Dissolved	52	74	70 27	ug/L	1.1	80	2	2	4.124	10.86	9.643	95% KM (Chebyshev) UCL
Mercuric Chloride	Dissolved	21	74	28.38	ug/L	0.01	0.08	0.03	0.03	0.0194	0.0152	0.0243	95% KM (Chebyshev) UCL
Molybdenum	Dissolved	74	74	100	ug/L	0 26	1.2	N/A	N/A	0.451	0.197	0.49	95% Student's-t UCL
Nickel	Dissolved	74	74	100	ug/L	1.1	13	N/A	N/A	2.303	1.368	2.588	95% Modified-t UCL
Selenium	Dissolved	7	74	9.46	ug/L	0.61	0.77	1	1	0.517	0.055	0.528	95% KM (t) UCL
Silver	Dissolved	0	74	0	ug/L	N/A	N/A	0 5	0.5	0.25	0		N/A
Thallium	Dissolved	0	74	0	ug/L	N/A	N/A	2	2	1	0		N/A
Vanadium	Dissolved	0	74	0	ug/L	N/A	N/A	4	4	2	0		N/A
Zinc	Dissolved	45	74	60.81	ug/L	2.8	270	2.6	14	13.5	33.26	30	95% KM (Chebyshev) UCL
Aluminum	Total	57	74	77.03	ug/L	10	190	20	20	27.97	31.79	44.12	95% KM (Chebyshev) UCL
Antimony	Total	0	74	0	ug/L	N/A	N/A	1	1	0.5	0		N/A
Arsenic	Total	67	74	90 54	ug/L	0.74	6.8	1	1	2.799	2.063	3.845	95% KM (Chebyshev) UCL
Barium	Total	74	74	100	ug/L	28	180	N/A	N/A	70.47	23.34	75.08	95% Modified-t UCL
Beryllium	Total	0	74	0	ug/L	N/A	N/A	0 5	0.5	0.25	0		N/A
Boron	Total	74	74	100	ug/L	90	100	N/A	N/A	95	5.774	100	Maximum Concentration
Cadmium	Total	1	74	1 35	ug/L	0.29	0.29	1	1	0.497	0.0244	0.29	Maximum Concentration
Chromium	Total	1	74	1 35	ug/L	0.61	0.61	1	1	0.501	0.0128	0.61	Maximum Concentration
Cobalt	Total	3	74	4.05	ug/L	0 27	0.44	0 5	0.5	0.253	0.0226	0.259	95% KM (t) UCL
Copper	Total	63	74	85.14	ug/L	1.3	120	1 3	11	13.04	23.13	24.69	95% KM (Chebyshev) UCL
Iron	Total	28	74	37.84	ug/L	50	280	100	100	63.65	38.27	71.76	95% KM (BCA) UCL
Lead	Total	14	74	18.92	ug/L	1	9.6	2	2	1.272	1.132	1.305	KM H-UCL
Lithium	Total	73	74	98.65	ug/L	12	35	10	10	19.53	3.713	20.54	KM H-UCL

Table B1.7
Summary Statistics for Lakeside Residents Drinking Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Manganese	Total	69	74	93 24	ug/L	1.2	80	2	2	11.45	12.68	17.88	95% KM (Chebyshev) UCL
Mercuric Chloride	Total	40	74	54.05	ug/L	0.01	0.25	0.03	0.03	0.0303	0.0373	0.0475	95% KM (Chebyshev) UCL
Molybdenum	Total	74	74	100	ug/L	0 25	0.94	N/A	N/A	0.433	0.17	0.466	95% Student's-t UCL
Nickel	Total	74	74	100	ug/L	1.2	7.9	N/A	N/A	2.384	0.849	2.556	95% Modified-t UCL
Selenium	Total	7	74	9.46	ug/L	0.6	0.86	1	1	0.521	0.0717	0.536	95% KM (t) UCL
Silver	Total	0	74	0	ug/L	N/A	N/A	0 5	0.5	0.25	0		N/A
Thallium	Total	0	74	0	ug/L	N/A	N/A	2	2	1	0		N/A
Vanadium	Total	1	74	1 35	ug/L	2.6	2.6	4	4	2.008	0.0697	2.6	Maximum Concentration
Zinc	Total	62	74	83.78	ug/L	2.7	140	3	13	15.32	21.75	20.01	KM H-UCL

UCL = Upper Confidence Limit on the Mean
ug/L = microgram per liter
N/A = Not applicable
KM = Kaplan Meier

Table B1.8
Summary Statistics for Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Dissolved	26	42	61.90	ug/L	5.1	320	10	400	50 9	68.88	81.33	95% KM (Chebyshev) UCL
Antimony	Dissolved	2	42	4.76	ug/L	0.52	6.1	0.43	60	2.121	6.369	1.268	95% KM (Chebyshev) UCL
Arsenic	Dissolved	33	42	78.57	ug/L	0.56	6.5	1	1	1.593	1.733	2.762	95% KM (Chebyshev) UCL
Barium	Dissolved	37	42	88.10	ug/L	13	89.7	73.4	1000	51.6	75.58	53.4	95% KM (Chebyshev) UCL
Beryllium	Dissolved	0	42	0.00	ug/L	N/A	N/A	0.3	5	0.587	0.531	N/A	
Boron	Dissolved	40	40	100	ug/L	850	11000	N/A	N/A	4544	3366	6864	95% Chebyshev (Mean, Sd) UCL
Cadmium	Dissolved	0	42	0	ug/L	N/A	N/A	0.2	5	0.532	0.48	N/A	
Chromium	Dissolved	2	42	4.76	ug/L	0.85	1.1	0.9	50	1.867	4.025	0.534	95% KM (t) UCL
Cobalt	Dissolved	27	42	64.29	ug/L	0.29	7.5	0.5	250	8.094	20.3	2.635	95% GROS Adjusted Gamma UCL
Copper	Dissolved	9	42	21.43	ug/L	0.78	1.5	1.8	8	1.129	0.499	0.953	95% KM (t) UCL
Iron	Dissolved	4	42	9.52	ug/L	20	70	20	500	52.02	33.08	22.71	95% KM (t) UCL
Lead	Dissolved	1	42	2.38	ug/L	0.02	0.02	1	10	0.948	0.955	0.02	Maximum concentration
Lithium	Dissolved	16	17	94.12	ug/L	14	150	17	17	55.14	50.97	95.01	KM H-UCL
Manganese	Dissolved	39	42	92.86	ug/L	4.8	3900	0.4	75	368.9	781.2	894.4	95% KM (Chebyshev) UCL
Mercuric Chloride	Dissolved	14	42	33.33	ug/L	0.01	0.21	0.03	0.2	0.0342	0.0406	0.0283	KM H-UCL
Methyl Mercury	Dissolved	5	5	100	ug/L	0.0003	0.0008	N/A	N/A	5.60E-04	2 25E-04	0.0007741	95% Student's-t UCL
Molybdenum	Dissolved	7	41	17.07	ug/L	0.31	0.56	0.27	20	0.784	2.116	0.222	95% KM (t) UCL
Nickel	Dissolved	37	42	88.10	ug/L	1.6	28	0.96	200	10.92	15.63	12.15	KM H-UCL
Selenium	Dissolved	5	42	11.90	ug/L	0.52	0.66	0.6	35	1.383	3.662	0.366	95% KM (t) UCL
Silver	Dissolved	1	42	2.38	ug/L	0.63	0.63	0.5	50	1.229	3.953	0.63	Maximum concentration
Thallium	Dissolved	0	42	0.00	ug/L	N/A	N/A	1	25	1.333	2.542	N/A	
Vanadium	Dissolved	2	42	4.76	ug/L	0.73	1.6	1.7	250	10 98	19.89	1.6	Maximum concentration
Zinc	Dissolved	22	42	52.38	ug/L	2	20.9	4.6	55.4	6.115	6.068	4.758	95% KM Adjusted Gamma UCL
Aluminum	Total	34	40	85	ug/L	10	2160	20	210	217.9	385.1	376.5	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Antimony	Total	2	40	5	ug/L	3.2	5.5	1	60	1.741	4.76	1.044	95% KM (t) UCL
Arsenic	Total	29	40	72 5	ug/L	0.5	12.1	1	10	1.783	2.277	3.056	95% KM (Chebyshev) UCL
Barium	Total	34	40	85	ug/L	14	90.5	77.8	200	40.89	29.21	49.96	95% KM (Chebyshev) UCL
Beryllium	Total	3	40	7.5	ug/L	0.17	0.29	0.5	5	0.599	0.558	0.196	95% KM (t) UCL
Boron	Total	38	38	100	ug/L	880	10000	N/A	N/A	4681	3336	7040	95% Chebyshev (Mean, Sd) UCL
Cadmium	Total	1	40	2 5	ug/L	0.56	0.56	0.2	5	0.557	0.493	0.56	Maximum concentration
Chromium	Total	5	40	12 5	ug/L	0.46	0.76	1	10	1.51	1.821	0.5	95% KM (t) UCL
Cobalt	Total	28	40	70	ug/L	0.33	7.3	0.5	50	6.184	9.636	2.054	KM H-UCL
Copper	Total	10	40	25	ug/L	0.65	3.3	2	10	1.294	0.942	1.198	95% KM (BCA) UCL
Fluoride	Total	21	21	100	ug/L	100	620	N/A	N/A	312.4	166.9	471.1	95% Chebyshev (Mean, Sd) UCL
Iron	Total	26	38	68.42	ug/L	50	1490	100	100	158.9	256.7	181.9	KM H-UCL
Lead	Total	0	40	0.00	ug/L	N/A	N/A	1	10	1.013	0.971	N/A	
Lithium	Total	15	15	100	ug/L	14	140	N/A	N/A	59 21	51.3	116.9	95% Chebyshev (Mean, Sd) UCL

Table B1.8
Summary Statistics for Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Manganese	Total	40	40	100	ug/L	10	4100	N/A	N/A	546.9	868.4	1145	95% Chebyshev (Mean, Sd) UCL
Mercuric Chloride	Total	23	40	57 5	ug/L	0.01	1.1	0.03	0.2	0.0956	0.187	0.121	KM H-UCL
Methyl Mercury	Total	5	5	100	ug/L	0.00045	0.00398	N/A	N/A	0.00143	0.00146	0.00282	95% Student's-t UCL
Molybdenum	Total	8	40	20	ug/L	0.25	2.7	0.5	20	0.901	2.165	0.738	95% KM (Chebyshev) UCL
Nickel	Total	36	40	90	ug/L	1.8	28	1.6	40	10 57	7.044	11.92	95% GROS Adjusted Gamma UCL
Nitrate+Nitrite as N	Total	5	10	50	ug/L	20	400	30	3000	271	449.9	178.1	95% KM (t) UCL
Nitrogen, Nitrate (as N)	Total	4	30	13.33	ug/L	60	360	100	500	75.33	73.8	66.51	KM H-UCL
Silver	Total	0	40	0	ug/L	N/A	N/A	0.5	10	0.869	1.48	N/A	
Selenium	Total	8	40	20	ug/L	0.1	0.73	1	35	1.687	3.961	0.376	95% KM (t) UCL
Thallium	Total	0	40	0	ug/L	N/A	N/A	1	25	1.563	2.718	N/A	
Vanadium	Total	4	40	10	ug/L	0.63	2.9	4	50	7.003	7.69	1.161	95% KM (t) UCL
Zinc	Total	26	40	65	ug/L	2.5	17	5	56.6	6.463	5.623	6.248	95% GROS Adjusted Gamma UCL

UCL = Upper Confidence Limit on the Mean
ug/L = microgram per liter
N/A = Not applicable
KM = Kaplan Meier

Table B1.9
Summary Statistics for Acorns
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	wet	3	20	15	mg/kg	1.557	2.509	1.568	1.92	1.058	0.455	1.198	95% KM (t) UCL
Antimony	wet	1	20	5	mg/kg	0.022	0.022	0.0196	0.0238	0.0117	0.0025	0.022	Maximum concentration
Arsenic	wet	12	20	60	mg/kg	0.0426	0.0769	0.1568	0.1838	0.0679	0.0175	0.0606	95% KM (t) UCL
Barium	wet	20	20	100	mg/kg	0.579	11.57	N/A	N/A	3.711	3.292	6.585	95% H-UCL
Beryllium	wet	0	20	0	mg/kg	N/A	N/A	0.0626	0.0772	0.0358	0.00195	N/A	
Boron	wet	20	20	100	mg/kg	6.353	19.15	N/A	N/A	10.58	3.246	11.84	95% Student's-t UCL
Cadmium	wet	17	20	85	mg/kg	0.00122	0.0053	0.00864	0.00946	0.0031	0.00128	0.0033	95% KM (t) UCL
Chromium	wet	6	20	30	mg/kg	0.0266	0.289	0.1176	0.1424	0.0983	0.0667	0.104	95% KM (t) UCL
Cobalt	wet	20	20	100	mg/kg	0.02	0.3	N/A	N/A	0.195	0.0792	0.226	95% Student's-t UCL
Copper	wet	20	20	100	mg/kg	3.395	6.103	N/A	N/A	4.64	0.723	4.919	95% Student's-t UCL
Iron	wet	20	20	100	mg/kg	8.619	14.08	N/A	N/A	11.26	1.554	11.86	95% Student's-t UCL
Lead	wet	3	20	15	mg/kg	0.002	0.0188	0.01568	0.01958	0.0088	0.00317	0.00481	95% KM (t) UCL
Lithium	wet	0	20	0	mg/kg	N/A	N/A	0.588	0.722	0.335	0.0183	N/A	
Manganese	wet	20	20	100	mg/kg	5.293	66.05	N/A	N/A	40.56	18.47	47.7	95% Student's-t UCL
Mercury	wet	20	20	100	mg/kg	0.00112	0.0211	N/A	N/A	0.0106	0.00627	0.0131	95% Student's-t UCL
Methyl Merc	wet	4	20	20	mg/kg	0.000577	0.00111	2.32E-05	0.00202	0.000882	0.000235	8.52E-04	95% KM (t) UCL
Molybdenum	wet	1	20	5	mg/kg	0.00599	0.00599	0.0244	0.031	0.013	0.00197	0.00599	Maximum concentration
Nickel	wet	20	20	100	mg/kg	0.595	4.495	N/A	N/A	2.724	1.185	3.182	95% Student's-t UCL
Selenium	wet	13	20	65	mg/kg	0.0532	0.106	0.236	0.288	0.0988	0.0326	0.0865	95% KM (t) UCL
Silver	wet	2	20	10	mg/kg	0.00167	0.00929	0.00784	0.0098	0.00457	0.0013	0.00434	95% KM (Chebyshev) UCL
Thallium	wet	15	20	75	mg/kg	0.00522	0.446	0.001983	0.00262	0.13	0.141	0.185	95% KM (t) UCL
Vanadium	wet	0	20	0	mg/kg	N/A	N/A	0.117	0.145	0.067	0.0037	N/A	
Zinc	wet	20	20	100	mg/kg	6.394	9.696	N/A	N/A	7.981	0.959	8.352	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.10
Summary Statistics for Cattail Stalks
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	wet	9	10	90	mg/kg	0 664	5.634	1.388	1.388	1.828	1.542	2.726	95% KM (t) UCL
Antimony	wet	2	10	20	mg/kg	0.00526	0.0475	0.01748	0.024	0.0136	0.0121	0.0449	975% KM (Chebyshev) UCL
Arsenic	wet	2	10	20	mg/kg	0.036	0.045	0.1394	0.19	0.0746	0.02	0.045	Maximum concentration
Barium	wet	10	10	100	mg/kg	3.761	7.752	N/A	N/A	4.982	1.28	5.724	95% Student's-t UCL
Beryllium	wet	0	10	0	mg/kg	N/A	N/A	0.0554	0.076	0.0326	0.00379	N/A	
Boron	wet	8	10	80	mg/kg	1.56	8.284	2.156	2.272	3.311	2.428	5.571	KM H-UCL
Cadmium	wet	4	10	40	mg/kg	0.00126	0.00562	0.00694	0.0095	0.00376	0.00138	0.0033	95% KM (t) UCL
Chromium	wet	7	10	70	mg/kg	0.0427	0.242	0.1054	0.1422	0.107	0.0679	0.146	95% KM (t) UCL
Cobalt	wet	9	10	90	mg/kg	0.00514	0.0112	0.0474	0.0474	0.00886	0.00557	0.00849	95% KM (t) UCL
Copper	wet	10	10	100	mg/kg	0.179	90.2	N/A	N/A	9.36	28.41	90.2	Maximum concentration
Iron	wet	10	10	100	mg/kg	1.505	14.2	N/A	N/A	4.984	4.449	9.413	95% H-UCL
Lead	wet	5	10	50	mg/kg	0.00157	4.215	0.01476	0.01896	0.427	1.331	1.266	KM Bootstrap t UCL
Lithium	wet	10	10	100	mg/kg	0.544	1.759	N/A	N/A	0.802	0.353	1.007	95% Student's-t UCL
Manganese	wet	10	10	100	mg/kg	0 267	8.576	N/A	N/A	2.608	2.83	6.12	95% Adjusted Gamma UCL
Mercury	wet	6	10	60	mg/kg	0.000152	0.0155	0.0007435	0.0007756	0.00209	0.00474	0.0155	Maximum concentration
Methyl Mercury	wet	0	10	0	mg/kg	N/A	N/A	0.001864	0.001973	0.000961	1.86E-05	N/A	
Molybdenum	wet	10	10	100	mg/kg	0.00538	0.0689	N/A	N/A	0.0299	0.0229	0.0431	95% Student's-t UCL
Nickel	wet	9	10	90	mg/kg	0.0465	0.719	0.0474	0.0474	0.167	0.203	0.452	95% KM Adjusted Gamma UCL
Selenium	wet	2	10	20	mg/kg	0.0565	0.0579	0.222	0.286	0.113	0.0312	0.0579	Maximum concentration
Silver	wet	1	10	10	mg/kg	0.034	0.034	0.00684	0.00942	0.00707	0.00947	0.034	Maximum concentration
Thallium	wet	1	10	10	mg/kg	0.000263	0.000263	0.001799	0.00228	0.000945	0.000256	0.000263	Maximum concentration
Vanadium	wet	3	10	30	mg/kg	0.126	0.181	0.1042	0.1426	0.0871	0.0464	0.115	95% KM (t) UCL
Zinc	wet	10	10	100	mg/kg	0 251	64.07	N/A	N/A	7.62	19.86	64.07	Maximum concentration

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.11
Summary Statistics for Cattail Roots
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	wet	10	10	100	mg/kg	17.23	43.51	N/A	N/A	29.11	8.764	34.19	95% Student's-t UCL
Antimony	wet	9	10	90	mg/kg	0.00432	0.0121	0.01848	0.01848	0.00702	0.00261	0.00816	95% KM (t) UCL
Arsenic	wet	7	10	70	mg/kg	0.0432	0.083	0.1368	0.181	0.0671	0.0149	0.0703	95% KM (t) UCL
Barium	wet	10	10	100	mg/kg	2.703	11.01	N/A	N/A	4.939	2.351	6.685	95% Adjusted Gamma UCL
Beryllium	wet	0	10	0	mg/kg	N/A	N/A	0.0534	0.0728	0.0307	0.00341	N/A	
Boron	wet	10	10	100	mg/kg	2.786	10.43	N/A	N/A	4.776	2.789	6.734	95% H-UCL
Cadmium	wet	7	10	70	mg/kg	0.00109	0.0168	0.00756	0.00904	0.00403	0.00468	0.0168	Maximum concentration
Chromium	wet	10	10	100	mg/kg	0.0697	0.613	N/A	N/A	0.224	0.168	0.377	95% Adjusted Gamma UCL
Cobalt	wet	10	10	100	mg/kg	0.0113	0.06	N/A	N/A	0.0287	0.0152	0.0374	95% Student's-t UCL
Copper	wet	10	10	100	mg/kg	0.885	11.34	N/A	N/A	2.727	3.284	7.253	95% Chebyshev (Mean, Sd) UCL
Iron	wet	10	10	100	mg/kg	20.68	49.17	N/A	N/A	38.9	9.438	44.37	95% Student's-t UCL
Lead	wet	10	10	100	mg/kg	0.0109	0.516	N/A	N/A	0.0681	0.158	0.285	95% Chebyshev (Mean, Sd) UCL
Lithium	wet	10	10	100	mg/kg	0.244	0.882	N/A	N/A	0.402	0.189	0.512	95% Student's-t UCL
Manganese	wet	10	10	100	mg/kg	1.613	34.17	N/A	N/A	7.146	9.826	16.68	95% H-UCL
Mercury	wet	10	10	100	mg/kg	0.00442	0.706	N/A	N/A	0.0806	0.22	0.384	95% Chebyshev (Mean, Sd) UCL
Methyl Mercury	wet	1	10	10	mg/kg	0.00063	0.00063	0.001876	0.001967	0.000925	0.000105	0.00063	Maximum concentration
Molybdenum	wet	10	10	100	mg/kg	0.012	0.222	N/A	N/A	0.0971	0.0727	0.139	95% Student's-t UCL
Nickel	wet	10	10	100	mg/kg	0.17	0.518	N/A	N/A	0.328	0.111	0.393	95% Student's-t UCL
Selenium	wet	5	10	50	mg/kg	0.0653	0.0972	0.202	0.262	0.0987	0.0232	0.0903	95% KM (t) UCL
Silver	wet	0	10	0	mg/kg	N/A	N/A	0.00654	0.00978	0.00399	0.000561	N/A	
Thallium	wet	7	10	70	mg/kg	0.000298	0.0117	0.001746	0.001944	0.00202	0.00343	0.00683	95% KM (Chebyshev) UCL
Vanadium	wet	10	10	100	mg/kg	0.118	0.352	N/A	N/A	0.237	0.0731	0.279	95% Student's-t UCL
Zinc	wet	10	10	100	mg/kg	1.508	19.1	N/A	N/A	5.238	5.726	10.79	95% H-UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.12
Summary Statistics for Tule Stalks
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	wet	8	10	80	mg/kg	2.04	32.51	1.814	1.966	9.271	9.632	14.93	95% KM (t) UCL
Antimony	wet	0	10	0	mg/kg	N/A	N/A	0.01852	0.0248	0.0108	0.00112	N/A	
Arsenic	wet	1	10	10	mg/kg	0.054	0.054	0.1488	0.2	0.0827	0.0133	0.054	Maximum concentration
Barium	wet	10	10	100	mg/kg	0.529	8.077	N/A	N/A	4.581	2.736	6.167	95% Student's-t UCL
Beryllium	wet	0	10	0	mg/kg	N/A	N/A	0.0596	0.0796	0.0346	0.00352	N/A	
Boron	wet	6	10	60	mg/kg	2.975	8.881	1.862	2.146	3.772	2.884	5.501	95% KM (t) UCL
Cadmium	wet	0	10	0	mg/kg	N/A	N/A	0.00744	0.00982	0.00432	0.000414	N/A	
Chromium	wet	10	10	100	mg/kg	0.518	1.221	N/A	N/A	0.876	0.263	1.028	95% Student's-t UCL
Cobalt	wet	6	10	60	mg/kg	0.00756	0.0692	0.0382	0.0446	0.0266	0.0219	0.0692	Maximum concentration
Copper	wet	10	10	100	mg/kg	0.132	1.303	N/A	N/A	0.589	0.394	0.959	95% Adjusted Gamma UCL
Iron	wet	10	10	100	mg/kg	7.938	48.27	N/A	N/A	18.72	12.72	26.09	95% Student's-t UCL
Lead	wet	0	10	0	mg/kg	N/A	N/A	0.01488	0.02	0.00866	0.000894	N/A	
Lithium	wet	9	10	90	mg/kg	0.0955	0.699	0.684	0.684	0.285	0.183	0.376	95% KM (t) UCL
Manganese	wet	10	10	100	mg/kg	22.66	226.8	N/A	N/A	75.54	62.79	111.9	95% Student's-t UCL
Mercury	wet	10	10	100	mg/kg	0.00155	0.00414	N/A	N/A	0.00229	0.000773	0.00273	95% Student's-t UCL
Methyl Mercury	wet	1	10	10	mg/kg	0.00112	0.00112	0.001825	0.001938	0.0009551	6.15E-05	0.00112	Maximum concentration
Molybdenum	wet	4	10	40	mg/kg	0.0227	0.11	0.0224	0.0272	0.0267	0.0306	0.0458	95% KM (t) UCL
Nickel	wet	10	10	100	mg/kg	0.244	0.72	N/A	N/A	0.494	0.196	0.607	95% Student's-t UCL
Selenium	wet	0	10	0	mg/kg	N/A	N/A	0.224	0.298	0.13	0.0132	N/A	
Silver	wet	0	10	0	mg/kg	N/A	N/A	0.00744	0.00982	0.00432	0.000414	N/A	
Thallium	wet	5	10	50	mg/kg	0.000394	0.00408	0.001903	0.00224	0.00167	0.00121	0.00224	95% KM (t) UCL
Vanadium	wet	5	10	50	mg/kg	0.122	0.209	0.1164	0.149	0.108	0.0476	0.15	95% KM Adjusted Gamma UCL
Zinc	wet	10	10	100	mg/kg	0.406	3.184	N/A	N/A	1.591	1.136	2.25	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.13
Summary Statistics for Tule Roots
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	wet	10	10	100	mg/kg	13.21	64.07	N/A	N/A	32	16.81	41.75	95% Student's-t UCL
Antimony	wet	3	10	30	mg/kg	0.00772	0.017	0.0189	0.0236	0.0109	0.00244	0.0112	95% KM (t) UCL
Arsenic	wet	2	10	20	mg/kg	0.0471	0.0559	0.1512	0.1902	0.0775	0.0151	0.0559	Maximum concentration
Barium	wet	10	10	100	mg/kg	0.326	3.572	N/A	N/A	1.384	0.95	1.935	95% Student's-t UCL
Beryllium	wet	0	10	0	mg/kg	N/A	N/A	0.0606	0.0778	0.0342	0.00294	N/A	
Boron	wet	7	10	70	mg/kg	1.009	64.8	1.818	2.154	13.26	20.06	25.17	95% KM (t) UCL
Cadmium	wet	4	10	40	mg/kg	0.00309	0.00903	0.00756	0.0094	0.00536	0.00215	0.00628	95% KM (t) UCL
Chromium	wet	10	10	100	mg/kg	0.132	4.67	N/A	N/A	0.714	1.417	2.667	95% Chebyshev (Mean, Sd) UCL
Cobalt	wet	5	10	50	mg/kg	0.0298	0.275	0.0388	0.048	0.0658	0.0785	0.176	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Copper	wet	10	10	100	mg/kg	0.468	2.58	N/A	N/A	1.316	0.738	1.744	95% Student's-t UCL
Iron	wet	10	10	100	mg/kg	13.8	72.76	N/A	N/A	34.1	18.3	44.71	95% Student's-t UCL
Lead	wet	1	10	10	mg/kg	0.0249	0.0249	0.01512	0.01902	0.0101	0.00526	0.0249	Maximum concentration
Lithium	wet	9	10	90	mg/kg	0.0547	0.916	0.584	0.584	0.24	0.249	0.555	95% KM Adjusted Gamma UCL
Manganese	wet	10	10	100	mg/kg	5.353	65.63	N/A	N/A	23.09	19.07	34.14	95% Student's-t UCL
Mercury	wet	10	10	100	mg/kg	0.00151	0.00667	N/A	N/A	0.00345	0.00136	0.00424	95% Student's-t UCL
Methyl Mercury	wet	6	10	60	mg/kg	0.000547	0.00164	0.001806	0.001977	0.000939	0.000304	0.00105	95% KM (t) UCL
Molybdenum	wet	5	10	50	mg/kg	0.00627	0.0688	0.0226	0.0266	0.0185	0.018	0.0458	95% KM Bootstrap t UCL
Nickel	wet	10	10	100	mg/kg	0.339	3.801	N/A	N/A	1.065	1.054	1.974	95% Adjusted Gamma UCL
Selenium	wet	0	10	0	mg/kg	N/A	N/A	0.226	0.292	0.128	0.0111	N/A	
Silver	wet	0	10	0	mg/kg	N/A	N/A	0.00756	0.0099	0.00429	0.00038	N/A	
Thallium	wet	4	10	40	mg/kg	0.00086	0.0029	0.00189	0.0023	0.00129	0.000593	0.00158	95% KM (t) UCL
Vanadium	wet	9	10	90	mg/kg	0.124	0 302	0.1422	0.1422	0.164	0.0592	0.213	95% KM Adjusted Gamma UCL
Zinc	wet	10	10	100	mg/kg	0.523	15.61	N/A	N/A	4.832	5.334	12.18	95% Chebyshev (Mean, Sd) UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.14
Summary Statistics for Surface Water (Clear Lake)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Total	122	133	91.73	ug/L	10	164000	20	210	7718	24145	43765	KM H-UCL
Antimony	Total	6	133	4.51	ug/L	1.3	8.8	1	60	1.19	2.829	0.783	95% KM (t) UCL
Arsenic	Total	72	132	54.55	ug/L	0.41	27.3	1	10	1.55	3.13	2.454	95% KM (Chebyshev) UCL
Barium	Total	108	118	91.53	ug/L	7.6	90.5	77.8	1000	36.38	59.61	32.03	95% KM (Chebyshev) UCL
Beryllium	Total	42	118	35.59	ug/L	0.17	33.2	0.5	5	1 941	4.731	1.507	KM H-UCL
Boron	Total	111	111	100	ug/L	880	248000	N/A	N/A	16069	26303	26952	95% Chebyshev (Mean, Sd) UCL
Cadmium	Total	35	133	26.32	ug/L	0.39	4	0.2	5	0.742	0.654	0.495	KM H-UCL
Chromium III	Total	21	118	17.80	ug/L	0.46	15.5	1	40	1.461	2.756	1.523	95% KM (Chebyshev) UCL
Cobalt	Total	100	118	84.75	ug/L	0.33	626	0.5	50	33.96	88.79	68.15	95% KM (Chebyshev) UCL
Copper	Total	53	132	40.15	ug/L	0.46	11.4	2	10	1.744	1.656	1.909	95% KM (Chebyshev) UCL
Fluoride	Total	69	69	100	ug/L	60	1900	N/A	N/A	414.9	382	511.7	95% H-UCL
Iron	Total	86	126	68 25	ug/L	50	1490	100	500	170.8	248.8	266.4	95% KM (Chebyshev) UCL
Lead	Total	1	118	0.85	ug/L	3.1	3.1	1	10	0 992	0.77	3.1	Maximum concentration
Lithium	Total	33	33	100	ug/L	14	3200	N/A	N/A	363.2	616.3	563.7	95% Adjusted Gamma UCL
Manganese	Total	132	133	99.25	ug/L	10	28800	15	15	2254	4354	3038	95% KM Approximate Gamma UCL
Mercuric chloride	Total	96	131	73.28	ug/L	0.01	23	0.03	0.2	0.625	2.665	1.637	95% KM (Chebyshev) UCL
Methyl Mercury	Total	31	33	93.94	ug/L	2.00E-05	0.00622	0	0.00005	9 30E-04	0.00132	0.00152	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Molybdenum	Total	19	118	16.10	ug/L	0.25	3.7	0.5	20	6 94E-01	1.62E+00	6.28E-01	95% KM (Chebyshev) UCL
Nickel	Total	123	133	92.48	ug/L	1.8	269	1.6	40	27.25	44.52	43 38	95% KM (Chebyshev) UCL
Nitrate+Nitrite as N	Total	9	17	52.94	ug/L	20	150000	30	3000	9681	36211	80395	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Nitrogen, Nitrate (as N)	Total	48	101	47.52	ug/L	60	46400	100	500	1637	5980	2207	KM H-UCL
Nitrogen, Nitrite (as N)	Total	9	100	9.00	ug/L	100	100	100	5000	119.5	277.4	100	Maximum concentration
Selenium	Total	22	118	18.64	ug/L	0.1	14.3	1	35	2 251	3.272	1.276	95% KM (Chebyshev) UCL
Silica	Total	58	58	100	ug/L	1800	38000	N/A	N/A	19102	9331	21513	95% Approximate Gamma UCL
Silicon	Total	1	1	100	ug/L	55300	55300	N/A	N/A	55300	N/A	55300	Maximum concentration
Silver	Total	1	118	0.85	ug/L	2.5	2 5	0.5	10	0.625	1.029	2 5	Maximum concentration
Thallium	Total	2	118	1.69	ug/L	2.5	13.9	1	25	1.436	2.176	1.337	95% KM (Chebyshev) UCL
Vanadium	Total	4	118	3.39	ug/L	0.63	2.9	4	250	7 925	15.1	0.918	95% KM (t) UCL
Zinc	Total	106	133	79.70	ug/L	2.5	653	5	80	54.3	113.5	95 96	95% KM (Chebyshev) UCL
Aluminum	FLT	103	126	81.75	ug/L	5.1	174000	10	400	6335	21081	14524	95% KM (Chebyshev) UCL
Antimony	FLT	6	126	4.76	ug/L	0.07	6.1	0.43	60	1.126	3.73	0.29	95% KM Approximate Gamma UCL
Arsenic	FLT	74	125	59.2	ug/L	0.36	6 9	1	5	1.05	1.258	1.473	95% KM (Chebyshev) UCL
Barium	FLT	106	115	92.17	ug/L	7.8	89.7	73.4	1000	39.39	70.16	33.49	95% KM (Chebyshev) UCL
Beryllium	FLT	36	115	31.30	ug/L	0.33	25.9	0.3	5	1.719	3.348	1.492	KM H-UCL
Boron	FLT	113	113	100	ug/L	850	249000	N/A	N/A	15843	26266	26613	95% Chebyshev (Mean, Sd) UCL

Table B1.14
Summary Statistics for Surface Water (Clear Lake)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Cadmium	FLT	29	126	23.02	ug/L	0.36	4 3	0.2	5	0.706	0.6	0.445	KM H-UCL
Chromium	FLT	11	115	9.57	ug/L	0.52	14.1	0.9	50	1.442	3.226	1.385	95% KM (Chebyshev) UCL
Cobalt	FLT	93	115	80.87	ug/L	0.29	531	0.5	250	30.05	69.91	55.61	95% KM (Chebyshev) UCL
Copper	FLT	56	126	44.44	ug/L	0.57	13.4	1.4	10	1 533	1.414	1.858	95% KM (Chebyshev) UCL
Iron	FLT	34	126	26.98	ug/L	20	460	20	100000	466.2	4449	43.01	KM H-UCL
Lead	FLT	1	115	0.87	ug/L	0.02	0.02	1	10	0.92	0.745	0.02	Maximum concentration
Lithium	FLT	34	35	97.14	ug/L	1.40E+01	3320	17	17	3.53E+02	627	645.1	Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)
Manganese	FLT	123	126	97.62	ug/L	4.8	28400	0.4	75	2031	3868	3533	95% KM (Chebyshev) UCL
Mercury	FLT	57	124	45.97	ug/L	0.01	5 9	0.03	0.2	0.108	0.553	0.321	95% KM (Chebyshev) UCL
Methyl Mercury	FLT	28	34	82.35	ug/L	3.00E-05	0.00295	0	0.00005	4.61E-04	5.85E-04	0.00070554	95% KM Adjusted Gamma UCL
Molybdenum	FLT	12	113	10.62	ug/L	0.27	0 56	0.27	20	0.478	1.303	0.182	95% KM (t) UCL
Nickel	FLT	119	126	94.44	ug/L	1.6	265	0.96	200	24.81	39.5	38 94	95% KM (Chebyshev) UCL
Selenium	FLT	10	114	8.77	ug/L	0.52	10.3	0.6	35	1 978	3.118	1.127	95% KM (Chebyshev) UCL
Silver	FLT	2	115	1.74	ug/L	0.63	1.7	0.5	50	0.651	2.419	0.349	95% KM (Chebyshev) UCL
Thallium	FLT	2	115	1.74	ug/L	1	2.4	1	25	1.082	1.613	0.629	95% KM (Chebyshev) UCL
Vanadium	FLT	2	115	1.74	ug/L	0.73	1.6	1.7	250	9 271	17.95	2.48	95% KM (Chebyshev) UCL
Zinc	FLT	96	126	76.19	ug/L	2	639	4.6	60	46.08	96.51	82.16	95% KM (Chebyshev) UCL

FLT = filtered
UCL = Upper Confidence Limit on the Mean
ug/L = microgram per liter
N/A = Not applicable
KM = Kaplan Meier

Table B1.15
Summary Statistics for Surface Water (Herman Impoundment)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Total	9	9	100	ug/L	2020	18200	N/A	N/A	8291	5040	11415	95% Student's-t UCL
Antimony	Total	3	9	33.33	ug/L	2.9	3.7	2	10	2.433	1.401	2.773	95% KM (t) UCL
Arsenic	Total	6	8	75	ug/L	2.2	7.6	5	5	3.475	1.869	4.717	95% KM (t) UCL
Barium	Total	3	7	42.86	ug/L	37.1	39.1	200	200	73.39	33.2	39.09	95% KM (t) UCL
Beryllium	Total	7	7	100	ug/L	1.1	21.6	N/A	N/A	4.529	7.551	21.6	Maximum concentration
Boron	Total	7	7	100	ug/L	419000	517000	N/A	N/A	470286	40779	500236	95% Student's-t UCL
Cadmium	Total	7	9	77.78	ug/L	0.16	0.47	0.2	0.2	0.214	0.112	0.39	95% GROS Adjusted Gamma UCL
Chromium III	Total	2	7	28.57	ug/L	0.75	3.3	10	10	4.15	1.628	3.3	Maximum concentration
Cobalt	Total	6	7	85.71	ug/L	125	176	50	50	132.4	50.61	170.1	95% KM (t) UCL
Copper	Total	7	8	87.5	ug/L	3.7	8.8	10	10	5.7	1.543	6.703	95% KM (t) UCL
Fluoride	Total	3	3	100	ug/L	750	930	N/A	N/A	816.7	98.66	930	Maximum concentration
Iron	Total	9	9	100	ug/L	618	6500	N/A	N/A	3281	1898	4457	95% Student's-t UCL
Fluoride	Total	3	3	100	ug/L	750	930	N/A	N/A	816.7	98.66	930	Maximum concentration
Lithium	Total	7	7	100	ug/L	643	4190	N/A	N/A	2908	1117	3728	95% Student's-t UCL
Manganese	Total	9	9	100	ug/L	2190	11300	N/A	N/A	8654	2580	10254	95% Student's-t UCL
Mercury	Total	9	9	100	ug/L	0.18	7	N/A	N/A	1.416	2.202	4.176	95% Adjusted Gamma UCL
Nickel	Total	9	9	100	ug/L	88	455	N/A	N/A	386	113.5	455	Maximum concentration
Selenium	Total	7	7	100	ug/L	1	12.6	N/A	N/A	4.986	4.862	12.6	Maximum concentration
Zinc	Total	9	9	100	ug/L	93.5	485	N/A	N/A	391.6	117.1	485	Maximum concentration
Aluminum	FLT	10	10	100	ug/L	2100	17900	N/A	N/A	10663	5335	13755	95% Student's-t UCL
Antimony	FLT	3	11	27.27	ug/L	2.90E+00	3.7	2	10	2.336	1.252	2.4	95% KM (t) UCL
Arsenic	FLT	7	9	77.78	ug/L	0.91	4.4	5	5	2.768	1.075	3.372	95% KM (t) UCL
Barium	FLT	5	9	55.56	ug/L	31.8	39.4	200	1000	108.7	150	38.06	95% KM (t) UCL
Beryllium	FLT	9	9	100	ug/L	1.2	23.6	N/A	N/A	4.267	7.262	14.82	95% Chebyshev (Mean, Sd) UCL
Boron	FLT	9	9	100	ug/L	396000	524000	N/A	N/A	445222	48654	475380	95% Student's-t UCL
Cadmium	FLT	10	11	90.91	ug/L	0.13	0.57	0.2	0.2	0.275	0.163	0.479	95% GROS Adjusted Gamma UCL
Calcium	FLT	9	9	100	ug/L	134000	180000	N/A	N/A	153778	16068	163738	95% Student's-t UCL
Chromium III	FLT	1	9	11.11	ug/L	2.9	2.9	3.2	50	6.611	7.005	2.9	Maximum concentration
Cobalt	FLT	8	9	88.89	ug/L	124	176	250	250	151.4	20.91	164.5	95% KM (t) UCL
Copper	FLT	8	9	88.89	ug/L	4.6	7.3	10	10	5.789	1.039	6.423	95% KM (t) UCL
Iron	FLT	11	11	100	ug/L	786	6090	N/A	N/A	3400	1694	4325	95% Student's-t UCL
Lithium	FLT	8	9	88.89	ug/L	2200	4180	3470	3470	2886	779.3	3373	95% KM (t) UCL

Table B1.15
Summary Statistics for Surface Water (Herman Impoundment)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Magnesium	FLT	9	9	100	ug/L	96500	135000	N/A	N/A	113056	12325	120695	95% Student's-t UCL
Manganese	FLT	11	11	100	ug/L	7980	11700	N/A	N/A	9532	1039	10099	95% Student's-t UCL
Mercury	FLT	10	11	90.91	ug/L	0.032	0.8	0.2	0.2	0.204	0.257	0.544	95% KM (Chebyshev) UCL
Nickel	FLT	11	11	100	ug/L	351	453	N/A	N/A	420.7	25.9	434.9	95% Student's-t UCL
Potassium	FLT	9	9	100	ug/L	25600	35500	N/A	N/A	29733	3061	31630	95% Student's-t UCL
Selenium	FLT	8	9	88.89	ug/L	1.8	12.8	1	1	6.544	5.257	12.8	Maximum concentration
Sodium	FLT	6	9	66.67	ug/L	646000	843000	712000	1000000	617889	164973	718685	95% KM (t) UCL
Zinc	FLT	11	11	100	ug/L	350	477	N/A	N/A	433.2	36.11	452.9	95% Student's-t UCL

FLT = filtered
UCL = Upper Confidence Limit on the Mean
µg/L = microgram per liter
N/A = Not applicable
KM = Kaplan Meier

Table B1.16
Summary Statistics for Ambient Surface Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Total	4	10	40	ug/L	14	50	20	20	15.5	13 26	34.16	95% KM (Chebyshev) UCL
Antimony	Total	0	10	0	ug/L	N/A	N/A	0.5	0.5	0.25	0.25	N/A	
Arsenic	Total	10	10	100	ug/L	3.1	3.6	N/A	N/A	3.35	3.346	3.449	95% Student's-t UCL
Barium	Total	10	10	100	ug/L	77	83	N/A	N/A	79.4	79 38	80.43	95% Student's-t UCL
Beryllium	Total	0	10	0	ug/L	N/A	N/A	0.5	0.5	0.25	0.25	N/A	
Boron	Total	10	10	100	ug/L	1200	1200	N/A	N/A	1200	1200	1200	Maximum concentration
Cadmium	Total	0	10	0	ug/L	N/A	N/A	0.4	0.4	0.2	0 2	N/A	
Chromium	Total	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Cobalt	Total	3	10	30	ug/L	0.13	0.15	0.25	0.25	0.129	0.128	0.134	95% KM (t) UCL
Copper	Total	3	10	30	ug/L	1.3	3.8	2	2	1.38	1.237	1.973	95% KM (t) UCL
Iron	Total	1	10	10	ug/L	100	100	100	100	55	53 59	100	Maximum concentration
Lead	Total	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Lithium	Total	10	10	100	ug/L	20	22	N/A	N/A	20.4	20 39	20.82	95% Modified-t UCL
Magnesium	Total	10	10	100	ug/L	19000	20000	N/A	N/A	19800	19796	20000	Maximum concentration
Manganese	Total	10	10	100	ug/L	14	27	N/A	N/A	17.3	16 95	19.62	95% Student's-t UCL
Mercury	Total	10	10	100	ug/L	0.0033	0.043	N/A	N/A	0.015	0.0112	0.0275	95% Adjusted Gamma UCL
Methyl Mercury (as Mercury)	Total	10	10	100	ug/L	0.000042	0.000062	N/A	N/A	5 25E-05	5.22E-05	5.60E-05	95% Student's-t UCL
Molybdenum	Total	1	10	10	ug/L	0.25	0.25	0.5	0.5	0.25	0 25	0.25	Maximum concentration
Nickel	Total	10	10	100	ug/L	2.1	4.6	N/A	N/A	2.47	2.399	2.945	95% Modified-t UCL
Nitrate+Nitrite as N	Total	5	10	50	ug/L	16	36	30	30	19.9	18.82	24.68	95% KM (t) UCL
Nitrogen, Ammonia (as N)	Total	10	10	100	ug/L	100	190	N/A	N/A	126	124.3	140.9	95% Modified-t UCL
Selenium	Total	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Silver	Total	0	10	0	ug/L	N/A	N/A	0.25	0.25	0.125	0.125	N/A	
Thallium	Total	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Vanadium	Total	0	10	0	ug/L	N/A	N/A	4	4	2	2	N/A	
Zinc	Total	0	10	0	ug/L	N/A	N/A	5	5	3.01	2.794	N/A	
Aluminum	FLT	0	10	0	ug/L	N/A	N/A	20	20	10	10	N/A	
Antimony	FLT	0	10	0	ug/L	N/A	N/A	0.5	0.5	0.25	0.25	N/A	
Arsenic	FLT	10	10	100	ug/L	3.1	3.5	N/A	N/A	3.24	3.238	3.318	95% Student's-t UCL
Barium	FLT	10	10	100	ug/L	74	77	N/A	N/A	76.2	76.19	76.73	95% Student's-t UCL
Beryllium	FLT	0	10	0	ug/L	N/A	N/A	0.5	0.5	0.25	0.25	N/A	
Boron	FLT	10	10	100	ug/L	1200	1300	N/A	N/A	1290	1290	1300	Maximum concentration
Cadmium	FLT	0	10	0	ug/L	N/A	N/A	0.4	0.4	0.2	0 2	N/A	
Chromium	FLT	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Cobalt	FLT	0	10	0	ug/L	N/A	N/A	0.25	0.25	0.125	0.125	N/A	
Copper	FLT	0	10	0	ug/L	N/A	N/A	2	2	1	1	N/A	
Iron	FLT	0	10	0	ug/L	N/A	N/A	100	100	50	50	N/A	
Lead	FLT	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Lithium	FLT	10	10	100	ug/L	20	22	N/A	N/A	20.9	20.89	21.23	95% Student's-t UCL

Table B1.16
Summary Statistics for Ambient Surface Water
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Manganese	FLT	8	10	80	ug/L	1.1	2.8	2	2	1.62	1.534	1.959	95% KM (t) UCL
Mercury	FLT	10	10	100	ug/L	0.00044	0.0025	N/A	N/A	0.00106	0.0008519	0.00152	95% Student's-t UCL
Methyl Mercury (as Mercury)	FLT	0	10	0	ug/L	N/A	N/A	0.00005	0.00005	0.000025	0.000025	N/A	
Molybdenum	FLT	0	10	0	ug/L	N/A	N/A	0.5	0.5	0.25	0.25	N/A	
Nickel	FLT	10	10	100	ug/L	2	2.2	N/A	N/A	2.06	2.059	2.101	95% Student's-t UCL
Selenium	FLT	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Silver	FLT	0	10	0	ug/L	N/A	N/A	0.25	0.25	0.125	0.125	N/A	
Thallium	FLT	0	10	0	ug/L	N/A	N/A	1	1	0.5	0 5	N/A	
Vanadium	FLT	0	10	0	ug/L	N/A	N/A	4	4	2	2	N/A	
Zinc	FLT	1	10	10	ug/L	7.6	7.6	5	5	2.5	2 5	7.6	Maximum concentration

Flt = Filtered
UCL = Upper Confidence Limit on the Mean
ug/L = microgram per liter
N/A = Not applicable
KM = Kaplan Meier

Table B1.17
Summary Statistics for Sediment
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Dry	159	159	100.00	mg/kg	5790	180000	N/A	N/A	29323	23092	32221	95% H-UCL
Antimony	Dry	166	47	28 31	mg/kg	0.01	110	0.53	930	23.69	43.22	15.58	95% KM (Chebyshev) UCL
Arsenic	Dry	175	127	72.57	mg/kg	0.68	190	1.2	100	19.2	32.55	29.11	95% KM (Chebyshev) UCL
Barium	Dry	166	164	98 80	mg/kg	43	1280	46	100	379.4	205.7	409.1	95% GROS Approximate Gamma UCL
Beryllium	Dry	166	163	98.19	mg/kg	0.21	21	0.39	0.59	1.763	3.335	2.891	95% KM (Chebyshev) UCL
Boron	Dry	115	115	100.00	mg/kg	6.9	2800	N/A	N/A	260.9	375.3	361.5	95% H-UCL
Cadmium	Dry	166	77	46 39	mg/kg	0.02	7.2	0.34	47	1.177	2.063	0.631	KM H-UCL
Chromium	Dry	166	164	98 80	mg/kg	8.5	170	20	93	49.38	27.08	52.97	95% KM Approximate Gamma UCL
Cobalt	Dry	166	164	98 80	mg/kg	4.4	240	7.8	8	27.02	29.08	36.86	95% KM (Chebyshev) UCL
Copper	Dry	166	154	92.77	mg/kg	3.5	160	3.4	190	33.18	30.34	39.59	KM H-UCL
Iron	Dry	159	159	100.00	mg/kg	2500	290000	N/A	N/A	29640	27574	32028	95% H-UCL
Lead	Dry	166	137	82.53	mg/kg	1	58.4	1.2	50	8.857	8.37	10.02	KM H-UCL
Lithium	Dry	26	26	100.00	mg/kg	19.7	130	N/A	N/A	38.23	22.83	46.33	95% Modified-t UCL
Manganese	Dry	166	166	100.00	mg/kg	98	19000	N/A	N/A	1056	1937	1711	95% Chebyshev (Mean, Sd) UCL
Mercury	Dry	206	204	99.03	mg/kg	0.05	1900	0.05	0.8	80.97	226	170	KM H-UCL
Methyl Mercury	Dry	100	99	99.00	mg/kg	4.75E-05	0.117	4.75E-05	4.75E-05	0.00863	0.0208	0.0161	KM H-UCL
Molybdenum	Dry	154	8	5.19	mg/kg	0.32	1.4	0.02	470	9.531	20.95	0.508	95% KM (t) UCL
Nickel	Dry	166	164	98 80	mg/kg	11	400	46	100	77.17	56.11	83.63	KM H-UCL
Selenium	Dry	167	98	58 68	mg/kg	0.4	23	0.36	100	3.844	5.023	3.135	95% KM Approximate Gamma UCL
Silver	Dry	166	48	28 92	mg/kg	0.04	7.7	0.41	93	2.208	3.994	0.974	95% KM (Chebyshev) UCL
Thallium	Dry	166	5	3.01	mg/kg	0.05	0.42	0.2	3300	38.41	143.4	0.171	95% KM (t) UCL
Vanadium	Dry	166	162	97.59	mg/kg	7	157	19	190	40.49	25.78	43.81	KM H-UCL
Zinc	Dry	166	165	99.40	mg/kg	18.1	320	16	16	87.82	59.4	96	95% KM Approximate Gamma UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.18
Summary Statistics for Ambient Sediment
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Aluminum	Dry	9	9	100.00	mg/kg	1700	48800	N/A	N/A	15639	15083	34990	95% Adjusted Gamma UCL
Antimony	Dry	9	9	100.00	mg/kg	0.045	5.78	N/A	N/A	1.615	1.753	2.702	95% Student's-t UCL
Arsenic	Dry	9	9	100.00	mg/kg	1.09	31.7	N/A	N/A	11.4	9.598	17.35	95% Student's-t UCL
Barium	Dry	9	9	100.00	mg/kg	21.8	757	N/A	N/A	260.6	236.5	407.1	95% Student's-t UCL
Beryllium	Dry	9	9	100.00	mg/kg	0.061	2.07	N/A	N/A	0.662	0.628	1.051	95% Student's-t UCL
Boron	Dry	7	9	77.78	mg/kg	2.2	123	33.1	39.6	36.48	39.32	59.66	95% KM (t) UCL
Cadmium	Dry	8	9	88.89	mg/kg	0.012	0.597	0.046	0.046	0.202	0.181	0.314	95% KM (t) UCL
Chromium	Dry	9	9	100.00	mg/kg	6.19	222	N/A	N/A	77.17	69.23	120.1	95% Student's-t UCL
Cobalt	Dry	9	9	100.00	mg/kg	5.37	89.1	N/A	N/A	32.25	26.83	48.88	95% Student's-t UCL
Copper	Dry	9	9	100.00	mg/kg	7.15	158	N/A	N/A	57.77	47.83	87.41	95% Student's-t UCL
Iron	Dry	9	9	100.00	mg/kg	6190	103000	N/A	N/A	34454	30392	69509	95% Adjusted Gamma UCL
Lead	Dry	9	9	100.00	mg/kg	0.784	37.1	N/A	N/A	13.74	11.53	20.89	95% Student's-t UCL
Lithium	Dry	9	9	100.00	mg/kg	6.26	75.7	N/A	N/A	27.18	22.37	41.04	95% Student's-t UCL
Manganese	Dry	9	9	100.00	mg/kg	165	1960	N/A	N/A	724	568.3	1076	95% Student's-t UCL
Mercury	Dry	9	9	100.00	mg/kg	0.173	64.2	N/A	N/A	26.83	22.81	40.97	95% Student's-t UCL
Methyl Mercury	Dry	9	9	100.00	mg/kg	2.77E-04	0.00836	N/A	N/A	0.00386	0.0031	0.00578	95% Student's-t UCL
Molybdenum	Dry	7	9	77.78	mg/kg	0.262	1.69	0.202	0.224	0.572	0.497	0.885	95% KM (t) UCL
Nickel	Dry	9	9	100.00	mg/kg	12.5	392	N/A	N/A	144.8	121.2	220	95% Student's-t UCL
Selenium	Dry	4	9	44.44	mg/kg	3.21	10.7	1.01	7.25	3.963	3.288	5.825	95% KM (t) UCL
Thallium	Dry	8	9	88.89	mg/kg	0.0094	0.541	0.0084	0.0084	0.183	0.17	0.289	95% KM (t) UCL
Vanadium	Dry	9	9	100.00	mg/kg	5.83	132	N/A	N/A	49.86	42.74	76.35	95% Student's-t UCL
Zinc	Dry	9	9	100.00	mg/kg	11.9	248	N/A	N/A	86.24	71.95	130.8	95% Student's-t UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Table B1.19
Summary Statistics for Fish Tissue
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Receptor	Parameter	Basis	Number of Detects	Number of Analyses	Frequency of Detects (%)	Units	Minimum Detect	Maximum Detect	Minimum NonDetect	Maximum NonDetect	Arithmetic Mean	Standard Deviation	Upper Confidence Limit on the Mean	UCL Test
Game Fishers	Mercury	Wet	140	140	100	mg/kg	0.03	1.15	N/A	N/A	0 289	0.231	0.322	95% Approximate Gamma UCL
Traditional Tribal	Mercury	Wet	177	177	100	mg/kg	0.027	1.15	N/A	N/A	0 248	0.221	0.287	95% H-UCL

UCL = Upper Confidence Limit on the Mean
mg/kg = milligrams per kilogram
N/A = Not applicable
KM = Kaplan Meier

Appendix C
Risk Calculation Tables

Appendix C Table of Contents
Risk Calculation Tables
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Table No.	Title
C-1	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Drinking Water
C-2	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Drinking Water
C-3	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Drinking Water
C-4	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Drinking Water
C-5	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Ambient Surface Water
C-6	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Ambient Surface Water
C-7	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Ambient Surface Water
C-8	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Ambient Surface Water
C-9	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Residential Soil
C-10	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Residential Soil
C-11	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Residential Soil
C-12	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Residential Soil
C-13	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Exposure to PMB Soil (Franciscan)
C-14	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Exposure to PMB Soil (Franciscan)
C-15	Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Exposure to PMB Soil (Franciscan)
C-16	Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Exposure to PMB Soil (Franciscan)
C-17	Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake - Surface
C-18	Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure Scenario in Clear Lake - Surface Water
C-19	Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake Ambient Surface Water
C-20	Risk Calculation Worksheet for - Non Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake Ambient Surface Water
C-21	Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure to Sediment
C-22	Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure to Sediment
C-23	Risk Calculation Worksheet for - Carcinogenic Effects - Recreational Exposure to Ambient Sediment
C-24	Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure to Ambient Sediment
C-25	Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Low End Fish Ingestion Rate
C-26	Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User High End Fish Ingestion Rate
C-27	Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure to On-Mine Soil
C-28	Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to On-Mine Soil
C-29	Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure to PMB Soil (Andesite)
C-30	Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to PMB Soil (Andesite)
C-31	Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure Scenario in Herman Impoundment
C-32	Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure Scenario in Herman Impoundment
C-33	Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure Scenario - Background (Geothemal Wells)
C-34	Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure Scenario - Background (Geothemal
C-35	Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to Vapors
C-36	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Adult Exposure to Soil
C-37	Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Adult Exposure to Soil
C-38	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Child Exposure to Soil
C-39	Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Child Exposure to Soil
C-40	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Adult Exposure to PMB Soil (Andesite)
C-41	Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Adult Exposure to PMB Soil (Andesite)
C-42	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Child Exposure to PMB Soil (Andesite)
C-43	Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Child Exposure to PMB Soil (Andesite)
C-44	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Clear Lake Drinking Water
C-45	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Clear Lake Drinking Water

Appendix C Table of Contents
Risk Calculation Tables
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Table No.	Title
C-46	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Child Exposure Scenario - Clear Lake Drinking Water
C-47	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Child Exposure Scenario - Clear Lake Drinking Water
C-48	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Ambient Surface
C-49	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Ambient Surface Water
C-50	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Child Exposure Scenario - Ambient Surface
C-51	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Child Exposure Scenario - Ambient Surface Water
C-52	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion
C-53	Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion
C-54	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion
C-55	Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion
C-56	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion
C-57	Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion
C-58	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion
C-59	Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion
C-60	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion
C-61	Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion
C-62	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion
C-63	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion
C-64	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion
C-65	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion
C-66	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Tule Roots Ingestion
C-67	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion
C-68	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion
C-69	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion
C-70	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion
C-71	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion
Additional Scenarios	
C-72	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Trespasser Exposure to On-Mine Soil
C-73	Risk Calculation Worksheet for - NonCarcinogenic Effects - Unauthorized Tribal User Exposure to On-Mine Soil
C-74	Risk Calculation Worksheet for - Carcinogenic Effects - Unauthorized Tribal User Exposure to PMB Soil (Andesite)
C-75	Risk Calculation Worksheet for - NonCarcinogenic Effects - Unauthorized Tribal User Exposure to PMB Soil (Andesite)
C-76	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Clear Lake Drinking Water
C-77	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Clear Lake Drinking Water
C-78	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Clear Lake Drinking Water
C-79	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Child Exposure Scenario - Clear Lake Drinking Water
C-80	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Ambient Surface Water
C-81	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Ambient Surface Water
C-82	Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Ambient Surface Water
C-83	Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Ambient Surface Water
C-84	Risk Calculation Worksheet for - Carcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake
C-85	Risk Calculation Worksheet for - NonCarcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake
C-86	Risk Calculation Worksheet for - Carcinogenic Effects -Future Recreational User Exposure Scenario in Clear Lake Ambient Surface Water
C-87	Risk Calculation Worksheet for - Non Carcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake Ambient Surface Water
C-88	Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year-Round)
C-89	Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year-Round)
C-90	Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year Round)
C-91	Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year Round)
C-92	Risk Calculation Worksheet for - Non-Carcinogenic Effects - Tribal Cultural Use - Lake Intensive Homesteader
C-93	Risk Calculation Worksheet for - Non-Carcinogenic Effects - Tribal Cultural Use - Land Intensive Homesteader

Table C-1

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Drinking Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	20	year
Drinking Water Ingestion Rate	IR_adult	2.5	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk
Inorganics				
Aluminum	4.41E-02	3.8E-04	N/A	---
Arsenic	3.85E-03	3.3E-05	9.5E+00	3.1E-04
Barium	7.51E-02	6.4E-04	N/A	---
Boron	1.00E-01	8.6E-04	N/A	---
Cadmium	2.90E-04	2.5E-06	N/A	---
Chromium	6.10E-04	5.2E-06	N/A	---
Cobalt	2.59E-04	2.2E-06	N/A	---
Copper	2.47E-02	2.1E-04	N/A	---
Iron	7.18E-02	6.1E-04	N/A	---
Lead	1.31E-03	1.1E-05	N/A	---
Lithium	2.05E-02	1.8E-04	N/A	---
Manganese	1.79E-02	1.5E-04	N/A	---
Mercuric Chloride	4.75E-05	4.1E-07	N/A	---
Molybdenum	4.66E-04	4.0E-06	N/A	---
Nickel	2.56E-03	2.2E-05	N/A	---
Selenium	5.36E-04	4.6E-06	N/A	---
Vanadium	2.60E-03	0.0E+00	N/A	---
Zinc	2.00E-02	2.1E+00	N/A	---
Total Lakeside Resident - Adult				3.1E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk	Total Cancer Risk
Inorganics					
Aluminum	1.23E-02	0.0E+00	N/A	---	---
Arsenic	3.80E-03	0.0E+00	9.5E+00	---	3.1E-04
Barium	7.43E-02	0.0E+00	N/A	---	---
Boron	1.18E+00	0.0E+00	N/A	---	---
Cadmium	0.00E+00	0.0E+00	N/A	---	---
Chromium	0.00E+00	0.0E+00	N/A	---	---
Cobalt	2.70E-04	0.0E+00	N/A	---	---
Copper	2.05E-02	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lead	1.04E-03	0.0E+00	N/A	---	---
Lithium	2.04E-02	0.0E+00	N/A	---	---
Manganese	9.64E-03	4.9E-07	N/A	---	---
Mercuric Chloride	2.43E-05	0.0E+00	N/A	---	---
Molybdenum	4.90E-04	0.0E+00	N/A	---	---
Nickel	2.59E-03	0.0E+00	N/A	---	---
Selenium	5.28E-04	0.0E+00	N/A	---	---
Vanadium	0.00E+00	0.0E+00	N/A	---	---
Zinc	3.00E-02	0.0E+00	N/A	---	---
				0.0E+00	3.1E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-2

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Drinking Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	20	year
Drinking Water Ingestion Rate	IR_adult	2.5	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics									
Aluminum	4.41E-02	1.3E-03	1.0E+00	1.3E-03	1.23E-02	0.0E+00	1.0E+00	0.0E+00	1.3E-03
Arsenic	3.85E-03	1.2E-04	3.5E-06	3.3E+01	3.80E-03	0.0E+00	3.5E-06	0.0E+00	3.3E+01
Barium	7.51E-02	2.2E-03	2.0E-01	1.1E-02	7.43E-02	0.0E+00	1.4E-02	0.0E+00	1.1E-02
Boron	1.00E-01	3.0E-03	2.0E-01	1.5E-02	1.18E+00	0.0E+00	2.0E-01	0.0E+00	1.5E-02
Cadmium	2.90E-04	8.7E-06	5.0E-04	1.7E-02	0.00E+00	0.0E+00	2.5E-05	0.0E+00	1.7E-02
Chromium	6.10E-04	1.8E-05	1.5E+00	1.2E-05	0.00E+00	0.0E+00	2.0E-02	0.0E+00	1.2E-05
Cobalt	2.59E-04	7.8E-06	3.0E-04	2.6E-02	2.70E-04	0.0E+00	3.0E-04	0.0E+00	2.6E-02
Copper	2.47E-02	7.4E-04	4.0E-02	1.8E-02	2.05E-02	0.0E+00	4.0E-02	0.0E+00	1.8E-02
Iron	7.18E-02	2.2E-03	7.0E-01	3.1E-03	0.00E+00	0.0E+00	7.0E-01	0.0E+00	3.1E-03
Lead	1.31E-03	3.9E-05	N/A	---	1.04E-03	0.0E+00	N/A	---	--
Lithium	2.05E-02	6.2E-04	2.0E-03	3.1E-01	2.04E-02	0.0E+00	2.0E-03	0.0E+00	3.1E-01
Manganese	1.79E-02	5.4E-04	2.4E-02	2.2E-02	9.64E-03	1.7E-06	2.4E-02	7.1E-05	2.2E-02
Mercuric Chloride	4.75E-05	1.4E-06	1.6E-04	8.9E-03	2.43E-05	0.0E+00	1.1E-05	0.0E+00	8.9E-03
Molybdenum	4.66E-04	1.4E-05	5.0E-03	2.8E-03	4.90E-04	0.0E+00	5.0E-03	0.0E+00	2.8E-03
Nickel	2.56E-03	7.7E-05	1.1E-02	7.0E-03	2.59E-03	0.0E+00	4.4E-04	0.0E+00	7.0E-03
Selenium	5.36E-04	1.6E-05	5.0E-03	3.2E-03	5.28E-04	0.0E+00	5.0E-03	0.0E+00	3.2E-03
Silver	0.00E+00	0.0E+00	5.0E-03	0.0E+00	0.00E+00	0.0E+00	2.0E-04	0.0E+00	--
Thallium	0.00E+00	0.0E+00	1.0E-05	0.0E+00	0.00E+00	0.0E+00	1.0E-05	0.0E+00	--
Vanadium	2.60E-03	7.8E-05	5.0E-03	1.6E-02	0.00E+00	0.0E+00	1.3E-04	0.0E+00	1.6E-02
Zinc	2.00E-02	6.0E-04	3.0E-01	2.0E-03	3.00E-02	0.0E+00	3.0E-01	0.0E+00	2.0E-03
Total Lakeside Resident - Adult				3.4E+01				7.1E-05	3.4E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-3

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Drinking Water
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	0.78	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogen	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk
Inorganics				
Aluminum	4.41E-02	1.9E-04	N/A	---
Arsenic	3.85E-03	1.6E-05	9.5E+00	1.6E-04
Barium	7.51E-02	3.2E-04	N/A	---
Boron	1.00E-01	4.3E-04	N/A	---
Cadmium	2.90E-04	1.2E-06	N/A	---
Chromium	6.10E-04	2.6E-06	N/A	---
Cobalt	2.59E-04	1.1E-06	N/A	---
Copper	2.47E-02	1.1E-04	N/A	---
Iron	7.18E-02	3.1E-04	N/A	---
Lead	1.31E-03	5.6E-06	N/A	---
Lithium	2.05E-02	8.8E-05	N/A	---
Manganese	1.79E-02	7.6E-05	N/A	---
Mercuric Chloride	4.75E-05	2.0E-07	N/A	---
Molybdenum	4.66E-04	2.0E-06	N/A	---
Nickel	2.56E-03	1.1E-05	N/A	---
Selenium	5.36E-04	2.3E-06	N/A	---
Vanadium	2.60E-03	1.1E-05	N/A	---
Zinc	2.00E-02	8.6E-05	N/A	---
Total Lakeside Resident - Child				1.6E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk	
Inorganics					
Aluminum	1.23E-02	0.0E+00	N/A	---	---
Arsenic	3.80E-03	0.0E+00	9.5E+00	---	1.6E-04
Barium	7.43E-02	0.0E+00	N/A	---	---
Boron	1.18E+00	0.0E+00	N/A	---	---
Cadmium	0.00E+00	0.0E+00	N/A	---	---
Chromium	0.00E+00	0.0E+00	N/A	---	---
Cobalt	2.70E-04	0.0E+00	N/A	---	---
Copper	2.05E-02	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lead	1.04E-03	0.0E+00	N/A	---	---
Lithium	2.04E-02	0.0E+00	N/A	---	---
Manganese	9.64E-03	3.9E-07	N/A	---	---
Mercuric Chloride	2.43E-05	0.0E+00	N/A	---	---
Molybdenum	4.90E-04	0.0E+00	N/A	---	---
Nickel	2.59E-03	0.0E+00	N/A	---	---
Selenium	5.28E-04	0.0E+00	N/A	---	---
Vanadium	0.00E+00	0.0E+00	N/A	---	---
Zinc	3.00E-02	0.0E+00	N/A	---	---
				0.0E+00	1.6E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-4

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Drinking Water
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	0.78	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	RME Medium EPC Value, Cw (mg/L)	Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics									
Aluminum	4.41E-02	2.2E-03	1.0E+00	2.2E-03	1.23E-02	0.0E+00	1.0E+00	0.0E+00	2.2E-03
Arsenic	3.85E-03	1.9E-04	3.5E-06	5.5E+01	3.80E-03	0.0E+00	3.5E-06	0.0E+00	5.5E+01
Barium	7.51E-02	3.7E-03	2.0E-01	1.9E-02	7.43E-02	0.0E+00	1.4E-02	0.0E+00	1.9E-02
Boron	1.00E-01	5.0E-03	2.0E-01	2.5E-02	1.18E+00	0.0E+00	2.0E-01	0.0E+00	2.5E-02
Cadmium	2.90E-04	1.4E-05	5.0E-04	2.9E-02	0.00E+00	0.0E+00	2.5E-05	0.0E+00	2.9E-02
Chromium	6.10E-04	3.0E-05	1.5E+00	2.0E-05	0.00E+00	0.0E+00	2.0E-02	0.0E+00	2.0E-05
Cobalt	2.59E-04	1.3E-05	3.0E-04	4.3E-02	2.70E-04	0.0E+00	3.0E-04	0.0E+00	4.3E-02
Copper	2.47E-02	1.2E-03	4.0E-02	3.1E-02	2.05E-02	0.0E+00	4.0E-02	0.0E+00	3.1E-02
Iron	7.18E-02	3.6E-03	7.0E-01	5.1E-03	0.00E+00	0.0E+00	7.0E-01	0.0E+00	5.1E-03
Lead	1.31E-03	6.5E-05	N/A	---	1.04E-03	0.0E+00	N/A	---	--
Lithium	2.05E-02	1.0E-03	2.0E-03	5.1E-01	2.04E-02	0.0E+00	2.0E-03	0.0E+00	5.1E-01
Manganese	1.79E-02	8.9E-04	2.4E-02	3.7E-02	9.64E-03	4.3E-07	2.4E-02	1.8E-05	3.7E-02
Mercuric Chlorid	4.75E-05	2.4E-06	1.6E-04	1.5E-02	2.43E-05	0.0E+00	1.1E-05	0.0E+00	1.5E-02
Molybdenum	4.66E-04	2.3E-05	5.0E-03	4.6E-03	4.90E-04	0.0E+00	5.0E-03	0.0E+00	4.6E-03
Nickel	2.56E-03	1.3E-04	1.1E-02	1.2E-02	2.59E-03	0.0E+00	4.4E-04	0.0E+00	1.2E-02
Selenium	5.36E-04	2.7E-05	5.0E-03	5.3E-03	5.28E-04	0.0E+00	5.0E-03	0.0E+00	5.3E-03
Silver	0.00E+00	0.0E+00	5.0E-03	0.0E+00	0.00E+00	0.0E+00	2.0E-04	0.0E+00	--
Thallium	0.00E+00	0.0E+00	1.0E-05	0.0E+00	0.00E+00	0.0E+00	1.0E-05	0.0E+00	--
Vanadium	2.60E-03	1.3E-04	5.0E-03	2.6E-02	0.00E+00	0.0E+00	1.3E-04	0.0E+00	2.6E-02
Zinc	2.00E-02	1.0E-03	3.0E-01	3.3E-03	3.00E-02	0.0E+00	3.0E-01	0.0E+00	3.3E-03
Total Lakeside Resident - Child				5.6E+01				1.8E-05	5.6E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-5

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	20	year
Drinking Water Ingestion Rate	IR_adult	2.5	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor [mg/kg/day]$^{-1}$	Exposure Route = Oral: Cancer Risk
Inorganics				
Aluminum	3.42E-02	2.9E-04	N/A	---
Arsenic	3.45E-03	3.0E-05	9.5E+00	2.8E-04
Barium	8.04E-02	6.9E-04	N/A	---
Boron	1.20E+00	1.0E-02	N/A	---
Cobalt	1.34E-04	1.1E-06	N/A	---
Copper	1.97E-03	1.7E-05	N/A	---
Iron	1.00E-01	8.6E-04	N/A	---
Lithium	2.08E-02	1.8E-04	N/A	---
Manganese	1.96E-02	1.7E-04	N/A	---
Mercuric Chlorid	2.75E-05	2.4E-07	N/A	---
Methyl mercury	5.60E-08	4.8E-10	N/A	---
Molybdenum	2.50E-04	2.1E-06	N/A	---
Nickel	2.95E-03	2.5E-05	N/A	---
Zinc	0.00E+00	5.4E-01	N/A	---
Total Lakeside Resident - Adult				2.8E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor [mg/kg/day]$^{-1}$	Exposure Route = Dermal: Cancer Risk	Total Cancer Risk
Inorganics					
Aluminum	0.00E+00	0.0E+00	N/A	---	---
Arsenic	3.32E-03	0.0E+00	9.5E+00	---	2.8E-04
Barium	7.67E-02	0.0E+00	N/A	---	---
Boron	1.30E+00	0.0E+00	N/A	---	---
Cobalt	0.00E+00	0.0E+00	N/A	---	---
Copper	0.00E+00	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lithium	2.12E-02	0.0E+00	N/A	---	---
Manganese	1.96E-03	1.0E-07	N/A	---	---
Mercuric Chloride	1.52E-06	0.0E+00	N/A	---	---
Methyl mercury	0.00E+00	0.0E+00	N/A	---	---
Molybdenum	0.00E+00	0.0E+00	N/A	---	---
Nickel	2.10E-03	0.0E+00	N/A	---	---
Zinc	7.60E-03	0.0E+00	N/A	---	---
				0.0E+00	2.8E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-6

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Ambient Surface Water
	eceptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	20	year
Drinking Water Ingestion Rate	IR_adult	2.5	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics								
Aluminum	3.42E-02	1.0E-03	1.0E+00	1.0E-03	0.00E+00	0.0E+00	0.0E+00	1.0E-03
Arsenic	3.45E-03	1.0E-04	3.5E-06	3.0E+01	3.32E-03	0.0E+00	0.0E+00	3.0E+01
Barium	8.04E-02	2.4E-03	2.0E-01	1.2E-02	7.67E-02	0.0E+00	0.0E+00	1.2E-02
Boron	1.20E+00	3.6E-02	2.0E-01	1.8E-01	1.30E+00	0.0E+00	0.0E+00	1.8E-01
Cobalt	1.34E-04	4.0E-06	3.0E-04	1.3E-02	0.00E+00	0.0E+00	0.0E+00	1.3E-02
Copper	1.97E-03	5.9E-05	4.0E-02	1.5E-03	0.00E+00	0.0E+00	0.0E+00	1.5E-03
Iron	1.00E-01	3.0E-03	7.0E-01	4.3E-03	0.00E+00	0.0E+00	0.0E+00	4.3E-03
Lithium	2.08E-02	6.2E-04	2.0E-03	3.1E-01	2.12E-02	0.0E+00	0.0E+00	3.1E-01
Manganese	1.96E-02	5.9E-04	2.4E-02	2.4E-02	1.96E-03	3.5E-07	2.4E-02	1.5E-05	2.5E-02
Mercuric Chloride	2.75E-05	8.2E-07	1.6E-04	5.2E-03	1.52E-06	0.0E+00	1.1E-05	0.0E+00	5.2E-03
Methyl mercury	5.60E-08	1.7E-09	1.0E-04	1.7E-05	0.00E+00	0.0E+00	1.0E-04	0.0E+00	1.7E-05
Molybdenum	2.50E-04	7.5E-06	5.0E-03	1.5E-03	0.00E+00	0.0E+00	5.0E-03	0.0E+00	1.5E-03
Nickel	2.95E-03	8.8E-05	1.1E-02	8.0E-03	2.10E-03	0.0E+00	4.4E-04	0.0E+00	8.0E-03
Zinc	0.00E+00	0.0E+00	3.0E-01	0.0E+00	7.60E-03	0.0E+00	3.0E-01	0.0E+00	--
Total Lakeside Resident - Adult				3.0E+01			1.5E-05	3.0E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-7

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	0.78	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Even	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinoge	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk
Inorganics				
Aluminum	3.42E-02	1.5E-04	N/A	---
Arsenic	3.45E-03	1.5E-05	9.5E+00	1.4E-04
Barium	8.04E-02	3.4E-04	N/A	---
Boron	1.20E+00	5.1E-03	N/A	---
Cobalt	1.34E-04	5.7E-07	N/A	---
Copper	1.97E-03	8.4E-06	N/A	---
Iron	1.00E-01	4.3E-04	N/A	---
Lithium	2.08E-02	8.9E-05	N/A	---
Manganese	1.96E-02	8.4E-05	N/A	---
Mercuric Chloride	2.75E-05	1.2E-07	N/A	---
Molybdenum	2.50E-04	1.1E-06	N/A	---
Nickel	2.95E-03	1.3E-05	N/A	---
Zinc	0.00E+00	0.0E+00	N/A	---
Total Lakeside Resident - Child				1.4E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk	
Inorganics					
Aluminum	0.00E+00	0.0E+00	N/A	---	---
Arsenic	3.32E-03	0.0E+00	9.5E+00	---	1.4E-04
Barium	7.67E-02	0.0E+00	N/A	---	---
Boron	1.30E+00	0.0E+00	N/A	---	---
Cobalt	0.00E+00	0.0E+00	N/A	---	---
Copper	0.00E+00	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lithium	2.12E-02	0.0E+00	N/A	---	---
Manganese	1.96E-03	3.7E-08	N/A	---	---
Mercuric Chloride	1.52E-06	0.0E+00	N/A	---	---
Molybdenum	0.00E+00	0.0E+00	N/A	---	---
Nickel	2.10E-03	0.0E+00	N/A	---	---
Zinc	7.60E-03	0.0E+00	N/A	---	---
				0.0E+00	1.4E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-8

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Lakeside Resident
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	0.78	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Conversion Factor	**CF**	**0.000001**	**kg/g**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**6**	**year**

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	3.42E-02	1.7E-03	1.0E+00	1.7E-03
Arsenic	3.45E-03	1.7E-04	3.5E-06	4.9E+01
Barium	8.04E-02	4.0E-03	2.0E-01	2.0E-02
Boron	1.20E+00	6.0E-02	2.0E-01	3.0E-01
Cobalt	1.34E-04	6.7E-06	3.0E-04	2.2E-02
Copper	1.97E-03	9.8E-05	4.0E-02	2.5E-03
Iron	1.00E-01	5.0E-03	7.0E-01	7.1E-03
Lithium	2.08E-02	1.0E-03	2.0E-03	5.2E-01
Manganese	1.96E-02	9.8E-04	2.4E-02	4.1E-02
Mercuric Chloride	2.75E-05	1.4E-06	1.6E-04	8.6E-03
Methyl Mercury	5.60E-08	2.8E-09	1.0E-04	2.8E-05
Molybdenum	2.50E-04	1.2E-05	5.0E-03	2.5E-03
Nickel	2.95E-03	1.5E-04	1.1E-02	1.3E-02
Zinc	0.00E+00	0.0E+00	3.0E-01	0.0E+00
Total Lakeside Resident - Child				5.0E+01

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00	1.70E-03
Arsenic	3.32E-03	0.0E+00	3.5E-06	0.0E+00	4.91E+01
Barium	7.67E-02	0.0E+00	1.4E-02	0.0E+00	2.01E-02
Boron	1.30E+00	0.0E+00	2.0E-01	0.0E+00	2.99E-01
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00	2.23E-02
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00	2.46E-03
Iron	0.00E+00	0.0E+00	7.0E-01	0.0E+00	7.12E-03
Lithium	2.12E-02	0.0E+00	2.0E-03	0.0E+00	5.19E-01
Manganese	1.96E-03	4.3E-07	2.4E-02	1.8E-05	4.08E-02
Mercuric Chloride	1.52E-06	0.0E+00	1.1E-05	0.0E+00	8.57E-03
Methyl Mercury	0.00E+00	0.0E+00	1.0E-04	0.0E+00	2.79E-05
Molybdenum	0.00E+00	0.0E+00	5.0E-03	0.0E+00	2.49E-03
Nickel	2.10E-03	0.0E+00	4.4E-04	0.0E+00	1.33E-02
Zinc	7.60E-03	0.0E+00	3.0E-01	0.0E+00	--
				1.8E-05	5.0E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-9

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Residential Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Lakeside Residential Area
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	26	year
Incidental Ingestion Rate	IR_res_a	100	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**26**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]	Exposure Concentration $[mg/m^3]$	Inhalation Unit Risk $[mg/m^3]^{-1}$	Cancer Risk [-]	Total Cancer Risk [-]
Adult Resident											
Aluminum	12895	5.74E-03	--	--	0	--	--	3.38E-06	--	--	--
Antimony	56.48	2.51E-05	--	--	0	--	--	1.48E-08	--	--	--
Arsenic	19.03	5.08E-06	9.5	4.83E-05	1.07E-06	9.5	1.02E-05	4.98E-09	0.0043	2.14E-11	5.85E-05
Barium	324	1.44E-04	--	--	0	--	--	8.49E-08	--	--	--
Beryllium	0.578	2.57E-07	--	--	0	--	--	1.51E-10	0.0024	3.63E-13	3.63E-13
Cadmium	0.27	1.20E-07	--	--	5.08E-10	--	--	7.07E-11	0.0042	2.97E-13	2.97E-13
Chromium	82.01	3.65E-05	--	--	0	--	--	2.15E-08	--	--	--
Cobalt	16.57	7.38E-06	--	--	0	--	--	4.34E-09	0.009	3.91E-11	3.91E-11
Copper	43.26	1.93E-05	--	--	0	--	--	1.13E-08	--	--	--
Iron	26398	1.18E-02	--	--	0	--	--	6.91E-06	--	--	--
Lead	15.91	7.08E-06	--	--	0	--	--	4.17E-09	--	--	--
Manganese	718.1	3.20E-04	--	--	0	--	--	1.88E-07	--	--	--
Mercury	47.02	2.09E-05	--	--	0	--	--	1.23E-08	--	--	--
Nickel	104.6	4.66E-05	--	--	0	--	--	2.74E-08	0.00026	7.12E-12	7.12E-12
Selenium	2.2	9.79E-07	--	--	0	--	--	5.76E-10	--	--	--
Silver	0.65	2.89E-07	--	--	0	--	--	1.70E-10	--	--	--
Thallium	1.6	7.12E-07	--	--	0	--	--	4.19E-10	--	--	--
Vanadium	38.65	1.72E-05	--	--	0	--	--	1.01E-08	--	--	--
Zinc	88.61	3.94E-05	--	--	0	--	--	2.32E-08	--	--	--
Total Adult Resident				4.8E-05			1.0E-05			6.8E-11	5.8E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-10

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Residential Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Lakeside Residential Area
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	26	year
Incidental Ingestion Rate	IR_rec	100	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**26**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Adult Resident											
Aluminum	12895	1.55E-02	1.00E+00	1.55E-02	0	1.00E+00	–	9.09E-06	5.00E-03	1.82E-03	1.73E-02
Antimony	56.48	6.77E-05	4.00E-04	1.69E-01	0	4.00E-04	–	3.98E-08	–	–	1.69E-01
Arsenic	19.03	1.37E-05	3.50E-06	3.91E+00	2.89E-06	3.50E-06	8.26E-01	1.34E-08	1.50E-05	8.95E-04	4.74E+00
Barium	324	3.88E-04	2.00E-01	1.94E-03	0	2.00E-01	–	2.28E-07	5.00E-04	4.57E-04	2.40E-03
Beryllium	0.578	6.93E-07	2.00E-04	3.46E-03	0	2.00E-04	–	4.08E-10	7.00E-06	5.82E-05	3.52E-03
Cadmium	0.27	3.24E-07	1.00E-03	3.24E-04	1.37E-09	1.00E-03	1.37E-06	1.90E-10	1.00E-05	1.90E-05	3.44E-04
Chromium	82.01	9.83E-05	1.50E+00	6.55E-05	0	1.50E+00	–	5.78E-08	–	–	6.55E-05
Cobalt	16.57	1.99E-05	3.00E-04	6.62E-02	0	3.00E-04	–	1.17E-08	6.00E-06	1.95E-03	6.82E-02
Copper	43.26	5.19E-05	4.00E-02	1.30E-03	0	4.00E-02	–	3.05E-08	–	–	1.30E-03
Iron	26398	3.16E-02	7.00E-01	4.52E-02	0	7.00E-01	–	1.86E-05	–	–	4.52E-02
Lead	15.91	1.91E-05	–	–	0	–	–	1.12E-08	–	–	–
Manganese	718.1	8.61E-04	1.40E-01	6.15E-03	0	1.40E-01	–	5.06E-07	5.00E-05	1.01E-02	1.63E-02
Mercury	47.02	5.64E-06	1.60E-04	3.52E-02	0	1.60E-04	–	3.32E-08	3.00E-05	1.11E-03	3.63E-02
Nickel	104.6	1.25E-04	1.10E-02	1.14E-02	0	1.10E-02	–	7.38E-08	1.40E-05	5.27E-03	1.67E-02
Selenium	2.2	2.64E-06	5.00E-03	5.27E-04	0	5.00E-03	–	1.55E-09	2.00E-02	7.76E-08	5.27E-04
Silver	0.65	7.79E-07	5.00E-03	1.56E-04	0	5.00E-03	–	4.58E-10	–	–	1.56E-04
Thallium	1.6	1.92E-06	1.00E-05	1.92E-01	0	1.00E-05	–	1.13E-09	–	–	1.92E-01
Vanadium	38.65	4.63E-05	5.00E-03	9.27E-03	0	5.00E-03	–	2.73E-08	1.00E-04	2.73E-04	9.54E-03
Zinc	88.61	1.06E-04	3.00E-01	3.54E-04	0	3.00E-01	–	6.25E-08	–	–	3.54E-04
Total Adult Resident				4.47E+00			8.26E-01			2.20E-02	5.32E+00

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-11

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Residential Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Lakeside Residential Area
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_res	200	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0 2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/g**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Child Resident											
Aluminum	12895	1.41E-02	--	--	0	--	--	7.79E-07	--	--	--
Antimony	56.48	6.19E-05	--	--	0	--	--	3.41E-09	--	--	--
Arsenic	19.03	1 25E-05	9 5	1.19E-04	1.48E-06	9.5	1.41E-05	1.15E-09	0.0043	4.95E-12	1.33E-04
Barium	324	3 55E-04	--	--	0	--	--	1.96E-08	--	--	--
Beryllium	0 578	6.33E-07	--	--	0	--	--	3.49E-11	0.0024	8.38E-14	8.38E-14
Cadmium	0.27	2 96E-07	--	--	7.02E-10	--	--	1.63E-11	0.0042	6.85E-14	6.85E-14
Chromium	82.01	8 99E-05	--	--	0	--	--	4.96E-09	--	--	--
Cobalt	16.57	1.82E-05	--	--	0	--	--	1.00E-09	0.009	9.01E-12	9.01E-12
Copper	43.26	4.74E-05	--	--	0	--	--	2.61E-09	--	--	--
Iron	26398	2.89E-02	--	--	0	--	--	1.60E-06	--	--	--
Lead	15.91	1.74E-05	--	--	0	--	--	9.62E-10	--	--	--
Manganese	718.1	7.87E-04	--	--	0	--	--	4.34E-08	--	--	--
Mercury	47.02	5.15E-05	--	--	0	--	--	2.84E-09	--	--	--
Nickel	104.6	1.15E-04	--	--	0	--	--	6.32E-09	0.00026	1.64E-12	1.64E-12
Selenium	2.2	2.41E-06	--	--	0	--	--	1.33E-10	--	--	--
Silver	0.65	7.12E-07	--	--	0	--	--	3.93E-11	--	--	--
Thallium	1.6	1.75E-06	--	--	0	--	--	9.67E-11	--	--	--
Vanadium	38.65	4.24E-05	--	--	0	--	--	2.34E-09	--	--	--
Zinc	88.61	9.71E-05	--	--	0	--	--	5.36E-09	--	--	--
Total Child Resident				1 2E-04			1.4E-05			1.6E-11	1 3E-04

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-12

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Residential Soi

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	xposure Medium:	Soil
	xposure Point:	Lakeside Residential Area
	eceptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	200	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/g**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Child Resident											
Aluminum	12895	1.65E-01	1.00E+00	1.65E-01	0	1.00E+00	--	9.09E-06	5.00E-03	1.82E-03	1.67E-01
Antimony	56.48	7.22E-04	4.00E-04	1.81E+00	0	4.00E-04	--	3.98E-08	--	--	1.81E+00
Arsenic	19.03	1.46E-04	3.50E-06	4.17E+01	1.7E-05	3.50E-06	4.95E+00	1.34E-08	1.50E-05	8.95E-04	4.67E+01
Barium	324	4.14E-03	2.00E-01	2.07E-02	0	2.00E-01	--	2.28E-07	5.00E-04	4.57E-04	2.12E-02
Beryllium	0.578	7.39E-06	2.00E-04	3.69E-02	0	2.00E-04	--	4.08E-10	7.00E-06	5.82E-05	3.70E-02
Cadmium	0.27	3.45E-06	1.00E-03	3.45E-03	8.2E-09	1.00E-03	8.19E-06	1.90E-10	1.00E-05	1.90E-05	3.48E-03
Chromium	82.01	1.05E-03	1.50E+00	6.99E-04	0	1.50E+00	--	5.78E-08	--	--	6.99E-04
Cobalt	16.57	2.12E-04	3.00E-04	7.06E-01	0	3.00E-04	--	1.17E-08	6.00E-06	1.95E-03	7.08E-01
Copper	43.26	5.53E-04	4.00E-02	1.38E-02	0	4.00E-02	--	3.05E-08	--	--	1.38E-02
Iron	26398	3.38E-01	7.00E-01	4.82E-01	0	7.00E-01	--	1.86E-05	--	--	4.82E-01
Lead	15.91	2.03E-04	--	--	0	--	--	1.12E-08	--	--	--
Manganese	718.1	9.18E-03	1.40E-01	6.56E-02	0	1.40E-01	--	5.06E-07	5.00E-05	1.01E-02	7.57E-02
Mercury	47.02	6.01E-05	1.60E-04	3.76E-01	0	1.60E-04	--	3.32E-08	3.00E-05	1.11E-03	3.77E-01
Nickel	104.6	1.34E-03	1.10E-02	1.22E-01	0	1.10E-02	--	7.38E-08	1.40E-05	5.27E-03	1.27E-01
Selenium	2.2	2.81E-05	5.00E-03	5.63E-03	0	5.00E-03	--	1.55E-09	2.00E-02	7.76E-08	5.63E-03
Silver	0.65	8.31E-06	5.00E-03	1.66E-03	0	5.00E-03	--	4.58E-10	--	--	1.66E-03
Thallium	1.6	2.05E-05	1.00E-05	2.05E+00	0	1.00E-05	--	1.13E-09	--	--	2.05E+00
Vanadium	38.65	4.94E-04	5.00E-03	9.88E-02	0	5.00E-03	--	2.73E-08	1.00E-04	2.73E-04	9.91E-02
Zinc	88.61	1.13E-03	3.00E-01	3.78E-03	0	3.00E-01	--	6.25E-08	--	--	3.78E-03
Total Child Resident				4.57E+01			4.95E+00			2.01E-02	5.07E+01

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-13

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Exposure to PMB Soil (Franciscan)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB - Franciscan)
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	26	year
Incidental Ingestion Rate	IR_rec	100	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**26**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Adult Resident											
Aluminum	9827	4.38E-03	--	--	0	--	--	2.57E-06	--	--	--
Antimony	1.756	7.82E-07	--	--	0	--	--	4.60E-10	--	--	--
Arsenic	9.852	2.63E-06	9.5	2.50E-05	5.6E-07	9.5	5.28E-06	2.58E-09	0.0043	1.11E-11	3.03E-05
Barium	157.7	7.02E-05	--	--	0	--	--	4.13E-08	--	--	--
Beryllium	0.45	2.00E-07	--	--	0	--	--	1.18E-10	0.0024	2.83E-13	2.83E-13
Cadmium	0.086	3.83E-08	--	--	1.6E-10	--	--	2.25E-11	0.0042	9.46E-14	9.46E-14
Chromium	45.45	2.02E-05	--	--	0	--	--	1.19E-08	--	--	--
Cobalt	16.61	7.39E-06	--	--	0	--	--	4.35E-09	0.009	3.91E-11	3.91E-11
Copper	30.41	1.35E-05	--	--	0	--	--	7.96E-09	--	--	--
Iron	24685	1.10E-02	--	--	0	--	--	6.46E-06	--	--	--
Lead	12.62	5.62E-06	--	--	0	--	--	3.30E-09	--	--	--
Lithium	10.66	4.75E-06	--	--	0	--	--	2.79E-09	--	--	--
Manganese	904.6	4.03E-04	--	--	0	--	--	2.37E-07	--	--	--
Mercury	33.98	1.51E-05	--	--	0	--	--	8.90E-09	--	--	--
Molybdenum	0.367	1.63E-07	--	--	0	--	--	9.61E-11	--	--	--
Nickel	45.7	2.03E-05	--	--	0	--	--	1.20E-08	0.00026	3.11E-12	3.11E-12
Selenium	1.586	7.06E-07	--	--	0	--	--	4.15E-10	--	--	--
Silver	0.0857	3.82E-08	--	--	0	--	--	2.24E-11	--	--	--
Thallium	0.0724	3.22E-08	--	--	0	--	--	1.90E-11	--	--	--
Vanadium	39.47	1.76E-05	--	--	0	--	--	1.03E-08	--	--	--
Zinc	54.82	2.44E-05	--	--	0	--	--	1.44E-08	--	--	--
Total Adult Resident				2.5E-05			5.3E-06			5.4E-11	3.0E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-14

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Adult Exposure Scenario - Exposure to PMB Soil (Franciscan)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB - Franciscan)
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	26	year
Incidental Ingestion Rate	IR_rec	100	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**26**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Residential Adult											
Aluminum	9827	1.18E-02	1.00E+00	1.18E-02	0	1.00E+00	--	6.93E-06	5.00E-03	1.39E-03	1.32E-02
Antimony	1.756	2.10E-06	4.00E-04	5.26E-03	0	4.00E-04	--	1.24E-09	--	--	5.26E-03
Arsenic	9.852	7.09E-06	3.50E-06	2.02E+00	1.50E-06	3.50E-06	4.27E-01	6.95E-09	1.50E-05	4.63E-04	2.45E+00
Barium	157.7	1.89E-04	2.00E-01	9.45E-04	0	2.00E-01	--	1.11E-07	5.00E-04	2.22E-04	1.17E-03
Beryllium	0.45	5.39E-07	2.00E-04	2.70E-03	0	2.00E-04	--	3.17E-10	7.00E-06	4.53E-05	2.74E-03
Cadmium	0.086	1.03E-07	1.00E-03	1.03E-04	4.35E-10	1.00E-03	4.35E-07	6.06E-11	1.00E-05	6.06E-06	1.10E-04
Chromium	45.45	5.45E-05	1.50E+00	3.63E-05	0	1.50E+00	--	3.20E-08	--	--	3.63E-05
Cobalt	16.61	1.99E-05	3.00E-04	6.64E-02	0	3.00E-04	--	1.17E-08	6.00E-06	1.95E-03	6.83E-02
Copper	30.41	3.65E-05	4.00E-02	9.11E-04	0	4.00E-02	--	2.14E-08	--	--	9.11E-04
Iron	24685	2.96E-02	7.00E-01	4.23E-02	0	7.00E-01	--	1.74E-05	--	--	4.23E-02
Lead	12.62	1.51E-05	--	--	0	--	--	8.90E-09	--	--	--
Lithium	10.66	1.28E-05	2.00E-03	6.39E-03	0	2.00E-03	--	7.52E-09	--	--	6.39E-03
Manganese	904.6	1.08E-03	1.40E-01	7.74E-03	0	1.40E-01	--	6.38E-07	5.00E-05	1.28E-02	2.05E-02
Mercury	33.98	4.07E-06	1.60E-04	2.55E-02	0	1.60E-04	--	2.40E-08	3.00E-05	7.99E-04	2.63E-02
Molybdenum	0.367	4.40E-07	5.00E-03	8.80E-05	0	5.00E-03	--	2.59E-10	--	--	8.80E-05
Nickel	45.7	5.48E-05	1.10E-02	4.98E-03	0	1.10E-02	--	3.22E-08	1.40E-05	2.30E-03	7.28E-03
Selenium	1.586	1.90E-06	5.00E-03	3.80E-04	0	5.00E-03	--	1.12E-09	2.00E-02	5.59E-08	3.80E-04
Silver	0.0857	1.03E-07	5.00E-03	2.05E-05	0	5.00E-03	--	6.04E-11	--	--	2.05E-05
Thallium	0.0724	8.68E-08	1.00E-05	8.68E-03	0	1.00E-05	--	5.10E-11	--	--	8.68E-03
Vanadium	39.47	4.73E-05	5.00E-03	9.46E-03	0	5.00E-03	--	2.78E-08	1.00E-04	2.78E-04	9.74E-03
Zinc	54.82	6.57E-05	3.00E-01	2.19E-04	0	3.00E-01	--	3.87E-08	--	--	2.19E-04
Total Adult Resident				2.2E+00			4.3E-01			2.0E-02	2.7E+00

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-15

Risk Calculation Worksheet for - Carcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Exposure to PMB Soil (Franciscan)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB - Franciscan)
	Receptor Age:	Child

Exposure Parameter	**Variable**	**Child Value**	**Units**
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	200	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	**AF**	**0.2**	**mg/cm^2**
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Risk Calculations

		Exposure Route = Oral			**Exposure Route = Dermal**			**Exposure Route = Inhalation**			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Residential Child											
Aluminum	9827	1.08E-02	--	--	0	--	--	5.94E-07	--	--	--
Antimony	1.756	1.92E-06	--	--	0	--	--	1.06E-10	--	--	--
Arsenic	9.852	6.48E-06	9.5	6.15E-05	7.69E-07	9.5	7.30E-06	5.95E-10	0.0043	2.56E-12	6.88E-05
Barium	157.7	1.73E-04	--	--	0	--	--	9.53E-09	--	--	--
Beryllium	0.45	4.93E-07	--	--	0	--	--	2.72E-11	0.0024	6.53E-14	6.53E-14
Cadmium	0.086	9.42E-08	--	--	2.24E-10	--	--	5.20E-12	0.0042	2.18E-14	2.18E-14
Chromium	45.45	4.98E-05	--	--	0	--	--	2.75E-09	--	--	--
Cobalt	16.61	1.82E-05	--	--	0	--	--	1.00E-09	0.009	9.03E-12	9.03E-12
Copper	30.41	3.33E-05	--	--	0	--	--	1.84E-09	--	--	--
Iron	24685	2.71E-02	--	--	0	--	--	1.49E-06	--	--	--
Lead	12.62	1.38E-05	--	--	0	--	--	7.63E-10	--	--	--
Lithium	10.66	1.17E-05	--	--	0	--	--	6.44E-10	--	--	--
Manganese	904.6	9.91E-04	--	--	0	--	--	5.47E-08	--	--	--
Mercury	33.98	3.72E-05	--	--	0	--	--	2.05E-09	--	--	--
Molybdenum	0.367	4.02E-07	--	--	0	--	--	2.22E-11	--	--	--
Nickel	45.7	5.01E-05	--	--	0	--	--	2.76E-09	0.00026	7.18E-13	7.18E-13
Selenium	1.586	1.74E-06	--	--	0	--	--	9.59E-11	--	--	--
Silver	0.0857	9.39E-08	--	--	0	--	--	5.18E-12	--	--	--
Thallium	0.0724	7.93E-08	--	--	0	--	--	4.38E-12	--	--	--
Vanadium	39.47	4.33E-05	--	--	0	--	--	2.39E-09	--	--	--
Zinc	54.82	6.01E-05	--	--	0	--	--	3.31E-09	--	--	--
Total Child Resident				6.2E-05			7.3E-06			1.2E-11	6.9E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-16

Risk Calculation Worksheet for - NonCarcinogenic Effects - Lakeside Resident - Child Exposure Scenario - Exposure to PMB Soil (Franciscan)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational
	Scenario Timeframe:	Chronic
	Exposure Medium:	Sediment
	Exposure Point:	Ambient (PMB - Franciscan)
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	200	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	6	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Aluminum	9827	5.44E-01	1.00E+00	5.44E-01	0	1.00E+00	--	6.93E-06	5.00E-03	1.39E-03	5.46E-01
Antimony	1.756	9.73E-05	4.00E-04	2.43E-01	0	4.00E-04	--	1.24E-09	--	--	2.43E-01
Arsenic	9.852	7.56E-05	3.50E-06	2.16E+01	8.97E-06	3 50E-06	2.56E+00	6.95E-09	1 50E-05	4.63E-04	2.42E+01
Barium	157.7	8.74E-03	2.00E-01	4 37E-02	0	2.00E-01	--	1.11E-07	5.00E-04	2.22E-04	4.39E-02
Beryllium	0.45	2.49E-05	2.00E-04	1 25E-01	0	2.00E-04	--	3.17E-10	7.00E-06	4.53E-05	1.25E-01
Cadmium	0.086	4.76E-06	1.00E-03	4.76E-03	2.61E-09	1.00E-03	2.61E-06	6.06E-11	1.00E-05	6.06E-06	4.77E-03
Chromium	45.45	2.52E-03	1.50E+00	1.68E-03	0	1 50E+00	--	3.20E-08	--	--	1.68E-03
Cobalt	16.61	9.20E-04	3.00E-04	3.07E+00	0	3.00E-04	--	1.17E-08	6.00E-06	1.95E-03	3.07E+00
Copper	30.41	1.68E-03	4.00E-02	4 21E-02	0	4.00E-02	--	2.14E-08	--	--	4.21E-02
Iron	24685	1 37E+00	7.00E-01	1.95E+00	0	7.00E-01	--	1.74E-05	--	--	1.95E+00
Lead	12.62	6.99E-04	--	--	0	--	--	8.90E-09	--	--	--
Lithium	10.66	5.91E-04	2.00E-03	2 95E-01	0	2.00E-03	--	7.52E-09	--	--	2.95E-01
Manganese	904.6	5.01E-02	1.40E-01	3 58E-01	0	1.40E-01	--	6.38E-07	5.00E-05	1.28E-02	3.71E-01
Mercury	33.98	4.34E-05	1.60E-04	2.72E-01	0	1.60E-04	--	2.40E-08	3.00E-05	7.99E-04	2.72E-01
Molybdenum	0.367	2.03E-05	5.00E-03	4.07E-03	0	5.00E-03	--	2.59E-10	--	--	4.07E-03
Nickel	45.7	2.53E-03	1.10E-02	2 30E-01	0	1.10E-02	--	3 22E-08	1.40E-05	2.30E-03	2.32E-01
Selenium	1.586	8.79E-05	5.00E-03	1.76E-02	0	5.00E-03	--	1.12E-09	2.00E-02	5.59E-08	1.76E-02
Silver	0.0857	4.75E-06	5.00E-03	9 50E-04	0	5.00E-03	--	6.04E-11	--	--	9.50E-04
Thallium	0.0724	4.01E-06	1.00E-05	4.01E-01	0	1.00E-05	--	5.10E-11	--	--	4.01E-01
Vanadium	39.47	2.19E-03	5.00E-03	4 37E-01	0	5.00E-03	--	2.78E-08	1.00E-04	2.78E-04	4.38E-01
Zinc	54.82	3.04E-03	3.00E-01	1.01E-02	0	3.00E-01	--	3.87E-08	--	--	1.01E-02
Total Child Resident				3.0E+01			2.6E+00			2.0E-02	3 2E+01

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-17

Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake - Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario I formation	Scenario Timeframe:	Current
	Receptor Population:	Recreational User
	xposure Medium:	Clear Lake Surface Water
	eceptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor $[mg/kg/day]^{-1}$	Exposure Route = Oral: Cancer Risk
Inorganics				
Aluminum	4.38E+01	3 3E-03	N/A	---
Antimony	7.83E-04	5 9E-08	N/A	---
Arsenic	2.45E-03	1 9E-07	9.5E+00	1.8E-06
Barium	3 20E-02	2.4E-06	N/A	---
Beryllium	1 51E-03	1.1E-07	N/A	
Boron	2.70E+01	2.0E-03	N/A	---
Cadmium	4 95E-04	3.7E-08	N/A	---
Chromium III	1 52E-03	1 2E-07	N/A	---
Cobalt	6.82E-02	5.1E-06	N/A	---
Copper	1 91E-03	1.4E-07	N/A	---
Iron	2.66E-01	2.0E-05	N/A	---
Lead	3.10E-03	2 3E-07	N/A	---
Lithium	5.64E-01	4 3E-05	N/A	---
Manganese	3.04E+00	2 3E-04	N/A	---
Mercuric chlorid	1.64E-03	1 2E-07	N/A	---
Methyl mercury	1 52E-06	1.1E-10	N/A	
Molybdenum	6 28E-04	4.7E-08	N/A	---
Nickel	4 34E-02	3 3E-06	N/A	---
Selenium	1 28E-03	9.6E-08	N/A	---
Silver	2 50E-03	1 9E-07	N/A	
Thallium	1 34E-03	1.0E-07	N/A	
Vanadium	9.18E-04	6 9E-08	N/A	---
Zinc	9.60E-02	7 2E-06	N/A	---
				1.8E-06

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor $[mg/kg/day]^{-1}$	Exposure Route = Dermal: Cancer Risk	Total Cancer Risk
norganics					
Aluminum	1.45E+01	0.0E+00	N/A	---	---
Antimony	2.90E-04	5.8E-09	N/A	---	---
Arsenic	1.47E-03	0.0E+00	9.5E+00	0.0E+00	1.8E-06
Barium	3.35E-02	2.4E-07	N/A	---	---
Beryllium	1.49E-03	1.1E-08	N/A	---	---
Boron	2.66E+01	0.0E+00	N/A	---	---
Cadmium	4.45E-04	3.7E-09	N/A	---	---
Chromium III	1.39E-03	2.3E-08	N/A	---	---
Cobalt	5.56E-02	0.0E+00	N/A	---	---
Copper	1.86E-03	1.4E-08	N/A	---	---
Iron	4.30E-02	0.0E+00	N/A	---	---
Lead	2.00E-05	0.0E+00	N/A	---	---
Lithium	6.45E-01	0.0E+00	N/A	---	---
Manganese	3.53E+00	2.2E-05	N/A	---	---
Mercuric Chloride	3.21E-04	1.2E-08	N/A	---	---
Methyl mercury	7.06E-07	2.7E-05	N/A	---	---
Molybdenum	1.82E-04	0.0E+00	N/A	---	---
Nickel	3.89E-02	6.4E-08	N/A	---	---
Selenium	1.13E-03	9.4E-09	N/A	---	---
Silver	3.49E-04	1.1E-08	N/A	---	---
Thallium	6.29E-04	0.0E+00	N/A	---	---
Vanadium	2.48E-03	0.0E+00	N/A	---	---
Zinc	8.22E-02	0.0E+00	N/A	---	---
				0.0E+00	1.8E-06

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-18

Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure Scenario in Clear Lake - Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current
	Receptor Population:	Recreational User
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Reference Dose [mg/kg/day]	Exposure Route = Oral: Hazard Quotient [-]
Inorganics				
Aluminum	1.45E+01	6.4E-03	1.0E+00	6.4E-03
Antimony	2.90E-04	1 3E-07	4.0E-04	3 2E-04
Arsenic	1.47E-03	6 5E-07	3 5E-06	1 9E-01
Barium	3 35E-02	1 5E-05	2.0E-01	7.4E-05
Beryllium	1.49E-03	6.6E-07	2.0E-04	3 3E-03
Boron	2.66E+01	1 2E-02	2.0E-01	5 9E-02
Cadmium	4.45E-04	2.0E-07	5.0E-04	3 9E-04
Chromium III	1 39E-03	6.1E-07	1.5E+00	4.1E-07
Cobalt	5.56E-02	2 5E-05	3.0E-04	8 2E-02
Copper	1.86E-03	8 2E-07	4.0E-02	2.0E-05
Iron	4.30E-02	1 9E-05	7.0E-01	2.7E-05
Lead	2.00E-05	8.8E-09	N/A	---
Lithium	6.45E-01	2.8E-04	2.0E-03	1.4E-01
Manganese	3.53E+00	1.6E-03	2.4E-02	6 5E-02
Mercuric Chloride	3 21E-04	1.4E-07	1.6E-04	8.8E-04
Methyl mercury	7.06E-07	3.1E-10	1.0E-04	3.1E-06
Molybdenum	1.82E-04	8.0E-08	5.0E-03	1.6E-05
Nickel	3.89E-02	1.7E-05	1.1E-02	1.6E-03
Selenium	1.13E-03	5.0E-07	5.0E-03	9 9E-05
Silver	3.49E-04	1 5E-07	5.0E-03	3.1E-05
Thallium	6 29E-04	2.8E-07	1.0E-05	2.8E-02
Vanadium	2.48E-03	1.1E-06	5.0E-03	2 2E-04
Zinc	8 22E-02	3.6E-05	3.0E-01	1 2E-04
				5.7E-01

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Reference Dose [mg/kg/day]	Exposure Route = Dermal: Hazard Quotient [-]	Total Hazard Quotient [-]
norganics					
Aluminum	4.38E+01	0.0E+00	1.0E+00	0.0E+00	6.40E-03
Antimony	7.83E-04	3.4E-08	4.0E-04	8.4E-05	4.04E-04
Arsenic	2.45E-03	0.0E+00	3.5E-06	0.0E+00	1.85E-01
Barium	3.20E-02	1.4E-06	1.4E-02	9.9E-05	1.72E-04
Beryllium	1.51E-03	6 5E-08	1.4E-06	4.6E-02	4 97E-02
Boron	2.70E+01	0.0E+00	2.0E-01	0.0E+00	5.86E-02
Cadmium	4.95E-04	2.1E-08	2.5E-05	8.5E-04	1 25E-03
Chromium III	1.52E-03	1 3E-07	2.0E-02	6.7E-06	7.14E-06
Cobalt	6.82E-02	0.0E+00	3.0E-04	0.0E+00	8.17E-02
Copper	1.91E-03	8 2E-08	4.0E-02	2.1E-06	2 25E-05
Iron	2.66E-01	0.0E+00	7.0E-01	0.0E+00	2.71E-05
Lead	3.10E-03	0.0E+00	N/A	---	--
Lithium	5.64E-01	0.0E+00	2.0E-03	0.0E+00	1.42E-01
Manganese	3.04E+00	1 3E-04	2.4E-02	5.5E-03	7.03E-02
Mercuric Chloride	1.64E-03	7.1E-08	1.1E-05	6.3E-03	7.18E-03
Methyl mercury	1.52E-06	0.0E+00	1.0E-04	0.0E+00	3.11E-06
Molybdenum	6.28E-04	0.0E+00	5.0E-03	0.0E+00	1.60E-05
Nickel	4.34E-02	3.7E-07	4.4E-04	8.5E-04	2.41E-03
Selenium	1.28E-03	5 5E-08	5.0E-03	1.1E-05	1.10E-04
Silver	2.50E-03	6 5E-08	2.0E-04	3.2E-04	3 54E-04
Thallium	1.34E-03	0.0E+00	1.0E-05	0.0E+00	2.77E-02
Vanadium	9.18E-04	0.0E+00	1.3E-04	0.0E+00	2.19E-04
Zinc	9.60E-02	0.0E+00	3.0E-01	0.0E+00	1 21E-04
				6.0E-02	6.3E-01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-19

Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Scenario Timeframe:	Current
	Receptor Population:	Recreational User
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	0.00E+00	0.0E+00	N/A	---
Arsenic	3.32E-03	2.5E-07	9.5E+00	2.4E-06
Barium	7.67E-02	5.8E-06	N/A	---
Boron	1.30E+00	9.8E-05	N/A	---
Cobalt	0.00E+00	0.0E+00	N/A	---
Copper	0.00E+00	0.0E+00	N/A	---
Iron	0.00E+00	0.0E+00	N/A	---
Lithium	2.12E-02	1.6E-06	N/A	---
Manganese	1.96E-03	1.5E-07	N/A	---
Mercuric Chloric	1.52E-06	1.1E-10	N/A	---
Methyl mercury	0.00E+00	0.0E+00	N/A	---
Molybdenum	0.00E+00	0.0E+00	N/A	---
Nickel	2.10E-03	1.6E-07	N/A	---
Zinc	7.60E-03	0.0E+00	N/A	---
Total Recreational Youth				2.4E-06

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	3.42E-02	0.0E+00	N/A	---	---
Arsenic	3.45E-03	0.0E+00	9.5E+00		2.4E-06
Barium	8.04E-02	1.9E-06	N/A	---	---
Boron	1.20E+00	0.0E+00	N/A	---	---
Cobalt	1.34E-04	0.0E+00	N/A	---	---
Copper	1.97E-03	0.0E+00	N/A	---	---
Iron	1.00E-01	0.0E+00	N/A	---	---
Lithium	2.08E-02	0.0E+00	N/A	---	---
Manganese	1.96E-02	0.0E+00	N/A	---	---
Mercuric Chloride	2.75E-05	0.0E+00	N/A	---	---
Methyl mercury	5.60E-08	8.7E-05	N/A	---	---
Molybdenum	2.50E-04	0.0E+00	N/A	---	---
Nickel	2.95E-03	0.0E+00	N/A	---	---
Zinc	0.00E+00	0.0E+00	N/A	---	---
				0.0E+00	2.4E-06

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-20

Risk Calculation Worksheet for - Non Carcinogenic Effects - Recreational User Exposure Scenario in Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current
	Receptor Population:	Tribal
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics								
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00	3.42E-02	0.0E+00	1.0E+00	0.0E+00	--
Arsenic	3.32E-03	1.5E-06	3.5E-06	4.2E-01	3.45E-03	0.0E+00	3.5E-06	0.0E+00	4.18E-01
Barium	7.67E-02	3.4E-05	2.0E-01	1.7E-04	8.04E-02	1.4E-06	1.4E-02	1.0E-04	2.69E-04
Boron	1.30E+00	5.7E-04	2.0E-01	2.9E-03	1.20E+00	0.0E+00	2.0E-01	0.0E+00	2.86E-03
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00	1.34E-04	0.0E+00	3.0E-04	0.0E+00	--
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00	1.97E-03	8.8E-08	4.0E-02	2.2E-06	2.19E-06
Iron	0.00E+00	0.0E+00	7.0E-01	0.0E+00	1.00E-01	0.0E+00	7.0E-01	0.0E+00	--
Lithium	2.12E-02	9.4E-06	2.0E-03	4.7E-03	2.08E-02	0.0E+00	2.0E-03	0.0E+00	4.68E-03
Manganese	1.96E-03	8.6E-07	2.4E-02	3.6E-05	1.96E-02	1.3E-04	2.4E-02	5.6E-03	5.63E-03
Mercuric Chloride	1.52E-06	6.7E-10	1.6E-04	4.2E-06	2.75E-05	8.4E-08	1.1E-05	7.5E-03	7.55E-03
Methyl mercury	0.00E+00	0.0E+00	1.0E-04	0.0E+00	5.60E-08	0.0E+00	1.0E-04	0.0E+00	--
Molybdenum	0.00E+00	0.0E+00	5.0E-03	0.0E+00	2.50E-04	0.0E+00	1.0E-04	0.0E+00	--
Nickel	2.10E-03	9.3E-07	1.1E-02	8.4E-05	2.95E-03	3.8E-07	5.0E-03	7.6E-05	1.60E-04
Zinc	7.60E-03	3.3E-06	3.0E-01	1.1E-05	0.00E+00	0.0E+00	4.4E-04	0.0E+00	1.12E-05
Total Recreational Youth				4.3E-01			1.3E-02	4.4E-01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-21

Risk Calculation Worksheet for - Carcinogenic Effects - Recreational User Exposure to Sediment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational
	Scenario Timeframe:	Chronic
	Exposure Medium:	Sediment
	Exposure Point:	Site-Related
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_rec	50	g/day
Body Weight	BW	44 3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Recreational Youth											
Aluminum	32221	8.88E-04	--	--	0	--	--	5.79E-07	--	--	--
Antimony	15.58	4.29E-07	--	--	0	--	--	2.80E-10	--	--	--
Arsenic	29.11	4.81E-07	9.5	4.57E-06	5.0E-07	9 5	4.73E-06	5.23E-10	0.0043	2 25E-12	9.30E-06
Barium	409.1	1.13E-05	--	--	0	--	--	7.35E-09	--	--	--
Beryllium	2.891	7.97E-08	--	--	0	--	--	5.19E-11	0.0024	1 25E-13	1.25E-13
Boron	361.5	9.96E-06	--	--	0	--	--	6.49E-09	--	--	--
Cadmium	0.631	1.74E-08	--	--	3.6E-10	--	--	1.13E-11	0.0042	4.76E-14	4.76E-14
Chromium	52.97	1.46E-06	--	0.00E+00	0	--	--	9.51E-10	0	0.00E+00	--
Cobalt	36.86	1.02E-06	--	--	0	--	--	6.62E-10	0.009	5 96E-12	5.96E-12
Copper	39.59	1.09E-06	--	--	0	--	--	7.11E-10	--	--	--
Iron	32028	8.83E-04	--	--	0	--	--	5.75E-07	--	--	--
Lead	10.02	2.76E-07	--	--	0	--	--	1.80E-10	--	--	--
Lithium	46.33	1.28E-06	--	--	0	--	--	8.32E-10	--	--	--
Manganese	1711	4.72E-05	--	--	0	--	--	3.07E-08	--	--	--
Mercury	170	4.69E-06	--	--	0	--	--	3.05E-09	--	--	--
Methyl Mercury	0.0161	4.44E-10	--	--	0	--	--	2.89E-13	--	--	--
Molybdenum	0 508	1.40E-08	--	--	0	--	--	9.12E-12	--	--	--
Nickel	83.63	2.31E-06	--	--	0	--	--	1.50E-09	0.00026	3 90E-13	3.90E-13
Selenium	3.135	8.64E-08	--	--	0	--	--	5.63E-11	--	--	--
Silver	0 974	2.68E-08	--	--	0	--	--	1.75E-11	--	--	--
Thallium	0.171	4.71E-09	--	--	0	--	--	3.07E-12	--	--	--
Vanadium	43.81	1.21E-06	--	--	0	--	--	7.87E-10	--	--	--
Zinc	96	2.65E-06	--	--	0	--	--	1.72E-09	--	--	--
Total Recreational Youth				4.6E-06			4.7E-06			8.8E-12	9 3E-06

Cs = Concentration in Sediment
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-22

Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure to Sediment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational
	Scenario Timeframe:	Chronic
	Exposure Medium:	Sediment
	Exposure Point:	Site-Related
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_rec	50	g/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Recreational Youth											
Aluminum	32221	5.18E-03	1.00E+00	5.18E-03	0	1.00E+00	--	3.38E-06	5.00E-03	6.75E-04	5.86E-03
Antimony	15.58	2.51E-06	4.00E-04	6.26E-03	0	4.00E-04	--	1.63E-09	--	--	6 26E-03
Arsenic	29.11	2.81E-06	3.50E-06	8.02E-01	2.91E-06	3.50E-06	8.30E-01	3.05E-09	1.50E-05	2.03E-04	1.63E+00
Barium	409.1	6.58E-05	2.00E-01	3.29E-04	0	2.00E-01	--	4.29E-08	5.00E-04	8.57E-05	4.15E-04
Beryllium	2.891	4.65E-07	2.00E-04	2.32E-03	0	2.00E-04	--	3.03E-10	7.00E-06	4.33E-05	2 37E-03
Boron	361 5	5.81E-05	2.00E-01	2.91E-04	0	2.00E-01	--	3.79E-08	2.00E-02	1.89E-06	2 93E-04
Cadmium	0.631	1.01E-07	1.00E-03	1.01E-04	2.10E-09	1.00E-03	2.10E-06	6.61E-11	1.00E-05	6.61E-06	1.10E-04
Chromium	52.97	8.52E-06	1 50E+00	5.68E-06	0	1.50E+00	--	5.55E-09	--	--	5.68E-06
Cobalt	36.86	5.93E-06	3.00E-04	1.98E-02	0	3.00E-04	--	3.86E-09	6.00E-06	6.44E-04	2.04E-02
Copper	39.59	6.37E-06	4.00E-02	1.59E-04	0	4.00E-02	--	4.15E-09	--	--	1 59E-04
Iron	32028	5.15E-03	7.00E-01	7.36E-03	0	7.00E-01	--	3.36E-06	--	--	7 36E-03
Lead	10.02	1.61E-06	--	--	0	--	--	1.05E-09	--	--	--
Lithium	46.33	7.45E-06	2.00E-03	3.72E-03	0	2.00E-03	--	4.85E-09	--	--	3.72E-03
Manganese	1711	2.75E-04	1.40E-01	1.97E-03	0	1.40E-01	--	1.79E-07	5.00E-05	3.58E-03	5 55E-03
Mercury	170	2.73E-06	1.60E-04	1.71E-02	0	1.60E-04	--	1.78E-08	3.00E-06	5.94E-03	2 30E-02
Methyl Mercury	0.0161	2.59E-09	1.00E-04	2.59E-05	0	1.00E-04	--	1.69E-12	--	--	2 59E-05
Molybdenum	0.508	8.17E-08	5.00E-03	1.63E-05	0	5.00E-03	--	5.32E-11	--	--	1.63E-05
Nickel	83.63	1.34E-05	1.10E-02	1.22E-03	0	1.10E-02	--	8.76E-09	1.40E-05	6.26E-04	1.85E-03
Selenium	3.135	5.04E-07	5.00E-03	1.01E-04	0	5.00E-03	--	3.28E-10	2.00E-02	1.64E-08	1.01E-04
Silver	0.974	1.57E-07	5.00E-03	3.13E-05	0	5.00E-03	--	1.02E-10	--	--	3.13E-05
Thallium	0.171	2.75E-08	1.00E-05	2.75E-03	0	1.00E-05	--	1.79E-11	--	--	2.75E-03
Vanadium	43.81	7.04E-06	5.00E-03	1.41E-03	0	5.00E-03	--	4.59E-09	1.00E-04	4.59E-05	1.45E-03
Zinc	96	1.54E-05	3.00E-01	5.15E-05	0	3.00E-01	--	1.01E-08	--	--	5.15E-05
Total Recreational Youth				8.7E-01			8.3E-01			1.2E-02	1.7E+00

Cs = Concentration in Sediment
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-23

Risk Calculation Worksheet for - Carcinogenic Effects - Recreational Exposure to Ambient Sediment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational
	Scenario Timeframe:	Chronic
	Exposure Medium:	Sediment
	Exposure Point:	Ambient
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_rec	50	mg/day
Body Weight	BW	44 3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**12**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Recreational Youth											
Aluminum	34990	9.65E-04	--	--	0	--	--	6.28E-07	--	--	--
Antimony	2.702	7.45E-08	--	--	0	--	--	4.85E-11	--	--	--
Arsenic	17 35	2.87E-07	9.5	2.73E-06	2.97E-07	9 5	2.82E-06	3.12E-10	0.0043	1 34E-12	5 55E-06
Barium	407.1	1.12E-05	--	--	0	--	--	7.31E-09	--	--	--
Beryllium	1.051	2.90E-08	--	--	0	--	--	1.89E-11	0.0024	4 53E-14	4 53E-14
Boron	59.66	1.64E-06	--	--	0	--	--	1.07E-09	--	--	--
Cadmium	0.314	8.66E-09	--	--	1.79E-10	--	--	5.64E-12	0.0042	2 37E-14	2 37E-14
Chromium	120.1	3.31E-06	0	0.00E+00	0	0	0.00E+00	2.16E-09	0	0.00E+00	--
Cobalt	48.88	1.35E-06	--	--	0	--	--	8.78E-10	0.009	7 90E-12	7 90E-12
Copper	87.41	2.41E-06	--	--	0	--	--	1.57E-09	--	--	--
Iron	69509	1.92E-03	--	--	0	--	--	1.25E-06	--	--	--
Lead	20.89	5.76E-07	--	--	0	--	--	3.75E-10	--	--	--
Lithium	41.04	1.13E-06	--	--	0	--	--	7.37E-10	--	--	--
Manganese	1076	2.97E-05	--	--	0	--	--	1.93E-08	--	--	--
Mercury	40 97	1.13E-06	--	--	0	--	--	7.36E-10	--	--	--
Methyl Mercury	0.00578	1.59E-10	--	--	0	--	--	1.04E-13	--	--	--
Molybdenum	0.885	2.44E-08	--	--	0	--	--	1.59E-11	--	--	--
Nickel	220	6.06E-06	--	--	0	--	--	3.95E-09	0.00026	1.03E-12	1.03E-12
Selenium	5.825	1.61E-07	--	--	0	--	--	1.05E-10	--	--	--
Thallium	0.289	7.97E-09	--	--	0	--	--	5.19E-12	--	--	--
Vanadium	76 35	2.10E-06	--	--	0	--	--	1.37E-09	--	--	--
Zinc	130.8	3.61E-06	--	--	0	--	--	2.35E-09	--	--	--
Total Recreational Youth				2.7E-06			2.8E-06			1.0E-11	5.5E-06

Cs = Concentration in Sediment
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-24

Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Exposure to Ambient Sediment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational
	Scenario Timeframe:	Chronic
	Exposure Medium:	Sediment
	Exposure Point:	Ambient
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_rec	50	g/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1 36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**12**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Recreational Youth											
Aluminum	34990	5.63E-03	1.00E+00	5.63E-03	0	1.00E+00	--	3.67E-06	5.00E-03	7.33E-04	6 36E-03
Antimony	2.702	4.34E-07	4.00E-04	1.09E-03	0	4.00E-04	--	2.83E-10	--	--	1.09E-03
Arsenic	17.35	1.67E-06	3.50E-06	4.78E-01	1.73E-06	3.50E-06	4.95E-01	1.82E-09	1 50E-05	1.21E-04	9.73E-01
Barium	407.1	6.55E-05	2.00E-01	3.27E-04	0	2.00E-01	--	4.26E-08	5.00E-04	8.53E-05	4.13E-04
Beryllium	1.051	1.69E-07	2.00E-04	8.45E-04	0	2.00E-04	--	1.10E-10	7.00E-06	1.57E-05	8.61E-04
Boron	59.66	9.59E-06	2.00E-01	4.80E-05	0	2.00E-01	--	6.25E-09	2.00E-02	3.12E-07	4.83E-05
Cadmium	0 314	5.05E-08	1.00E-03	5.05E-05	1.04E-09	1.00E-03	1.04E-06	3.29E-11	1.00E-05	3.29E-06	5.48E-05
Chromium	120.1	1.93E-05	1 50E+00	1.29E-05	0	1 50E+00	--	1.26E-08	--	--	1 29E-05
Cobalt	48.88	7.86E-06	3.00E-04	2.62E-02	0	3.00E-04	--	5.12E-09	6.00E-06	8.53E-04	2.71E-02
Copper	87.41	1.41E-05	4.00E-02	3.51E-04	0	4.00E-02	--	9.16E-09	--	--	3 51E-04
Iron	69509	1.12E-02	7.00E-01	1.60E-02	0	7.00E-01	--	7.28E-06	--	--	1.60E-02
Lead	20.89	3.36E-06	--	--	0	--	--	2.19E-09	--	--	--
Lithium	41.04	6.60E-06	2.00E-03	3.30E-03	0	2.00E-03	--	4.30E-09	--	--	3 30E-03
Manganese	1076	1.73E-04	1.40E-01	1.24E-03	0	1.40E-01	--	1.13E-07	5.00E-05	2.25E-03	3.49E-03
Mercury	40.97	4.48E-07	1.60E-04	2.80E-03	0	1.60E-04	--	4 29E-09	3.00E-06	1.43E-03	4 23E-03
Methyl Mercury	0.00578	9.29E-10	1.00E-04	9.29E-06	0	1.00E-04	--	6.05E-13	--	--	9 29E-06
Molybdenum	0.885	1.42E-07	5.00E-03	2.85E-05	0	5.00E-03	--	9.27E-11	--	--	2.85E-05
Nickel	220	3.54E-05	1.10E-02	3.22E-03	0	1.10E-02	--	2.30E-08	1.40E-05	1.65E-03	4.86E-03
Selenium	5.825	9.37E-07	5.00E-03	1.87E-04	0	5.00E-03	--	6.10E-10	2.00E-02	3.05E-08	1.87E-04
Thallium	0 289	4.65E-08	1.00E-05	4.65E-03	0	1.00E-05	--	3.03E-11	--	--	4.65E-03
Vanadium	76.35	1.23E-05	5.00E-03	2.46E-03	0	5.00E-03	--	8.00E-09	1.00E-04	8.00E-05	2 54E-03
Zinc	130.8	2.10E-05	3.00E-01	7.01E-05	0	3.00E-01	--	1.37E-08	--	--	7.01E-05
Total Recreational Youth				5.5E-01			4.9E-01			7 2E-03	1.05E+00

Cs = Concentration in Sediment
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-25

Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User Low End Fish Ingestion Rate

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational User- Low End Fish Ingestion Rate
	Scenario Timeframe	Chronic
	Exposure Medium:	Fish
	Exposure Point:	Clear Lake
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	350	350	day/year
Exposure Duration	ED	24	6	year
Recreational User - Low End Fish Ingestion Rate	IR fish	42	10	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cfish [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**
Recreational User - Low End Fish Ingestion Rate - Adult				
Mercury	0.322	1.62E-04	0.0001	1.6

	Exposure Route = Oral			
RME Medium EPC Value, Cacorn [mg/kg]	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Adult Plus Child**
Recreational/Resident - Low End Fish Ingestion Rate - Child				
0.322	2.15E-04	0.0001	2.1	3.8

Cfish = Concentration in Fish
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-26

Risk Calculation Worksheet for - NonCarcinogenic Effects - Recreational User High End Fish Ingestion Rate

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Recreational User - High End Fish Ingestion Rate
	Scenario Timeframe:	Chronic
	Exposure Medium:	Fish
	Exposure Point:	Clear Lake
	Receptor Age:	Adult/Child

Exposure Parameter	**Variable**	**Adult Value**	**Child Value**	**Units**
Exposure Frequency	EF	350	350	day/year
Exposure Duration	ED	24	6	year
Recreational/Resident - High End Fish Ingestion Rate	IR fish	142	27	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cfish [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**
Recreational User - High End Fish Ingestion Rate - Adult				
Mercury	0.322	5.48E-04	0.0001	5.5

	Exposure Route = Oral			
RME Medium EPC Value, Cacorn [mg/kg]	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Adult Plus Child**
Recreational User- High End Fish Ingestion Rate - Child				
	5.80E-04	0.0001	5.8	11.3

Cfish = Concentration in Fish
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-27

Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure to On-Mine Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	On-Mine
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_tres	100	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1 36E+09	m^3/kg
Conversion Factor	CF	0.000001	kg/mg
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-}$	Cancer Risk [-]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Exposure Concentration [mg/m^3]	Inhalation Unit Risk [mg/m^3]$^{-1}$	Cancer Risk [-]	Total Cancer Risk [-]
Trespasser											
Aluminum	6757	3.73E-04	--	--	0	--	--	1.21E-07	--	--	--
Antimony	223.3	1.23E-05	--	--	0	--	--	4.01E-09	--	--	--
Arsenic	73.84	2.44E-06	9 5	2 32E-05	9.83E-07	9.5	9.34E-06	1.33E-09	0.0043	5.70E-12	3.25E-05
Barium	241.4	1.33E-05	--	--	0	--	--	4.34E-09	--	--	--
Beryllium	0.18	9.92E-09	--	--	0	--	--	3.23E-12	0.0024	7.76E-15	7.76E-15
Boron	8 2	4.52E-07	--	--	0	--	--	1.47E-10	--	--	--
Cadmium	0.0651	3.59E-09	--	--	2.89E-11	--	--	1.17E-12	0.0042	4 91E-15	4.91E-15
Chromium	26.02	1.43E-06	--	--	0	--	--	4.67E-10	--	--	--
Cobalt	3.264	1.80E-07	--	--	0	--	--	5.86E-11	0.009	5 28E-13	5.28E-13
Copper	26 91	1.48E-06	--	--	0	--	--	4.83E-10	--	--	--
Iron	41862	2.31E-03	--	--	0	--	--	7.52E-07	--	--	--
Lead	17 23	9.50E-07	--	--	0	--	--	3.09E-10	--	--	--
Lithium	1.14	6.28E-08	--	--	0	--	--	2.05E-11	--	--	--
Manganese	164.4	9.06E-06	--	--	0	--	--	2.95E-09	--	--	--
Mercury	629.1	3.47E-06	--	--	0	--	--	1.13E-08	--	--	--
Methyl Mercury	0.00596	3.29E-10	--	--	0	--	--	1.07E-13	--	--	--
Nickel	13.8	7.61E-07	--	--	0	--	--	2.48E-10	0.00026	6.44E-14	6.44E-14
Selenium	0.29	1.60E-08	--	--	0	--	--	5.21E-12	--	--	--
Silver	0.0794	4.38E-09	--	--	0	--	--	1.43E-12	--	--	--
Thallium	0.849	4.68E-08	--	--	0	--	--	1.52E-11	--	--	--
Vanadium	26.85	1.48E-06	--	--	0	--	--	4.82E-10	--	--	--
Zinc	12.41	6.84E-07	--	--	0	--	--	2.23E-10	--	--	--
Total Trespasser				2.3E-05			9.3E-06			6.3E-12	3.3E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-28

Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to On-Mine Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	OnMine
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_tres	100	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	CF	0.000001	kg/mg
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Trespasser											
Aluminum	6757	2.17E-03	1.00E+00	2.17E-03	0	1.00E+00	--	7.08E-07	5.00E-03	1.42E-04	2.31E-03
Antimony	223.3	7.18E-05	4.00E-04	1.80E-01	0	4.00E-04	--	2.34E-08	--	--	1.80E-01
Arsenic	73.84	1.42E-05	3.50E-06	4.07E+00	5.73E-06	3.50E-06	1.64E+00	7.74E-09	1.50E-05	5.16E-04	5.71E+00
Barium	241.4	7.76E-05	2.00E-01	3.88E-04	0	2.00E-01	--	2.53E-08	5.00E-04	5.06E-05	4.39E-04
Beryllium	0.18	5.79E-08	2.00E-04	2.89E-04	0	2.00E-04	--	1.89E-11	7.00E-06	2.69E-06	2.92E-04
Boron	8.2	2.64E-06	2.00E-01	1.32E-05	0	2.00E-01	--	8.59E-10	2.00E-02	4.29E-08	1.32E-05
Cadmium	0.0651	2.09E-08	1.00E-03	2.09E-05	1.69E-10	1.00E-03	1.69E-07	6.82E-12	1.00E-05	6.82E-07	2.18E-05
Chromium	26.02	8.37E-06	1.50E+00	5.58E-06	0	1.50E+00	--	2.73E-09	--	--	5.58E-06
Cobalt	3.264	1.05E-06	3.00E-04	3.50E-03	0	3.00E-04	--	3.42E-10	6.00E-06	5.70E-05	3.56E-03
Copper	26.91	8.65E-06	4.00E-02	2.16E-04	0	4.00E-02	--	2.82E-09	--	--	2.16E-04
Iron	41862	1.35E-02	7.00E-01	1.92E-02	0	7.00E-01	--	4.39E-06	--	--	1.92E-02
Lead	17.23	5.54E-06	--	--	0	--	--	1.80E-09	--	--	--
Lithium	1.14	3.67E-07	2.00E-03	1.83E-04	0	2.00E-03	--	1.19E-10	--	--	1.83E-04
Manganese	164.4	5.29E-05	1.40E-01	3.78E-04	0	1.40E-01	--	1.72E-08	5.00E-05	3.44E-04	7.22E-04
Mercury	629.1	2.02E-05	1.60E-04	1.26E-01	0	1.60E-04	--	6.59E-08	3.00E-05	2.20E-03	1.29E-01
Methyl Mercury	0.00596	1.92E-09	1.00E-04	1.92E-05	0	1.00E-04	--	6.24E-13	--	--	1.92E-05
Nickel	13.8	4.44E-06	1.10E-02	4.03E-04	0	1.10E-02	--	1.45E-09	1.40E-05	1.03E-04	5.07E-04
Selenium	0.29	9.33E-08	5.00E-03	1.87E-05	0	5.00E-03	--	3.04E-11	2.00E-02	1.52E-09	1.87E-05
Thallium	0.849	2.73E-07	1.00E-05	2.73E-02	0	1.00E-05	--	8.89E-11	--	--	2.73E-02
Vanadium	26.85	8.63E-06	5.00E-03	1.73E-03	0	5.00E-03	--	2.81E-09	1.00E-04	2.81E-05	1.76E-03
Zinc	12.41	3.99E-06	3.00E-01	1.33E-05	0	3.00E-01	--	1.30E-09	--	--	1.33E-05
Total Trespasser				4.4E+00			1.6E+00			3.4E-03	6.1E+00

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-29

Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario I formation	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	xposure Medium:	Soil
	xposure Point:	Ambient (PMB -Andesite)
	eceptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_tres	100	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0 2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	CF	0.000001	kg/mg
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Trespasser											
Aluminum	23987	1.32E-03	--	--	0	--	--	4.31E-07	--	--	--
Antimony	1.803	9.94E-08	--	--	0	--	--	3.24E-11	--	--	--
Arsenic	8.716	2.88E-07	9.5	2.74E-06	1.2E-07	9.5	1.10E-06	1.56E-10	0.0043	6.73E-13	3.84E-06
Barium	274 5	1.51E-05	--	--	0	--	--	4.93E-09	--	--	--
Beryllium	1.688	9.31E-08	--	--	0	--	--	3.03E-11	0.0024	7.28E-14	7.28E-14
Boron	174.1	9.60E-06	--	--	0	--	--	3.13E-09	--	--	--
Cadmium	0.233	1.28E-08	--	--	1.0E-10	--	--	4.18E-12	0.0042	1.76E-14	1.76E-14
Chromium	53.08	2.93E-06	--	--	0	--	--	9.53E-10	--	--	--
Cobalt	16.74	9.23E-07	--	--	0	--	--	3.01E-10	0.009	2.71E-12	2.71E-12
Copper	33.76	1.86E-06	--	--	0	--	--	6.06E-10	--	--	--
Iron	27206	1.50E-03	--	--	0	--	--	4.89E-07	--	--	--
Lead	14.54	8.02E-07	--	--	0	--	--	2.61E-10	--	--	--
Lithium	55.15	3.04E-06	--	--	0	--	--	9.90E-10	--	--	--
Manganese	1191	6.57E-05	--	--	0	--	--	2.14E-08	--	--	--
Mercury	13.68	7.54E-07	--	--	0	--	--	2.46E-10	--	--	--
Molybdenum	0.417	2.30E-08	--	--	0	--	--	7.49E-12	--	--	--
Nickel	43.92	2.42E-06	--	--	0	--	--	7.89E-10	0.00026	2.05E-13	2.05E-13
Selenium	6.484	3.57E-07	--	--	0	--	--	1.16E-10	--	--	--
Silver	0.15	8.27E-09	--	--	0	--	--	2.69E-12	--	--	--
Thallium	0.184	1.01E-08	--	--	0	--	--	3.30E-12	--	--	--
Vanadium	67	3.69E-06	--	--	0	--	--	1.20E-09	--	--	--
Zinc	86.14	4.75E-06	--	--	0	--	--	1.55E-09	--	--	--
Total Trespasser				2.7E-06			1.1E-06			3.7E-12	3.8E-06

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-30

Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB -Andesite)
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_rec	100	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Trespasser											
Aluminum	23987	7.71E-03	1.00E+00	7.71E-03	0	1.00E+00	--	2.51E-06	5.00E-03	5.03E-04	8.22E-03
Antimony	1.803	5.80E-07	4.00E-04	1.45E-03	0	4.00E-04	--	1.89E-10	--	--	1.45E-03
Arsenic	8.714	1.68E-06	3 50E-06	4.80E-01	6.8E-07	3 50E-06	1 93E-01	9.13E-10	1.50E-05	6.09E-05	6.74E-01
Barium	274.5	8.83E-05	2.00E-01	4.41E-04	0	2.00E-01	--	2.88E-08	5.00E-04	5.75E-05	4.99E-04
Beryllium	1.688	5.43E-07	2.00E-04	2.71E-03	0	2.00E-04	--	1.77E-10	7.00E-06	2 53E-05	2.74E-03
Boron	174.1	5.60E-05	2.00E-01	2.80E-04	0	2.00E-01	--	1.82E-08	2.00E-02	9.12E-07	2.81E-04
Cadmium	0.233	7.49E-08	1.00E-03	7.49E-05	6.0E-10	1.00E-03	6.03E-07	2.44E-11	1.00E-05	2.44E-06	7.80E-05
Chromium	53.08	1.71E-05	1.50E+00	1.14E-05	0	1.50E+00	--	5.56E-09	--	--	1.14E-05
Cobalt	16.74	5.38E-06	3.00E-04	1.79E-02	0	3.00E-04	--	1.75E-09	6.00E-06	2 92E-04	1.82E-02
Copper	33.76	1.09E-05	4.00E-02	2.71E-04	0	4.00E-02	--	3.54E-09	--	--	2.71E-04
Iron	27206	8.75E-03	7.00E-01	1.25E-02	0	7.00E-01	--	2.85E-06	--	--	1.25E-02
Lead	14 54	4.68E-06	--	--	0	--	--	1.52E-09	--	--	--
Lithium	55.15	1.77E-05	2.00E-03	8.87E-03	0	2.00E-03	--	5.78E-09	--	--	8.87E-03
Manganese	1191	3.83E-04	1.40E-01	2.74E-03	0	1.40E-01	--	1.25E-07	5.00E-05	2.50E-03	5.23E-03
Mercury	35	1.13E-06	1.60E-04	7.03E-03	0	1.60E-04	--	1.43E-09	3.00E-05	4.78E-05	7.16E-03
Molybdenum	0.417	1.34E-07	5.00E-03	2.68E-05	0	5.00E-03	--	4.37E-11	--	--	2.68E-05
Nickel	43 92	1.41E-05	1.10E-02	1.28E-03	0	1.10E-02	--	4.60E-09	1.40E-05	3.29E-04	1.61E-03
Selenium	6.484	2.09E-06	5.00E-03	4.17E-04	0	5.00E-03	--	6.79E-10	2.00E-02	3.40E-08	4.17E-04
Silver	0.15	4.82E-08	5.00E-03	9.65E-06	0	5.00E-03	--	1.57E-11	--	--	9.65E-06
Thallium	0.184	5.92E-08	1.00E-05	5.92E-03	0	1.00E-05	--	1.93E-11	--	--	5.92E-03
Vanadium	67	2.15E-05	5.00E-03	4.31E-03	0	5.00E-03	--	7.02E-09	1.00E-04	7.02E-05	4.38E-03
Zinc	86.14	2.77E-05	3.00E-01	9.23E-05	0	3.00E-01	--	9.02E-09	--	--	9.23E-05
Total Trespasser				5.5E-01			1.9E-01			3 9E-03	7 5E-01

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-31

Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure Scenario in Herman Impoundment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Scenario Timeframe:	Current/Future
	Receptor Population:	Trespasser
	xposure Medium:	Herman Impoundment Surface Water
	eceptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	12	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	1.14E+01	2.0E-04	N/A	---
Antimony	2.77E-03	4.8E-08	N/A	---
Arsenic	4.72E-03	8.2E-08	9.5E+00	7.8E-07
Barium	3.91E-02	6.8E-07	N/A	---
Beryllium	2.16E-02	3.8E-07	N/A	---
Boron	5.00E+02	8.7E-03	N/A	---
Cadmium	3.90E-04	6.8E-09	N/A	---
Chromium II	3.30E-03	5.8E-08	N/A	---
Cobalt	1.70E-01	3.0E-06	N/A	---
Copper	6.70E-03	1.2E-07	N/A	---
Fluoride	9.30E-01	1.6E-05	N/A	---
Iron	4.46E+00	7.8E-05	N/A	---
Lithium	3.73E+00	6.5E-05	N/A	---
Manganese	1.03E+01	1.8E-04	N/A	---
Mercury	4.18E-03	7.3E-08	N/A	---
Nickel	4.55E-01	7.9E-06	N/A	---
Selenium	1.26E-02	2.2E-07	N/A	---
Zinc	4.85E-01	8.5E-06	N/A	---
				7.8E-07

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	1.38E+01	0.0E+00	N/A	---	---
Antimony	2.40E-03	4.1E-09	N/A	---	---
Arsenic	3.37E-03	0.0E+00	9.5E+00	0.0E+00	7.8E-07
Barium	3.81E-02	6.5E-08	N/A	---	---
Beryllium	1.48E-02	2.5E-08	N/A	---	---
Boron	4.75E+02	8.1E-04	N/A	---	---
Cadmium	4.79E-04	8.2E-10	N/A	---	---
Chromium III	2.90E-03	4.9E-09	N/A	---	---
Cobalt	1.65E-01	0.0E+00	N/A	---	---
Copper	6.42E-03	1.1E-08	N/A	---	---
Fluoride	0.00E+00	0.0E+00	N/A	---	---
Iron	4.33E+00	0.0E+00	N/A	---	---
Lithium	3.37E+00	0.0E+00	N/A	---	---
Manganese	1.01E+01	1.7E-05	N/A	---	---
Mercury	5.44E-04	9.3E-10	N/A	---	---
Nickel	4.35E-01	1.5E-07	N/A	---	---
Selenium	1.28E-02	2.2E-08	N/A	---	---
Zinc	4.53E-01	0.0E+00	N/A	---	---
				0.0E+00	7.8E-07

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-32

Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure Scenario in Herman Impoundment

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Trespasser
	Exposure Medium:	Herman Impoundment Surface Water
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal				Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	RME Medium EPC Value, Cw (mg/L)	Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics									
Aluminum	1.14E+01	1.2E-03	1.0E+00	1.2E-03	1.38E+01	0.0E+00	1.0E+00	0.0E+00	1.16E-03
Antimony	2.77E-03	2.8E-07	4.0E-04	7.0E-04	2.40E-03	2.4E-08	4.0E-04	6.0E-05	7.65E-04
Arsenic	4.72E-03	4.8E-07	3.5E-06	1.4E-01	3.37E-03	0.0E+00	3.5E-06	0.0E+00	1.37E-01
Barium	3.91E-02	4.0E-06	2.0E-01	2.0E-05	3.81E-02	3.8E-07	1.4E-02	2.7E-05	4.69E-05
Beryllium	2.16E-02	2.2E-06	2.0E-04	1.1E-02	1.48E-02	1.5E-07	1.4E-06	1.1E-01	1.16E-01
Cadmium	3.90E-04	4.0E-08	5.0E-04	7.9E-05	4.79E-04	4.8E-09	2.5E-05	1.9E-04	2.70E-04
Chromium III	3.30E-03	3.4E-07	1.5E+00	2.2E-07	2.90E-03	2.9E-08	2.0E-02	1.5E-06	1.70E-06
Cobalt	1.70E-01	1.7E-05	3.0E-04	5.8E-02	1.65E-01	0.0E+00	3.0E-04	0.0E+00	5.76E-02
Copper	6.70E-03	6.8E-07	4.0E-02	1.7E-05	6.42E-03	6.4E-08	4.0E-02	1.6E-06	1.86E-05
Fluoride	9.30E-01	9.5E-05	4.0E-02	2.4E-03	0.00E+00	0.0E+00	4.0E-02	0.0E+00	2.36E-03
Iron	4.46E+00	4.5E-04	7.0E-01	6.5E-04	4.33E+00	0.0E+00	7.0E-01	0.0E+00	6.47E-04
Lithium	3.73E+00	3.8E-04	2.0E-03	1.9E-01	3.37E+00	0.0E+00	2.0E-03	0.0E+00	1.90E-01
Manganese	1.03E+01	1.0E-03	2.4E-02	4.3E-02	1.01E+01	1.0E-04	2.4E-02	4.2E-03	4.76E-02
Mercury	4.18E-03	4.2E-07	1.6E-04	2.7E-03	5.44E-04	5.4E-09	1.1E-05	4.8E-04	3.14E-03
Nickel	4.55E-01	4.6E-05	1.1E-02	4.2E-03	4.35E-01	8.6E-07	4.4E-04	2.0E-03	6.17E-03
Selenium	1.26E-02	1.3E-06	5.0E-03	2.6E-04	1.28E-02	1.3E-07	5.0E-03	2.5E-05	2.82E-04
Zinc	4.85E-01	4.9E-05	3.0E-01	1.6E-04	4.53E-01	0.0E+00	3.0E-01	0.0E+00	1.64E-04
Total Trespasser				4.5E-01				1.1E-01	5.6E-01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-33

Risk Calculation Worksheet for - Carcinogenic Effects - Trespasser Exposure Scenario - Background (Geothemal Wells)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Trespasser
	Exposure Medium:	Geothermal Wells
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	12	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	6.55E-02	1.1E-06	N/A	---
Antimony	5.29E-03	9 2E-08	N/A	---
Arsenic	1.84E-02	3 2E-07	9.5E+00	3.0E-06
Barium	2.18E+00	3.8E-05	N/A	---
Beryllium	2.85E-04	5.0E-09	N/A	---
Boron	6.79E+02	1 2E-02	N/A	---
Cadmium	1.92E-04	3 3E-09	N/A	---
Chromium III	2.11E-03	3.7E-08	N/A	---
Cobalt	1.48E-03	2.6E-08	N/A	---
Copper	4.77E-03	8 3E-08	N/A	---
Iron	2.64E+00	4.6E-05	N/A	---
Lithium	4 93E+00	8.6E-05	N/A	---
Manganese	2.67E-01	4.7E-06	N/A	---
Mercury	1.46E-03	2 5E-08	N/A	---
Molybdenum	1.52E-03	2.7E-08	N/A	---
Nickel	5.55E-03	9.7E-08	N/A	---
Selenium	1.56E-02	2.7E-07	N/A	---
Silver	4.00E-05	7.0E-10	N/A	---
Thallium	1.61E-03	2.8E-08	N/A	---
Vanadium	2.67E-03	4.7E-08	N/A	---
Zinc	1.16E-02	2.0E-07	N/A	---
Total Trespasser				3.0E-06

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	6 55E-02	0.0E+00	N/A	---	---
Antimony	5 29E-03	9.0E-09	N/A		---
Arsenic	1.84E-02	0.0E+00	9.5E+00	0.0E+00	3.0E-06
Barium	2.18E+00	3.7E-06	N/A	---	---
Beryllium	2.85E-04	4 9E-10	N/A	---	---
Boron	6.79E+02	0.0E+00	N/A	---	---
Cadmium	1 92E-04	3 3E-10	N/A	---	---
Chromium III	2.11E-03	3.6E-09	N/A	---	---
Cobalt	1.48E-03	1.0E-09	N/A	---	---
Copper	4.77E-03	8.1E-09	N/A	---	---
Iron	2.64E+00	0.0E+00	N/A	---	---
Lithium	4.93E+00	0.0E+00	N/A	---	---
Manganese	2.67E-01	4.6E-07	N/A	---	---
Mercury	1.46E-03	2 5E-09	N/A	---	---
Molybdenum	1 52E-03	0.0E+00	N/A	---	---
Nickel	5 55E-03	1 9E-09	N/A	---	---
Selenium	1 56E-02	2.7E-08	N/A	---	---
Silver	4.00E-05	4.1E-11	N/A	---	---
Thallium	1.61E-03	0.0E+00	N/A	---	---
Vanadium	2.67E-03	4 5E-09	N/A	---	---
Zinc	1.16E-02	0.0E+00	N/A	---	---
				0.0E+00	3.0E-06

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-34

Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure Scenario - Background (Geothemal Wells)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Trespasser
	Exposure Medium:	Geothermal Wells
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cw (mg/L)**	**Chronic Daily Intake mg/kg-day)**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**
Inorganics				
Aluminum	6.55E-02	6.7E-06	1.0E+00	6.7E-06
Antimony	5.29E-03	5.4E-07	4.0E-04	1.3E-03
Arsenic	1.84E-02	1.9E-06	3.5E-06	5.3E-01
Barium	2.18E+00	2.2E-04	2.0E-01	1.1E-03
Beryllium	2.85E-04	2.9E-08	2.0E-04	1.4E-04
Boron	6.79E+02	6.9E-02	2.0E-01	3.5E-01
Cadmium	1.92E-04	2.0E-08	5.0E-04	3.9E-05
Chromium III	2.11E-03	2.1E-07	1.5E+00	1.4E-07
Cobalt	1.48E-03	1.5E-07	3.0E-04	5.0E-04
Copper	4.77E-03	4.9E-07	4.0E-02	1.2E-05
Iron	2.64E+00	2.7E-04	7.0E-01	3.8E-04
Lithium	4.93E+00	5.0E-04	2.0E-03	2.5E-01
Manganese	2.67E-01	2.7E-05	2.4E-02	1.1E-03
Mercury	1.46E-03	1.5E-07	1.6E-04	9.3E-04
Molybdenum	1.52E-03	1.5E-07	5.0E-03	3.1E-05
Nickel	5.55E-03	5.6E-07	1.1E-02	5.1E-05
Selenium	1.56E-02	1.6E-06	5.0E-03	3.2E-04
Silver	4.00E-05	4.1E-09	5.0E-03	8.1E-07
Thallium	1.61E-03	1.6E-07	1.0E-05	1.6E-02
Vanadium	2.67E-03	2.7E-07	5.0E-03	5.4E-05
Zinc	1.16E-02	1.2E-06	3.0E-01	3.9E-06
Total Trespasser				1.2E+00

		Exposure Route = Dermal			
hemical o Poten ial Conce n	**RME Medi m EPC V lue, Cw (mg L)**	**Chronic Daily Intake (mg/kg-day)**	**Reference Dose [mg/kg/day**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Inorganics					
Aluminum	6.55E-02	0.0E+00	1.0E+00	0.0E+00	6.66E-06
Antimony	5.29E-03	5.3E-08	4.0E-04	1.3E-04	1.48E-03
Arsenic	1.84E-02	0.0E+00	3.5E-06	0.0E+00	5.33E-01
Barium	2.18E+00	2.2E-05	1.4E-02	1.5E-03	2.65E-03
Beryllium	2.85E-04	2.8E-09	1.4E-06	2.0E-03	2.17E-03
Boron	6.79E+02	0.0E+00	2.0E-01	0.0E+00	3.45E-01
Cadmium	1.92E-04	1.9E-09	2.5E-05	7.6E-05	1.15E-04
Chromium II	2.11E-03	2.1E-08	2.0E-02	1.1E-06	1.22E-06
Cobalt	1.48E-03	5.9E-09	2.5E-05	2.3E-04	7.35E-04
Copper	4.77E-03	4.7E-08	3.0E-04	1.6E-04	1.70E-04
Iron	2.64E+00	0.0E+00	4.0E-02	0.0E+00	3.84E-04
Lithium	4.93E+00	0.0E+00	2.0E-03	0.0E+00	2.51E-01
Manganese	2.67E-01	2.7E-06	2.4E-02	1.1E-04	1.24E-03
Mercury	1.46E-03	1.5E-08	1.1E-05	1.3E-03	2.22E-03
Molybdenum	1.52E-03	0.0E+00	5.0E-03	0.0E+00	3.09E-05
Nickel	5.55E-03	1.1E-08	4.4E-04	2.5E-05	7.64E-05
Selenium	1.56E-02	0.0E+00	5.0E-03	0.0E+00	3.18E-04
Silver	4.00E-05	0.0E+00	2.0E-04	0.0E+00	8.13E-07
Thallium	1.61E-03	0.0E+00	1.0E-05	0.0E+00	1.63E-02
Vanadium	2.67E-03	2.7E-08	1.3E-04	2.0E-04	2.58E-04
Zinc	1.16E-02	0.0E+00	3.0E-01	0.0E+00	3.93E-06
				5.8E-03	1.2E+00

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-35

Risk Calculation Worksheet for - NonCarcinogenic Effects - Trespasser Exposure to Vapors

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	On-Site Mercury Vapors
	Receptor Age:	Youth

Exposure Parameter	**Variable**	**Adult Value**	**Units**
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Exposure Time	ET	1	hours/day
Conversion Factor	CF	0.0001	kg/g
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Inhalation		
Chemical of Potential Concern	**RME Medium EPC Value, Cv (mg/m^3)**	**Chronic Daily Intake (mg/m^3)**	**Reference Concentration (mg/m^3)**	**Hazard Quotient [-]**
Trespasser - Youth				
Mercury	0.035	2.08E-04	0.3	0.0007

Cv = Concentration in Vapor

mg/m^3 = micrograms per cubic meter

RME = reasonable maximum exposure

EPC = exposure point concentration

Table C-36

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Adult Exposure to Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Elem Indian Colony
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Incidental Ingestion Rate	IR_res_a	400	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	CF	0.000001	kg/mg
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	70	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk**
Tribal Adult											
Aluminum	27446.4	1.37E-01	--	--	0	--	--	2.02E-05	--	--	--
Antimony	2.972	1.49E-05	--	--	0	--	--	2.19E-09	--	--	--
Arsenic	4.2284	1.27E-05	9.5	1.21E-04	6.70E-07	9.5	6.36E-06	3.11E-09	0.0043	1.34E-11	1.27E-04
Barium	244.28	1.22E-03	--	--	0	--	--	1.80E-07	--	--	--
Beryllium	0.4096	2.05E-06	--	--	0	--	--	3.01E-10	0.0024	7.23E-13	7.23E-13
Cadmium	0.3052	1.53E-06	--	--	1.61E-09	--	--	2.24E-10	0.0042	9.43E-13	9.43E-13
Chromium	78.958	3.95E-04	--	--	0	--	--	5.81E-08	--	--	--
Cobalt	9.3728	4.69E-05	--	--	0	--	--	6.89E-09	0.009	6.20E-11	6.20E-11
Copper	73	3.65E-04	--	--	0	--	--	5.37E-08	--	--	--
Iron	23224	1.16E-01	--	--	0	--	--	1.71E-05	--	--	--
Lead	15.5304	7.77E-05	--	--	0	--	--	1.14E-08	--	--	--
Manganese	537.4	2.69E-03	--	--	0	--	--	3.95E-07	--	--	--
Mercury	10.4282	5.21E-05	--	--	0	--	--	7.67E-09	--	--	--
Nickel	35.92	1.80E-04	--	--	0	--	--	2.64E-08	0.00026	6.87E-12	6.87E-12
Selenium	0.7806	3.90E-06	--	--	0	--	--	5.74E-10	--	--	--
Silver	0.08376	4.19E-07	--	--	0	--	--	6.16E-11	--	--	--
Thallium	1.8722	9.36E-06	--	--	0	--	--	1.38E-09	--	--	--
Vanadium	79.682	3.98E-04	--	--	0	--	--	5.86E-08	--	--	--
Zinc	54.418	2.72E-04	--	--	0	--	--	4.00E-08	--	--	--
Total Tribal Adult				1.2E-04			6.4E-06			8.4E-11	1.3E-04

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-37

Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Adult Exposure to Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Elem Indian Colony
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Incidental Ingestion Rate	IR_rec	400	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**70**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]	Hazard Quotient [-]	Total Hazard Quotient [-]
Tribal Adult											
Aluminum	27446.4	1.37E-01	1.00E+00	1.37E-01	0	1.00E+00	--	2.02E-05	5.00E-03	4.04E-03	1.41E-01
Antimony	2.972	1.49E-05	4.00E-04	3.72E-02	0	4.00E-04	--	2.19E-09	--	--	3.72E-02
Arsenic	4.2284	1.27E-05	3.50E-06	3.62E+00	6.70E-07	3.50E-06	1.91E-01	3.11E-09	1.50E-05	2.07E-04	3.82E+00
Barium	244.28	1.22E-03	2.00E-01	6.11E-03	0	2.00E-01	--	1.80E-07	5.00E-04	3.59E-04	6.47E-03
Beryllium	0.4096	2.05E-06	2.00E-04	1.02E-02	0	2.00E-04	--	3.01E-10	7.00E-06	4.30E-05	1.03E-02
Cadmium	0.3052	1.53E-06	1.00E-03	1.53E-03	1.61E-09	1.00E-03	1.61E-06	2.24E-10	1.00E-05	2.24E-05	1.55E-03
Chromium	78.958	3.95E-04	1.50E+00	2.63E-04	0	1.50E+00	--	5.81E-08	--	--	2.63E-04
Cobalt	9.3728	4.69E-05	3.00E-04	1.56E-01	0	3.00E-04	--	6.89E-09	6.00E-06	1.15E-03	1.57E-01
Copper	73	3.65E-04	4.00E-02	9.13E-03	0	4.00E-02	--	5.37E-08	--	--	9.13E-03
Iron	23224	1.16E-01	7.00E-01	1.66E-01	0	7.00E-01	--	1.71E-05	--	--	1.66E-01
Lead	15.5304	7.77E-05	--	--	0	--	--	1.14E-08	--	--	--
Manganese	537.4	2.69E-03	1.40E-01	1.92E-02	0	1.40E-01	--	3.95E-07	5.00E-05	7.90E-03	2.71E-02
Mercury	10.4282	6.26E-06	1.60E-04	3.91E-02	0	1.60E-04	--	7.67E-09	3.00E-05	2.56E-04	3.94E-02
Nickel	35.92	1.80E-04	1.10E-02	1.63E-02	0	1.10E-02	--	2.64E-08	1.40E-05	1.89E-03	1.82E-02
Selenium	0.7806	3.90E-06	5.00E-03	7.81E-04	0	5.00E-03	--	5.74E-10	2.00E-02	2.87E-08	7.81E-04
Silver	0.08376	4.19E-07	5.00E-03	8.38E-05	0	5.00E-03	--	6.16E-11	--	--	8.38E-05
Thallium	1.8722	9.36E-06	1.00E-05	9.36E-01	0	1.00E-05	--	1.38E-09	--	--	9.36E-01
Vanadium	79.682	3.98E-04	5.00E-03	7.97E-02	0	5.00E-03	--	5.86E-08	1.00E-04	5.86E-04	8.03E-02
Zinc	54.418	2.72E-04	3.00E-01	9.07E-04	0	3.00E-01	--	4.00E-08	--	--	9.07E-04
Total Adult Resident				**5.2E+00**			**1.9E-01**			**1.6E-02**	**5.4E+00**

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-38

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Child Exposure to Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	xposure Medium:	Soil
	xposure Point:	Elem Indian Colony
	eceptor Age:	Child

Exposure Parameter	**Variable**	**Child Value**	**Units**
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_res	400	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			**Exposure Route = Dermal**			**Exposure Route = Inhalation**			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor $[mg/kg/day]^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration $[mg/m^3]$**	**Inhalation Unit Risk $[mg/m^3]^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Aluminum	27446.4	6.27E-02	--	--	0	--	--	1.73E-06	--	--	--
Antimony	2.972	6.79E-06	--	--	0	--	--	1.87E-10	--	--	--
Arsenic	4.2284	5.80E-06	9.5	5.51E-05	3.44E-07	9.5	3.27E-06	2.66E-10	0.0043	1.15E-12	5.84E-05
Barium	244.28	5.58E-04	--	--	0	--	--	1.54E-08	--	--	--
Beryllium	0.4096	9.36E-07	--	--	0	--	--	2.58E-11	0.0024	6.20E-14	6.20E-14
Cadmium	0.3052	6.98E-07	--	--	8.28E-10	--	--	1.92E-11	0.0042	8.08E-14	8.08E-14
Chromium	78.958	1.80E-04	--	--	0	--	--	4.98E-09	--	--	--
Cobalt	9.3728	2.14E-05	--	--	0	--	--	5.91E-10	0.009	5.32E-12	5.32E-12
Copper	73	1.67E-04	--	--	0	--	--	4.60E-09	--	--	--
Iron	23224	5.31E-02	--	--	0	--	--	1.46E-06	--	--	--
Lead	15.5304	3.55E-05	--	--	0	--	--	9.79E-10	--	--	--
Manganese	537.4	1.23E-03	--	--	0	--	--	3.39E-08	--	--	--
Mercury	10.4282	2.38E-05	--	--	0	--	--	6.57E-10	--	--	--
Nickel	35.92	8.21E-05	--	--	0	--	--	2.26E-09	0.00026	5.89E-13	5.89E-13
Selenium	0.7806	1.78E-06	--	--	0	--	--	4.92E-11	--	--	--
Silver	0.08376	1.91E-07	--	--	0	--	--	5.28E-12	--	--	--
Thallium	1.8722	4.28E-06	--	--	0	--	--	1.18E-10	--	--	--
Vanadium	79.682	1.82E-04	--	--	0	--	--	5.02E-09	--	--	--
Zinc	54.418	1.24E-04	--	--	0	--	--	3.43E-09	--	--	--
Total Child Resident				5.5E-05			3.3E-06			7.2E-12	5.8E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-39

Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Child Exposure to Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario formation	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Elem Indian Colony
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	400	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [$mg/m^3]^{-1}$	Hazard Quotient [-]	Total Hazard Quotient [-]
Tribal Child											
Aluminum	27446.4	7.32E-01	1.00E+00	7.32E-01	0	1.00E+00	--	2.02E-05	5.00E-03	4.04E-03	7.36E-01
Antimony	2.972	7.93E-05	4.00E-04	1.98E-01	0	4.00E-04	--	2.19E-09	--	--	1.98E-01
Arsenic	4.2284	6.77E-05	3.50E-06	1.93E+01	4.0E-06	3.50E-06	1.15E+00	3.11E-09	1.50E-05	2.07E-04	2.05E+01
Barium	244.28	6.51E-03	2.00E-01	3.26E-02	0	2.00E-01	--	1.80E-07	5.00E-04	3.59E-04	3.29E-02
Beryllium	0.4096	1.09E-05	2.00E-04	5.46E-02	0	2.00E-04	--	3.01E-10	7.00E-06	4.30E-05	5.47E-02
Cadmium	0.3052	8.14E-06	1.00E-03	8.14E-03	9.7E-09	1.00E-03	9.66E-06	2.24E-10	1.00E-05	2.24E-05	8.17E-03
Chromium	78.958	2.11E-03	1.50E+00	1.40E-03	0	1.50E+00	--	5.81E-08	--	--	1.40E-03
Cobalt	9.3728	2.50E-04	3.00E-04	8.33E-01	0	3.00E-04	--	6.89E-09	6.00E-06	1.15E-03	8.34E-01
Copper	73	1.95E-03	4.00E-02	4.87E-02	0	4.00E-02	--	5.37E-08	--	--	4.87E-02
Iron	23224	6.19E-01	7.00E-01	8.85E-01	0	7.00E-01	--	1.71E-05	--	--	8.85E-01
Lead	15.5304	4.14E-04	--	--	0	--	--	1.14E-08	--	--	--
Manganese	537.4	1.43E-02	1.40E-01	1.02E-01	0	1.40E-01	--	3.95E-07	5.00E-05	7.90E-03	1.10E-01
Mercury	10.4282	3.34E-05	1.60E-04	2.09E-01	0	1.60E-04	--	7.67E-09	3.00E-05	2.56E-04	2.09E-01
Nickel	35.92	9.58E-04	1.10E-02	8.71E-02	0	1.10E-02	--	2.64E-08	1.40E-05	1.89E-03	8.90E-02
Selenium	0.7806	2.08E-05	5.00E-03	4.16E-03	0	5.00E-03	--	5.74E-10	2.00E-02	2.87E-08	4.16E-03
Silver	0.08376	2.23E-06	5.00E-03	4.47E-04	0	5.00E-03	--	6.16E-11	--	--	4.47E-04
Thallium	1.8722	4.99E-05	1.00E-05	4.99E+00	0	1.00E-05	--	1.38E-09	--	--	4.99E+00
Vanadium	79.682	2.12E-03	5.00E-03	4.25E-01	0	5.00E-03	--	5.86E-08	1.00E-04	5.86E-04	4.26E-01
Zinc	54.418	1.45E-03	3.00E-01	4.84E-03	0	3.00E-01	--	4.00E-08	--	--	4.84E-03
Total Child Resident				**2.7E+01**			**1.1E+00**			**1.2E-02**	**2.8E+01**

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-40

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Adult Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Andesite (PMB)
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Incidental Ingestion Rate	R_rec	400	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	70	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Tribal Adult											
Aluminum	23987	1.20E-01	--	--	0	--	--	1.76E-05	--	--	--
Antimony	1.803	9.02E-06	--	--	0	--	--	1.33E-09	--	--	--
Arsenic	8.714	2.61E-05	9.5	2.48E-04	1.4E-06	9.5	1.31E-05	6.41E-09	0.0043	2.76E-11	2.61E-04
Barium	274.5	1.37E-03	--	--	0	--	--	2.02E-07	--	--	--
Beryllium	1.688	8.44E-06	--	--	0	--	--	1.24E-09	0.0024	2 98E-12	2.98E-12
Boron	174.1	8.71E-04	--	--	0	--	--	1.28E-07	--	--	--
Cadmium	0 233	1.17E-06	--	--	1.2E-09	--	--	1.71E-10	0.0042	7 20E-13	7.20E-13
Chromium	53.08	2.65E-04	--	--	0	--	--	3.90E-08	--	--	--
Cobalt	16.74	8.37E-05	--	--	0	--	--	1.23E-08	0.009	1.11E-10	1.11E-10
Copper	33.76	1.69E-04	--	--	0	--	--	2.48E-08	--	--	--
Iron	27206	1.36E-01	--	--	0	--	--	2.00E-05	--	--	--
Lead	14.54	7.27E-05	--	--	0	--	--	1.07E-08	--	--	--
Lithium	55.15	2.76E-04	--	--	0	--	--	4.06E-08	--	--	--
Manganese	1191	5.96E-03	--	--	0	--	--	8.76E-07	--	--	--
Mercury	13.68	6.84E-05	--	--	0	--	--	1.01E-08	--	--	--
Molybdenum	0.417	2.09E-06	--	--	0	--	--	3.07E-10	--	--	--
Nickel	43.92	2.20E-04	--	--	0	--	--	3.23E-08	0.00026	8.40E-12	8.40E-12
Selenium	6.484	3.24E-05	--	--	0	--	--	4.77E-09	--	--	--
Silver	0.15	7.50E-07	--	--	0	--	--	1.10E-10	--	--	--
Thallium	0.184	9.20E-07	--	--	0	--	--	1.35E-10	--	--	--
Vanadium	67	3.35E-04	--	--	0	--	--	4.93E-08	--	--	--
Zinc	86.14	4.31E-04	--	--	0	--	--	6.33E-08	--	--	--
Total Tribal Adult				2.5E-04			1.3E-05			1.5E-10	2.6E-04

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-41

Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Adult Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Andesite (PMB)
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Incidental Ingestion Rate	R_rec	400	mg/day
Body Weight	BW	80	kg
Skin Surface Area	SA	6032	cm^2/day
Adherence Factor	AF	0.07	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	70	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	RME Medium EPC Value, Cs [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Chronic Daily Intake [mg/m^3]	Reference Concentration [mg/m^3]$^{-1}$	Hazard Quotient [-]	Total Hazard Quotient [-]
Tribal Adult											
Aluminum	23987	1 20E-01	1.00E+00	1.20E-01	0	1.00E+00	--	1.76E-05	5.00E-03	3.53E-03	1.23E-01
Antimony	1.803	9.02E-06	4.00E-04	2.25E-02	0	4.00E-04	--	1 33E-09	--	--	2.25E-02
Arsenic	8.714	2.61E-05	3 50E-06	7.47E+00	1.38E-06	3.50E-06	3 94E-01	6.41E-09	1.50E-05	4.27E-04	7.86E+00
Barium	274 5	1 37E-03	2.00E-01	6.86E-03	0	2.00E-01	--	2.02E-07	5.00E-04	4.04E-04	7.27E-03
Beryllium	1.688	8.44E-06	2.00E-04	4.22E-02	0	2.00E-04	--	1 24E-09	7.00E-06	1.77E-04	4.24E-02
Boron	174.1	8.71E-04	2.00E-01	4.35E-03	0	2.00E-01	--	1 28E-07	2.00E-02	6.40E-06	4.36E-03
Cadmium	0.233	1.17E-06	1.00E-03	1.17E-03	1.23E-09	1.00E-03	1 23E-06	1.71E-10	1.00E-05	1.71E-05	1.18E-03
Chromium	53.08	2.65E-04	1 50E+00	1.77E-04	0	1 50E+00	--	3 90E-08	--	--	1.77E-04
Cobalt	16.74	8 37E-05	3.00E-04	2.79E-01	0	3.00E-04	--	1 23E-08	6.00E-06	2.05E-03	2.81E-01
Iron	27206	1 36E-01	7.00E-01	1.94E-01	0	7.00E-01	--	2.00E-05	--	--	1.94E-01
Lead	14.54	7 27E-05	--	--	0	--	--	1.07E-08	--	--	--
Lithium	55.15	2.76E-04	2.00E-03	1.38E-01	0	2.00E-03	--	4.06E-08	--	--	1.38E-01
Manganese	1191	5 96E-03	1.40E-01	4.25E-02	0	1.40E-01	--	8.76E-07	5.00E-05	1.75E-02	6.01E-02
Mercury	13.68	8 21E-06	1.60E-04	5.13E-02	0	1.60E-04	--	1.01E-08	3.00E-05	3.35E-04	5.16E-02
Molybdenum	0.417	2.09E-06	5.00E-03	4.17E-04	0	5.00E-03	--	3.07E-10	--	--	4.17E-04
Nickel	43.92	2 20E-04	1.10E-02	2.00E-02	0	1.10E-02	--	3 23E-08	1.40E-05	2.31E-03	2.23E-02
Selenium	6.484	3 24E-05	5.00E-03	6.48E-03	0	5.00E-03	--	4.77E-09	2.00E-02	2.38E-07	6.48E-03
Silver	0.15	7 50E-07	5.00E-03	1.50E-04	0	5.00E-03	--	1.10E-10	--	--	1.50E-04
Thallium	0.184	9 20E-07	1.00E-05	9.20E-02	0	1.00E-05	--	1 35E-10	--	--	9.20E-02
Vanadium	67	3 35E-04	5.00E-03	6.70E-02	0	5.00E-03	--	4 93E-08	1.00E-04	4.93E-04	6.75E-02
Zinc	86.14	4 31E-04	3.00E-01	1.44E-03	0	3.00E-01	--	6 33E-08	--	--	1.44E-03
Vanadium	67	3 35E-04	5.00E-03	6.70E-02	0	5.00E-03	--	4 93E-08	1.00E-04	4.93E-04	6.75E-02
Zinc	86.14	4 31E-04	3.00E-01	1.44E-03	0	3.00E-01	--	6 33E-08	--	--	1.44E-03
Total Adult Resident				8.6E+00			3.9E-01			2.8E-02	9.0E+00

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-42

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Child Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB - Andesite)
	Receptor Age:	Child

Exposure Parameter	**Variable**	**Child Value**	**Units**
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	400	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	6	year

Risk Calculations

		Exposure Route = Oral			**Exposure Route = Dermal**			**Exposure Route = Inhalation**			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Child Resident											
Aluminum	23987	5.48E-02	--	--	0	--	--	1.51E-06	--	--	--
Antimony	1.803	4.12E-06	--	--	0	--	--	1.14E-10	--	--	--
Arsenic	8.714	1.20E-05	9.5	1.14E-04	7.09E-07	9.5	6.74E-06	5.49E-10	0.0043	2.36E-12	1.20E-04
Barium	274.5	6.27E-04	--	--	0	--	--	1.73E-08	--	--	--
Beryllium	1.688	3.86E-06	--	--	0	--	--	1.06E-10	0.0024	2.55E-13	2.55E-13
Boron	174.1	3.98E-04	--	--	0.00E+00	--	--	1.10E-08	--	--	--
Cadmium	0.233	5.33E-07	--	--	6.31896E-10	--	--	1.47E-11	0.0042	6.17E-14	6.17E-14
Chromium	53.08	1.21E-04	--	--	0	--	--	3.35E-09	--	--	--
Cobalt	16.74	3.83E-05	--	--	0	--	--	1.06E-09	0.009	9.50E-12	9.50E-12
Copper	33.76	7.72E-05	--	--	0	--	--	2.13E-09	--	--	--
Iron	27206	6.22E-02	--	--	0	--	--	1.71E-06	--	--	--
Lead	14.54	3.32E-05	--	--	0	--	--	9.16E-10	--	--	--
Lithium	55.15	1.26E-04	--	--	0	--	--	3.48E-09	--	--	--
Manganese	1191	2.72E-03	--	--	0	--	--	7.51E-08	--	--	--
Mercury	13.68	3.13E-05	--	--	0	--	--	8.62E-10	--	--	--
Molybdenum	0.417	9.53E-07	--	--	0	--	--	2.63E-11	--	--	--
Nickel	43.92	1.00E-04	--	--	0	--	--	2.77E-09	0.00026	7.20E-13	7.20E-13
Selenium	6.484	1.48E-05	--	--	0	--	--	4.09E-10	--	--	--
Silver	0.15	3.43E-07	--	--	0	--	--	9.45E-12	--	--	--
Thallium	0.184	4.21E-07	--	--	0	--	--	1.16E-11	--	--	--
Vanadium	67	1.53E-04	--	--	0	--	--	4.22E-09	--	--	--
Total Child Resident				1.1E-04			6.7E-06			1.3E-11	1.2E-04

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-43

Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Child Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal
	Scenario Timeframe	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB - Andesite)
	Receptor Age:	Child

Exposure Parameter	Variable	Child Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Incidental Ingestion Rate	IR_rec	400	mg/day
Body Weight	BW	15	kg
Skin Surface Area	SA	2373	cm^2/day
Adherence Factor	AF	0 2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinoge	**ATnc**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Tribal Child											
Aluminum	23987	6.40E-01	1.00E+00	6.40E-01	0	1.00E+00	--	1.76E-05	5.00E-03	3.53E-03	6.43E-01
Antimony	1.803	4.81E-05	4.00E-04	1.20E-01	0	4.00E-04	--	1 33E-09	--	--	1 20E-01
Arsenic	8.714	1.39E-04	3 50E-06	3 98E+01	8 27E-06	3 50E-06	2.36E+00	6.41E-09	1.50E-05	4.27E-04	4 22E+01
Barium	274 5	7.32E-03	2.00E-01	3.66E-02	0	2.00E-01	--	2.02E-07	5.00E-04	4.04E-04	3.70E-02
Beryllium	1.688	4.50E-05	2.00E-04	2.25E-01	0	2.00E-04	--	1 24E-09	7.00E-06	1.77E-04	2 25E-01
Boron	174.1	4.64E-03	2.00E-01	2.32E-02	0	2.00E-01	--	1 28E-07	2.00E-02	6.40E-06	2 32E-02
Cadmium	0.233	6.21E-06	1.00E-03	6.21E-03	7.4E-09	1.00E-03	7.37E-06	1.71E-10	1.00E-05	1.71E-05	6 24E-03
Chromium	53.08	1.42E-03	1 50E+00	9.44E-04	0	1.50E+00	--	3 90E-08	--	--	9.44E-04
Cobalt	16.74	4.46E-04	3.00E-04	1.49E+00	0	3.00E-04	--	1 23E-08	6.00E-06	2.05E-03	1.49E+00
Copper	33.76	9.00E-04	4.00E-02	2.25E-02	0	4.00E-02	--	2.48E-08	--	--	2 25E-02
Iron	27206	7.25E-01	7.00E-01	1.04E+00	0	7.00E-01	--	2.00E-05	--	--	1.04E+00
Lead	14.54	3.88E-04	--	--	0	--	--	1.07E-08	--	--	--
Lithium	55.15	1.47E-03	2.00E-03	7.35E-01	0	2.00E-03	--	4.06E-08	--	--	7 35E-01
Manganese	1191	3.18E-02	1.40E-01	2.27E-01	0	1.40E-01	--	8.76E-07	5.00E-05	1.75E-02	2.44E-01
Mercury	13.68	4.38E-05	1.60E-04	2.74E-01	0	1.60E-04	--	1.01E-08	3.00E-05	3.35E-04	2.74E-01
Molybdenum	0.417	1.11E-05	5.00E-03	2.22E-03	0	5.00E-03	--	3.07E-10	--	--	2 22E-03
Nickel	43.92	1.17E-03	1.10E-02	1.06E-01	0	1.10E-02	--	3 23E-08	1.40E-05	2.31E-03	1.09E-01
Selenium	6.484	1.73E-04	5.00E-03	3.46E-02	0	5.00E-03	--	4.77E-09	2.00E-02	2.38E-07	3.46E-02
Silver	0.15	4.00E-06	5.00E-03	8.00E-04	0	5.00E-03	--	1.10E-10	--	--	8.00E-04
Thallium	0.184	4.91E-06	1.00E-05	4.91E-01	0	1.00E-05	--	1 35E-10	--	--	4 91E-01
Vanadium	67	1.79E-03	5.00E-03	3.57E-01	0	5.00E-03	--	4 93E-08	1.00E-04	4.93E-04	3 58E-01
Zinc	86.14	2.30E-03	3.00E-01	7.66E-03	0	3.00E-01	--	6 33E-08	--	--	7.66E-03
Total Child Resident				4.5E+01			2.4E+00			2.4E-02	4.7E+01

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table -C44

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	R_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	8.13E-02	4.1E-03	N/A	---
Antimony	1 27E-03	6.3E-05	N/A	---
Arsenic	2.76E-03	1.4E-04	9 5E+00	1.3E-03
Barium	5 34E-02	2.7E-03	N/A	---
Beryllium	--	--	--	--
Boron	6.86E+00	3.4E-01	N/A	---
Cadmium	--	--	--	--
Chromium	5 34E-04	2.7E-05	N/A	---
Cobalt	2.64E-03	1.3E-04	N/A	---
Copper	9 53E-04	4.8E-05	N/A	---
Iron	2 27E-02	1.1E-03	N/A	---
Lead	2.00E-05	1.0E-06	N/A	---
Lithium	9 50E-02	4.8E-03	N/A	---
Manganese	8 94E-01	4.5E-02	N/A	---
Mercuric Chloride	2.83E-05	1.4E-06	N/A	---
Methyl Mercury	7.74E-07	3.9E-08	N/A	---
Molybdenum	2 22E-04	1.1E-05	N/A	---
Nickel	1 22E-02	6.1E-04	N/A	---
Selenium	3.66E-04	1.8E-05	N/A	---
Silver	6 30E-04	3.2E-05	N/A	---
Vanadium	1.60E-03	8.0E-05	N/A	---
Zinc	4.76E-03	2.4E-04	N/A	---
Total Tribal Adult				1.3E-03

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake mg/kg-day	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
norganics					
Aluminum	3.77E-01	0.0E+00	N/A	---	---
Antimony	1.04E-03	0.0E+00	N/A	---	---
Arsenic	3.06E-03	0.0E+00	9 5E+00	---	1 3E-03
Barium	5.00E-02	0.0E+00	N/A	---	---
Beryllium	1 96E-04	0.0E+00	N/A	---	
Boron	7.0E+00	0.0E+00	N/A	---	---
Cadmium	5.60E-04	2.0E-07	N/A	---	
Chromium	5.0E-04	0.0E+00	N/A	---	---
Cobalt	2.05E-03	0.0E+00	N/A	---	---
Copper	1 20E-03	0.0E+00	N/A	---	---
Fluoride	4.71E-01	0.0E+00	N/A	---	---
Iron	1.82E-01	0.0E+00	N/A	---	---
Lithium	1.17E-01	0.0E+00	N/A	---	---
Manganese	1.15E+00	0.0E+00	N/A	---	---
Mercuric Chloride	1 21E-04	0.0E+00	N/A	---	---
Methyl Mercury	2.82E-06	0.0E+00	N/A	---	---
Molybdenum	7 38E-04	0.0E+00	N/A	---	---
Nickel	1.19E-02	0.0E+00	N/A	---	---
Nitrate	1.78E-01	0.0E+00	N/A	---	
Selenium	3.76E-04	0.0E+00	N/A	---	---
Vanadium	1.16E-03	0.0E+00	N/A	---	---
Zinc	6 25E-03	0.0E+00	N/A	---	---
				0.0E+00	1 3E-03

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-45

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	8.13E-02	4.1E-03	1.0E+00	4.1E-03
Antimony	1 27E-03	6 3E-05	4.0E-04	1.6E-01
Arsenic	2.76E-03	1.4E-04	3.5E-06	3.9E+01
Barium	5 34E-02	2.7E-03	2.0E-01	1 3E-02
Beryllium	--	--	--	--
Boron	6.86E+00	3.4E-01	2.0E-01	1.7E+00
Cadmium	--	--	--	--
Chromium	5 34E-04	2.7E-05	1.5E+00	1.8E-05
Cobalt	2.64E-03	1 3E-04	3.0E-04	4.4E-01
Copper	9 53E-04	4.8E-05	4.0E-02	1 2E-03
Iron	--	--	--	--
Lead	2.00E-05	1.0E-06	N/A	---
Lithium	9 50E-02	4.8E-03	2.0E-03	2.4E+00
Manganese	8 94E-01	4 5E-02	2.4E-02	1.9E+00
Mercuric Chloride	2.83E-05	1.4E-06	1.6E-04	8.8E-03
Methyl Mercury	7.74E-07	3 9E-08	1.0E-04	3 9E-04
Molybdenum	2 22E-04	1.1E-05	5.0E-03	2 2E-03
Nickel	1 22E-02	6.1E-04	1.1E-02	5 5E-02
Nitrate	--	--	--	--
Selenium	3.66E-04	1.8E-05	5.0E-03	3.7E-03
Silver	6 30E-04	3 2E-05	5.0E-03	6 3E-03
Vanadium	1.60E-03	8.0E-05	5.0E-03	1.6E-02
Zinc	4.76E-03	2.4E-04	3.0E-01	7 9E-04
Total Tribal Adult				4.6E+01

hemical Potentia Concern	RME Medium EPC Va e, Cw (mg/L)	Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics					
Aluminum	3.77E-01	0.0E+00	1.0E+00	0.0E+00	4.1E-03
Antimony	1.04E-03	0.0E+00	4.0E-04	0.0E+00	1.6E-01
Arsenic	3.06E-03	0.0E+00	3.5E-06	0.0E+00	3 9E+01
Barium	5.00E-02	0.0E+00	1.4E-02	0.0E+00	1.3E-02
Beryllium	1.96E-04	0.0E+00	1.4E-06	0.0E+00	--
Boron	7.04E+00	0.0E+00	2.0E-01	0.0E+00	1.7E+00
Cadmium	5.60E-04	0.0E+00	2.5E-05	0.0E+00	--
Chromium	5.00E-04	2.0E-07	2.0E-02	1.0E-05	2.8E-05
Cobalt	2.05E-03	0.0E+00	3.0E-04	0.0E+00	4.4E-01
Copper	1.20E-03	0.0E+00	4.0E-02	0.0E+00	1.2E-03
Fluoride	4.71E-01	0.0E+00	4.0E-02	0.0E+00	--
Iron	1.82E-01	0.0E+00	7.0E-01	0.0E+00	--
Lithium	1.17E-01	0.0E+00	2.0E-03	0.0E+00	2.4E+00
Manganese	1.15E+00	0.0E+00	2.4E-02	0.0E+00	1 9E+00
Mercuric Chloride	1.21E-04	0.0E+00	1.1E-05	0.0E+00	8.8E-03
Methyl Mercury	2.82E-06	0.0E+00	1.0E-04	0.0E+00	3.9E-04
Molybdenum	7.38E-04	0.0E+00	5.0E-03	0.0E+00	2.2E-03
Nickel	1.19E-02	0.0E+00	4.4E-04	0.0E+00	5.5E-02
Nitrate	1.78E-01	0.0E+00	1.6E+00	0.0E+00	--
Selenium	--	--	--	--	3.7E-03
Silver	--	--	--	--	6.3E-03
Vanadium	--	--	--	--	1.6E-02
Zinc	6.25E-03	0.0E+00	3.0E-01	0.0E+00	7.9E-04
				1.0E-05	4.6E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-46

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	R_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Conversion Factor	CF	0.000001	kg/mg
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor $[mg/kg/day]^{-1}$	Exposure Route = Oral: Cancer Risk
Inorganics				
Aluminum	8.13E-02	5.6E-04	N/A	---
Antimony	1 27E-03	8.7E-06	N/A	---
Arsenic	2.76E-03	1 9E-05	9.5E+00	1.8E-04
Barium	5 34E-02	3.7E-04	N/A	---
Beryllium	--	--	--	--
Boron	6.86E+00	4.7E-02	N/A	---
Cadmium	--	--	--	--
Chromium	5 34E-04	3.7E-06	N/A	---
Cobalt	2.64E-03	1.8E-05	N/A	---
Copper	9 53E-04	6 5E-06	N/A	---
Iron	2 27E-02	1.6E-04	N/A	---
Lead	2.00E-05	1.4E-07	N/A	---
Lithium	9 50E-02	6 5E-04	N/A	---
Manganese	8 94E-01	6.1E-03	N/A	---
Mercuric Chloride	2.83E-05	1 9E-07	N/A	---
Methyl Mercury	7.74E-07	5 3E-09	N/A	---
Molybdenum	2 22E-04	1 5E-06	N/A	---
Nickel	1 22E-02	8 3E-05	N/A	---
Nitrate	--	--	--	--
Selenium	3.66E-04	2 5E-06	N/A	---
Silver	6 30E-04	4 3E-06	N/A	---
Vanadium	1.60E-03	1.1E-05	N/A	---
Zinc	4.76E-03	3 3E-05	N/A	---
Total Tribal Child				1.8E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor $[mg/kg/day]^{-1}$	Exposure Route = Dermal: Cancer Risk	Total Cancer Risk
norganics					
Aluminum	3.77E-01	0.0E+00	N/A	---	---
Antimony	1.04E-03	0.0E+00	N/A	---	---
Arsenic	3.06E-03	0.0E+00	9 5E+00	---	1.8E-04
Barium	5.00E-02	0.0E+00	N/A	---	---
Beryllium	1 96E-04	0.0E+00	N/A	---	---
Boron	7.04E+00	0.0E+00	N/A	---	---
Cadmium	5.60E-04	0.0E+00	N/A	---	---
Chromium	5.00E-04	2.1E-08	N/A	---	---
Cobalt	2.05E-03	0.0E+00	N/A	---	---
Copper	1 20E-03	0.0E+00	N/A	---	---
Fluoride	4.71E-01	0.0E+00	N/A	---	---
Iron	1.82E-01	0.0E+00	N/A	---	---
Lithium	1.17E-01	0.0E+00	N/A	---	---
Manganese	1.15E+00	1.8E-05	N/A	---	---
Mercuric Chloride	1 21E-04	0.0E+00	N/A	---	---
Methyl Mercury	2.82E-06	0.0E+00	N/A	---	---
Molybdenum	7 38E-04	0.0E+00	N/A	---	---
Nickel	1.19E-02	0.0E+00	N/A	---	---
Nitrate	1.78E-01	0.0E+00	N/A	---	---
Selenium	3.76E-04	0.0E+00	N/A	---	---
Silver	--	--	--	---	---
Vanadium	1.16E-03	0.0E+00	N/A	---	---
Zinc	6 25E-03	0.0E+00	N/A	---	---
				0.0E+00	1.8E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-47

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	R_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0 54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	8.13E-02	6.5E-03	1.0E+00	6.5E-03
Antimony	1.27E-03	1.0E-04	4.0E-04	2.5E-01
Arsenic	2.76E-03	2.2E-04	3.5E-06	6 3E+01
Barium	5.34E-02	4.3E-03	2.0E-01	2.1E-02
Beryllium	--	--	--	--
Boron	6.86E+00	5.5E-01	2.0E-01	2.7E+00
Cadmium	--	--	--	--
Chromium	5.34E-04	4.3E-05	1.5E+00	2.8E-05
Cobalt	2.64E-03	2.1E-04	3.0E-04	7.0E-01
Copper	9.53E-04	7.6E-05	4.0E-02	1.9E-03
Iron	2.27E-02	1.8E-03	7.0E-01	2.6E-03
Lead	2.00E-05	1.6E-06	N/A	---
Lithium	9.50E-02	7.6E-03	2.0E-03	3.8E+00
Manganese	8.94E-01	7.2E-02	2.4E-02	3.0E+00
Mercuric Chloride	2.83E-05	2.3E-06	1.6E-04	1.4E-02
Methyl Mercury	7.74E-07	6.2E-08	1.0E-04	6.2E-04
Molybdenum	2.22E-04	1.8E-05	5.0E-03	3.6E-03
Nickel	1.22E-02	9.7E-04	1.1E-02	8.8E-02
Nitrate	--	--	--	--
Selenium	3.66E-04	2.9E-05	5.0E-03	5.9E-03
Silver	6.30E-04	5.0E-05	5.0E-03	1.0E-02
Vanadium	1.60E-03	1.3E-04	5.0E-03	2.6E-02
Zinc	4.76E-03	3.8E-04	3.0E-01	1.3E-03
Total Tribal Child				7.4E+01

hemical Potentia Concern	RME Medium EPC Va e, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	3.77E-01	0.0E+00	1.0E+00	0.0E+00	6 5E-03
Antimony	1.04E-03	0.0E+00	4.0E-04	0.0E+00	2 5E-01
Arsenic	3.06E-03	0.0E+00	3.5E-06	0.0E+00	6.3E+01
Barium	5.00E-02	0.0E+00	1.4E-02	0.0E+00	2.1E-02
Beryllium	1 96E-04	0.0E+00	1.4E-06	0.0E+00	--
Boron	7.04E+00	0.0E+00	2.0E-01	0.0E+00	2.7E+00
Cadmium	5.60E-04	0.0E+00	2.5E-05	0.0E+00	--
Chromium	5.00E-04	2 5E-07	2.0E-02	1.3E-05	4.1E-05
Cobalt	2.05E-03	0.0E+00	3.0E-04	0.0E+00	7.0E-01
Copper	1 20E-03	0.0E+00	4.0E-02	0.0E+00	1 9E-03
Fluoride	4.71E-01	0.0E+00	4.0E-02	0.0E+00	--
Iron	1.82E-01	0.0E+00	7.0E-01	0.0E+00	2.6E-03
Lithium	1.17E-01	0.0E+00	2.0E-03	0.0E+00	3.8E+00
Manganese	1.15E+00	2.1E-04	2.4E-02	8.6E-03	3.0E+00
Mercuric Chloride	1 21E-04	0.0E+00	1.1E-05	0.0E+00	1.4E-02
Methyl Mercury	2.82E-06	0.0E+00	1.0E-04	0.0E+00	6 2E-04
Molybdenum	7 38E-04	0.0E+00	5.0E-03	0.0E+00	3.6E-03
Nickel	1.19E-02	0.0E+00	4.4E-04	0.0E+00	8.8E-02
Nitrate	1.78E-01	0.0E+00	1.6E+00	0.0E+00	--
Selenium	3.76E-04	0.0E+00	5.0E-03	0.0E+00	5 9E-03
Silver	--	--	--	--	--
Vanadium	1.16E-03	0.0E+00	1.3E-04	0.0E+00	2.6E-02
Zinc	6 25E-03	0.0E+00	3.0E-01	0.0E+00	1 3E-03
				8.6E-03	7.4E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-48

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	0.00E+00	0.0E+00	N/A	---
Arsenic	3.32E-03	1.7E-04	9.5E+00	1.6E-03
Barium	7.67E-02	3.8E-03	N/A	---
Boron	1.30E+00	6.5E-02	N/A	---
Cobalt	0.00E+00	0.0E+00	N/A	---
Copper	0.00E+00	0.0E+00	N/A	---
Iron	0.00E+00	0.0E+00	N/A	---
Lithium	2.12E-02	1.1E-03	N/A	---
Manganese	1.96E-03	9.8E-05	N/A	---
Mercuric Chlor	1.52E-06	7.6E-08	N/A	---
Methyl mercury	0.00E+00	0.0E+00	N/A	---
Molybdenum	0.00E+00	0.0E+00	N/A	---
Nickel	2.10E-03	1.1E-04	N/A	---
Zinc	7.60E-03	0.0E+00	N/A	---
Total Tribal Adult				1.6E-03

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	Total Cancer Risk
Inorganics					
Aluminum	3.42E-02	0.0E+00	N/A	---	---
Arsenic	3.45E-03	0.0E+00	9.5E+00	---	1.6E-03
Barium	8.04E-02	0.0E+00	N/A	---	---
Boron	1.20E+00	0.0E+00	N/A	---	---
Cobalt	1.34E-04	0.0E+00	N/A	---	---
Copper	1.97E-03	0.0E+00	N/A	---	---
Iron	1.00E-01	0.0E+00	N/A	---	---
Lithium	2.08E-02	0.0E+00	N/A	---	---
Manganese	1.96E-02	0.0E+00	N/A	---	---
Mercuric Chlori	2.75E-05	0.0E+00	N/A	---	---
Methyl mercury	5.60E-08	0.0E+00	N/A	---	---
Molybdenum	2.50E-04	0.0E+00	N/A	---	---
Nickel	2.95E-03	0.0E+00	N/A	---	---
Zinc	0.00E+00	0.0E+00	N/A	---	---
				0.0E+00	1.6E-03

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-49

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Adult Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00
Arsenic	3.32E-03	1.7E-04	3.5E-06	4.7E+01
Barium	7.67E-02	3.8E-03	2.0E-01	1.9E-02
Boron	1.30E+00	6.5E-02	2.0E-01	3.3E-01
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00
Iron	0.00E+00	0.0E+00	7.0E-01	0.0E+00
Lithium	2.12E-02	1.1E-03	2.0E-03	5.3E-01
Manganese	1.96E-03	9.8E-05	2.4E-02	4.1E-03
Mercuric Chloride	1.52E-06	7.6E-08	1.6E-04	4.8E-04
Methyl mercury	0.00E+00	0.0E+00	1.0E-04	0.0E+00
Molybdenum	0.00E+00	0.0E+00	5.0E-03	0.0E+00
Nickel	2.10E-03	1.1E-04	1.1E-02	9.6E-03
Zinc	7.60E-03	3.8E-04	3.0E-01	1.3E-03
Total Tribal Adult				4.8E+01

Chemical of Potential Concern	RME Medium EPC Value, (mg/L)	Exposure Route = Dermal			
		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard [-]
norganics					
Aluminum	3.42E-02	0.0E+00	1.0E+00	0.0E+00	--
Arsenic	3.45E-03	0.0E+00	3.5E-06	0.0E+00	4.74E+01
Barium	8.04E-02	0.0E+00	1.4E-02	0.0E+00	1.92E-02
Boron	1.20E+00	0.0E+00	2.0E-01	0.0E+00	3.25E-01
Cobalt	1.34E-04	0.0E+00	3.0E-04	0.0E+00	--
Copper	1.97E-03	0.0E+00	4.0E-02	0.0E+00	--
ron	1.00E-01	0.0E+00	7.0E-01	0.0E+00	--
Lithium	2.08E-02	0.0E+00	2.0E-03	0.0E+00	5.31E-01
Manganese	1.96E-02	0.0E+00	2.4E-02	0.0E+00	4.08E-03
Mercuric Chl	2.75E-05	0.0E+00	1.1E-05	0.0E+00	4.75E-04
Methyl mercu	5.60E-08	0.0E+00	1.0E-04	0.0E+00	--
Molybdenum	2.50E-04	0.0E+00	1.0E-04	0.0E+00	--
Nickel	2.95E-03	0.0E+00	5.0E-03	0.0E+00	9.55E-03
Zinc	0.00E+00	0.0E+00	4.4E-04	0.0E+00	1.27E-03
				0.0E+00	4.8E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-50

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Child Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal				Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	RME Medium EPC Value, Cw (mg/L)	Chronic Daily Intake mg/kg-day	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics									
Aluminum	0.00E+00	0.0E+00	N/A	---	3.42E-02	0.0E+00	N/A	---	---
Arsenic	3.32E-03	2.3E-05	9.5E+00	2.2E-04	3.45E-03	0.0E+00	9.5E+00	---	2.2E-04
Barium	7.67E-02	5.3E-04	N/A	---	8.04E-02	0.0E+00	N/A	---	---
Boron	1.30E+00	8.9E-03	N/A	---	1.20E+00	0.0E+00	N/A	---	---
Chromium	0.00E+00	0.0E+00	N/A	---	0.00E+00	0.0E+00	N/A	---	---
Cobalt	0.00E+00	0.0E+00	N/A	---	1.34E-04	0.0E+00	N/A	---	---
Copper	0.00E+00	0.0E+00	N/A	---	1.97E-03	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	1.00E-01	0.0E+00	N/A	---	---
Lead	0.00E+00	0.0E+00	N/A	---	0.00E+00	0.0E+00	N/A	---	---
Lithium	2.12E-02	1.5E-04	N/A	---	2.08E-02	0.0E+00	N/A	---	---
Manganese	1.96E-03	1.3E-05	N/A	---	1.96E-02	3.9E-08	N/A	---	---
Mercuric Chloride	0.00E+00	0.0E+00	N/A	---	0.00E+00	0.0E+00	N/A	---	---
Methyl mercury	0.00E+00	0.0E+00			5.60E-08	0.0E+00	N/A	---	---
Molybdenum	0.00E+00	0.0E+00	N/A	---	2.50E-04	0.0E+00	N/A	---	---
Nickel	2.10E-03	1.4E-05	N/A	---	2.95E-03	0.0E+00	N/A	---	---
Zinc	7.60E-03	5.2E-05	N/A	---	0.00E+00	0.0E+00	N/A	---	---
Total Tribal Child				2.2E-04				0.0E+00	2.2E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-51

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Child Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	365	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00
Arsenic	3.32E-03	2.7E-04	3.5E-06	7.6E+01
Barium	7.67E-02	6.1E-03	2.0E-01	3.1E-02
Boron	1.30E+00	1.0E-01	2.0E-01	5.2E-01
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00
Iron	0.00E+00	0.0E+00	7.0E-01	0.0E+00
Lead	0.00E+00	0.0E+00	N/A	---
Lithium	2.12E-02	1.7E-03	2.0E-03	8.5E-01
Manganese	1.96E-03	1.6E-04	2.4E-02	6.5E-03
Mercuric Chl	0.00E+00	0.0E+00	1.6E-04	0.0E+00
Methyl mercu	0.00E+00	0.0E+00	1.0E-04	0.0E+00
Molybdenum	0.00E+00	0.0E+00	5.0E-03	0.0E+00
Nickel	2.10E-03	1.7E-04	1.1E-02	1.5E-02
Zinc	7.60E-03	6.1E-04	3.0E-01	2.0E-03
Total Tribal Child				7.7E+01

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	3.42E-02	0.0E+00	1.0E+00	0.0E+00	--
Arsenic	3.45E-03	0.0E+00	3.5E-06	0.0E+00	7.58E+01
Barium	8.04E-02	0.0E+00	1.4E-02	0.0E+00	3.07E-02
Boron	1.20E+00	0.0E+00	2.0E-01	0.0E+00	5.20E-01
Cobalt	1.34E-04	0.0E+00	3.0E-04	0.0E+00	--
Copper	1.97E-03	0.0E+00	4.0E-02	0.0E+00	--
Iron	1.00E-01	0.0E+00	7.0E-01	0.0E+00	--
Lead	0.00E+00	0.0E+00	N/A	---	--
Lithium	2.08E-02	0.0E+00	2.0E-03	0.0E+00	8.49E-01
Manganese	1.96E-02	4.5E-07	2.4E-02	1.9E-05	6.55E-03
Mercuric Chloride	0.00E+00	0.0E+00	1.1E-05	0.0E+00	--
Methyl mercury	5.60E-08	0.0E+00	1.0E-04	0.0E+00	--
Molybdenum	2.50E-04	0.0E+00	5.0E-03	0.0E+00	--
Nickel	2.95E-03	0.0E+00	4.4E-04	0.0E+00	1.53E-02
Zinc	0.00E+00	0.0E+00	3.0E-01	0.0E+00	2.03E-03
				1.9E-05	7.7E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-52

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Acorns
	Exposure Point:	Herman Impoundment Area/Buckeye Area
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Cacorn [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Adults Ingestion Acorns					
Aluminum	1.198	2.95E-04	--	--	--
Antimony	0.022	5.42E-06	--	--	--
Arsenic	0.0606	1.49E-05	9.5	1.42E-04	100.00%
Barium	6.585	1.62E-03	--	--	
Boron	11.84	2.92E-03	--	--	
Cadmium	0.0033	8.14E-07	--	--	
Chromium	0.104	2.56E-05	--	--	
Cobalt	0.226	5.57E-05	--	--	
Copper	4.919	1.21E-03	--	--	
Iron	11.86	2.92E-03	--	--	
Lead	0.00481	1.19E-06	--	--	
Manganese	47.7	1.18E-02	--	--	
Mercury	0.0131	3.23E-06	--	--	
Methyl Mercury	0.00085163	2.10E-07	--	--	
Molybdenum	0.00599	1.48E-06	--	--	
Nickel	3.182	7.85E-04	--	--	
Selenium	0.0865	2.13E-05	--	--	
Silver	0.00434	1.07E-06	--	--	
Thallium	0.185	4.56E-05	--	--	
Zinc	8.352	2.06E-03	--	--	
Total Tribal Adult				1.4E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Child ingesting Acorns			
3.38E-05	--	--	
6.20E-07	--	--	
1.71E-06	9.5	1.62E-05	100.00%
1.86E-04	--	--	
3.34E-04	--	--	
9.30E-08	--	--	
2.93E-06	--	--	
6.37E-06	--	--	
1.39E-04	--	--	
3.34E-04	--	--	
1.36E-07	--	--	
1.34E-03	--	--	
3.69E-07	--	--	
2.40E-08	--	--	
1.69E-07	--	--	
8.97E-05	--	--	
2.44E-06	--	--	
1.22E-07	--	--	
5.21E-06	--	--	
2.35E-04	--	--	
Total Tribal Child		1.6E-05	

Cacorn = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-53

Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Acorns
	Exposure Point:	Herman Impoundment Area/Buckeye Area
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinoge	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral				Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Cacorn [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingestion Acorns						**Child ingesting Acorns**			
Aluminum	1.198	2.95E-04	1	2.95E-04	0.003%	3.94E-04	1	3.94E-04	0.00%
Antimony	0.022	5.42E-06	0.0004	1.36E-02	0.15%	7.23E-06	0.0004	1.81E-02	0.15%
Arsenic	0.0606	1.49E-05	0.0000035	4.27E+00	46.02%	1.99E-05	0.0000035	5.69E+00	46.02%
Barium	6.585	1.62E-03	0.2	8.12E-03	0.09%	2.16E-03	0.2	1.08E-02	0.09%
Boron	11.84	2.92E-03	0.2	1.46E-02	0.16%	3.89E-03	0.2	1.95E-02	0.16%
Cadmium	0.0033	8.14E-07	0.001	8.14E-04	0.01%	1.08E-06	0.001	1.08E-03	0.01%
Chromium	0.104	2.56E-05	1.5	1.71E-05	0.00%	3.42E-05	1.5	2.28E-05	0.00%
Cobalt	0.226	5.57E-05	0.0003	1.86E-01	2.00%	7.43E-05	0.0003	2.48E-01	2.00%
Copper	4.919	1.21E-03	0.04	3.03E-02	0.33%	1.62E-03	0.04	4.04E-02	0.33%
Iron	11.86	2.92E-03	0.7	4.18E-03	0.05%	3.90E-03	0.7	5.57E-03	0.05%
Lead	0.00481	1.19E-06	--	--		1.58E-06	--	--	
Manganese	47.7	1.18E-02	0.14	8.40E-02	0.91%	1.57E-02	0.14	1.12E-01	0.91%
Mercury	0.0131	3.23E-06	0.00016	2.02E-02	0.22%	4.31E-06	0.00016	2.69E-02	0.22%
Methyl Mercury	0.00085163	2.10E-07	0.0001	2.10E-03	0.02%	2.80E-07	0.0001	2.80E-03	0.02%
Molybdenum	0.00599	1.48E-06	0.005	2.95E-04	0.003%	1.97E-06	0.005	3.94E-04	0.00%
Nickel	3.182	7.85E-04	0.011	7.13E-02	0.77%	1.05E-03	0.011	9.51E-02	0.77%
Selenium	0.0865	2.13E-05	0.005	4.27E-03	0.05%	2.84E-05	0.005	5.69E-03	0.05%
Silver	0.00434	1.07E-06	0.005	2.14E-04	0.002%	1.43E-06	0.005	2.85E-04	0.00%
Thallium	0.185	4.56E-05	0.00001	4.56E+00	49.17%	6.08E-05	0.00001	6.08E+00	49.17%
Zinc	8.352	2.06E-03	0.3	6.86E-03	0.07%	2.75E-03	0.3	9.15E-03	0.07%
Total Tribal Adult				9.3E+00		**Total Tribal Child**		1.2E+01	

Cacorn = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-54

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Stalk
	Exposure Point:	Elem and North Wetland
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Stalk Ingestion Rate	IRtules_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Adults Ingestion Tule Stalks					
Aluminum	14.93	1.02E-02	--	--	
Arsenic	0.054	3.69E-05	9.5	3.51E-04	100.00%
Barium	6.167	4.22E-03	--	--	
Boron	5.501	3.76E-03	--	--	
Chromium	1.028	7.03E-04	--	--	
Cobalt	0.0692	4.73E-05	--	--	
Copper	0.959	6.56E-04	--	--	
Iron	26.09	1.79E-02	--	--	
Lithium	0.376	2.57E-04	--	--	
Manganese	111.9	7.66E-02	--	--	
Mercury	0.00273	1.87E-06	--	--	
Methyl Mercury	0.00112	7.66E-07	--	--	
Molybdenum	0.0458	3.13E-05	--	--	
Nickel	0.607	4.15E-04	--	--	
Thallium	0.00224	1.53E-06	--	--	
Vanadium	0.15	1.03E-04	--	--	
Zinc	2.25	1.54E-03	--	--	
Total Tribal Adu t				3.5E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Child ingesting Tule Stalks			
1.19E-03	--	--	
4.31E-06	9.5	4.10E-05	100.00%
4.92E-04	--	--	
4.39E-04	--	--	
8.21E-05	--	--	
5.53E-06	--	--	
7.66E-05	--	--	
2.08E-03	--	--	
3.00E-05	--	--	
8.93E-03	--	--	
2.18E-07	--	--	
8.94E-08	--	--	
3.66E-06	--	--	
4.85E-05	--	--	
1.79E-07	--	--	
1.20E-05	--	--	
1.80E-04	--	--	
Total Tribal Child		4.1E-05	

Ctule_stalks = Concentration in tule stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-55

Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Stalks
	Exposure Point:	Elem and North Wetland
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Stalk Ingestion Rate	IR_tule_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingesting Tules - Stalks					
Aluminum	14.93	1.02E-02	1	1.02E-02	0.09%
Arsenic	0.054	3.69E-05	0.0000035	1.06E+01	90.04%
Barium	6.167	4.22E-03	0.2	2.11E-02	0.18%
Boron	5.501	3.76E-03	0.2	1.88E-02	0.16%
Chromium	1.028	7.03E-04	1.5	4.69E-04	0.00%
Cobalt	0.0692	4.73E-05	0.0003	1.58E-01	1.35%
Copper	0.959	6.56E-04	0.04	1.64E-02	0.14%
Iron	26.09	1.79E-02	0.7	2.55E-02	0.22%
Lithium	0.376	2.57E-04	0.002	1.29E-01	1.10%
Manganese	111.9	7.66E-02	0.14	5.47E-01	4.66%
Mercury	0.00273	1.87E-06	0.00016	1.17E-02	0.10%
Methyl Mercury	0.00112	7.66E-07	0.0001	7.66E-03	0.07%
Molybdenum	0.0458	3.13E-05	0.005	6.27E-03	0.05%
Nickel	0.607	4.15E-04	0.011	3.78E-02	0.32%
Thallium	0.00224	1.53E-06	0.00001	1.53E-01	1.31%
Vanadium	0.15	1.03E-04	0.005	2.05E-02	0.18%
Zinc	2.25	1.54E-03	0.3	5.13E-03	0.04%
Total Tribal Adult				1.2E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child Ingesting Tules - Stalks			
1.39E-02	1	1.39E-02	0.09%
5.03E-05	0.0000035	1.44E+01	90.04%
5.74E-03	0.2	2.87E-02	0.18%
5.12E-03	0.2	2.56E-02	0.16%
9.58E-04	1.5	6.38E-04	0.00%
6.45E-05	0.0003	2.15E-01	1.35%
8.93E-04	0.04	2.23E-02	0.14%
2.43E-02	0.7	3.47E-02	0.22%
3.50E-04	0.002	1.75E-01	1.10%
1.04E-01	0.14	7.45E-01	4.66%
2.54E-06	0.00016	1.59E-02	0.10%
1.04E-06	0.0001	1.04E-02	0.07%
4.27E-05	0.005	8.53E-03	0.05%
5.65E-04	0.011	5.14E-02	0.32%
2.09E-06	0.00001	2.09E-01	1.31%
1.40E-04	0.005	2.79E-02	0.18%
2.10E-03	0.3	6.99E-03	0.04%
Total Tribal Child		1.6E+01	

Ctule_stalks = Concentration in tule stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-56

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Roots
	Exposure Point:	Elem and North Wetland
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Root Ingestion Rate	IRtules_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinoge	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_roots [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Adults Ingestion Tule Roots					
Aluminum	41.75	2.36E-02	--	--	
Antimony	0.0112	6.33E-06	--	--	
Arsenic	0.0559	3.16E-05	9.5	3.00E-04	100.00%
Barium	1.935	1.09E-03	--	--	
Boron	25.17	1.42E-02	--	--	
Cadmium	0.00628	3.55E-06	--	--	
Chromium	2.667	1.51E-03	--	--	
Cobalt	0.176	9.95E-05	--	--	
Copper	1.744	9.85E-04	--	--	
Iron	44.71	2.53E-02	--	--	
Lead	0.0249	1.41E-05	--	--	
Lithium	0.555	3.14E-04	--	--	
Manganese	34.14	1.93E-02	--	--	
Mercury	0.00424	2.40E-06	--	--	
Methyl Mercury	0.00105	5.93E-07	--	--	
Molybdenum	0.0458	2.59E-05	--	--	
Nickel	1.974	1.12E-03	--	--	
Thallium	0.00158	8.93E-07	--	--	
Vanadium	0.213	1.20E-04	--	--	
Zinc	12.18	6.88E-03	--	--	
Total Tribal Adult				3.0E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Child ingesting Tule Roots			
2.55E-03	--	--	
6.84E-07	--	--	
3.41E-06	9.5	3.24E-05	100.00%
1.18E-04	--	--	
1.54E-03	--	--	
3.83E-07	--	--	
1.63E-04	--	--	
1.07E-05	--	--	
1.06E-04	--	--	
2.73E-03	--	--	
1.52E-06	--	--	
3.39E-05	--	--	
2.08E-03	--	--	
2.59E-07	--	--	
6.41E-08	--	--	
2.80E-06	--	--	
1.21E-04	--	--	
9.65E-08	--	--	
1.30E-05	--	--	
7.44E-04	--	--	
Total Tribal Child		3.2E-05	

Ctule_roots = Concentration in tule roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-57
Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Roots
	Exposure Point:	Elem and North Wetland
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Root Ingestion Rate	IRtules_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	**ATnc**	**70**	**6**	**year**

Risk Calculations

		Exposure Route = Oral				Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_roots [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingesting Tules - Roots						**Child Ingesting Tules - Roots**			
Aluminum	41.75	2.36E-02	1	2.36E-02	0.23%	2.97E-02	1	2.97E-02	0.23%
Antimony	0.0112	6.33E-06	0.0004	1.58E-02	0.16%	7.98E-06	0.0004	1.99E-02	0.16%
Arsenic	0.0559	3.16E-05	0.0000035	9.02E+00	89.60%	3.98E-05	0.0000035	1.14E+01	89.60%
Barium	1.935	1.09E-03	0.2	5.47E-03	0.05%	1.38E-03	0.2	6.89E-03	0.05%
Boron	25.17	1.42E-02	0.2	7.11E-02	0.71%	1.79E-02	0.2	8.96E-02	0.71%
Cadmium	0.00628	3.55E-06	0.001	3.55E-03	0.04%	4.47E-06	0.001	4.47E-03	0.04%
Chromium	2.667	1.51E-03	1.5	1.00E-03	0.01%	1.90E-03	1.5	1.27E-03	0.01%
Cobalt	0.176	9.95E-05	0.0003	3.32E-01	3.29%	1.25E-04	0.0003	4.18E-01	3.29%
Copper	1.744	9.85E-04	0.04	2.46E-02	0.24%	1.24E-03	0.04	3.11E-02	0.24%
Iron	44.71	2.53E-02	0.7	3.61E-02	0.36%	3.18E-02	0.7	4.55E-02	0.36%
Lead	0.0249	1.41E-05	--	--		1.77E-05	--	--	
Lithium	0.555	3.14E-04	0.002	1.57E-01	1.56%	3.95E-04	0.002	1.98E-01	1.56%
Manganese	34.14	1.93E-02	0.14	1.38E-01	1.37%	2.43E-02	0.14	1.74E-01	1.37%
Mercury	0.00424	2.40E-06	0.00016	1.50E-02	0.15%	3.02E-06	0.00016	1.89E-02	0.15%
Methyl Mercury	0.00105	5.93E-07	0.0001	5.93E-03	0.06%	7.48E-07	0.0001	7.48E-03	0.06%
Molybdenum	0.0458	2.59E-05	0.005	5.18E-03	0.05%	3.26E-05	0.005	6.52E-03	0.05%
Nickel	1.974	1.12E-03	0.011	1.01E-01	1.01%	1.41E-03	0.011	1.28E-01	1.01%
Thallium	0.00158	8.93E-07	0.00001	8.93E-02	0.89%	1.13E-06	0.00001	1.13E-01	0.89%
Vanadium	0.213	1.20E-04	0.005	2.41E-02	0.24%	1.52E-04	0.005	3.03E-02	0.24%
Zinc	12.18	6.88E-03	0.3	2.29E-02	0.23%	8.68E-03	0.3	2.89E-02	0.23%
Total Tribal Adult				1.0E+01		**Total Tribal Child**		1.3E+01	

Ctule_roots = Concentration in tule roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-58

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattails - Stalk
	Exposure Point:	Elem Area near Buckeye
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Cattail Stalk Ingestion Rate	IRcattail_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	**ATnc**	**70**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Ccattail_stalks [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Adults Ingestion Cattail Stalks					
Aluminum	2.726	1.87E-03	--	--	
Antimony	0.0449	3.07E-05	--	--	
Arsenic	0.045	3.08E-05	9.5	2.93E-04	100%
Barium	5.724	3.92E-03	--	--	
Boron	5.571	3.81E-03	--	--	
Cadmium	0.0033	2.26E-06	--	--	
Chromium	0.146	9.99E-05	--	--	
Cobalt	0.00849	5.81E-06	--	--	
Copper	90.2	6.17E-02	--	--	
Iron	9.413	6.44E-03	--	--	
Lead	1.266	8.66E-04	--	--	
Lithium	1.007	6.89E-04	--	--	
Manganese	6.12	4.19E-03	--	--	
Mercury	0.0155	1.06E-05	--	--	
Molybdenum	0.0431	2.95E-05	--	--	
Nickel	0.452	3.09E-04	--	--	
Selenium	0.0579	3.96E-05	--	--	
Silver	0.034	2.33E-05	--	--	
Thallium	0.000263	1.80E-07	--	--	
Vanadium	0.115	7.87E-05	--	--	
Zinc	64.07	4.38E-02	--	--	
Total Tribal Adult				2.9E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Child ingesting Cattail Stalks			
2.18E-04	--	--	
3.58E-06	--	--	
3.59E-06	9.5	3.41E-05	100%
4.57E-04	--	--	
4.45E-04	--	--	
2.63E-07	--	--	
1.17E-05	--	--	
6.78E-07	--	--	
7.20E-03	--	--	
7.52E-04	--	--	
1.01E-04	--	--	
8.04E-05	--	--	
4.89E-04	--	--	
1.24E-06	--	--	
3.44E-06	--	--	
3.61E-05	--	--	
4.62E-06	--	--	
2.71E-06	--	--	
2.10E-08	--	--	
9.18E-06	--	--	
5.12E-03	--	--	
Total Tribal Child		3.4E-05	

Ccattail_stalks = Concentration in cattail stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-59

Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattails - Stalk
	Exposure Point:	Elem Area near Buckeye
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	20	6	year
Cattail Stalk Ingestion Rate	IRcattail_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	**ATnc**	**70**	**6**	**year**

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ccattail_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingestion Cattail Stalks					
Aluminum	2.726	1.87E-03	1	1.87E-03	0.02%
Antimony	0.0449	3.07E-05	0.0004	7.68E-02	0.69%
Arsenic	0.045	3.08E-05	0.0000035	8.80E+00	78.86%
Barium	5.724	3.92E-03	0.2	1.96E-02	0.18%
Boron	5.571	3.81E-03	0.2	1.91E-02	0.17%
Cadmium	0.0033	2.26E-06	0.001	2.26E-03	0.02%
Chromium	0.146	9.99E-05	1.5	6.66E-05	0.00%
Cobalt	0.00849	5.81E-06	0.0003	1.94E-02	0.17%
Copper	90.2	6.17E-02	0.04	1.54E+00	13.83%
Iron	9.413	6.44E-03	0.7	9.20E-03	0.08%
Lead	1.266	8.66E-04	--	--	
Lithium	1.007	6.89E-04	0.002	3.45E-01	3.09%
Manganese	6.12	4.19E-03	0.14	2.99E-02	0.27%
Mercury	0.0155	1.06E-05	0.00016	6.63E-02	0.59%
Molybdenum	0.0431	2.95E-05	0.005	5.90E-03	0.05%
Nickel	0.452	3.09E-04	0.011	2.81E-02	0.25%
Selenium	0.0579	3.96E-05	0.005	7.92E-03	0.07%
Silver	0.034	2.33E-05	0.005	4.65E-03	0.04%
Thallium	0.000263	1.80E-07	0.00001	1.80E-02	0.16%
Vanadium	0.115	7.87E-05	0.005	1.57E-02	0.14%
Zinc	64.07	4.38E-02	0.3	1.46E-01	1.31%
Total Tribal Adult				1.1E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child ingesting Cattail Stalks			
2.54E-03	1	2.54E-03	0.02%
4.18E-05	0.0004	1.05E-01	0.69%
4.19E-05	0.0000035	1.20E+01	78.86%
5.33E-03	0.2	2.67E-02	0.18%
5.19E-03	0.2	2.59E-02	0.17%
3.07E-06	0.001	3.07E-03	0.02%
1.36E-04	1.5	9.07E-05	0.00%
7.91E-06	0.0003	2.64E-02	0.17%
8.40E-02	0.04	2.10E+00	13.83%
8.77E-03	0.7	1.25E-02	0.08%
1.18E-03	--	--	
9.38E-04	0.002	4.69E-01	3.09%
5.70E-03	0.14	4.07E-02	0.27%
1.44E-05	0.00016	9.02E-02	0.59%
4.01E-05	0.005	8.03E-03	0.05%
4.21E-04	0.011	3.83E-02	0.25%
5.39E-05	0.005	1.08E-02	0.07%
3.17E-05	0.005	6.33E-03	0.04%
2.45E-07	0.00001	2.45E-02	0.16%
1.07E-04	0.005	2.14E-02	0.14%
5.97E-02	0.3	1.99E-01	1.31%
Total Tribal Child		1.5E+01	

Ccattail_stalks = Concentration in cattail stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-60

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattails - Roots
	Exposure Point:	Elem Area near Buckeye
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Cattail Root Ingestion Rate	IRcattail_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Ccattail_roots [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Adults Ingestion Cattail Roots					
Aluminum	34.19	1.93E-02	--	--	
Antimony	0.00816	4.61E-06	--	--	
Arsenic	0.0703	3.97E-05	9.5	3.77E-04	100.00%
Barium	6.685	3.78E-03	--	--	
Boron	6.734	3.81E-03	--	--	
Cadmium	0.0168	9.49E-06	--	--	
Chromium	0.377	2.13E-04	--	--	
Cobalt	0.0374	2.11E-05	--	--	
Copper	7.253	4.10E-03	--	--	
Iron	44.37	2.51E-02	--	--	
Lead	0.285	1.61E-04	--	--	
Lithium	0.512	2.89E-04	--	--	
Manganese	16.68	9.43E-03	--	--	
Mercury	0.384	2.17E-04	--	--	
Methyl Mercury	0.00063	3.56E-07	--	--	
Molybdenum	0.139	7.85E-05	--	--	
Nickel	0.393	2.22E-04	--	--	
Selenium	0.0903	5.10E-05	--	--	
Thallium	0.00683	3.86E-06	--	--	
Vanadium	0.279	1.58E-04	--	--	
Zinc	10.79	6.10E-03	--	--	
Total Tribal Adult				3.8E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Child ingesting Cattail Roots			
2.09E-03	--	--	
4.98E-07	--	--	
4.29E-06	9.5	4.08E-05	100.00%
4.08E-04	--	--	
4.11E-04	--	--	
1.03E-06	--	--	
2.30E-05	--	--	
2.28E-06	--	--	
4.43E-04	--	--	
2.71E-03	--	--	
1.74E-05	--	--	
3.13E-05	--	--	
1.02E-03	--	--	
2.34E-05	--	--	
3.85E-08	--	--	
8.49E-06	--	--	
2.40E-05	--	--	
5.51E-06	--	--	
4.17E-07	--	--	
1.70E-05	--	--	
6.59E-04	--	--	
Total Tribal Child		4.1E-05	

Ccattail_roots = Concentration in cattail roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-61

Risk Calculation Worksheet for - NonCarcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattail - Roots
	Exposure Point:	Elem and North Wetland
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	20	6	year
Tule Root Ingestion Rate	IRcattail_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ccattail_roots [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingesting Cattail - Roots					
Aluminum	34.19	1.93E-02	1.00E+00	1.93E-02	0.14%
Antimony	0.00816	4.61E-06	4.00E-04	1.15E-02	0.08%
Arsenic	0.0703	3.97E-05	3.50E-06	1.13E+01	82.89%
Barium	6.685	3.78E-03	2.00E-01	1.89E-02	0.14%
Boron	6.734	3.81E-03	2.00E-01	1.90E-02	0.14%
Cadmium	0.0168	9.49E-06	1.00E-03	9.49E-03	0.07%
Chromium	0.377	2.13E-04	1.50E+00	1.42E-04	0.00%
Cobalt	0.0374	2.11E-05	3.00E-04	7.04E-02	0.51%
Copper	7.253	4.10E-03	4.00E-02	1.02E-01	0.75%
Iron	44.37	2.51E-02	7.00E-01	3.58E-02	0.26%
Lead	0.285	1.61E-04	--	--	
Lithium	0.512	2.89E-04	2.00E-03	1.45E-01	1.06%
Manganese	16.68	9.43E-03	1.40E-01	6.73E-02	0.49%
Mercury	0.384	2.17E-04	1.60E-04	1.36E+00	9.90%
Methyl Mercury	0.00063	3.56E-07	1.00E-04	3.56E-03	0.03%
Molybdenum	0.139	7.85E-05	5.00E-03	1.57E-02	0.11%
Nickel	0.393	2.22E-04	1.10E-02	2.02E-02	0.15%
Selenium	0.0903	5.10E-05	5.00E-03	1.02E-02	0.07%
Thallium	0.00683	3.86E-06	1.00E-05	3.86E-01	2.82%
Vanadium	0.279	1.58E-04	5.00E-03	3.15E-02	0.23%
Zinc	10.79	6.10E-03	3.00E-01	2.03E-02	0.15%
Total Tribal Adult				1.4E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child Ingesting Cattail - Roots			
2.44E-02	1.00E+00	2.44E-02	0.14%
5.81E-06	4.00E-04	1.45E-02	0.08%
5.01E-05	3.50E-06	1.43E+01	82.89%
4.76E-03	2.00E-01	2.38E-02	0.14%
4.80E-03	2.00E-01	2.40E-02	0.14%
1.20E-05	1.00E-03	1.20E-02	0.07%
2.69E-04	1.50E+00	1.79E-04	0.00%
2.66E-05	3.00E-04	8.88E-02	0.51%
5.17E-03	4.00E-02	1.29E-01	0.75%
3.16E-02	7.00E-01	4.52E-02	0.26%
2.03E-04	--	--	
3.65E-04	2.00E-03	1.82E-01	1.06%
1.19E-02	1.40E-01	8.49E-02	0.49%
2.74E-04	1.60E-04	1.71E+00	9.90%
4.49E-07	1.00E-04	4.49E-03	0.03%
9.90E-05	5.00E-03	1.98E-02	0.11%
2.80E-04	1.10E-02	2.54E-02	0.15%
6.43E-05	5.00E-03	1.29E-02	0.07%
4.87E-06	1.00E-05	4.87E-01	2.82%
1.99E-04	5.00E-03	3.97E-02	0.23%
7.69E-03	3.00E-01	2.56E-02	0.15%
Total Tribal Child		1.7E+01	

Ccattail_roots = Concentration in cattail roots

mg/kg = milligrams per kilogram

g/day = grams per day

kg = kilograms

RME = reasonable maximum exposure

EPC = exposure point concentration

Table C-62

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Acorns
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	RME Medium EPC Value, Cacorn [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]
Adults Ingestion Acorns				
Arsenic	1.74E-02	4.28E-06	9.50E+00	4.07E-05
Total Tribal Adult				4.1E-05

	Exposure Route = Oral		
RME Medium EPC Value, Cacorn [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]
	Child ingesting Acorns		
	4.89E-07	9.50E+00	4.65E-06
Total Tribal Child			4.6E-06

Cacorns = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-63

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	xposure Medium:	Acorns
	xposure Point:	Background
	eceptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Cacorn [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Percent Contribution
Adults Ingestion Acorns					
Arsenic	0.017355607	4.28E-06	3.50E-06	1.22E+00	33.87%
Thallium	0.096827357	2.39E-05	1.00E-05	2.39E+00	66.13%
Total Tribal Adult				3.6E+00	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Percent Contribution
Child ingesting Acorns			
5.71E-06	3.50E-06	1.63E+00	33.9%
3.18E-05	1.00E-05	3.18E+00	66.13%
Total Tribal Child		4.8E+00	

Cacorns = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-64

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Stalk
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Stalk Ingestion Rate	IRtules_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Adults Ingestion Tule Stalks					
Arsenic	0.335071942	2.29E-04	9.5	2.18E-03	100.00%
Total Tribal Adult				2.2E-03	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Child ingesting Tule Stalks			
2.68E-05	9.5	2.54E-04	100.00%
Total Tribal Child		2.5E-04	

Ctule stalks = Concentration in tule stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-65

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Tule Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	xposure Medium:	Tules - Stalks
	xposure Point:	Background
	eceptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Stalk Ingestion Rate	IR_tule_s	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral				Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ctule_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingesting Tules - Stalks						**Child Ingesting Tules - Stalks**			
Arsenic	0.335071942	2.29E-04	0.0000035	6.55E+01	98.01%	3.12E-04	0.0000035	8.92E+01	98.01%
Manganese	271.9282337	1.86E-01	0.14	1.33E+00	1.99%	2.53E-01	0.14	1.81E+00	1.99%
Total Tribal Adult				6.7E+01		**Total Tribal Child**		9.1E+01	

Ctule stalks = Concentration in tule stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-66

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Tule Roots Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Roots
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Root Ingestion Rate	IRtules_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Ctule_roots [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]-1	Cancer Risk [-]	Percent Contribution
Adults Ingestion Tule Roots					
Arsenic	0.319435252	1.81E-04	9.5	1.71E-03	100.00%
Total Tribal Adult				1.7E-03	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]-1	Cancer Risk [-]	Percent Contribution
Child ingesting Tule Roots			
1.95E-05	9.5	1.85E-04	100.00%
Total Tribal Child		1.9E-04	

Ctule roots = Concentration in tule roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-67

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Tule Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Tules - Roots
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Root Ingestion Rate	IRtules_r	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Ctule_roots [mg/kg]	Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Percent Contribution
Adults Ingesting Tules - Roots					
Arsenic	0.319435252	1.81E-04	3.50E-06	5.16E+01	100.00%
Total Tribal Adult				5.2E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Percent Contribution
Child Ingesting Tules - Roots			
2.28E-04	3.50E-06	6.50E+01	100.00%
Total Tribal Child		6.5E+01	

Ctule roots = Concentration in tule roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-68

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	xposure Medium:	Cattails - Stalk
	xposure Point:	Background
	eceptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	20	6	year
Cattail Stalk Ingestion Rate	IRcattail_s	333	85	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	20	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Ccattail_stalks [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Adults Ingestion Cattail Stalks					
Arsenic	0.285179799	1.95E-04	9.5	1.85E-03	100.00%
Total Tribal Adult				1.9E-03	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor [mg/kg/day]$^{-1}$	Cancer Risk [-]	Percent Contribution
Child ingesting Cattail Stalks			
2.28E-05	9.5	2.16E-04	100.00%
Total Tribal Child		2.2E-04	

Ccattail stalks = Concentration in cattail stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-69

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Cattail Stalk Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattails - Stalk
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Cattail Stalk Ingestion Rate	IRcattail_s	275	52	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ccattail_stalks [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingestion Cattail Stalks					
Arsenic	0.285179799	1.95E-04	0.0000035	5.58E+01	99.13%
Copper	28.44687938	1.95E-02	0.04	4.87E-01	0.87%
Total Tribal Adu t				5.6E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child ingesting Cattail Stalks			
2.66E-04	0.0000035	7.59E+01	99.1%
2.65E-02	0.04	6.62E-01	0.87%
Total Tribal Child		7.7E+01	

Ccattail stalks = Concentration in cattail stalks
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-70

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattails - Roots
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Cattail Root Ingestion Rate	IRcattail_r	275	65	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ccattail_roots [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Adults Ingestion Cattail Roots					
Arsenic	0.474976544	2.68E-04	9.5	2.55E-03	100.00%
Total Tribal Adult				2.5E-03	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Percent Contribution**
Child ingesting Cattail Roots			
2.90E-05	9.5	2.76E-04	100.00%
Total Tribal Child		2.8E-04	

Ccattail roots = Concentration in cattail roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-71

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Cattail Root Ingestion

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Seasonal
	Exposure Medium:	Cattail - Roots
	Exposure Point:	Background
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	60	60	day/year
Exposure Duration	ED	70	6	year
Tule Root Ingestion Rate	IRcattail_r	275	52	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Ccattail_roots [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingesting Cattail - Roots					
Arsenic	4.75E-01	2.68E-04	3.50E-06	7.67E+01	99.99%
Mercury	1.38E-03	7.81E-07	1.60E-04	4.88E-03	0.01%
Total Tribal Adult				7.7E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child Ingesting Cattail - Roots			
3.38E-04	3.50E-06	9.67E+01	99.99%
9.85E-07	1.60E-04	6.16E-03	0.01%
Total Tribal Child		9.67E+01	

Ccattail roots = Concentration in cattail roots
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-72

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Trespasser Exposure to On-Mine Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Trespasser
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	On-Mine
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	104	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_tres	400	mg/day
Body Weight	BW	44 3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**12**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Trespasser											
Aluminum	6757	2.98E-03	--	--	0	--	--	2.43E-07	--	--	--
Antimony	223.3	9.85E-05	--	--	0	--	--	8.02E-09	--	--	--
Arsenic	73.84	1.95E-05	9.5	1.86E-04	2.53E-06	9.5	2.40E-05	2.65E-09	0.0043	1.14E-11	2.10E-04
Barium	241.4	1.06E-04	--	--	0	--	--	8.67E-09	--	--	--
Beryllium	0.18	7.94E-08	--	--	0	--	--	6.46E-12	0.0024	1.55E-14	1.55E-14
Boron	8.2	3.62E-06	--	--	0	--	--	2 95E-10	--	--	--
Cadmium	0.0651	2.87E-08	--	--	7.42E-11	--	--	2 34E-12	0.0042	9.82E-15	9.82E-15
Chromium	26.02	1.15E-05	--	--	0	--	--	9 35E-10	--	--	--
Cobalt	3 264	1.44E-06	--	--	0	--	--	1.17E-10	0.009	1.06E-12	1.06E-12
Copper	26.91	1.19E-05	--	--	0	--	--	9.66E-10	--	--	--
Iron	41862	1.85E-02	--	--	0	--	--	1 50E-06	--	--	--
Lead	17.23	7.60E-06	--	--	0	--	--	6.19E-10	--	--	--
Lithium	1.14	5.03E-07	--	--	0	--	--	4.09E-11	--	--	--
Manganese	164.4	7.25E-05	--	--	0	--	--	5 90E-09	--	--	--
Mercury	629.1	2.77E-04	--	--	0	--	--	2 26E-08	--	--	--
Methyl Mercury	0.00596	2.63E-09	--	--	0	--	--	2.14E-13	--	--	--
Nickel	13.8	6.09E-06	--	--	0	--	--	4 96E-10	0.00026	1.29E-13	1.29E-13
Selenium	0.29	1.28E-07	--	--	0	--	--	1.04E-11	--	--	--
Silver	0.0794	3.50E-08	--	--	0	--	--	2.85E-12	--	--	--
Thallium	0.849	3.74E-07	--	--	0	--	--	3.05E-11	--	--	--
Vanadium	26.85	1.18E-05	--	--	0	--	--	9.64E-10	--	--	--
Zinc	12.41	5.47E-06	--	--	0	--	--	4.46E-10	--	--	--
Total Trespasser				1.9E-04			2.4E-05			1 3E-11	2.1E-04

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-73

Risk Calculation Worksheet for - NonCarcinogenic Effects - Unauthorized Tribal User Exposure to On-Mine Soil

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Unauthorized Tribal User
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	OnMine
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	104	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_tres	400	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	PEF	1.36E+09	m^3/kg
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	**ATnc**	**12**	**year**

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Trespasser											
Aluminum	6757	1.74E-02	1.00E+00	1.74E-02	0	1.00E+00	--	1.42E-06	5.00E-03	2.83E-04	1.77E-02
Antimony	223.3	5.74E-04	4.00E-04	1.44E+00	0	4.00E-04	--	4.68E-08	--	--	1.44E+00
Arsenic	73.84	1.14E-04	3.50E-06	3.26E+01	1.47E-05	3.50E-06	4.21E+00	1.55E-08	1.50E-05	1.03E-03	3.68E+01
Barium	241.4	6.21E-04	2.00E-01	3.11E-03	0	2.00E-01	--	5.06E-08	5.00E-04	1.01E-04	3.21E-03
Beryllium	0.18	4.63E-07	2.00E-04	2.32E-03	0	2.00E-04	--	3.77E-11	7.00E-06	5.39E-06	2.32E-03
Boron	8.2	2.11E-05	2.00E-01	1.05E-04	0	2.00E-01	--	1.72E-09	2.00E-02	8.59E-08	1.06E-04
Cadmium	0.0651	1.67E-07	1.00E-03	1.67E-04	4.33E-10	1.00E-03	4.33E-07	1.36E-11	1.00E-05	1.36E-06	1.69E-04
Chromium	26.02	6.69E-05	1.50E+00	4.46E-05	0	1.50E+00	--	5.45E-09	--	--	4.46E-05
Cobalt	3.264	8.40E-06	3.00E-04	2.80E-02	0	3.00E-04	--	6.84E-10	6.00E-06	1.14E-04	2.81E-02
Copper	26.91	6.92E-05	4.00E-02	1.73E-03	0	4.00E-02	--	5.64E-09	--	--	1.73E-03
Iron	41862	1.08E-01	7.00E-01	1.54E-01	0	7.00E-01	--	8.77E-06	--	--	1.54E-01
Lead	17.23	4.43E-05	--	--	0	--	--	3.61E-09	--	--	--
Lithium	1.14	2.93E-06	2.00E-03	1.47E-03	0	2.00E-03	--	2.39E-10	--	--	1.47E-03
Manganese	164.4	4.23E-04	1.40E-01	3.02E-03	0	1.40E-01	--	3.44E-08	5.00E-05	6.89E-04	3.71E-03
Mercury	629.1	1.62E-04	1.60E-04	1.01E+00	0	1.60E-04	--	1.32E-07	3.00E-05	4.39E-03	1.02E+00
Methyl Mercury	0.00596	1.53E-08	1.00E-04	1.53E-04	0	1.00E-04	--	1.25E-12	--	--	1.53E-04
Nickel	13.8	3.55E-05	1.10E-02	3.23E-03	0	1.10E-02	--	2.89E-09	1.40E-05	2.07E-04	3.43E-03
Selenium	0.29	7.46E-07	5.00E-03	1.49E-04	0	5.00E-03	--	6.08E-11	2.00E-02	3.04E-09	1.49E-04
Thallium	0.849	2.18E-06	1.00E-05	2.18E-01	0	1.00E-05	--	1.78E-10	--	--	2.18E-01
Vanadium	26.85	6.91E-05	5.00E-03	1.38E-02	0	5.00E-03	--	5.63E-09	1.00E-04	5.63E-05	1.39E-02
Zinc	12.41	3.19E-05	3.00E-01	1.06E-04	0	3.00E-01	--	2.60E-09	--	--	1.06E-04
Total Trespasser				3.5E+01			4.2E+00			6.9E-03	4.0E+01

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-74

Risk Calculation Worksheet for - Carcinogenic Effects - Unauthorized Tribal User Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario I formation	Exposure Scenario:	Unauthorized Tribal User
	Scenario Timeframe:	Chronic
	xposure Medium:	Soil
	xposure Point:	Ambient (PMB -Andesite)
	eceptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	104	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_tres	400	mg/day
Body Weight	BW	44 3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Exposure Concentration [mg/m^3]**	**Inhalation Unit Risk [mg/m^3]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Trespasser											
Aluminum	23987	1.06E-02	--	--	0	--	--	8.62E-07	--	--	--
Antimony	1.803	7.95E-07	--	--	0	--	--	6.48E-11	--	--	--
Arsenic	8.714	2.31E-06	9.5	2.19E-05	3.0E-07	9 5	2.83E-06	3.13E-10	0.0043	1.35E-12	2.47E-05
Barium	274 5	1.21E-04	--	--	0	--	--	9.86E-09	--	--	--
Beryllium	1.688	7.44E-07	--	--	0	--	--	6.06E-11	0.0024	1.46E-13	1.46E-13
Boron	174.1	7.68E-05	--	--	0	--	--	6 25E-09	--	--	--
Cadmium	0.233	1.03E-07	--	--	2.7E-10	--	--	8 37E-12	0.0042	3.51E-14	3.51E-14
Chromium	53.08	2.34E-05	--	--	0	--	--	1 91E-09	--	--	--
Cobalt	16.74	7.38E-06	--	--	0	--	--	6.01E-10	0.009	5.41E-12	5.41E-12
Copper	33.76	1.49E-05	--	--	0	--	--	1 21E-09	--	--	--
Iron	27206	1.20E-02	--	--	0	--	--	9.77E-07	--	--	--
Lead	14.54	6.41E-06	--	--	0	--	--	5 22E-10	--	--	--
Lithium	55.15	2.43E-05	--	--	0	--	--	1 98E-09	--	--	--
Manganese	1191	5.25E-04	--	--	0	--	--	4 28E-08	--	--	--
Mercury	13.68	6.03E-06	--	--	0	--	--	4 91E-10	--	--	--
Molybdenum	0.417	1.84E-07	--	--	0	--	--	1 50E-11	--	--	--
Nickel	43.92	1.94E-05	--	--	0	--	--	1 58E-09	0.00026	4.10E-13	4.10E-13
Selenium	6.484	2.86E-06	--	--	0	--	--	2 33E-10	--	--	--
Silver	0.15	6.62E-08	--	--	0	--	--	5 39E-12	--	--	--
Thallium	0.184	8.12E-08	--	--	0	--	--	6.61E-12	--	--	--
Vanadium	67	2.95E-05	--	--	0	--	--	2.41E-09	--	--	--
Zinc	86.14	3.80E-05	--	--	0	--	--	3.09E-09	--	--	--
Total Trespasser				2.2E-05			2.8E-06			7.3E-12	2.5E-05

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-75

Risk Calculation Worksheet for - NonCarcinogenic Effects - Unauthorized Tribal User Exposure to PMB Soil (Andesite)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Unauthorized Tribal User
	Scenario Timeframe:	Chronic
	Exposure Medium:	Soil
	Exposure Point:	Ambient (PMB -Andesite)
	Receptor Age:	Youth

Exposure Parameter	Variable	Youth Value	Units
Exposure Frequency	EF	104	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	R_rec	400	mg/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	5172	cm^2/day
Adherence Factor	AF	0.2	mg/cm^2
Particulate Emission Factor	**PEF**	**1.36E+09**	**m^3/kg**
Conversion Factor	**CF**	**0.000001**	**kg/mg**
Averaging Time for carcinogens	**ATc**	**70**	**year**
Averaging Time for noncarcinogens	ATnc	12	year

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/m^3]**	**Reference Concentration [mg/m^3]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Trespasser											
Aluminum	23987	6.17E-02	1.00E+00	6.17E-02	0	1.00E+00	--	5.03E-06	5.00E-03	1.01E-03	6.27E-02
Antimony	1.803	4.64E-06	4.00E-04	1.16E-02	0	4.00E-04	--	3.78E-10	--	--	1.16E-02
Arsenic	8.714	1.35E-05	3 50E-06	3.84E+00	1.73926E-06	3 50E-06	4 97E-01	1.83E-09	1.50E-05	1 22E-04	4.34E+00
Barium	274 5	7.06E-04	2.00E-01	3.53E-03	0	2.00E-01	--	5.75E-08	5.00E-04	1.15E-04	3.65E-03
Beryllium	1.688	4.34E-06	2.00E-04	2.17E-02	0	2.00E-04	--	3 54E-10	7.00E-06	5.05E-05	2.18E-02
Boron	174.1	4.48E-04	2.00E-01	2.24E-03	0	2.00E-01	--	3.65E-08	2.00E-02	1.82E-06	2.24E-03
Cadmium	0.233	5.99E-07	1.00E-03	5.99E-04	1 55018E-09	1.00E-03	1 55E-06	4.88E-11	1.00E-05	4.88E-06	6.06E-04
Chromium	53.08	1.37E-04	1.50E+00	9.10E-05	0	1 50E+00	--	1.11E-08	--	--	9.10E-05
Cobalt	16.74	4.31E-05	3.00E-04	1.44E-01	0	3.00E-04	--	3 51E-09	6.00E-06	5.85E-04	1.44E-01
Copper	33.76	8.69E-05	4.00E-02	2.17E-03	0	4.00E-02	--	7.07E-09	--	--	2.17E-03
Iron	27206	7.00E-02	7.00E-01	1.00E-01	0	7.00E-01	--	5.70E-06	--	--	1.00E-01
Lead	14.54	3.74E-05	--	--	0	--	--	3.05E-09	--	--	--
Lithium	55.15	1.42E-04	2.00E-03	7.09E-02	0	2.00E-03	--	1.16E-08	--	--	7.09E-02
Manganese	1191	3.06E-03	1.40E-01	2.19E-02	0	1.40E-01	--	2 50E-07	5.00E-05	4 99E-03	2.69E-02
Mercury	13.68	3.52E-06	1.60E-04	2.20E-02	0	1.60E-04	--	2.87E-09	3.00E-05	9 55E-05	2.21E-02
Molybdenum	0.417	1.07E-06	5.00E-03	2.15E-04	0	5.00E-03	--	8.74E-11	--	--	2.15E-04
Nickel	43.92	1.13E-04	1.10E-02	1.03E-02	0	1.10E-02	--	9 20E-09	1.40E-05	6 57E-04	1.09E-02
Selenium	6.484	1.67E-05	5.00E-03	3.34E-03	0	5.00E-03	--	1 36E-09	2.00E-02	6.79E-08	3.34E-03
Silver	0.15	3.86E-07	5.00E-03	7.72E-05	0	5.00E-03	--	3.14E-11	--	--	7.72E-05
Thallium	0.184	4.73E-07	1.00E-05	4.73E-02	0	1.00E-05	--	3.85E-11	--	--	4.73E-02
Vanadium	67	1.72E-04	5.00E-03	3.45E-02	0	5.00E-03	--	1.40E-08	1.00E-04	1.40E-04	3.46E-02
Zinc	86.14	2.22E-04	3.00E-01	7.39E-04	0	3.00E-01	--	1.80E-08	--	--	7.39E-04
Total Trespasser				4.4E+00			5.0E-01			7.77E-03	4.9E+00

Cs = Concentration in Soil
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table -C76

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	2.68E-03	N/A	N/A	---
Antimony	7.44E-06	N/A	N/A	---
Arsenic	2.18E-05	9 5E+00	9 5E+00	2.1E-04
Barium	3.56E-04	N/A	N/A	---
Beryllium	1.40E-06	N/A	N/A	
Boron	5.01E-02	N/A	N/A	---
Cadmium	3.99E-06	N/A	N/A	
Chromium	3.56E-06	N/A	N/A	---
Cobalt	1.46E-05	N/A	N/A	---
Copper	8.53E-06	N/A	N/A	---
Fluoride	3.36E-03	N/A	N/A	---
Iron	1.30E-03	N/A	N/A	---
Lithium	8.33E-04	N/A	N/A	---
Manganese	8.16E-03	N/A	N/A	---
Mercuric Chloride	8.62E-07	N/A	N/A	---
Methyl Mercury	2.01E-08	N/A	N/A	---
Molybdenum	5.26E-06	N/A	N/A	---
Nickel	8.49E-05	N/A	N/A	---
Nitrate	1.27E-03	N/A	N/A	---
Selenium	2.68E-06	N/A	N/A	---
Silver	0.00E+00	N/A	N/A	---
Vanadium	8.27E-06	N/A	N/A	---
Zinc	4.45E-05	N/A	N/A	---
Total Ceremonial Tribal				2.1E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake mg/kg-day	Exposure Route = Dermal: Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	Total Cancer Risk
norganics					
Aluminum	8.13E-02	0.0E+00	N/A	---	---
Antimony	1.27E-03	0.0E+00	N/A	---	---
Arsenic	2.76E-03	0.0E+00	9 5E+00	---	2.1E-04
Barium	5.34E-02	0.0E+00	N/A	---	---
Beryllium	0.00E+00	5.2E-09	N/A	---	---
Boron	6 9E+00	0.0E+00	N/A	---	---
Cadmium	0.00E+00	1.5E-08	N/A	---	---
Chromium	5 3E-04	2.6E-08	N/A	---	---
Cobalt	2.64E-03	0.0E+00	N/A	---	---
Copper	9.53E-04	0.0E+00	N/A	---	---
Fluoride	0.00E+00	0.0E+00	N/A	---	---
Iron	2.27E-02	0.0E+00	N/A	---	---
Lithium	9.50E-02	0.0E+00	N/A	---	---
Manganese	8.94E-01	0.0E+00	N/A	---	---
Mercuric Chloride	2.83E-05	0.0E+00	N/A	---	---
Methyl Mercury	7.74E-07	0.0E+00	N/A	---	---
Molybdenum	2.22E-04	0.0E+00	N/A	---	---
Nickel	1.22E-02	0.0E+00	N/A	---	---
Nitrate	0.00E+00	0.0E+00	N/A	---	---
Selenium	3.66E-04	0.0E+00	N/A	---	---
Silver	6.30E-04	0.0E+00	N/A	---	---
Vanadium	1.60E-03	0.0E+00	N/A	---	---
Zinc	4.76E-03	0.0E+00	N/A	---	---
					2.1E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-77

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	3.77E-01	2.7E-03	1.0E+00	2.7E-03
Antimony	1.04E-03	7.4E-06	4.0E-04	1.9E-02
Arsenic	3.06E-03	2.2E-05	3.5E-06	6.2E+00
Barium	5.00E-02	3.6E-04	2.0E-01	1.8E-03
Beryllium	1.96E-04	1.4E-06	2.0E-04	7.0E-03
Boron	7.04E+00	5.0E-02	2.0E-01	2.5E-01
Cadmium	5.60E-04	4.0E-06	5.0E-04	8.0E-03
Chromium	5.00E-04	3.6E-06	1.5E+00	2.4E-06
Cobalt	2.05E-03	1.5E-05	3.0E-04	4.9E-02
Copper	1.20E-03	8.5E-06	4.0E-02	2.1E-04
Iron	1.82E-01	1.3E-03	7.0E-01	1.9E-03
Lithium	1.17E-01	8.3E-04	2.0E-03	4.2E-01
Manganese	1.15E+00	8.2E-03	2.4E-02	3.4E-01
Mercuric Chloride	1.21E-04	8.6E-07	1.6E-04	5.4E-03
Methyl Mercury	2.82E-06	2.0E-08	1.0E-04	2.0E-04
Molybdenum	7.38E-04	5.3E-06	5.0E-03	1.1E-03
Nickel	1.19E-02	8.5E-05	1.1E-02	7.7E-03
Selenium	3.76E-04	2.7E-06	5.0E-03	5.4E-04
Silver	0.00E+00	0.0E+00	5.0E-03	0.0E+00
Vanadium	1.16E-03	8.3E-06	5.0E-03	1.7E-03
Zinc	6.25E-03	4.5E-05	3.0E-01	1.5E-04
Total Ceremonial Tribal				7.3E+00

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: Chronic Daily Intake mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	8.13E-02	0.0E+00	1.0E+00	0.0E+00	2.68E-03
Antimony	1.27E-03	0.0E+00	4.0E-04	0.0E+00	1.86E-02
Arsenic	2.76E-03	0.0E+00	3.5E-06	0.0E+00	6.22E+00
Barium	5.34E-02	0.0E+00	1.4E-02	0.0E+00	1.78E-03
Beryllium	0.00E+00	0.0E+00	1.4E-06	0.0E+00	6.98E-03
Boron	6.86E+00	0.0E+00	2.0E-01	0.0E+00	2.51E-01
Cadmium	0.00E+00	0.0E+00	2.5E-05	0.0E+00	7.98E-03
Chromium	5.34E-04	9.6E-08	2.0E-02	4.9E-06	7.28E-06
Cobalt	2.64E-03	0.0E+00	3.0E-04	0.0E+00	4.88E-02
Copper	9.53E-04	0.0E+00	4.0E-02	0.0E+00	2.13E-04
Iron	2.27E-02	0.0E+00	7.0E-01	0.0E+00	1.85E-03
Lithium	9.50E-02	0.0E+00	2.0E-03	0.0E+00	4.16E-01
Manganese	8.94E-01	0.0E+00	2.4E-02	0.0E+00	3.40E-01
Mercuric Chloride	2.83E-05	0.0E+00	1.1E-05	0.0E+00	5.39E-03
Methyl Mercury	7.74E-07	0.0E+00	1.0E-04	0.0E+00	2.01E-04
Molybdenum	2.22E-04	0.0E+00	5.0E-03	0.0E+00	1.05E-03
Nickel	1.22E-02	0.0E+00	4.4E-04	0.0E+00	7.72E-03
Selenium	3.66E-04	0.0E+00	5.0E-03	0.0E+00	5.36E-04
Silver	6.30E-04				--
Vanadium	1.60E-03	0.0E+00	1.3E-04	0.0E+00	1.65E-03
Zinc	4.76E-03	0.0E+00	3.0E-01	0.0E+00	1.48E-04
				4.9E-06	7.3E+00

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-78

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	xposure Medium:	Clear Lake Surface Water
	eceptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	3.77E-01	3.7E-04	N/A	---
Antimony	1.04E-03	1.0E-06	N/A	---
Arsenic	3.06E-03	3.0E-06	9.5E+00	2.8E-05
Barium	5.00E-02	4.9E-05	N/A	---
Beryllium	1 96E-04			
Boron	7.04E+00	6.9E-03	N/A	---
Cadmium	5.60E-04			
Chromium	5.00E-04	4.9E-07	N/A	---
Cobalt	2.05E-03	2.0E-06	N/A	---
Copper	1 20E-03	1.2E-06	N/A	---
Fluoride	4.71E-01	4.6E-04	N/A	---
Iron	1.82E-01	1.8E-04	N/A	---
Lithium	1.17E-01	1.1E-04	N/A	---
Manganese	1.15E+00	1.1E-03	N/A	---
Mercuric Chlorid	1 21E-04	1.2E-07	N/A	---
Methyl Mercury	2.82E-06	2.8E-09	N/A	---
Molybdenum	7 38E-04	7.2E-07	N/A	---
Nickel	1.19E-02	1.2E-05	N/A	---
Nitrate	1.78E-01	1.7E-04	N/A	---
Selenium	3.76E-04	3.7E-07	N/A	---
Silver	0.00E+00	0.0E+00	N/A	---
Vanadium	1.16E-03	1.1E-06	N/A	---
Zinc	6 25E-03	6.1E-06	N/A	---
Total Ceremonial Tribal				2.8E-05

Concern	Medium	Exposure Route = Dermal: Chronic Daily Intake (mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	Total Cancer Risk
	(mg/L)				
Inorganics					
Aluminum	8.13E-02	0.0E+00	N/A	---	---
Antimony	1.27E-03	0.0E+00	N/A	---	---
Arsenic	2.76E-03	0.0E+00	9.5E+00	---	2.8E-05
Barium	5.34E-02	0.0E+00	N/A	---	---
Beryllium	0.00E+00	5 5E-10	N/A	---	---
Boron	6.86E+00	0.0E+00	N/A	---	---
Cadmium	0.00E+00	0.0E+00	N/A	---	---
Chromium	5.34E-04	0.0E+00	N/A	---	---
Cobalt	2.64E-03	0.0E+00	N/A	---	---
Copper	9.53E-04	0.0E+00	N/A	---	---
Fluoride	0.00E+00	0.0E+00	N/A	---	---
Iron	2.27E-02	0.0E+00	N/A	---	---
Lithium	9.50E-02	0.0E+00	N/A	---	---
Manganese	8.94E-01	3 2E-06	N/A	---	---
Mercuric Chloride	2.83E-05	3.4E-10	N/A	---	---
Methyl Mercury	7.74E-07	0.0E+00	N/A		
Molybdenum	2.22E-04	0.0E+00	N/A	---	---
Nickel	1.22E-02	0.0E+00	N/A	---	---
Nitrate	0.00E+00	0.0E+00	N/A	---	---
Selenium	3.66E-04	0.0E+00	N/A	---	---
Silver	6.30E-04	0.0E+00	N/A	---	---
Vanadium	1.60E-03	0.0E+00	N/A	---	---
Zinc	4.76E-03	0.0E+00	N/A	---	---
				--	2.8E-05

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-79

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Clear Lake Drinking Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Ceremonial Tribal
	Exposure Medium:	Clear Lake Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	R_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0 54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	3.77E-01	4.3E-03	1.0E+00	4.3E-03
Antimony	1.04E-03	1.2E-05	4.0E-04	3.0E-02
Arsenic	3.06E-03	3.5E-05	3 5E-06	1.0E+01
Barium	5.00E-02	5.7E-04	2.0E-01	2.8E-03
Beryllium	1.96E-04	2.2E-06	2.0E-04	1.1E-02
Boron	7.04E+00	8.0E-02	2.0E-01	4.0E-01
Cadmium	5.60E-04	6.4E-06	5.0E-04	1.3E-02
Chromium	5.00E-04	5.7E-06	1.5E+00	3.8E-06
Cobalt	2.05E-03	2.3E-05	3.0E-04	7.8E-02
Copper	1.20E-03	1.4E-05	4.0E-02	3.4E-04
Fluoride	4.71E-01	5.4E-03	4.0E-02	1.3E-01
Iron	1.82E-01	2.1E-03	7.0E-01	3.0E-03
Lithium	1.17E-01	1.3E-03	2.0E-03	6.7E-01
Manganese	1.15E+00	1.3E-02	2.4E-02	5.4E-01
Mercuric Chloric	1.21E-04	1.4E-06	1.6E-04	8.6E-03
Methyl Mercury	2.82E-06	3.2E-08	1.0E-04	3.2E-04
Molybdenum	7.38E-04	8.4E-06	5.0E-03	1.7E-03
Nickel	1.19E-02	1.4E-04	1.1E-02	1.2E-02
Nitrate	1.78E-01	2.0E-03	1.6E+00	1.3E-03
Selenium	3.76E-04	4.3E-06	5.0E-03	8.6E-04
Silver	0.00E+00	0.0E+00	5.0E-03	0.0E+00
Vanadium	1.16E-03	1.3E-05	5.0E-03	2.6E-03
Zinc	6.25E-03	7.1E-05	3.0E-01	2.4E-04
Total Ceremonial Tribal				1 2E+01

hemical Potentia Concern	RME Medium EPC Va e, Cw (mg/L)	Exposure Route = Dermal			
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	8.13E-02	0.0E+00	1.0E+00	0.0E+00	4.29E-03
Antimony	1.27E-03	0.0E+00	4.0E-04	0.0E+00	2.97E-02
Arsenic	2.76E-03	0.0E+00	3.5E-06	0.0E+00	9.95E+00
Barium	5.34E-02	0.0E+00	1.4E-02	0.0E+00	2.85E-03
Beryllium	0.00E+00	6.4E-09	1.4E-06	4.6E-03	1.57E-02
Boron	6.86E+00	0.0E+00	2.0E-01	0.0E+00	4.01E-01
Cadmium	0.00E+00	0.0E+00	2.5E-05	0.0E+00	1.28E-02
Chromium	5.34E-04	0.0E+00	2.0E-02	0.0E+00	3.80E-06
Cobalt	2.64E-03	0.0E+00	3.0E-04	0.0E+00	7.80E-02
Copper	9.53E-04	0.0E+00	4.0E-02	0.0E+00	3.41E-04
Fluoride	0.00E+00	0.0E+00	4.0E-02	0.0E+00	1.34E-01
Iron	2.27E-02	0.0E+00	7.0E-01	0.0E+00	2.96E-03
Lithium	9.50E-02	0.0E+00	2.0E-03	0.0E+00	6.66E-01
Manganese	8.94E-01	3.7E-05	2.4E-02	1.6E-03	5.45E-01
Mercuric Chlorid	2.83E-05	4.0E-09	1.1E-05	3.5E-04	8.97E-03
Methyl Mercury	7.74E-07	0.0E+00	1.0E-04	0.0E+00	3.21E-04
Molybdenum	2.22E-04	0.0E+00	5.0E-03	0.0E+00	1.68E-03
Nickel	1.22E-02	0.0E+00	4.4E-04	0.0E+00	1.24E-02
Nitrate	0.00E+00	0.0E+00	1.6E+00	0.0E+00	1.27E-03
Selenium	3.66E-04	0.0E+00	5.0E-03	0.0E+00	8.57E-04
Silver	6.30E-04	0.0E+00	5.0E-03	0.0E+00	0.00E+00
Vanadium	1.60E-03	0.0E+00	1.3E-04	0.0E+00	2.65E-03
Zinc	4.76E-03	0.0E+00	3.0E-01	0.0E+00	2.37E-04
					1 2E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-80

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	3.42E-02	2.4E-04	N/A	---
Arsenic	3.45E-03	2.5E-05	9.5E+00	2.3E-04
Barium	8.04E-02	5.7E-04	N/A	---
Boron	1.20E+00	8.5E-03	N/A	---
Cobalt	1.34E-04	9.5E-07	N/A	---
Copper	1.97E-03	1.4E-05	N/A	---
Iron	1.00E-01	7.1E-04	N/A	---
Lithium	2.08E-02	1.5E-04	N/A	---
Manganese	1.96E-02	1.4E-04	N/A	---
Mercuric Chlori	2.75E-05	2.0E-07	N/A	---
Methyl mercury	5.60E-08	4.0E-10	N/A	---
Molybdenum	2.50E-04	1.8E-06	N/A	---
Nickel	2.95E-03	2.1E-05	N/A	---
Zinc	0.00E+00	2.8E-01	N/A	---
Total Ceremonial Tribal Adult				2.3E-04

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	0.00E+00	0.0E+00	N/A	---	---
Arsenic	3.32E-03	0.0E+00	9.5E+00	---	2.3E-04
Barium	7.67E-02	0.0E+00	N/A	---	---
Boron	1.30E+00	0.0E+00	N/A	---	---
Cobalt	0.00E+00	0.0E+00	N/A	---	---
Copper	0.00E+00	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lithium	2.12E-02	0.0E+00	N/A	---	---
Manganese	1.96E-03	0.0E+00	N/A	---	---
Mercuric Chlor	1.52E-06	0.0E+00	N/A	---	---
Methyl mercur	0.00E+00	0.0E+00	N/A	---	---
Molybdenum	0.00E+00	0.0E+00	N/A	---	---
Nickel	2.10E-03	0.0E+00	N/A	---	---
Zinc	7.60E-03	0.0E+00	N/A	---	---
				0.0E+00	2.3E-04

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-81

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Adult Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	70	year
Drinking Water Ingestion Rate	IR_adult	4	L/day
Body Weight	BW	80	kg
Skin Surface Area	SA	20900	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.71	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	20	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	3.42E-02	2.4E-04	1.0E+00	2.4E-04
Arsenic	3.45E-03	2.5E-05	3.5E-06	7.0E+00
Barium	8.04E-02	5.7E-04	2.0E-01	2.9E-03
Boron	1.20E+00	8.5E-03	2.0E-01	4.3E-02
Cobalt	1.34E-04	9.5E-07	3.0E-04	3.2E-03
Copper	1.97E-03	1.4E-05	4.0E-02	3.5E-04
ron	1.00E-01	7.1E-04	7.0E-01	1.0E-03
Lithium	2.08E-02	1.5E-04	2.0E-03	7.4E-02
Manganese	1.96E-02	1.4E-04	2.4E-02	5.8E-03
Mercuric Chlori	2.75E-05	2.0E-07	1.6E-04	1.2E-03
Methyl mercury	5.60E-08	4.0E-10	1.0E-04	4.0E-06
Molybdenum	2.50E-04	1.8E-06	5.0E-03	3.6E-04
Nickel	2.95E-03	2.1E-05	1.1E-02	1.9E-03
Zinc	0.00E+00	0.0E+00	3.0E-01	0.0E+00
Total Ceremonial Tribal Adult				7.2E+00

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Hazard [-]
		Chronic Daily (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics					
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00	2.43E-04
Arsenic	3.32E-03	0.0E+00	3.5E-06	0.0E+00	7.02E+00
Barium	7.67E-02	0.0E+00	1.4E-02	0.0E+00	2.86E-03
Boron	1.30E+00	0.0E+00	2.0E-01	0.0E+00	4.27E-02
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00	3.18E-03
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00	3.51E-04
Iron	0.00E+00	0.0E+00	7.0E-01	0.0E+00	1.02E-03
Lithium	2.12E-02	0.0E+00	2.0E-03	0.0E+00	7.42E-02
Manganese	1.96E-03	0.0E+00	2.4E-02	0.0E+00	5.82E-03
Mercuric Chl	1.52E-06	0.0E+00	1.1E-05	0.0E+00	1.22E-03
Methyl mercu	0.00E+00	0.0E+00	1.0E-04	0.0E+00	3.99E-06
Molybdenum	0.00E+00	0.0E+00	1.0E-04	0.0E+00	3.56E-04
Nickel	2.10E-03	0.0E+00	5.0E-03	0.0E+00	1.91E-03
Zinc	7.60E-03	0.0E+00	4.4E-04	0.0E+00	
				0.0E+00	7.2E+00

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-82

Risk Calculation Worksheet for - Carcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	Exposure Medium:	Ambient Surface Water
	Receptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	3.42E-02	3.3E-05	N/A	---
Arsenic	3.45E-03	3.4E-06	9.5E+00	3.2E-05
Barium	8.04E-02	7.9E-05	N/A	---
Boron	1.20E+00	1.2E-03	N/A	---
Cobalt	1.34E-04	1.3E-07	N/A	---
Copper	1.97E-03	1.9E-06	N/A	---
Iron	1.00E-01	9.8E-05	N/A	---
Lithium	2.08E-02	2.0E-05	N/A	---
Manganese	1.96E-02	1.9E-05	N/A	---
Mercuric Chloride	2.75E-05	2.7E-08	N/A	---
Methyl mercury	5.60E-08	5.5E-11		
Molybdenum	2.50E-04	2.4E-07	N/A	---
Nickel	2.95E-03	2.9E-06	N/A	---
Zinc	0.00E+00	0.0E+00	N/A	---
Total Ceremonial Tribal Child				3.2E-05

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	0.00E+00	0.0E+00	N/A	---	---
Arsenic	3.32E-03	0.0E+00	9.5E+00	---	3.2E-05
Barium	7.67E-02	0.0E+00	N/A	---	---
Boron	1.30E+00	0.0E+00	N/A	---	---
Cobalt	0.00E+00	0.0E+00	N/A	---	---
Copper	0.00E+00	0.0E+00	N/A	---	---
Iron	0.00E+00	0.0E+00	N/A	---	---
Lithium	2.12E-02	0.0E+00	N/A	---	---
Manganese	1.96E-03	5.5E-08	N/A	---	---
Mercuric Chloride	1.52E-06	7.7E-11	N/A	---	---
Methyl mercury	0.00E+00	0.0E+00	N/A	---	---
Molybdenum	0.00E+00	0.0E+00	N/A	---	---
Nickel	2.10E-03	0.0E+00	N/A	---	---
Zinc	7.60E-03	0.0E+00	N/A	---	---
				---	3.2E-05

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-83

Risk Calculation Worksheet for - NonCarcinogenic Effects - Traditional Tribal Ceremonial Child Exposure Scenario - Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Scenario Timeframe:	Current/Future
	Receptor Population:	Tribal Ceremonial
	xposure Medium:	Ambient Surface Water
	eceptor Age:	Child

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	6	year
Drinking Water Ingestion Rate	IR_child	1.2	L/day
Body Weight	BW	15	kg
Skin Surface Area	SA	6378	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	0.54	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	6	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	3.42E-02	3.9E-04	1.0E+00	3.9E-04
Arsenic	3.45E-03	3.9E-05	3.5E-06	1.1E+01
Barium	8.04E-02	9.2E-04	2.0E-01	4.6E-03
Boron	1.20E+00	1.4E-02	2.0E-01	6.8E-02
Cobalt	1.34E-04	1.5E-06	3.0E-04	5.1E-03
Copper	1.97E-03	2.2E-05	4.0E-02	5.6E-04
ron	1.00E-01	1.1E-03	7.0E-01	1.6E-03
Lithium	2.08E-02	2.4E-04	2.0E-03	1.2E-01
Manganese	1.96E-02	2.2E-04	2.4E-02	9.3E-03
Mercuric Chlo	2.75E-05	3.1E-07	1.6E-04	2.0E-03
Methyl mercu	5.60E-08	6.4E-10	1.0E-04	6.4E-06
Molybdenum	2.50E-04	2.8E-06	5.0E-03	5.7E-04
Nickel	2.95E-03	3.4E-05	1.1E-02	3.1E-03
Zinc	0.00E+00	0.0E+00	3.0E-01	0.0E+00
Total Ceremonial Tribal Child				1.1E+01

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	Total Hazard Quotient [-]
Inorganics					
Aluminum	0.00E+00	0.0E+00	1.0E+00	0.0E+00	3.89E-04
Arsenic	3.32E-03	0.0E+00	3.5E-06	0.0E+00	1.12E+01
Barium	7.67E-02	0.0E+00	1.4E-02	0.0E+00	4.58E-03
Boron	1.30E+00	0.0E+00	2.0E-01	0.0E+00	6.84E-02
Cobalt	0.00E+00	0.0E+00	3.0E-04	0.0E+00	5.09E-03
Copper	0.00E+00	0.0E+00	4.0E-02	0.0E+00	5.62E-04
ron	0.00E+00	0.0E+00	7.0E-01	0.0E+00	1.63E-03
Lithium	2.12E-02	0.0E+00	2.0E-03	0.0E+00	1.19E-01
Manganese	1.96E-03	6.4E-07	2.4E-02	2.7E-05	9.34E-03
Mercuric Chl	1.52E-06	9.0E-10	1.1E-05	8.0E-05	2.04E-03
Methyl merc	0.00E+00	0.0E+00	1.0E-04	0.0E+00	6.38E-06
Molybdenum	0.00E+00	0.0E+00	5.0E-03	0.0E+00	5.70E-04
Nickel	2.10E-03	0.0E+00	4.4E-04	0.0E+00	3.05E-03
Zinc	7.60E-03	0.0E+00	3.0E-01	0.0E+00	--
				1.1E-04	1.1E+01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-84

Risk Calculation Worksheet for - Carcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Future
	Receptor Population:	Recreational User
	Exposure Medium:	Modeled Future Surface Water
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	8.10E-05	4.6E-09	N/A	---
Antimony	4.68E-03	2.6E-07	N/A	---
Arsenic	4.63E-03	2.6E-07	9.5E+00	2.5E-06
Boron	2.27E-04	1.3E-08	N/A	---
Iron	1.72E-02	9.7E-07	N/A	---
Manganese	3.89E+00	2.2E-04	N/A	---
Mercury	1.20E-03	6.8E-08	N/A	---
Zinc	1.77E-01	1.0E-05	N/A	---
Total Recreational Youth				2.5E-06

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Cancer Risk
		Chronic Daily Intake (mg/kg-day)	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk	
Inorganics					
Aluminum	8.1E-05	0.0E+00	N/A	---	
Antimony	4.6E-03	0.0E+00	N/A	---	
Arsenic	2.3E-04	2.6E-08	9.5E+00	2.4E-07	
Boron	6.4E+02	3.5E-03	N/A	---	
Iron	1.7E-02	0.0E+00	N/A	---	
Manganese	3.9E+00	2.1E-05	N/A	---	
Mercury	1.2E-03	6.6E-09	N/A	---	
Zinc	1.8E-01	0.0E+00	N/A	---	
				2.4E-07	2.7E-06

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-85

Risk Calculation Worksheet for - NonCarcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Future
	Receptor Population:	Recreational User
	Exposure Medium:	Modeled Future Surface Water
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral		
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]
Inorganics				
Aluminum	8.10E-05	4.6E-09	1.0E+00	4.6E-09
Antimony	4.63E-03	2.6E-07	4.0E-04	6.5E-04
Arsenic	2.27E-04	1.3E-08	3.5E-06	3.6E-03
Boron	6.41E+02	3.6E-02	2.0E-01	1.8E-01
Iron	1.72E-02	9.7E-07	7.0E-01	1.4E-06
Manganese	3.89E+00	2.2E-04	2.4E-02	9.1E-03
Mercury	1.20E-03	6.8E-08	1.6E-04	4.2E-04
Zinc	1.77E-01	1.0E-05	3.0E-01	3.3E-05
Total Recreational Youth				1.94E-01

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal			Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics					
Aluminum	8.10E-05	0.0E+00	1.0E+00	0.0E+00	4.56E-09
Antimony	4.63E-03	0.0E+00	4.0E-04	0.0E+00	6.51E-04
Arsenic	2.27E-04	2.6E-08	3.5E-06	7.4E-03	1.10E-02
Boron	6.41E+02	3.5E-03	2.0E-01	1.8E-02	1.98E-01
Iron	1.13E+03	0.0E+00	7.0E-01	0.0E+00	1.38E-06
Manganese	2.71E+01	2.1E-05	2.4E-02	8.9E-04	1.00E-02
Mercury	1.74E+00	6.6E-09	1.1E-05	5.9E-04	1.01E-03
Zinc	9.35E+00	0.0E+00	3.0E-01	0.0E+00	0.0E+00
				2.65E-02	
				5.3E-02	2.2E-01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-86

Risk Calculation Worksheet for - Carcinogenic Effects -Future Recreational User Exposure Scenario in Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Future
	Receptor Population:	Recreational User
	Exposure Medium:	Modeled Groundwater
	Receptor Age:	Youth

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral: Chronic Daily Intake (mg/kg-day)	Exposure Route = Oral: Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk
Inorganics				
Aluminum	6.55E-02	3.7E-06	N/A	---
Antimony	5.29E-03	3.0E-07	N/A	---
Arsenic	1.84E-02	1.0E-06	9.5E+00	9.8E-06
Barium	2.18E+00	1.2E-04	N/A	---
Beryllium	2.85E-04	1.6E-08	N/A	---
Boron	6.79E+02	3.8E-02	N/A	---
Cadmium	1.92E-04	1.1E-08	N/A	---
Chromium III	2.11E-03	1.2E-07	N/A	---
Cobalt	1.48E-03	8.3E-08	N/A	---
Copper	4.77E-03	2.7E-07	N/A	---
Iron	2.64E+00	1.5E-04	N/A	---
Lithium	4.93E+00	2.8E-04	N/A	---
Manganese	2.67E-01	1.5E-05	N/A	---
Mercury	1.46E-03	8.2E-08	N/A	---
Molybdenum	1.52E-03	8.6E-08	N/A	---
Nickel	5.55E-03	3.1E-07	N/A	---
Selenium	1.56E-02	8.8E-07	N/A	---
Silver	4.00E-05	2.3E-09	N/A	---
Thallium	1.61E-03	9.0E-08	N/A	---
Vanadium	2.67E-03	1.5E-07	N/A	---
Zinc	1.16E-02	6.5E-07	N/A	---
Total Recreational Youth				9.8E-06

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Dermal: C ronic Daily Intake mg/kg-day)	Exposure Route = Dermal: Cancer Slope Factor mg/kg/day]⁻	Cancer Risk	otal C ncer Ri k
Inorganics					
Aluminum	6.55E-02	0.0E+00	N/A	---	---
Antimony	5.29E-03	2.9E-08	N/A		---
Arsenic	1.84E-02	0.0E+00	9.5E+00	0.0E+00	9.8E-06
Barium	2.18E+00	1.2E-05	N/A	---	---
Beryllium	2.85E-04	1.6E-09	N/A	---	---
Boron	6.79E+02	0.0E+00	N/A	---	---
Cadmium	1.92E-04	1.1E-09	N/A	---	---
Chromium II	2.11E-03	1.2E-08	N/A	---	---
Cobalt	1.48E-03	3.2E-09	N/A	---	---
Copper	4.77E-03	2.6E-08	N/A	---	---
Iron	2.64E+00	0.0E+00	N/A	---	---
Lithium	4.93E+00	0.0E+00	N/A	---	---
Manganese	2.67E-01	1.5E-06	N/A	---	---
Mercury	1.46E-03	8.0E-09	N/A	---	---
Molybdenum	1.52E-03	0.0E+00	N/A	---	---
Nickel	5.55E-03	6.1E-09	N/A	---	---
Selenium	1.56E-02	8.6E-08	N/A	---	---
Silver	4.00E-05	1.3E-10	N/A	---	---
Thallium	1.61E-03	0.0E+00	N/A	---	---
Vanadium	2.67E-03	1.5E-08	N/A	---	---
Zinc	1.16E-02	0.0E+00	N/A	---	---
				0.0E+00	9.8E-06

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-87

Risk Calculation Worksheet for - Non Carcinogenic Effects - Future Recreational User Exposure Scenario in Clear Lake Ambient Surface Water

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Scenario Timeframe:	Future
	Receptor Population:	Tribal
	Exposure Medium:	Modeled Groundwater
	Receptor Age:	Adult

Exposure Parameter	Variable	Adult Value	Units
Exposure Frequency	EF	52	day/year
Exposure Duration	ED	12	year
Incidental Ingestion Rate	IR_youth	0.137	L/day
Body Weight	BW	44.3	kg
Skin Surface Area	SA	13400	cm^2/day
Dose Absorbed per Unit per Event	DA	Chemical Specific	mg/cm^2-event
Exposure Time per Event	ET	1	hours/event
Averaging Time for carcinogens	ATc	70	year
Averaging Time for noncarcinogens	ATnc	12	year

Chemical of Potential Concern	RME Medium EPC Value, Cw (mg/L)	Exposure Route = Oral			Exposure Route = Dermal				Total Hazard Quotient [-]
		Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	RME Medium EPC Value, Cw (mg/L)	Chronic Daily Intake (mg/kg-day)	Reference Dose [mg/kg/day]	Hazard Quotient [-]	
Inorganics									
Aluminum	6.55E-02	3.7E-06	1.0E+00	3.7E-06	6.55E-02	0.0E+00	1.0E+00	0.0E+00	3.69E-06
Antimony	5.29E-03	3.0E-07	4.0E-04	7.4E-04	5.29E-03	2.9E-08	4.0E-04	7.3E-05	8.17E-04
Arsenic	1.84E-02	1.0E-06	3.5E-06	3.0E-01	1.84E-02	0.0E+00	3.5E-06	0.0E+00	2.95E-01
Barium	2.18E+00	1.2E-04	2.0E-01	6.1E-04	2.18E+00	1.2E-05	1.4E-02	8.6E-04	1.47E-03
Beryllium	2.85E-04	1.6E-08	2.0E-04	8.0E-05	2.85E-04	1.6E-09	1.4E-06	1.1E-03	1.20E-03
Boron	6.79E+02	3.8E-02	2.0E-01	1.9E-01	6.79E+02	0.0E+00	2.0E-01	0.0E+00	1.91E-01
Cadmium	1.92E-04	1.1E-08	5.0E-04	2.2E-05	1.92E-04	1.1E-09	2.5E-05	4.2E-05	6.39E-05
Chromium III	2.11E-03	1.2E-07	1.5E+00	7.9E-08	2.11E-03	1.2E-08	2.0E-02	6.0E-07	6.75E-07
Cobalt	1.48E-03	8.3E-08	3.0E-04	2.8E-04	1.48E-03	3.2E-09	2.5E-05	1.3E-04	4.07E-04
Copper	4.77E-03	2.7E-07	4.0E-02	6.7E-06	4.77E-03	2.6E-08	3.0E-04	8.8E-05	9.43E-05
Iron	2.64E+00	1.5E-04	7.0E-01	2.1E-04	2.64E+00	0.0E+00	4.0E-02	0.0E+00	2.12E-04
Lithium	4.93E+00	2.8E-04	2.0E-03	1.4E-01	4.93E+00	0.0E+00	2.0E-03	0.0E+00	1.39E-01
Manganese	2.67E-01	1.5E-05	2.4E-02	6.3E-04	2.67E-01	1.5E-06	2.4E-02	6.1E-05	6.88E-04
Mercury	1.46E-03	8.2E-08	1.6E-04	5.1E-04	1.46E-03	8.0E-09	1.1E-05	7.2E-04	1.23E-03
Molybdenum	1.52E-03	8.6E-08	5.0E-03	1.7E-05	1.52E-03	0.0E+00	5.0E-03	0.0E+00	1.71E-05
Nickel	5.55E-03	3.1E-07	1.1E-02	2.8E-05	5.55E-03	6.1E-09	4.4E-04	1.4E-05	4.23E-05
Selenium	1.56E-02	8.8E-07	5.0E-03	1.8E-04	1.56E-02	0.0E+00	5.0E-03	0.0E+00	1.76E-04
Silver	4.00E-05	2.3E-09	5.0E-03	4.5E-07	4.00E-05	0.0E+00	2.0E-04	0.0E+00	4.50E-07
Thallium	1.61E-03	9.0E-08	1.0E-05	9.0E-03	1.61E-03	0.0E+00	1.0E-05	0.0E+00	9.04E-03
Vanadium	2.67E-03	1.5E-07	5.0E-03	3.0E-05	2.67E-03	1.5E-08	1.3E-04	1.1E-04	1.43E-04
Zinc	1.16E-02	6.5E-07	3.0E-01	2.2E-06	1.16E-02	0.0E+00	3.0E-01	0.0E+00	2.18E-06
Total Recreational Youth				6.4E-01				3.2E-03	6.4E-01

Cw = Concentration in Water
mg/L = milligrams per liter
L/day = liters per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-88

Risk Calculation Worksheet for - Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year-Round)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Year Round
	Exposure Medium:	Acorns
	Exposure Point:	Herman Impoundment Area/Buckeye Area
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	RME Medium EPC Value, Cacorn [mg/kg]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]	Percent Contribution
Adults Ingestion Acorns					
Aluminum	1.198	1.80E-03	--	--	--
Antimony	0.022	3.30E-05	--	--	--
Arsenic	0.0606	9.09E-05	9.5	8.64E-04	100.00%
Barium	6.585	9.88E-03	--	--	--
Boron	11.84	1.78E-02	--	--	--
Cadmium	0.0033	4.95E-06	--	--	--
Chromium	0.104	1.56E-04	--	--	--
Cobalt	0.226	3.39E-04	--	--	--
Copper	4.919	7.38E-03	--	--	--
Iron	11.86	1.78E-02	--	--	--
Lead	0.00481	7.22E-06	--	--	--
Manganese	47.7	7.16E-02	--	--	--
Mercury	0.0131	1.97E-05	--	--	--
Methyl Mercury	0.00085163	1.28E-06	--	--	--
Molybdenum	0.00599	8.99E-06	--	--	--
Nickel	3.182	4.77E-03	--	--	--
Selenium	0.0865	1.30E-04	--	--	--
Silver	0.00434	6.51E-06	--	--	--
Thallium	0.185	2.78E-04	--	--	--
Zinc	8.352	1.25E-02	--	--	--
Total Tribal Adult				8.6E-04	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor $[mg/kg/day]^{-1}$	Cancer Risk [-]	Percent Contribution
Child ingesting Acorns			
2.05E-04	--	--	--
3.77E-06	--	--	--
1.04E-05	9.5	9.87E-05	100.00%
1.13E-03	--	--	--
2.03E-03	--	--	--
5.66E-07	--	--	--
1.78E-05	--	--	--
3.87E-05	--	--	--
8.43E-04	--	--	--
2.03E-03	--	--	--
8.25E-07	--	--	--
8.18E-03	--	--	--
2.25E-06	--	--	--
1.46E-07	--	--	--
1.03E-06	--	--	--
5.45E-04	--	--	--
1.48E-05	--	--	--
7.44E-07	--	--	--
3.17E-05	--	--	--
1.43E-03	--	--	--
Total Tribal Child		9.9E-05	

Cacorn = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-89

Risk Calculation Worksheet for - Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year-Round)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Year Round
	Exposure Medium:	Acorns
	Exposure Point:	Herman Impoundment Area/Buckeye Area
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Cacorn [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingestion Acorns					
Aluminum	1.198	1.80E-03	1	1.80E-03	0.003%
Antimony	0.022	3.30E-05	0.0004	8.25E-02	0.15%
Arsenic	0.0606	9.09E-05	0.0000035	2.60E+01	46.02%
Barium	6.585	9.88E-03	0.2	4.94E-02	0.09%
Boron	11.84	1.78E-02	0.2	8.88E-02	0.16%
Cadmium	0.0033	4.95E-06	0.001	4.95E-03	0.01%
Chromium	0.104	1.56E-04	1.5	1.04E-04	0.00%
Cobalt	0.226	3.39E-04	0.0003	1.13E+00	2.00%
Copper	4.919	7.38E-03	0.04	1.84E-01	0.33%
Iron	11.86	1.78E-02	0.7	2.54E-02	0.05%
Lead	0.00481	7.22E-06	--	--	
Manganese	47.7	7.16E-02	0.14	5.11E-01	0.91%
Mercury	0.0131	1.97E-05	0.00016	1.23E-01	0.22%
Methyl Mercury	0.00085163	1.28E-06	0.0001	1.28E-02	0.02%
Molybdenum	0.00599	8.99E-06	0.005	1.80E-03	0.003%
Nickel	3.182	4.77E-03	0.011	4.34E-01	0.77%
Selenium	0.0865	1.30E-04	0.005	2.60E-02	0.05%
Silver	0.00434	6.51E-06	0.005	1.30E-03	0.002%
Thallium	0.185	2.78E-04	0.00001	2.78E+01	49.17%
Zinc	8.352	1.25E-02	0.3	4.18E-02	0.07%
Total Tribal Adult				5.6E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child ingesting Acorns			
2.40E-03	1	2.40E-03	0.00%
4.40E-05	0.0004	1.10E-01	0.15%
1.21E-04	0.0000035	3.46E+01	46.02%
1.32E-02	0.2	6.59E-02	0.09%
2.37E-02	0.2	1.18E-01	0.16%
6.60E-06	0.001	6.60E-03	0.01%
2.08E-04	1.5	1.39E-04	0.00%
4.52E-04	0.0003	1.51E+00	2.00%
9.84E-03	0.04	2.46E-01	0.33%
2.37E-02	0.7	3.39E-02	0.05%
9.62E-06	--	--	
9.54E-02	0.14	6.81E-01	0.91%
2.62E-05	0.00016	1.64E-01	0.22%
1.70E-06	0.0001	1.70E-02	0.02%
1.20E-05	0.005	2.40E-03	0.00%
6.36E-03	0.011	5.79E-01	0.77%
1.73E-04	0.005	3.46E-02	0.05%
8.68E-06	0.005	1.74E-03	0.00%
3.70E-04	0.00001	3.70E+01	49.17%
1.67E-02	0.3	5.57E-02	0.07%
Total Tribal Child		7.5E+01	

Cacorn = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-90

Risk Calculation Worksheet for Background Carcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year Round)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Year Round
	xposure Medium:	Acorns
	xposure Point:	Background
	eceptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cacorn [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**
Adults Ingestion Acorns				
Arsenic	1.74E-02	2.60E-05	9.50E+00	2.47E-04
Total Tribal Adult				2.5E-04

	Exposure Route = Oral		
RME Medium EPC Value, Cacorn [mg/kg]	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**
	Child ingesting Acorns		
	2.18E-06	9.50E+00	2.07E-05
Total Tribal Child			2.1E-05

Cacorns = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-91

Risk Calculation Worksheet for Background Noncarcinogenic Effects - Tribal Cultural Use - Acorn Ingestion (Year Round)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario nformation	Exposure Scenario:	Tribal Cultural Use
	Scenario Timeframe:	Year Round
	xposure Medium:	Acorns
	xposure Point:	Background
	eceptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Acorn Ingestion Rate	IRacorn	120	30	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for carcinogens	ATc	70	70	year
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral			
Chemical of Potential Concern	**RME Medium EPC Value, Cacorn [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Adults Ingestion Acorns					
Arsenic	0.055036176	8.26E-05	3.50E-06	2.36E+01	86.54%
Thallium	0.02446	3.67E-05	1.00E-05	3.67E+00	13.46%
Total Tribal Adult				2.7E+01	

Exposure Route = Oral			
Chronic Daily Intake [mg/kg/day]	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Percent Contribution**
Child ingesting Acorns			
1.10E-04	3.50E-06	3.14E+01	86.5%
4.89E-05	1.00E-05	4.89E+00	13.46%
Total Tribal Child		3.6E+01	

Cacorns = Concentration in acorns
mg/kg = milligrams per kilogram
g/day = grams per day
kg = kilograms

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-92

Risk Calculation Worksheet for - Non-Carcinogenic Effects - Tribal Cultural Use - Lake Intensive Homesteader

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use Lake Intensive Homesteader
	Scenario Timeframe:	Chronic
	Exposure Medium:	Fish
	Exposure Point:	Clear Lake
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Recreational User - Low End Fish Ingest	IR fish	220	41	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cfish [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**
Lake Intensive Homesteader Adult				
Mercury	0.287	1.79E-03	0.0001	17.9

Exposure Route = Oral				
RME Medium EPC Value, Cacorn [mg/kg]	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Adult Plus Child**
Lake Intensive Homesteader Child				
	0.001798533	0.0	18.0	35.9

Cfish = Concentration in Fish
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Table C-93

Risk Calculation Worksheet for - Non-Carcinogenic Effects - Tribal Cultural Use - Land Intensive Homesteader

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake Oaks, California

Exposure Scenario Information	Exposure Scenario:	Tribal Cultural Use Land Intensive Homesteader
	Scenario Timeframe:	Chronic
	Exposure Medium:	Fish
	Exposure Point:	Clear Lake
	Receptor Age:	Adult/Child

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	365	365	day/year
Exposure Duration	ED	70	6	year
Land-Intensive Tribal Fish Ingestion Rate	IRfish	220	41	g/day
Body Weight	BW	80	15	kg
Conversion Factor	CF	0.001	0.001	kg/g
Averaging Time for noncarcinogens	ATnc	70	6	year

Risk Calculations

		Exposure Route = Oral		
Chemical of Potential Concern	**RME Medium EPC Value, Cfish [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**
Land Intensive Homesteader Adult				
Mercury	0.287	7.89E-04	0.0001	7.9

	Exposure Route = Oral			
RME Medium EPC Value, Cacorn [mg/kg]	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose [mg/kg/day]**	**Hazard Quotient [-]**	**Adult Plus Child**
Land Intensive Homesteader Child				
	7.84E-04	0.0	7.8	15.7

Cfish = Concentration in Fish
mg/kg = milligrams per kilogram
mg/day = milligrams per day
kg = kilograms
g = grams

RME = reasonable maximum exposure
EPC = exposure point concentration

Appendix D
Surface Water Dermal Absorption Factors (DA event)
(CD only)

Appendix D Table of Contents
Surface Water Dermal Absorption Factors (DA event)
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Table No.	Title
	Estimation of Dermal Absorbed Dose For Inorganics in Surface Water:
D-1	Lakeside Resident Drinking Water- Adult
D-2	Lakeside Resident Drinking Water- Child
D-3	Ambient Drinking Water - Adult
D-4	Ambient Drinking Water - Child
D-5	Traditional Tribal Drinking Water - Adult
D-6	Traditional Tribal Drinking Water - Child
D-7	Ambient Tribal Drinking Water - Adult
D-8	Ambient Tribal Drinking Water - Child
D-9	Clear Lake Recreational - Youth
D-10	Ambient Clear Lake Recreational - Youth
D-11	Herman Impoundment Recreational - Youth
D-12	Ambient Herman Impoundment Recreational - Youth

Table D-1
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Lakeside Resident Drinking Water - Adult

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	20900	cm2
t_event =	0.71	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	350	days/yr
ED =	20	years
BW =	80	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Traditional Tribal Adult (on reservation) contact with surface water for 0.71 hours/day, compared with drinking 3 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water — IR = 2500 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract — Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic (arsenite)	1.0E-03	default	3.80E-06	2.70E-09	1.9E-07	100%	0.59%	N	1.8406E-05
Barium	1.0E-03	default	7.43E-05	5.28E-08	3.8E-06	7%	8.48%	N	1.8406E-05
Copper	1.0E-03	default	2.05E-05	1.46E-08	1.0E-06	57%	1.04%	N	1.8406E-05
Manganese	1.0E-03	default	9.64E-06	6 85E-09	4.9E-07	4%	14.84%	Y	1.8406E-05
Mercuric chloride (other soluble salts)	1.0E-03	experimental	2.43E-08	1.73E-11	4.0E+00	7%	8.48%	N	1.8406E-05
Nickel	2.0E-04	experimental	2.59E-06	3.67E-10	2.6E-08	4%	2.97%	N	3.6812E-06
Selenium	1.0E-03	default	5.28E-07	3.75E-10	2.7E-08	30%	1.98%	N	1.8406E-05
Zinc	6.0E-04	experimental	3.00E-05	1 28E-08	9.1E-07	100.0%	0.36%	N	1.10436E-05
Added Metals									
Aluminum	1.0E-03	default	1.23E-05	8.75E-09	6.3E-07	100.0%	0.59%	N	1.8406E-05
Boron	1.0E-03	default	1.18E-03	8.35E-07	6.0E-05	100.0%	0.59%	N	1.8406E-05
Cobalt	4.0E-04	experimental	2.70E-07	7.67E-11	5.5E-09	100.0%	0.24%	N	7.3624E-06
Lead	1.0E-04	experimental	1.04E-06	7 39E-11	5.3E-09	100.0%	0.06%	N	1.8406E-06
Lithium	1.0E-03	default	2.04E-05	1.45E-08	1.0E-06	100.0%	0.59%	N	1.8406E-05
Molybdenum	1.0E-03	default	4.90E-07	3.48E-10	2.5E-08	100.0%	0.59%	N	1.8406E-05

Table D-2
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Lakeside Resident Drinking Water - Child

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter he Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	6378	cm2
t_event =	0.54	hr/event (32.4 minutes/event)
EV =	1	event/day
EF =	350	days/yr
ED =	6	years
BW =	15	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Child Resident contact with surface water for 2 hours/day, compared with drinking 0.78 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water — IR = 780 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract — Chemical specific
Condi ion for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic (arsenite)	1.0E-03	default	3.80E-06	2.05E-09	7 2E-08	100%	0.44%	N	5.62E-06
Barium	1.0E-03	default	7.43E-05	4.01E-08	1.4E-06	7%	6.31%	N	5.62E-06
Copper	1.0E-03	default	2.05E-05	1.11E-08	3 9E-07	57 0%	0.77%	N	5.62E-06
Cyanate	1.0E-03	default	1.00E-03	5.40E-07	1 9E-05	47 0%	0.94%	N	5.62E-06
Manganese	1.0E-03	default	2.04E-05	1.10E-08	3 9E-07	4 0%	11.04%	Y	5.62E-06
Mercuric chloride (other soluble salts)	1.0E-03	experimental	9.64E-06	5.21E-09	1 8E-07	7%	6.31%	N	5.62E-06
Insoluble or metallic mercury	1.0E-03	experimental	4.90E-07	2.65E-10	9 2E-09	7%	6.31%	N	5.62E-06
Nickel	2.0E-04	experimental	1.04E-06	1.12E-10	3 9E-09	4%	2.21%	N	1.12E-06
Silver	6.0E-04	experimental	5.28E-07	1.71E-10	6 0E-09	4%	6.62%	N	3.37E-06
Zinc	6.0E-04	experimental	3.00E-05	9.72E-09	3.4E-07	100%	0.26%	N	3.37E-06
Added Metals									
Aluminum	1.0E-03	default	1.23E-05	6.66E-09	2 3E-07	100%	0.44%	N	5.62E-06
Boron	1.0E-03	default	1.18E-03	6.35E-07	2 2E-05	100%	0.44%	N	5.62E-06
Cobalt	4.0E-04	experimental	2.70E-07	5.83E-11	2 0E-09	100%	0.18%	N	2.25E-06
Lead	1.0E-04	experimental	4.90E-07	2.65E-11	9 2E-10	100%	0.04%	N	5.62E-07
Lithium	1.0E-03	default	1.04E-06	5.62E-10	2 0E-08	100%	0.44%	N	5.62E-06
Molybdenum	1.0E-03	default	2.43E-08	1.31E-11	0.00	100%	0.44%	N	5.62E-06

Table D-3
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Drinking Water - Adult

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter he Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	20900	cm2
t_event =	0.71	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	350	days/yr
ED =	20	years
BW =	80	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Adult Resident contact with surface water for 1 hour/day, compared with drinking 2 5 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	2500	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condi ion for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic (arsenite)	1.0E-03	default	3.32E-06	2.36E-09	1.7E-07	100%	0.59%	N	1.84E-05
Barium	1.0E-03	default	7.67E-05	5.45E-08	3 9E-06	7%	8.48%	N	1.84E-05
Manganese	1.0E-03	default	1.96E-06	1.39E-09	1 0E-07	4%	14.84%	Y	1.84E-05
Mercuric chloride (other soluble salts)	1.0E-03	experimental	2.10E-06	1.49E-09	4.0E+00	7%	8.48%	N	1.84E-05
Nickel	2.0E-04	experimental	2.10E-06	2.98E-10	2.1E-08	4%	2.97%	N	3.68E-06
Zinc	6.0E-04	experimental	7.60E-06	3.24E-09	2 3E-07	4%	8.90%	N	1.10E-05
Added Metals									
Boron	1.0E-03	default	1.30E-03	9.23E-07	6.6E-05	100 0%	0.59%	N	1.84E-05
Lithium	1.0E-03	default	2.12E-05	1.51E-08	1.1E-06	100 0%	0.59%	N	1.84E-05

Table D-4
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Drinking Water - Adult

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter he Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	6378	cm2
t_event =	0.54	hr/event (32.4 minutes/event)
EV =	1	event/day
EF =	350	days/yr
ED =	6	years
BW =	15	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Child Resident contact with surface water for 2 hours/day, compared with drinking 0.78 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	780	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condi ion for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic (arsenite)	1.0E-03	default	3.32E-06	1.79E-09	6 3E-08	100%	0.44%	N	5.62E-06
Barium	1.0E-03	default	7.67E-05	4.14E-08	1.4E-06	7 0%	6.31%	N	5.62E-06
Manganese	1.0E-03	default	1.96E-06	1.06E-09	3.7E-08	4%	11.04%	Y	5.62E-06
Mercuric chloride (other soluble salts)	1.0E-03	experimental	1.52E-09	8.21E-13	2 9E-11	7%	6.31%	N	5.62E-06
Nickel	2.0E-04	experimental	2.10E-06	2.27E-10	7 9E-09	4%	2.21%	N	1.12E-06
Zinc	6.0E-04	experimental	7.60E-06	2.46E-09	8.6E-08	4%	6.62%	N	3.37E-06
Added Metals									
Boron	1.0E-03	default	1.30E-03	7.02E-07	2 5E-05	100%	0.44%	N	5.62E-06
Lithium	1.0E-03	default	2.12E-05	1.15E-08	4 0E-07	100%	0.44%	N	5.62E-06

Site concentra ions: (dissolved)

Arsenic (arsenite)	3.3E-03	mg/L	3.32E-06	mg/cm3	Arsenic	331.80% ug/L
Barium	7.7E-02	mg/L	7.67E-05	mg/cm3	Barium	7673.00% ug/L

Table D-5
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Traditional Tribal Drinking Water - Adult

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorp ion of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	20900	cm2
t_event =	0.71	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	365	days/yr
ED =	70	years
BW =	80	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Tradi ional Tribal Adult contact wi h surface water for 0.71 hours/day, compared with drinking 3 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	4000	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equa ions to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
An imony	1.0E-03	default	1.27E-06	9.0E-10	2.4E-07	15%	2.47%	N	1.84E-05
Arsenic	1.0E-03	default	2.76E-06	1 96E-09	5.1E-07	100%	0.37%	N	1.84E-05
Barium	1.0E-03	default	5.34E-05	3.79E-08	9.9E-06	7%	5.30%	N	1.84E-05
Chromium	2.0E-03	experimental	5.34E-07	7 58E-10	2.0E-07	2.5%	29.68%	Y	3.68E-05
Copper	1.0E-03	default	9.53E-07	6.77E-10	1.8E-07	57.0%	0.65%	N	1.84E-05
Cyanate	1.0E-03	default	1.00E-03	7.10E-07	1.9E-04	47.0%	0.79%	N	1.84E-05
Manganese	1.0E-03	default	8.94E-04	6 35E-07	1.7E-04	4%	9.27%	N	1.84E-05
Mercury	1.0E-03	experimental	2.83E-08	2 01E-11	4.0E+00	7%	5.30%	N	1.84E-05
Nickel	2.0E-04	experimental	1.22E-05	1.73E-09	4.5E-07	4%	1.85%	N	3.68E-06
Selenium	1.0E-03	default	3.66E-07	2.60E-10	6.8E-08	30%	1.24%	N	1.84E-05
Silver	6.0E-04	experimental	6.30E-07	2.68E-10	7.0E-08	4%	5.56%	N	1.10E-05
Vanadium	1.0E-03	default	1.60E-06	1.14E-09	3.0E-07	100%	0.37%	N	1.84E-05
Zinc	6.0E-04	experimental	4.76E-06	2 03E-09	5.3E-07	100%	0.22%	N	1.10E-05
Added Metals									
Aluminum	1.0E-03	default	8.13E-05	5.77E-08	1.5E-05	100.0%	0.37%	N	1.84E-05
Boron	1.0E-03	default	6.86E-03	4 87E-06	1.3E-03	100.0%	0.37%	N	1.84E-05
Cobalt	4.0E-04	experimental	2.64E-06	7.48E-10	2.0E-07	100.0%	0.15%	N	7.36E-06
Iron	1.0E-03	default	2.27E-05	1.61E-08	4.2E-06	100.0%	0.00	N	1.84E-05
Li hium	1.0E-03	default	9.50E-05	6.75E-08	1.8E-05	100.0%	0.37%	N	1.84E-05
Molybdenum	1.0E-03	default	2.22E-07	1 58E-10	4.1E-08	100.0%	0.37%	N	1.84E-05

Table D-6
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Traditional Tribal Drinking Water - Child

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	6378	cm2
t_event =	0.54	hr/event (32.4 minutes/event)
EV =	1	event/day
EF =	365	days/yr
ED =	6	years
BW =	15	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Traditional Tribal Child contact with surface water for 0.54 hours/day, compared with drinking 0.78 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water — IR = 780 (cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract — Chemical specific
Condition for screening: "Y" when Dermal is 10% of Drinking

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min) — Q = 1135500 (cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Antimony	1.0E-03	default	1.27E-06	6.85E-10	2.5E-08	15%	2.94%	N	5.62E-06
Arsenic	1.0E-03	default	2.76E-06	1.49E-09	5.4E-08	100%	0.44%	N	5.62E-06
Barium	1.0E-03	default	5.34E-05	2.88E-08	1.1E-06	7.0%	6.31%	N	5.62E-06
Chromium	2.0E-03	experimental	5.34E-07	5.77E-10	2.1E-08	3%	35.32%	Y	1.12E-05
Copper	1.0E-03	default	9.53E-07	5.15E-10	1.9E-08	57.0%	0.77%	N	5.62E-06
Manganese	1.0E-03	default	8.94E-04	4 83E-07	1.8E-05	4%	11.04%	Y	5.62E-06
Mercury	1.0E-03	experimental	2.83E-08	1 53E-11	5.6E-10	7%	6.31%	N	5.62E-06
Nickel	2.0E-04	experimental	1.22E-05	1 31E-09	4.8E-08	4%	2.21%	N	1.12E-06
Selenium	1.0E-03	default	3.66E-07	1 98E-10	7.2E-09	30%	1.47%	N	5.62E-06
Silver	6.0E-04	experimental	6.30E-07	2 04E-10	7.4E-09	4%	6.62%	N	3.37E-06
Vanadium	1.0E-03	default	1.60E-06	8.64E-10	3.1E-08	100%	0.44%	N	5.62E-06
Zinc	6.0E-04	experimental	4.76E-06	1 54E-09	5.6E-08	7%	3.78%	N	3.37E-06
Added Metals									
Aluminum	1.0E-03	default	8.13E-05	4 39E-08	1.6E-06			N	5.62E-06
Boron	1.0E-03	default	6.86E-03	3.71E-06	1.4E-04			N	5.62E-06
Cobalt	4.0E-04	experimental	2.64E-06	5.69E-10	2.1E-08			N	2.25E-06
Iron	0.00	default	2.27E-05	1.23E-08	4.5E-07			N	5.62E-06
Lithium	1.0E-03	default	9.50E-05	5.13E-08	1.9E-06			N	5.62E-06

Table D-7
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Tribal Drinking Water - Adult

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	20900	cm2
t_event =	0.71	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	365	days/yr
ED =	70	years
BW =	80	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Traditional Tribal Adult contact with surface water for 0.71 hours/day, compared with drinking 4 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	4000	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic	1.0E-03	default	3.32E-06	2.36E-09	6.2E-07	100%	0.37%	N	1.84E-05
Barium	1.0E-03	default	7.67E-05	5.45E-08	1.4E-05	7%	5.30%	N	1.84E-05
Manganese	1.0E-03	default	1.96E-06	1 39E-09	3.6E-07	57%	0.65%	N	1.84E-05
Mercury	1.0E-03	default	1.00E-03	7.10E-07	1.9E-04	47%	0.79%	N	1.84E-05
Mercury	1.0E-03	default	1.52E-09	1.08E-12	2.8E-10	7%	5.30%	N	1.84E-05
Nickel	1.0E-03	default	2.10E-06	1.49E-09	3.9E-07	4%	9.27%	N	1.84E-05
Zinc	1.0E-03	experimental	7.60E-06	5.40E-09	4.0E+00	7%	5.30%	N	1.84E-05
Added Metals									
Boron	1.0E-03	default	1.30E-03	9.23E-07	2.4E-04	100.0%	0.37%	N	1.84E-05
Lithium	1.0E-03		2.12E-05	1.51E-08	3.9E-06	100.0%	0.0037098	N	1.84E-05

Table D-8
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Tribal Drinking Water - Child

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	6378	cm2
t_event =	0.54	hr/event (32.4 minutes/event)
EV =	1	event/day
EF =	350	days/yr
ED =	6	years
BW =	15	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Child Resident contact with surface water for 2 hours/day, compared with drinking 0.78 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	780	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic (arsenite)	1 0E-03	default	3.32E-06	1.79E-09	6.3E-08	100%	0.44%	N	5.62E-06
Barium	1 0E-03	default	7.67E-05	4.14E-08	1.4E-06	7.0%	6 31%	N	5.62E-06
Manganese	1 0E-03	default	1.96E-06	1.06E-09	3.7E-08	4%	11 04%	Y	5.62E-06
Mercuric chloride (other soluble salts)	1 0E-03	experimental	1.52E-09	8.21E-13	2.9E-11	7%	6 31%	N	5.62E-06
Nickel	2 0E-04	experimental	2.10E-06	2.27E-10	7.9E-09	4%	2 21%	N	1.12E-06
Zinc	6 0E-04	experimental	7.60E-06	2.46E-09	8.6E-08	4%	6.62%	N	3.37E-06
Added Metals									
Boron	1 0E-03	default	1.30E-03	7.02E-07	2.5E-05	100%	0.44%	N	5.62E-06
Lithium	1 0E-03	default	2.12E-05	1.15E-08	4.0E-07	100%	0.44%	N	5.62E-06

Table D-9
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Clear Lake Recreational - Youth

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	13400	cm2
t_event =	1.00	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	52	days/yr
ED =	12	years
BW =	44	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Recreational contact with surface water for 2 hours/day, compared with drinking 0.137 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	137	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

Table D-9
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Clear Lake Recreational - Youth

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Antimony	1.0E-03	default	2.90E-07	2.90E-10	2.1E-09	15%	65%	Y	1.18E-05
Arsenic	1.0E-03	default	1.47E-06	1.47E-09	1.1E-08	100%	10%	N	1.18E-05
Barium	1.0E-03	default	3.35E-05	3.35E-08	2.5E-07	7%	140%	Y	1.18E-05
Beryllium	1.0E-03	default	1.49E-06	1.49E-09	1.1E-08	1%	1397%	Y	1.18E-05
Cadmium	1.0E-03	experimental	4.45E-07	4.45E-10	3.3E-09	3%	391%	Y	1.18E-05
Chromium	2.0E-03	experimental	1.39E-06	2.77E-09	2.0E-08	3%	782%	Y	2.36E-05
Copper	1.0E-03	default	1.86E-06	1.86E-09	1.4E-08	57%	17%	Y	1.18E-05
Manganese	1.0E-03	default	3.53E-03	3.53E-06	2.6E-05	4%	245%	Y	1.18E-05
Mercury	1.0E-03	experimental	3.21E-07	3.21E-10	4.0E+00	7%	140%	Y	1.18E-05
Nickel	2.0E-04	experimental	3.89E-05	7.79E-09	5.8E-08	4%	49%	Y	2.36E-06
Selenium	1.00E-03	default	1.13E-06	1.1E-09	8.3E-09	30%	33%	Y	1.18E-05
Silver	6.00E-04	experimental	3.49E-07	2.1E-10	1.5E-09	4%	147%	Y	7.08E-06
Thallium	1.00E-03	default	6.29E-07	6.3E-10	4.6E-09	100%	10%	N	1.18E-05
Vanadium	1.00E-03	default	2.48E-06	2.5E-09	1.8E-08	100%	10%	N	1.18E-05
Zinc	6.00E-04	experimental	8.22E-05	4.9E-08	3.6E-07	100%	6%	N	7.08E-06
Added Metals									
Aluminum	1.00E-03	default	1.45E-02	1.5E-05	0.00	100%	10%	N	1.18E-05
Boron	1.00E-03	default	2.66E-02	2.7E-05	0.00	100%	10%	N	1.18E-05
Cobalt	4.00E-04	experimental	5.56E-05	2.2E-08	0.00	100%	4%	N	4.72E-06
Iron	1.00E-03	default	4.30E-05	4.3E-08	0.00	100%	10%	N	1.18E-05
Lead	1.00E-04	experimental	2.00E-08	2.0E-12	0.00	100%	1%	N	1.18E-06
Lithium	1.00E-03	default	6.45E-04	6.5E-07	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	1.82E-07	1.8E-10	0.00	100%	10%	N	1.18E-05

Table D-10
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Clear Lake - Recreational - Youth

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	13400	cm2
t_event =	1.00	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	52	days/yr
ED =	12	years
BW =	44	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Traditional Tribal Adult (on reservation) contact with surface water for 2 hours/day, compared with drinking 3 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	137	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

Table D-10
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Clear Lake - Recreational - Youth

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic	1.0E-03	default	3.45E-06	3.45E-09	2.5E-08	100%	10%	N	1.18E-05
Barium	1.0E-03	default	8.04E-05	8.04E-08	5.9E-07	7%	140%	Y	1.18E-05
Copper	1.0E-03	default	1.97E-06	1.97E-09	1.5E-08	57%	17%	Y	1.18E-05
Cyanate	1.0E-03	default	1.00E-03	1.00E-06	7.4E-06	47%	21%	Y	1.18E-05
Manganese	1.0E-03	default	1.96E-05	1.96E-08	1.4E-07	4%	245%	Y	1.18E-05
Mercury	1.0E-03	experimental	2.75E-08	2.75E-11	4.0E+00	7%	140%	Y	1.18E-05
Nickel	2.0E-04	experimental	2.95E-06	5.89E-10	4.4E-09	4%	49%	Y	2.36E-06
added metals									
Aluminum	1.0E-03	default	3.42E-05	3.42E-08	2.5E-07	100%	10%	N	1.18E-05
Boron	1.00E-03	default	1.20E-03	1.2E-06	0.00	100%	10%	N	1.18E-05
Cobalt	4.00E-04	experimental	1.34E-07	5.4E-11	0.00	100%	4%	N	4.72E-06
Iron	1.00E-03	default	1.00E-04	1.0E-07	0.00	100%	10%	N	1.18E-05
Lithium	1.00E-03		2.08E-05	2.1E-08	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	2.50E-07	2.5E-10	0.00	100%	10%	N	1.18E-05
Added Metals									
Aluminum	1.00E-03	default	1.45E-02	1.5E-05	0.00	100%	10%	N	1.18E-05
Boron	1.00E-03	default	2.66E-02	2.7E-05	0.00	100%	10%	N	1.18E-05
Cobalt	4.00E-04	experimental	5.56E-05	2.2E-08	0.00	100%	4%	N	4.72E-06
Iron	1.00E-03	default	4.30E-05	4.3E-08	0.00	100%	10%	N	1.18E-05
Lead	1.00E-04	experimental	2.00E-08	2.0E-12	0.00	100%	1%	N	1.18E-06
Lithium	1.00E-03	default	6.45E-04	6.5E-07	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	1.82E-07	1.8E-10	0.00	100%	10%	N	1.18E-05

Table D-11
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Herman Impoundment Recreational - Youth

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	13400	cm2
t_event =	1.00	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	12	days/yr
ED =	12	years
BW =	44	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Trespasser (youth) contact with surface water for 2 hours/day, compared with drinking 0.137 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	137	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

Table D-11
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Herman Impoundment Recreational - Youth

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic	0.001	default	3.4E-06	3.37E-09	2.49E-08	1.0E+00	10%	N	1.1801E-05
Antimony	0.001	default	2.4E-06	2.40E-09	1.77E-08	1.5E-01	65%	Y	1.1801E-05
Barium	0.001	default	3.8E-05	3.81E-08	2.81E-07	7.0E-02	140%	Y	1.1801E-05
Beryllium	0.001	default	1.5E-05	1.48E-08	1.09E-07	7.0E-03	1397%	Y	1.1801E-05
Chromium III	0.001	default	2.9E-06	2.90E-09	2.14E-08	1.3E-02	752%	Y	1.1801E-05
Copper	0.001	default	6.4E-06	6.42E-09	4.74E-08	5.7E-01	17%	Y	1.1801E-05
Cyanate	0.001	default	1.0E-03	1.00E-06	7.39E-06	4.7E-01	21%	Y	1.1801E-05
Manganese	0.001	default	1.0E-02	1.01E-05	7.46E-05	4.0E-02	245%	Y	1.1801E-05
Mercury	0.001	experimental	5.4E-07	5.44E-10	4.00E+00	7.0E-02	140%	Y	1.1801E-05
Nickel	0.0002	experimental	4.3E-04	8.70E-08	6.43E-07	4.0E-02	49%	Y	2.36019E-06
Selenium	0.001	default	1.3E-05	1.28E-08	9.46E-08	8.0E-01	12%	Y	1.1801E-05
added metals									
Aluminum	1.0E-03	default	1.38E-02	1.38E-05	1.0E-04	100%	10%	N	1.18E-05
Boron	1.0E-03	default	4.75E-01	4.75E-04	3.5E-03	7%	140%	Y	1.18E-05
Cadmium	1.0E-03	default	4.79E-07	4.79E-10	3.5E-09	5%	196%	Y	1.18E-05
Cobalt	4.0E-04	experimental	1.65E-04	6.58E-08	4.9E-07	100%	4%	N	4.72E-06
Iron	1.0E-03	default	4.33E-03	4.33E-06	3.2E-05	100%	10%	N	1.18E-05
Lithium	1.0E-03	default	3.37E-03	3.37E-06	2.5E-05	100%	10%	N	1.18E-05
Zinc	1.0E-03	default	4.53E-04	4.53E-07	3.3E-06	100%	10%	N	1.18E-05
Copper	1.0E-03	default	4.77E-06	4.77E-09	8.1E-09	70%	14%	Y	1.18E-05
Cyanate	1.0E-03	default	1.00E-03	1.00E-06	1.7E-06	47%	21%	Y	1.18E-05
Manganese	1.0E-03	default	2.67E-04	2.67E-07	4.6E-07	4%	245%	Y	1.18E-05
Mercury	1.0E-03	experimental	1.46E-06	1.46E-09	4.0E+00	7%	140%	Y	1.18E-05
Nickel	2.0E-04	experimental	5.55E-06	1.11E-09	1.9E-09	4%	49%	Y	2.36E-06
Selenium	1.0E-03	default	1.56E-05	1.56E-08	2.7E-08	80%	12%	Y	1.18E-05
Silver	6.00E-04	experimental	4.00E-08	2.4E-11	4.1E-11	4%	147%	Y	7.08E-06
Thallium	1.00E-03	default	1.61E-06	1.6E-09	2.7E-09	100%	10%	N	1.18E-05
Vanadium	1.00E-03	default	2.67E-06	2.7E-09	4.5E-09	3%	376%	Y	1.18E-05
Added Metals									
Aluminum	0.00	default	6.55E-05	6.6E-08	0.00	100%	10%	N	1.18E-05
Antimony	0.00	default	5.29E-06	5.3E-09	0.00	15%	65%	Y	1.18E-05
Boron	1.00E-03	default	6.79E-01	6.8E-04	0.00	100%	10%	N	1.18E-05
Cadmium	1.00E-03	default	1.92E-07	1.9E-10	0.00	3%	391%	Y	1.18E-05
Cobalt	4.00E-04	experimental	1.48E-06	5.9E-10	0.00	3%	156%	Y	4.72E-06
Iron	1.00E-03	default	2.64E-03	2.6E-06	0.00	100%	10%	N	1.18E-05
Lithium	1.00E-03	default	4.93E-03	4.9E-06	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	1.52E-06	1.5E-09	0.00	100%	10%	N	1.18E-05
Zinc	1.00E-03	default	1.16E-05	1.2E-08	0.00	100%	10%	N	1.18E-05

Table D-12
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Herman Impoundment Recreational - Youth

FOR INORGANIC CHEMICALS IN WATER (latest version 04/01)

Worksheet to Calculate Dermal Absorption of Inorganic Chemicals from Aqueous Media

Enter the Following Exposure Conditions: for site specific conditions, change values for A through AT

Conc =	0.001	mg/cm3 (default value for purpose of illustration)
SA=	13400	cm2
t_event =	1.00	hr/event (42.6 minutes/event)
EV =	1	event/day
EF =	52	days/yr
ED =	12	years
BW =	44	kg
AT =	25550	days

Default conditions for screening purposes:

Compare Dermal to Drinking: Traditional Tribal Adult (on reservation) contact with surface water for 2 hours/day, compared with drinking 3 L water/day

Dermal (mg/day) = DA_event * A * EV
Drinking (mg/day) = Conc * IR * ABSIG

IR: Ingestion rate of drinking water	IR =	137	(cm3/day = L/day * 1000 cm3/L)
ABSIG: Absorption fraction in GI tract	Chemical specific		
Condition for screening: "Y" when Dermal is 10% of Drinking			

Compare Dermal to Total dose exposed during adult showering assuming 5 gal/min of water flow rate

Total dose (mg/day) = Q * T_event * EV

Q: Shower flow rate (5-15 gal/min; here using 5 gal/min)	Q =	1135500	(cm3/hr = gal/min * 3.785 gal/l * 60 min/hr *1000 cm3/hr)

Refer to Appendix A for equations to evaluate DA_event and DAD

Table D-12
Estimation of Dermal Absorbed Dose for Inorganic COPCs in Surface Water
Ambient Herman Impoundment Recreational - Youth

CHEMICAL	Kp (cm/hr)	Source of Kp (exp or default)	Conc (mg/cm3)	DA_event (mg/cm2-event)	DAD (mg/kg-day)	ABSGI (chemical specific)	Screening	Chemicals to be assessed	Derm/ Total Dose
Arsenic	1.0E-03	default	3.45E-06	3.45E-09	2.5E-08	100%	10%	N	1.18E-05
Barium	1.0E-03	default	8.04E-05	8.04E-08	5.9E-07	7%	140%	Y	1.18E-05
Copper	1.0E-03	default	1.97E-06	1.97E-09	1.5E-08	57%	17%	Y	1.18E-05
Cyanate	1.0E-03	default	1.00E-03	1.00E-06	7.4E-06	47%	21%	Y	1.18E-05
Manganese	1.0E-03	default	1.96E-05	1.96E-08	1.4E-07	4%	245%	Y	1.18E-05
Mercury	1.0E-03	experimental	2.75E-08	2.75E-11	4.0E+00	7%	140%	Y	1.18E-05
Nickel	2.0E-04	experimental	2.95E-06	5.89E-10	4.4E-09	4%	49%	Y	2.36E-06
added metals									
Aluminum	1.0E-03	default	3.42E-05	3.42E-08	2.5E-07	100%	10%	N	1.18E-05
Boron	1.00E-03	default	1.20E-03	1.2E-06	0.00	100%	10%	N	1.18E-05
Cobalt	4.00E-04	experimental	1.34E-07	5.4E-11	0.00	100%	4%	N	4.72E-06
Iron	1.00E-03	default	1.00E-04	1.0E-07	0.00	100%	10%	N	1.18E-05
Lithium	1.00E-03		2.08E-05	2.1E-08	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	2.50E-07	2.5E-10	0.00	100%	10%	N	1.18E-05
Added Metals									
Aluminum	1.00E-03	default	1.45E-02	1.5E-05	0.00	100%	10%	N	1.18E-05
Boron	1.00E-03	default	2.66E-02	2.7E-05	0.00	100%	10%	N	1.18E-05
Cobalt	4.00E-04	experimental	5.56E-05	2.2E-08	0.00	100%	4%	N	4.72E-06
Iron	1.00E-03	default	4.30E-05	4.3E-08	0.00	100%	10%	N	1.18E-05
Lead	1.00E-04	experimental	2.00E-08	2.0E-12	0.00	100%	1%	N	1.18E-06
Lithium	1.00E-03	default	6.45E-04	6.5E-07	0.00	100%	10%	N	1.18E-05
Molybdenum	1.00E-03	default	1.82E-07	1.8E-10	0.00	100%	10%	N	1.18E-05

Appendix E
ProUCL Output
(CD only)

Appendix E Tables
Summary Statistics by Media and Exposure Area
Sitewide Human Health Risk Assessment Report
Sulphur Bank Mercury Mine, Clearlake Oaks, California

Table No.	Title
Table E1-1	On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-2	Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-3	Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-4	Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-5	PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-6	Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-7	Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-8	Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-9	Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-10	Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-11	Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-12	Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-13	Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-14	Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-15	Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Table E1-16	Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-17	Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-18	Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Table E1-19	Fish Tissue, 95% UCL on the Mean (EPA ProUCL Software)

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.112/10/2019 3:10:48 PM							
5				From File	OnMine_Acorn_ProUCLData_20191210.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Aluminum**											
12												
13						**General Statistics**							
14					Total Number of Observations	9			Number of Distinct Observations	9		
15									Number of Missing Observations	0		
16					Minimum	1960			Mean	4947		
17					Maximum	9630			Median	4200		
18					SD	2921			Std. Error of Mean	973.8		
19					Coefficient of Variation	0.591			Skewness	0.842		
20												
21					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
22					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
23					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
24					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
25												
26						**Normal GOF Test**						
27					Shapiro Wilk Test Statistic	0.861			**Shapiro Wilk GOF Test**			
28					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
29					Lilliefors Test Statistic	0.203			**Lilliefors GOF Test**			
30					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
31					Data appear Normal at 5% Significance Level							
32												
33						**Assuming Normal Distribution**						
34					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
35					95% Student's-t UCL	6757			95% Adjusted-CLT UCL (Chen-1995)	6840		
36									95% Modified-t UCL (Johnson-1978)	6803		
37												
38						**Gamma GOF Test**						
39					A-D Test Statistic	0.38			**Anderson-Darling Gamma GOF Test**			
40					5% A-D Critical Value	0.726			Detected data appear Gamma Distributed at 5% Significance Level			
41					K-S Test Statistic	0.21			**Kolmogorov-Smirnov Gamma GOF Test**			
42					5% K-S Critical Value	0.281			Detected data appear Gamma Distributed at 5% Significance Level			
43					Detected data appear Gamma Distributed at 5% Significance Level							
44												
45						**Gamma Statistics**						
46					k hat (MLE)	3.448			k star (bias corrected MLE)	2.373		
47					Theta hat (MLE)	1435			Theta star (bias corrected MLE)	2085		
48					nu hat (MLE)	62.06			nu star (bias corrected)	42.71		
49					MLE Mean (bias corrected)	4947			MLE Sd (bias corrected)	3211		
50									Approximate Chi Square Value (0.05)	28.72		
51					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	26.33		
52												
53						**Assuming Gamma Distribution**						
54					95% Approximate Gamma UCL (use when n>=50))	7355			95% Adjusted Gamma UCL (use when n<50)	8024		
55												
56						**Lognormal GOF Test**						
57					Shapiro Wilk Test Statistic	0.93			**Shapiro Wilk Lognormal GOF Test**			
58					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
59					Lilliefors Test Statistic	0.188			**Lilliefors Lognormal GOF Test**			
60					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
61					Data appear Lognormal at 5% Significance Level							
62												
63						**Lognormal Statistics**						
64					Minimum of Logged Data	7.581			Mean of logged Data	8.354		

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
65					Maximum of Logged Data	9.173				SD of logged Data		0.583
66												
67						**Assuming Lognormal Distribution**						
68					95% H-UCL	8251				90% Chebyshev (MVUE) UCL		7859
69					95% Chebyshev (MVUE) UCL	9185				97.5% Chebyshev (MVUE) UCL		11026
70					99% Chebyshev (MVUE) UCL	14642						
71												
72						**Nonparametric Distribution Free UCL Statistics**						
73						Data appear to follow a Discernible Distribution at 5% Significance Level						
74												
75						**Nonparametric Distribution Free UCLs**						
76					95% CLT UCL	6548				95% Jackknife UCL		6757
77					95% Standard Bootstrap UCL	6467				95% Bootstrap-t UCL		7736
78					95% Hall's Bootstrap UCL	7240				95% Percentile Bootstrap UCL		6391
79					95% BCA Bootstrap UCL	6633						
80					90% Chebyshev(Mean, Sd) UCL	7868				95% Chebyshev(Mean, Sd) UCL		9191
81					97.5% Chebyshev(Mean, Sd) UCL	11028				99% Chebyshev(Mean, Sd) UCL		14636
82												
83						**Suggested UCL to Use**						
84					95% Student's-t UCL	6757						
85												
86						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
87						Recommendations are based upon data size, data distribution, and skewness.						
88						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
89						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
90												
91												
92	**Antimony**											
93												
94						**General Statistics**						
95					Total Number of Observations	9				Number of Distinct Observations		9
96										Number of Missing Observations		0
97					Minimum	3				Mean		61.98
98					Maximum	240				Median		25.5
99					SD	83.64				Std. Error of Mean		27.88
100					Coefficient of Variation	1.349				Skewness		1.528
101												
102						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
103						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
104						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
105						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						
106												
107						**Normal GOF Test**						
108					Shapiro Wilk Test Statistic	0.764				**Shapiro Wilk GOF Test**		
109					5% Shapiro Wilk Critical Value	0.829				Data Not Normal at 5% Significance Level		
110					Lilliefors Test Statistic	0.308				**Lilliefors GOF Test**		
111					5% Lilliefors Critical Value	0.274				Data Not Normal at 5% Significance Level		
112						Data Not Normal at 5% Significance Level						
113												
114						**Assuming Normal Distribution**						
115					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
116					95% Student's-t UCL	113.8				95% Adjusted-CLT UCL (Chen-1995)		123
117										95% Modified-t UCL (Johnson-1978)		116.2
118												
119						**Gamma GOF Test**						
120					A-D Test Statistic	0.454				**Anderson-Darling Gamma GOF Test**		
121					5% A-D Critical Value	0.764				Detected data appear Gamma Distributed at 5% Significance Level		
122					K-S Test Statistic	0.228				**Kolmogorov-Smirnov Gamma GOF Test**		
123					5% K-S Critical Value	0.292				Detected data appear Gamma Distributed at 5% Significance Level		
124						Detected data appear Gamma Distributed at 5% Significance Level						
125												
126						**Gamma Statistics**						
127					k hat (MLE)	0.589				k star (bias corrected MLE)		0.467
128					Theta hat (MLE)	105.3				Theta star (bias corrected MLE)		132.8

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

129					nu hat (MLE)	10.6				nu star (bias corrected)		8.4
130					MLE Mean (bias corrected)	61.98				MLE Sd (bias corrected)		90.73
131										Approximate Chi Square Value (0.05)		2.969
132					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		2.331
133												
134					**Assuming Gamma Distribution**							
135				95% Approximate Gamma UCL (use when n>=50)		175.4				95% Adjusted Gamma UCL (use when n<50)		223.3
136												
137					**Lognormal GOF Test**							
138					Shapiro Wilk Test Statistic	0.911				**Shapiro Wilk Lognormal GOF Test**		
139					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		
140					Lilliefors Test Statistic	0.204				**Lilliefors Lognormal GOF Test**		
141					5% Lilliefors Critical Value	0.274				Data appear Lognormal at 5% Significance Level		
142					**Data appear Lognormal at 5% Significance Level**							
143												
144					**Lognormal Statistics**							
145					Minimum of Logged Data	1.099				Mean of logged Data		3.075
146					Maximum of Logged Data	5.481				SD of logged Data		1.666
147												
148					**Assuming Lognormal Distribution**							
149					95% H-UCL	1517				90% Chebyshev (MVUE) UCL		178.3
150					95% Chebyshev (MVUE) UCL	229.2				97.5% Chebyshev (MVUE) UCL		299.8
151					99% Chebyshev (MVUE) UCL	438.6						
152												
153					**Nonparametric Distribution Free UCL Statistics**							
154					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
155												
156					**Nonparametric Distribution Free UCLs**							
157					95% CLT UCL	107.8				95% Jackknife UCL		113.8
158					95% Standard Bootstrap UCL	103.9				95% Bootstrap-t UCL		187.1
159					95% Hall's Bootstrap UCL	146				95% Percentile Bootstrap UCL		106.9
160					95% BCA Bootstrap UCL	116						
161					90% Chebyshev(Mean, Sd) UCL	145.6				95% Chebyshev(Mean, Sd) UCL		183.5
162					97.5% Chebyshev(Mean, Sd) UCL	236.1				99% Chebyshev(Mean, Sd) UCL		339.4
163												
164					**Suggested UCL to Use**							
165					95% Adjusted Gamma UCL	223.3						
166												
167					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
168					Recommendations are based upon data size, data distribution, and skewness.							
169					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
170					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
171												
172												
173	**Arsenic**											
174												
175					**General Statistics**							
176					Total Number of Observations	58				Number of Distinct Observations		55
177										Number of Missing Observations		0
178					Minimum	0.53				Mean		54.14
179					Maximum	316				Median		33.45
180					SD	68.93				Std. Error of Mean		9.051
181					Coefficient of Variation	1.273				Skewness		2.028
182												
183					**Normal GOF Test**							
184					Shapiro Wilk Test Statistic	0.754				**Shapiro Wilk GOF Test**		
185					5% Shapiro Wilk P Value	1.492E-12				Data Not Normal at 5% Significance Level		
186					Lilliefors Test Statistic	0.218				**Lilliefors GOF Test**		
187					5% Lilliefors Critical Value	0.116				Data Not Normal at 5% Significance Level		
188					**Data Not Normal at 5% Significance Level**							
189												
190					**Assuming Normal Distribution**							
191					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
192					95% Student's-t UCL	69.27				95% Adjusted-CLT UCL (Chen-1995)		71.6

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
193							95% Modified-t UCL (Johnson-1978)					69.67
194												
195	**Gamma GOF Test**											
196	A-D Test Statistic					0.685	**Anderson-Darling Gamma GOF Test**					
197	5% A-D Critical Value					0.807	Detected data appear Gamma Distributed at 5% Significance Level					
198	K-S Test Statistic					0.0952	**Kolmogorov-Smirnov Gamma GOF Test**					
199	5% K-S Critical Value					0.123	Detected data appear Gamma Distributed at 5% Significance Level					
200	Detected data appear Gamma Distributed at 5% Significance Level											
201												
202	**Gamma Statistics**											
203	k hat (MLE)					0.594	k star (bias corrected MLE)					0.575
204	Theta hat (MLE)					91.16	Theta star (bias corrected MLE)					94.21
205	nu hat (MLE)					68.89	nu star (bias corrected)					66.66
206	MLE Mean (bias corrected)					54.14	MLE Sd (bias corrected)					71.42
207							Approximate Chi Square Value (0.05)					48.87
208	Adjusted Level of Significance					0.0459	Adjusted Chi Square Value					48.48
209												
210	**Assuming Gamma Distribution**											
211	95% Approximate Gamma UCL (use when n>=50)					73.84	95% Adjusted Gamma UCL (use when n<50)					74.43
212												
213	**Lognormal GOF Test**											
214	Shapiro Wilk Test Statistic					0.921	**Shapiro Wilk Lognormal GOF Test**					
215	5% Shapiro Wilk P Value					8.6614E-4	Data Not Lognormal at 5% Significance Level					
216	Lilliefors Test Statistic					0.165	**Lilliefors Lognormal GOF Test**					
217	5% Lilliefors Critical Value					0.116	Data Not Lognormal at 5% Significance Level					
218	Data Not Lognormal at 5% Significance Level											
219												
220	**Lognormal Statistics**											
221	Minimum of Logged Data					-0.635	Mean of logged Data					2.949
222	Maximum of Logged Data					5.756	SD of logged Data					1.746
223												
224	**Assuming Lognormal Distribution**											
225	95% H-UCL					194.9	90% Chebyshev (MVUE) UCL					162.8
226	95% Chebyshev (MVUE) UCL					199.2	97.5% Chebyshev (MVUE) UCL					249.7
227	99% Chebyshev (MVUE) UCL					349						
228												
229	**Nonparametric Distribution Free UCL Statistics**											
230	Data appear to follow a Discernible Distribution at 5% Significance Level											
231												
232	**Nonparametric Distribution Free UCLs**											
233	95% CLT UCL					69.02	95% Jackknife UCL					69.27
234	95% Standard Bootstrap UCL					69.14	95% Bootstrap-t UCL					73.78
235	95% Hall's Bootstrap UCL					71.98	95% Percentile Bootstrap UCL					69.78
236	95% BCA Bootstrap UCL					72.94						
237	90% Chebyshev(Mean, Sd) UCL					81.29	95% Chebyshev(Mean, Sd) UCL					93.59
238	97.5% Chebyshev(Mean, Sd) UCL					110.7	99% Chebyshev(Mean, Sd) UCL					144.2
239												
240	**Suggested UCL to Use**											
241	95% Approximate Gamma UCL					73.84						
242												
243	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
244	Recommendations are based upon data size, data distribution, and skewness.											
245	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
246	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
247												
248												
249	**Barium**											
250												
251	**General Statistics**											
252	Total Number of Observations					9	Number of Distinct Observations					9
253							Number of Missing Observations					0
254	Minimum					120	Mean					205.3
255	Maximum					312	Median					223
256	SD					58.24	Std. Error of Mean					19.41

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

257					Coefficient of Variation	0.284					Skewness	0.179
258												
259	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
260	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
261	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
262	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
263												
264	**Normal GOF Test**											
265					Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**					
266					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
267					Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**					
268					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
269	Data appear Normal at 5% Significance Level											
270												
271	**Assuming Normal Distribution**											
272	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
273					95% Student's-t UCL	241.4					95% Adjusted-CLT UCL (Chen-1995)	238.5
274											95% Modified-t UCL (Johnson-1978)	241.6
275												
276	**Gamma GOF Test**											
277					A-D Test Statistic	0.4	**Anderson-Darling Gamma GOF Test**					
278					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
279					K-S Test Statistic	0.209	**Kolmogorov-Smirnov Gamma GOF Test**					
280					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
281	Detected data appear Gamma Distributed at 5% Significance Level											
282												
283	**Gamma Statistics**											
284					k hat (MLE)	13.26					k star (bias corrected MLE)	8.914
285					Theta hat (MLE)	15.49					Theta star (bias corrected MLE)	23.03
286					nu hat (MLE)	238.7					nu star (bias corrected)	160.5
287					MLE Mean (bias corrected)	205.3					MLE Sd (bias corrected)	68.77
288											Approximate Chi Square Value (0.05)	132.2
289					Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	126.8
290												
291	**Assuming Gamma Distribution**											
292					95% Approximate Gamma UCL (use when n>=50))	249.3					95% Adjusted Gamma UCL (use when n<50)	259.9
293												
294	**Lognormal GOF Test**											
295					Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**					
296					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
297					Lilliefors Test Statistic	0.212	**Lilliefors Lognormal GOF Test**					
298					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
299	Data appear Lognormal at 5% Significance Level											
300												
301	**Lognormal Statistics**											
302					Minimum of Logged Data	4.787					Mean of logged Data	5.286
303					Maximum of Logged Data	5.743					SD of logged Data	0.3
304												
305	**Assuming Lognormal Distribution**											
306					95% H-UCL	255.8					90% Chebyshev (MVUE) UCL	267.6
307					95% Chebyshev (MVUE) UCL	295.7					97.5% Chebyshev (MVUE) UCL	334.6
308					99% Chebyshev (MVUE) UCL	411.1						
309												
310	**Nonparametric Distribution Free UCL Statistics**											
311	Data appear to follow a Discernible Distribution at 5% Significance Level											
312												
313	**Nonparametric Distribution Free UCLs**											
314					95% CLT UCL	237.3					95% Jackknife UCL	241.4
315					95% Standard Bootstrap UCL	233.7					95% Bootstrap-t UCL	241
316					95% Hall's Bootstrap UCL	242.9					95% Percentile Bootstrap UCL	235.4
317					95% BCA Bootstrap UCL	236.7						
318					90% Chebyshev(Mean, Sd) UCL	263.6					95% Chebyshev(Mean, Sd) UCL	290
319					97.5% Chebyshev(Mean, Sd) UCL	326.6					99% Chebyshev(Mean, Sd) UCL	398.5
320												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

321	**Suggested UCL to Use**											
322				95% Student's-t UCL		241.4						
323												
324	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
325	Recommendations are based upon data size, data distribution, and skewness.											
326	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
327	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
328												
329	**Beryllium**											
330												
331	**General Statistics**											
332				Total Number of Observations		9		Number of Distinct Observations			9	
333				Number of Detects		7		Number of Non-Detects			2	
334				Number of Distinct Detects		7		Number of Distinct Non-Detects			2	
335				Minimum Detect		0.022		Minimum Non-Detect			0.21	
336				Maximum Detect		0.29		Maximum Non-Detect			0.22	
337				Variance Detects		0.0137		Percent Non-Detects			22.22%	
338				Mean Detects		0.125		SD Detects			0.117	
339				Median Detects		0.082		CV Detects			0.941	
340				Skewness Detects		0.78		Kurtosis Detects			-1.404	
341				Mean of Logged Detects		-2.555		SD of Logged Detects			1.103	
342												
343	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
344	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
345	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
346	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
347												
348	**Normal GOF Test on Detects Only**											
349				Shapiro Wilk Test Statistic		0.815		**Shapiro Wilk GOF Test**				
350				5% Shapiro Wilk Critical Value		0.803		Detected Data appear Normal at 5% Significance Level				
351				Lilliefors Test Statistic		0.214		**Lilliefors GOF Test**				
352				5% Lilliefors Critical Value		0.304		Detected Data appear Normal at 5% Significance Level				
353	Detected Data appear Normal at 5% Significance Level											
354												
355	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
356				KM Mean		0.11		KM Standard Error of Mean			0.0377	
357				KM SD		0.102		95% KM (BCA) UCL			0.167	
358				95% KM (t) UCL		0.18		95% KM (Percentile Bootstrap) UCL			0.171	
359				95% KM (z) UCL		0.172		95% KM Bootstrap t UCL			0.209	
360				90% KM Chebyshev UCL		0.223		95% KM Chebyshev UCL			0.275	
361				97.5% KM Chebyshev UCL		0.346		99% KM Chebyshev UCL			0.485	
362												
363	**Gamma GOF Tests on Detected Observations Only**											
364				A-D Test Statistic		0.459		**Anderson-Darling GOF Test**				
365				5% A-D Critical Value		0.725		Detected data appear Gamma Distributed at 5% Significance Level				
366				K-S Test Statistic		0.241		**Kolmogorov-Smirnov GOF**				
367				5% K-S Critical Value		0.319		Detected data appear Gamma Distributed at 5% Significance Level				
368	Detected data appear Gamma Distributed at 5% Significance Level											
369												
370	**Gamma Statistics on Detected Data Only**											
371				k hat (MLE)		1.198		k star (bias corrected MLE)			0.78	
372				Theta hat (MLE)		0.104		Theta star (bias corrected MLE)			0.16	
373				nu hat (MLE)		16.77		nu star (bias corrected)			10.92	
374				Mean (detects)		0.125						
375												
376	**Gamma ROS Statistics using Imputed Non-Detects**											
377	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
378	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
379	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
380	This is especially true when the sample size is small.											
381	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
382				Minimum		0.022		Mean			0.11	
383				Maximum		0.29		Median			0.0579	
384				SD		0.106		CV			0.963	

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

385					k hat (MLE)	1.359				k star (bias corrected MLE)		0.98
386					Theta hat (MLE)	0.0808				Theta star (bias corrected MLE)		0.112
387					nu hat (MLE)	24.46				nu star (bias corrected)		17.64
388					Adjusted Level of Significance (β)	0.0231						
389					Approximate Chi Square Value (17.64, α)	9.132				Adjusted Chi Square Value (17.64, β)		7.875
390					95% Gamma Approximate UCL (use when n>=50)	0.212				95% Gamma Adjusted UCL (use when n<50)		0.246
391												
392						**Estimates of Gamma Parameters using KM Estimates**							
393					Mean (KM)	0.11				SD (KM)		0.102
394					Variance (KM)	0.0103				SE of Mean (KM)		0.0377
395					k hat (KM)	1.179				k star (KM)		0.86
396					nu hat (KM)	21.22				nu star (KM)		15.48
397					theta hat (KM)	0.0936				theta star (KM)		0.128
398					80% gamma percentile (KM)	0.18				90% gamma percentile (KM)		0.264
399					95% gamma percentile (KM)	0.349				99% gamma percentile (KM)		0.549
400												
401						**Gamma Kaplan-Meier (KM) Statistics**							
402					Approximate Chi Square Value (15.48, α)	7.597				Adjusted Chi Square Value (15.48, β)		6.468
403					95% Gamma Approximate KM-UCL (use when n>=50)	0.225				95% Gamma Adjusted KM-UCL (use when n<50)		0.264
404												
405						**Lognormal GOF Test on Detected Observations Only**							
406					Shapiro Wilk Test Statistic	0.879				**Shapiro Wilk GOF Test**		
407					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
408					Lilliefors Test Statistic	0.218				**Lilliefors GOF Test**		
409					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
410						Detected Data appear Lognormal at 5% Significance Level						
411												
412						**Lognormal ROS Statistics Using Imputed Non-Detects**							
413					Mean in Original Scale	0.108				Mean in Log Scale		-2.661
414					SD in Original Scale	0.107				SD in Log Scale		0.978
415					95% t UCL (assumes normality of ROS data)	0.174				95% Percentile Bootstrap UCL		0.164
416					95% BCA Bootstrap UCL	0.181				95% Bootstrap t UCL		0.262
417					95% H-UCL (Log ROS)	0.34						
418												
419						**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
420					KM Mean (logged)	-2.671				KM Geo Mean		0.0692
421					KM SD (logged)	0.986				95% Critical H Value (KM-Log)		3.209
422					KM Standard Error of Mean (logged)	0.383				95% H-UCL (KM -Log)		0.345
423					KM SD (logged)	0.986				95% Critical H Value (KM-Log)		3.209
424					KM Standard Error of Mean (logged)	0.383						
425												
426						**DL/2 Statistics**							
427					**DL/2 Normal**					**DL/2 Log-Transformed**		
428					Mean in Original Scale	0.121				Mean in Log Scale		-2.483
429					SD in Original Scale	0.102				SD in Log Scale		0.966
430					95% t UCL (Assumes normality)	0.184				95% H-Stat UCL		0.393
431						DL/2 is not a recommended method, provided for comparisons and historical reasons						
432												
433						**Nonparametric Distribution Free UCL Statistics**							
434						Detected Data appear Normal Distributed at 5% Significance Level						
435												
436						**Suggested UCL to Use**						
437					95% KM (t) UCL	0.18						
438												
439						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
440						Recommendations are based upon data size, data distribution, and skewness.						
441						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
442						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
443												
444	**Boron**											
445												
446						**General Statistics**						
447					Total Number of Observations	9				Number of Distinct Observations		7
448					Number of Detects	1				Number of Non-Detects		8

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

449					Number of Distinct Detects	1				Number of Distinct Non-Detects		6
450												
451	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
452	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
453												
454	The data set for variable Boron was not processed!											
455												
456												
457												
458	Cadmium											
459												
460	General Statistics											
461					Total Number of Observations	9				Number of Distinct Observations		9
462										Number of Missing Observations		0
463					Minimum	0.019				Mean		0.0462
464					Maximum	0.098				Median		0.036
465					SD	0.0305				Std. Error of Mean		0.0102
466					Coefficient of Variation	0.66				Skewness		1.254
467												
468	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
469	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
470	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
471	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
472												
473	Normal GOF Test											
474					Shapiro Wilk Test Statistic	0.779				Shapiro Wilk GOF Test		
475					5% Shapiro Wilk Critical Value	0.829				Data Not Normal at 5% Significance Level		
476					Lilliefors Test Statistic	0.26				Lilliefors GOF Test		
477					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
478	Data appear Approximate Normal at 5% Significance Level											
479												
480	Assuming Normal Distribution											
481					95% Normal UCL					95% UCLs (Adjusted for Skewness)		
482					95% Student's-t UCL	0.0651				95% Adjusted-CLT UCL (Chen-1995)		0.0675
483										95% Modified-t UCL (Johnson-1978)		0.0658
484												
485	Gamma GOF Test											
486					A-D Test Statistic	0.597				Anderson-Darling Gamma GOF Test		
487					5% A-D Critical Value	0.727				Detected data appear Gamma Distributed at 5% Significance Level		
488					K-S Test Statistic	0.207				Kolmogorov-Smirnov Gamma GOF Test		
489					5% K-S Critical Value	0.281				Detected data appear Gamma Distributed at 5% Significance Level		
490	Detected data appear Gamma Distributed at 5% Significance Level											
491												
492	Gamma Statistics											
493					k hat (MLE)	3.139				k star (bias corrected MLE)		2.167
494					Theta hat (MLE)	0.0147				Theta star (bias corrected MLE)		0.0213
495					nu hat (MLE)	56.51				nu star (bias corrected)		39.01
496					MLE Mean (bias corrected)	0.0462				MLE Sd (bias corrected)		0.0314
497										Approximate Chi Square Value (0.05)		25.7
498					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		23.45
499												
500	Assuming Gamma Distribution											
501					95% Approximate Gamma UCL (use when n>=50))	0.0702				95% Adjusted Gamma UCL (use when n<50)		0.0769
502												
503	Lognormal GOF Test											
504					Shapiro Wilk Test Statistic	0.897				Shapiro Wilk Lognormal GOF Test		
505					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		
506					Lilliefors Test Statistic	0.168				Lilliefors Lognormal GOF Test		
507					5% Lilliefors Critical Value	0.274				Data appear Lognormal at 5% Significance Level		
508	Data appear Lognormal at 5% Significance Level											
509												
510	Lognormal Statistics											
511					Minimum of Logged Data	-3.963				Mean of logged Data		-3.242
512					Maximum of Logged Data	-2.323				SD of logged Data		0.592

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

513												
514	**Assuming Lognormal Distribution**											
515					95% H-UCL	0.0773			90% Chebyshev (MVUE) UCL	0.0731		
516					95% Chebyshev (MVUE) UCL	0.0856			97.5% Chebyshev (MVUE) UCL	0.103		
517					99% Chebyshev (MVUE) UCL	0.137						
518												
519	**Nonparametric Distribution Free UCL Statistics**											
520	Data appear to follow a Discernible Distribution at 5% Significance Level											
521												
522	**Nonparametric Distribution Free UCLs**											
523					95% CLT UCL	0.063			95% Jackknife UCL	0.0651		
524					95% Standard Bootstrap UCL	0.0618			95% Bootstrap-t UCL	0.0931		
525					95% Hall's Bootstrap UCL	0.164			95% Percentile Bootstrap UCL	0.0633		
526					95% BCA Bootstrap UCL	0.0643						
527					90% Chebyshev(Mean, Sd) UCL	0.0767			95% Chebyshev(Mean, Sd) UCL	0.0906		
528					97.5% Chebyshev(Mean, Sd) UCL	0.11			99% Chebyshev(Mean, Sd) UCL	0.147		
529												
530	**Suggested UCL to Use**											
531					95% Student's-t UCL	0.0651						
532												
533	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											
534	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL											
535												
536	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
537	Recommendations are based upon data size, data distribution, and skewness.											
538	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
539	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
540												
541												
542	**Chromium**											
543												
544	**General Statistics**											
545					Total Number of Observations	9			Number of Distinct Observations	9		
546									Number of Missing Observations	0		
547					Minimum	8			Mean	19.73		
548					Maximum	35.3			Median	18.2		
549					SD	10.14			Std. Error of Mean	3.381		
550					Coefficient of Variation	0.514			Skewness	0.564		
551												
552	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
553	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
554	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
555	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
556												
557	**Normal GOF Test**											
558					Shapiro Wilk Test Statistic	0.908			**Shapiro Wilk GOF Test**			
559					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
560					Lilliefors Test Statistic	0.151			**Lilliefors GOF Test**			
561					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
562	Data appear Normal at 5% Significance Level											
563												
564	**Assuming Normal Distribution**											
565	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
566					95% Student's-t UCL	26.02			95% Adjusted-CLT UCL (Chen-1995)	25.97		
567									95% Modified-t UCL (Johnson-1978)	26.13		
568												
569	**Gamma GOF Test**											
570					A-D Test Statistic	0.27			**Anderson-Darling Gamma GOF Test**			
571					5% A-D Critical Value	0.725			Detected data appear Gamma Distributed at 5% Significance Level			
572					K-S Test Statistic	0.162			**Kolmogorov-Smirnov Gamma GOF Test**			
573					5% K-S Critical Value	0.28			Detected data appear Gamma Distributed at 5% Significance Level			
574	Detected data appear Gamma Distributed at 5% Significance Level											
575												
576	**Gamma Statistics**											

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
577					k hat (MLE)	4.177				k star (bias corrected MLE)		2.858
578					Theta hat (MLE)	4.725				Theta star (bias corrected MLE)		6.903
579					nu hat (MLE)	75.18				nu star (bias corrected)		51.45
580					MLE Mean (bias corrected)	19.73				MLE Sd (bias corrected)		11.67
581										Approximate Chi Square Value (0.05)		35.98
582					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		33.27
583												
584						**Assuming Gamma Distribution**							
585			95% Approximate Gamma UCL (use when n>=50))			28.22				95% Adjusted Gamma UCL (use when n<50)		30.52
586												
587						**Lognormal GOF Test**							
588					Shapiro Wilk Test Statistic	0.939				**Shapiro Wilk Lognormal GOF Test**		
589					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		
590					Lilliefors Test Statistic	0.145				**Lilliefors Lognormal GOF Test**		
591					5% Lilliefors Critical Value	0.274				Data appear Lognormal at 5% Significance Level		
592						Data appear Lognormal at 5% Significance Level						
593												
594						**Lognormal Statistics**						
595					Minimum of Logged Data	2.079				Mean of logged Data		2.858
596					Maximum of Logged Data	3.564				SD of logged Data		0.54
597												
598						**Assuming Lognormal Distribution**							
599					95% H-UCL	31.25				90% Chebyshev (MVUE) UCL		30.67
600					95% Chebyshev (MVUE) UCL	35.59				97.5% Chebyshev (MVUE) UCL		42.42
601					99% Chebyshev (MVUE) UCL	55.83						
602												
603						**Nonparametric Distribution Free UCL Statistics**							
604						Data appear to follow a Discernible Distribution at 5% Significance Level						
605												
606						**Nonparametric Distribution Free UCLs**							
607					95% CLT UCL	25.29				95% Jackknife UCL		26.02
608					95% Standard Bootstrap UCL	25.05				95% Bootstrap-t UCL		27.61
609					95% Hall's Bootstrap UCL	28.23				95% Percentile Bootstrap UCL		25.1
610					95% BCA Bootstrap UCL	25.27						
611					90% Chebyshev(Mean, Sd) UCL	29.88				95% Chebyshev(Mean, Sd) UCL		34.47
612					97.5% Chebyshev(Mean, Sd) UCL	40.85				99% Chebyshev(Mean, Sd) UCL		53.38
613												
614						**Suggested UCL to Use**							
615					95% Student's-t UCL	26.02						
616												
617						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
618						Recommendations are based upon data size, data distribution, and skewness.						
619						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
620						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
621												
622												
623	**Cobalt**											
624												
625						**General Statistics**							
626					Total Number of Observations	9				Number of Distinct Observations		9
627										Number of Missing Observations		0
628					Minimum	0.089				Mean		2.088
629					Maximum	5.6				Median		1.7
630					SD	1.899				Std. Error of Mean		0.633
631					Coefficient of Variation	0.909				Skewness		0.718
632												
633						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
634						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
635						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
636						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						
637												
638						**Normal GOF Test**						
639					Shapiro Wilk Test Statistic	0.915				**Shapiro Wilk GOF Test**		
640					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
641					Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**					
642					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
643					Data appear Normal at 5% Significance Level							
644												
645					**Assuming Normal Distribution**							
646					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
647					95% Student's-t UCL	3.264			95% Adjusted-CLT UCL (Chen-1995)			3.29
648									95% Modified-t UCL (Johnson-1978)			3.29
649												
650					**Gamma GOF Test**							
651					A-D Test Statistic	0.28	**Anderson-Darling Gamma GOF Test**					
652					5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level					
653					K-S Test Statistic	0.171	**Kolmogorov-Smirnov Gamma GOF Test**					
654					5% K-S Critical Value	0.288	Detected data appear Gamma Distributed at 5% Significance Level					
655					Detected data appear Gamma Distributed at 5% Significance Level							
656												
657					**Gamma Statistics**							
658					k hat (MLE)	0.912			k star (bias corrected MLE)			0.682
659					Theta hat (MLE)	2.29			Theta star (bias corrected MLE)			3.062
660					nu hat (MLE)	16.41			nu star (bias corrected)			12.27
661					MLE Mean (bias corrected)	2.088			MLE Sd (bias corrected)			2.528
662									Approximate Chi Square Value (0.05)			5.407
663					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value			4.484
664												
665					**Assuming Gamma Distribution**							
666					95% Approximate Gamma UCL (use when n>=50))	4.738			95% Adjusted Gamma UCL (use when n<50)			5.713
667												
668					**Lognormal GOF Test**							
669					Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk Lognormal GOF Test**					
670					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
671					Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**					
672					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
673					Data appear Lognormal at 5% Significance Level							
674												
675					**Lognormal Statistics**							
676					Minimum of Logged Data	-2.419			Mean of logged Data			0.0958
677					Maximum of Logged Data	1.723			SD of logged Data			1.449
678												
679					**Assuming Lognormal Distribution**							
680					95% H-UCL	28.58			90% Chebyshev (MVUE) UCL			6.498
681					95% Chebyshev (MVUE) UCL	8.263			97.5% Chebyshev (MVUE) UCL			10.71
682					99% Chebyshev (MVUE) UCL	15.53						
683												
684					**Nonparametric Distribution Free UCL Statistics**							
685					Data appear to follow a Discernible Distribution at 5% Significance Level							
686												
687					**Nonparametric Distribution Free UCLs**							
688					95% CLT UCL	3.129			95% Jackknife UCL			3.264
689					95% Standard Bootstrap UCL	3.045			95% Bootstrap-t UCL			3.414
690					95% Hall's Bootstrap UCL	3.307			95% Percentile Bootstrap UCL			3.133
691					95% BCA Bootstrap UCL	3.236						
692					90% Chebyshev(Mean, Sd) UCL	3.986			95% Chebyshev(Mean, Sd) UCL			4.846
693					97.5% Chebyshev(Mean, Sd) UCL	6.04			99% Chebyshev(Mean, Sd) UCL			8.384
694												
695					**Suggested UCL to Use**							
696					95% Student's-t UCL	3.264						
697												
698					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
699					Recommendations are based upon data size, data distribution, and skewness.							
700					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
701					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
702												
703												
704	**Copper**											

Table E1-1
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Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

705												
706	**General Statistics**											
707					Total Number of Observations	9				Number of Distinct Observations	9	
708										Number of Missing Observations	0	
709					Minimum	8.2				Mean	19.64	
710					Maximum	38.2				Median	14.3	
711					SD	11.72				Std. Error of Mean	3.907	
712					Coefficient of Variation	0.597				Skewness	0.769	
713												
714	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
715	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
716	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
717	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
718												
719	**Normal GOF Test**											
720					Shapiro Wilk Test Statistic	0.847	**Shapiro Wilk GOF Test**					
721					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
722					Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**					
723					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
724	Data appear Normal at 5% Significance Level											
725												
726	**Assuming Normal Distribution**											
727	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
728					95% Student's-t UCL	26.91	95% Adjusted-CLT UCL (Chen-1995)				27.14	
729							95% Modified-t UCL (Johnson-1978)				27.08	
730												
731	**Gamma GOF Test**											
732					A-D Test Statistic	0.501	**Anderson-Darling Gamma GOF Test**					
733					5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level					
734					K-S Test Statistic	0.217	**Kolmogorov-Smirnov Gamma GOF Test**					
735					5% K-S Critical Value	0.281	Detected data appear Gamma Distributed at 5% Significance Level					
736	Detected data appear Gamma Distributed at 5% Significance Level											
737												
738	**Gamma Statistics**											
739					k hat (MLE)	3.343				k star (bias corrected MLE)	2.303	
740					Theta hat (MLE)	5.876				Theta star (bias corrected MLE)	8.53	
741					nu hat (MLE)	60.18				nu star (bias corrected)	41.45	
742					MLE Mean (bias corrected)	19.64				MLE Sd (bias corrected)	12.94	
743										Approximate Chi Square Value (0.05)	27.7	
744					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	25.35	
745												
746	**Assuming Gamma Distribution**											
747					95% Approximate Gamma UCL (use when n>=50))	29.4				95% Adjusted Gamma UCL (use when n<50)	32.13	
748												
749	**Lognormal GOF Test**											
750					Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk Lognormal GOF Test**					
751					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
752					Lilliefors Test Statistic	0.197	**Lilliefors Lognormal GOF Test**					
753					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
754	Data appear Lognormal at 5% Significance Level											
755												
756	**Lognormal Statistics**											
757					Minimum of Logged Data	2.104				Mean of logged Data	2.821	
758					Maximum of Logged Data	3.643				SD of logged Data	0.592	
759												
760	**Assuming Lognormal Distribution**											
761					95% H-UCL	33.21				90% Chebyshev (MVUE) UCL	31.4	
762					95% Chebyshev (MVUE) UCL	36.75				97.5% Chebyshev (MVUE) UCL	44.18	
763					99% Chebyshev (MVUE) UCL	58.77						
764												
765	**Nonparametric Distribution Free UCL Statistics**											
766	Data appear to follow a Discernible Distribution at 5% Significance Level											
767												
768	**Nonparametric Distribution Free UCLs**											

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

769					95% CLT UCL	26.07				95% Jackknife UCL		26.91
770				95% Standard Bootstrap UCL		25.61				95% Bootstrap-t UCL		28.22
771				95% Hall's Bootstrap UCL		27.44				95% Percentile Bootstrap UCL		25.79
772				95% BCA Bootstrap UCL		26.59						
773				90% Chebyshev(Mean, Sd) UCL		31.36				95% Chebyshev(Mean, Sd) UCL		36.67
774				97.5% Chebyshev(Mean, Sd) UCL		44.04				99% Chebyshev(Mean, Sd) UCL		58.51
775												
776						**Suggested UCL to Use**						
777					95% Student's-t UCL	26.91						
778												
779	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
780	Recommendations are based upon data size, data distribution, and skewness.											
781	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
782	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
783												
784												
785	**Iron**											
786												
787						**General Statistics**						
788					Total Number of Observations	9				Number of Distinct Observations		8
789										Number of Missing Observations		0
790					Minimum	11700				Mean		31167
791					Maximum	58000				Median		29200
792					SD	17255				Std. Error of Mean		5752
793					Coefficient of Variation	0.554				Skewness		0.337
794												
795	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
796	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
797	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
798	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
799												
800						**Normal GOF Test**						
801					Shapiro Wilk Test Statistic	0.913				**Shapiro Wilk GOF Test**		
802					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
803					Lilliefors Test Statistic	0.17				**Lilliefors GOF Test**		
804					5% Lilliefors Critical Value	0.274				Data appear Normal at 5% Significance Level		
805	Data appear Normal at 5% Significance Level											
806												
807						**Assuming Normal Distribution**						
808					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
809					95% Student's-t UCL	41862				95% Adjusted-CLT UCL (Chen-1995)		41317
810										95% Modified-t UCL (Johnson-1978)		41970
811												
812						**Gamma GOF Test**						
813					A-D Test Statistic	0.341				**Anderson-Darling Gamma GOF Test**		
814					5% A-D Critical Value	0.726				Detected data appear Gamma Distributed at 5% Significance Level		
815					K-S Test Statistic	0.183				**Kolmogorov-Smirnov Gamma GOF Test**		
816					5% K-S Critical Value	0.281				Detected data appear Gamma Distributed at 5% Significance Level		
817	Detected data appear Gamma Distributed at 5% Significance Level											
818												
819						**Gamma Statistics**						
820					k hat (MLE)	3.373				k star (bias corrected MLE)		2.323
821					Theta hat (MLE)	9239				Theta star (bias corrected MLE)		13416
822					nu hat (MLE)	60.72				nu star (bias corrected)		41.81
823					MLE Mean (bias corrected)	31167				MLE Sd (bias corrected)		20449
824										Approximate Chi Square Value (0.05)		27.99
825					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		25.63
826												
827						**Assuming Gamma Distribution**						
828					95% Approximate Gamma UCL (use when n>=50))	46557				95% Adjusted Gamma UCL (use when n<50)		50848
829												
830						**Lognormal GOF Test**						
831					Shapiro Wilk Test Statistic	0.913				**Shapiro Wilk Lognormal GOF Test**		
832					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
833					Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**					
834					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
835	Data appear Lognormal at 5% Significance Level											
836												
837	**Lognormal Statistics**											
838					Minimum of Logged Data	9.367				Mean of logged Data	10.19	
839					Maximum of Logged Data	10.97				SD of logged Data	0.613	
840												
841	**Assuming Lognormal Distribution**											
842					95% H-UCL	54904				90% Chebyshev (MVUE) UCL	51095	
843					95% Chebyshev (MVUE) UCL	59997				97.5% Chebyshev (MVUE) UCL	72353	
844					99% Chebyshev (MVUE) UCL	96623						
845												
846	**Nonparametric Distribution Free UCL Statistics**											
847	Data appear to follow a Discernible Distribution at 5% Significance Level											
848												
849	**Nonparametric Distribution Free UCLs**											
850					95% CLT UCL	40627				95% Jackknife UCL	41862	
851					95% Standard Bootstrap UCL	40125				95% Bootstrap-t UCL	43408	
852					95% Hall's Bootstrap UCL	40163				95% Percentile Bootstrap UCL	40144	
853					95% BCA Bootstrap UCL	40789						
854					90% Chebyshev(Mean, Sd) UCL	48421				95% Chebyshev(Mean, Sd) UCL	56237	
855					97.5% Chebyshev(Mean, Sd) UCL	67085				99% Chebyshev(Mean, Sd) UCL	88394	
856												
857	**Suggested UCL to Use**											
858					95% Student's-t UCL	41862						
859												
860	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
861	Recommendations are based upon data size, data distribution, and skewness.											
862	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
863	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
864												
865												
866	**Lead**											
867												
868	**General Statistics**											
869					Total Number of Observations	9				Number of Distinct Observations	9	
870										Number of Missing Observations	0	
871					Minimum	5.5				Mean	13.58	
872					Maximum	26				Median	14.1	
873					SD	5.892				Std. Error of Mean	1.964	
874					Coefficient of Variation	0.434				Skewness	0.987	
875												
876	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
877	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
878	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
879	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
880												
881	**Normal GOF Test**											
882					Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**					
883					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
884					Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**					
885					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
886	Data appear Normal at 5% Significance Level											
887												
888	**Assuming Normal Distribution**											
889	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
890					95% Student's-t UCL	17.23				95% Adjusted-CLT UCL (Chen-1995)	17.5	
891										95% Modified-t UCL (Johnson-1978)	17.34	
892												
893	**Gamma GOF Test**											
894					A-D Test Statistic	0.202	**Anderson-Darling Gamma GOF Test**					
895					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
896					K-S Test Statistic	0.146	**Kolmogorov-Smirnov Gamma GOF Test**					

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
897					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
898	Detected data appear Gamma Distributed at 5% Significance Level											
899												
900	Gamma Statistics											
901					k hat (MLE)	6.099			k star (bias corrected MLE)			4.14
902					Theta hat (MLE)	2.226			Theta star (bias corrected MLE)			3.28
903					nu hat (MLE)	109.8			nu star (bias corrected)			74.52
904					MLE Mean (bias corrected)	13.58			MLE Sd (bias corrected)			6.673
905									Approximate Chi Square Value (0.05)			55.64
906					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value			52.21
907												
908	Assuming Gamma Distribution											
909			95% Approximate Gamma UCL (use when n>=50))			18.19			95% Adjusted Gamma UCL (use when n<50)			19.38
910												
911	Lognormal GOF Test											
912					Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Lognormal GOF Test					
913					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
914					Lilliefors Test Statistic	0.164	Lilliefors Lognormal GOF Test					
915					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
916	Data appear Lognormal at 5% Significance Level											
917												
918	Lognormal Statistics											
919					Minimum of Logged Data	1.705			Mean of logged Data			2.524
920					Maximum of Logged Data	3.258			SD of logged Data			0.444
921												
922	Assuming Lognormal Distribution											
923					95% H-UCL	19.39			90% Chebyshev (MVUE) UCL			19.72
924					95% Chebyshev (MVUE) UCL	22.49			97.5% Chebyshev (MVUE) UCL			26.34
925					99% Chebyshev (MVUE) UCL	33.88						
926												
927	Nonparametric Distribution Free UCL Statistics											
928	Data appear to follow a Discernible Distribution at 5% Significance Level											
929												
930	Nonparametric Distribution Free UCLs											
931					95% CLT UCL	16.81			95% Jackknife UCL			17.23
932					95% Standard Bootstrap UCL	16.6			95% Bootstrap-t UCL			17.97
933					95% Hall's Bootstrap UCL	20.07			95% Percentile Bootstrap UCL			16.66
934					95% BCA Bootstrap UCL	17.06						
935					90% Chebyshev(Mean, Sd) UCL	19.47			95% Chebyshev(Mean, Sd) UCL			22.14
936					97.5% Chebyshev(Mean, Sd) UCL	25.84			99% Chebyshev(Mean, Sd) UCL			33.12
937												
938	Suggested UCL to Use											
939					95% Student's-t UCL	17.23						
940												
941	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
942	Recommendations are based upon data size, data distribution, and skewness.											
943	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
944	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
945												
946	Lithium											
947												
948	General Statistics											
949					Total Number of Observations	9			Number of Distinct Observations			6
950					Number of Detects	4			Number of Non-Detects			5
951					Number of Distinct Detects	4			Number of Distinct Non-Detects			2
952					Minimum Detect	0.5			Minimum Non-Detect			0.6
953					Maximum Detect	1.8			Maximum Non-Detect			0.65
954					Variance Detects	0.423			Percent Non-Detects			55.56%
955					Mean Detects	1.145			SD Detects			0.65
956					Median Detects	1.14			CV Detects			0.568
957					Skewness Detects	0.0153			Kurtosis Detects			-5.168
958					Mean of Logged Detects	-0.00525			SD of Logged Detects			0.631
959												
960	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											

Table E1-1
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	A	B	C	D	E	F	G	H	I	J	K	L
961	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
962	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
963	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
964												
965	Normal GOF Test on Detects Only											
966					Shapiro Wilk Test Statistic	0.865	Shapiro Wilk GOF Test					
967					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level					
968					Lilliefors Test Statistic	0.263	Lilliefors GOF Test					
969					5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level					
970	Detected Data appear Normal at 5% Significance Level											
971												
972	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
973					KM Mean	0.787	KM Standard Error of Mean	0.19				
974					KM SD	0.494	95% KM (BCA) UCL	N/A				
975					95% KM (t) UCL	1.14	95% KM (Percentile Bootstrap) UCL	N/A				
976					95% KM (z) UCL	1.099	95% KM Bootstrap t UCL	N/A				
977					90% KM Chebyshev UCL	1.357	95% KM Chebyshev UCL	1.615				
978					97.5% KM Chebyshev UCL	1.973	99% KM Chebyshev UCL	2.677				
979												
980	Gamma GOF Tests on Detected Observations Only											
981					A-D Test Statistic	0.433	Anderson-Darling GOF Test					
982					5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level					
983					K-S Test Statistic	0.303	Kolmogorov-Smirnov GOF					
984					5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level					
985	Detected data appear Gamma Distributed at 5% Significance Level											
986												
987	Gamma Statistics on Detected Data Only											
988					k hat (MLE)	3.713	k star (bias corrected MLE)	1.095				
989					Theta hat (MLE)	0.308	Theta star (bias corrected MLE)	1.046				
990					nu hat (MLE)	29.7	nu star (bias corrected)	8.76				
991					Mean (detects)	1.145						
992												
993	Gamma ROS Statistics using Imputed Non-Detects											
994	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
995	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
996	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
997	This is especially true when the sample size is small.											
998	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
999					Minimum	0.0496	Mean	0.713				
1000					Maximum	1.8	Median	0.5				
1001					SD	0.595	CV	0.834				
1002					k hat (MLE)	1.457	k star (bias corrected MLE)	1.045				
1003					Theta hat (MLE)	0.49	Theta star (bias corrected MLE)	0.682				
1004					nu hat (MLE)	26.22	nu star (bias corrected)	18.82				
1005					Adjusted Level of Significance (β)	0.0231						
1006					Approximate Chi Square Value (18.82, α)	9.983	Adjusted Chi Square Value (18.82, β)	8.659				
1007					95% Gamma Approximate UCL (use when n>=50)	1.344	95% Gamma Adjusted UCL (use when n<50)	N/A				
1008												
1009	Estimates of Gamma Parameters using KM Estimates											
1010					Mean (KM)	0.787	SD (KM)	0.494				
1011					Variance (KM)	0.244	SE of Mean (KM)	0.19				
1012					k hat (KM)	2.54	k star (KM)	1.767				
1013					nu hat (KM)	45.72	nu star (KM)	31.81				
1014					theta hat (KM)	0.31	theta star (KM)	0.445				
1015					80% gamma percentile (KM)	1.195	90% gamma percentile (KM)	1.576				
1016					95% gamma percentile (KM)	1.941	99% gamma percentile (KM)	2.759				
1017												
1018	Gamma Kaplan-Meier (KM) Statistics											
1019					Approximate Chi Square Value (31.81, α)	19.92	Adjusted Chi Square Value (31.81, β)	17.97				
1020					95% Gamma Approximate KM-UCL (use when n>=50)	1.256	95% Gamma Adjusted KM-UCL (use when n<50)	1.393				
1021												
1022	Lognormal GOF Test on Detected Observations Only											
1023					Shapiro Wilk Test Statistic	0.877	Shapiro Wilk GOF Test					
1024					5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level					

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1025					Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**					
1026					5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level					
1027					Detected Data appear Lognormal at 5% Significance Level							
1028												
1029					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1030					Mean in Original Scale	0.764	Mean in Log Scale	-0.458				
1031					SD in Original Scale	0.547	SD in Log Scale	0.622				
1032					95% t UCL (assumes normality of ROS data)	1.103	95% Percentile Bootstrap UCL	1.051				
1033					95% BCA Bootstrap UCL	1.119	95% Bootstrap t UCL	1.908				
1034					95% H-UCL (Log ROS)	1.324						
1035												
1036					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1037					KM Mean (logged)	-0.387	KM Geo Mean	0.679				
1038					KM SD (logged)	0.5	95% Critical H Value (KM-Log)	2.227				
1039					KM Standard Error of Mean (logged)	0.192	95% H-UCL (KM -Log)	1.14				
1040					KM SD (logged)	0.5	95% Critical H Value (KM-Log)	2.227				
1041					KM Standard Error of Mean (logged)	0.192						
1042												
1043					**DL/2 Statistics**							
1044					**DL/2 Normal**		**DL/2 Log-Transformed**					
1045					Mean in Original Scale	0.687	Mean in Log Scale	-0.636				
1046					SD in Original Scale	0.59	SD in Log Scale	0.713				
1047					95% t UCL (Assumes normality)	1.052	95% H-Stat UCL	1.328				
1048					DL/2 is not a recommended method, provided for comparisons and historical reasons							
1049												
1050					**Nonparametric Distribution Free UCL Statistics**							
1051					Detected Data appear Normal Distributed at 5% Significance Level							
1052												
1053					**Suggested UCL to Use**							
1054					95% KM (t) UCL	1.14						
1055												
1056					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1057					Recommendations are based upon data size, data distribution, and skewness.							
1058					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1059					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1060												
1061												
1062	**Manganese**											
1063												
1064					**General Statistics**							
1065					Total Number of Observations	9	Number of Distinct Observations	9				
1066							Number of Missing Observations	0				
1067					Minimum	2.2	Mean	52.4				
1068					Maximum	208	Median	34.1				
1069					SD	66.73	Std. Error of Mean	22.24				
1070					Coefficient of Variation	1.274	Skewness	1.922				
1071												
1072					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
1073					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
1074					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
1075					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
1076												
1077					**Normal GOF Test**							
1078					Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**					
1079					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
1080					Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**					
1081					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
1082					Data Not Normal at 5% Significance Level							
1083												
1084					**Assuming Normal Distribution**							
1085					**95% Normal UCL**		**95% UCLs (Adjusted for Skewness)**					
1086					95% Student's-t UCL	93.77	95% Adjusted-CLT UCL (Chen-1995)	104.2				
1087							95% Modified-t UCL (Johnson-1978)	96.14				
1088												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1089						Gamma GOF Test						
1090					A-D Test Statistic	0.225	Anderson-Darling Gamma GOF Test					
1091					5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level					
1092					K-S Test Statistic	0.169	Kolmogorov-Smirnov Gamma GOF Test					
1093					5% K-S Critical Value	0.29	Detected data appear Gamma Distributed at 5% Significance Level					
1094					Detected data appear Gamma Distributed at 5% Significance Level							
1095												
1096						Gamma Statistics						
1097					k hat (MLE)	0.725	k star (bias corrected MLE)	0.557				
1098					Theta hat (MLE)	72.29	Theta star (bias corrected MLE)	94.02				
1099					nu hat (MLE)	13.05	nu star (bias corrected)	10.03				
1100					MLE Mean (bias corrected)	52.4	MLE Sd (bias corrected)	70.19				
1101							Approximate Chi Square Value (0.05)	3.962				
1102					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	3.198				
1103												
1104						Assuming Gamma Distribution						
1105					95% Approximate Gamma UCL (use when n>=50)	132.7	95% Adjusted Gamma UCL (use when n<50)	164.4				
1106												
1107						Lognormal GOF Test						
1108					Shapiro Wilk Test Statistic	0.956	Shapiro Wilk Lognormal GOF Test					
1109					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1110					Lilliefors Test Statistic	0.159	Lilliefors Lognormal GOF Test					
1111					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1112					Data appear Lognormal at 5% Significance Level							
1113												
1114						Lognormal Statistics						
1115					Minimum of Logged Data	0.788	Mean of logged Data	3.129				
1116					Maximum of Logged Data	5.338	SD of logged Data	1.531				
1117												
1118						Assuming Lognormal Distribution						
1119					95% H-UCL	851.2	90% Chebyshev (MVUE) UCL	152.8				
1120					95% Chebyshev (MVUE) UCL	195.2	97.5% Chebyshev (MVUE) UCL	254				
1121					99% Chebyshev (MVUE) UCL	369.5						
1122												
1123						Nonparametric Distribution Free UCL Statistics						
1124					Data appear to follow a Discernible Distribution at 5% Significance Level							
1125												
1126						Nonparametric Distribution Free UCLs						
1127					95% CLT UCL	88.99	95% Jackknife UCL	93.77				
1128					95% Standard Bootstrap UCL	86.46	95% Bootstrap-t UCL	164.3				
1129					95% Hall's Bootstrap UCL	283.7	95% Percentile Bootstrap UCL	88.99				
1130					95% BCA Bootstrap UCL	104.3						
1131					90% Chebyshev(Mean, Sd) UCL	119.1	95% Chebyshev(Mean, Sd) UCL	149.4				
1132					97.5% Chebyshev(Mean, Sd) UCL	191.3	99% Chebyshev(Mean, Sd) UCL	273.7				
1133												
1134						Suggested UCL to Use						
1135					95% Adjusted Gamma UCL	164.4						
1136												
1137					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1138					Recommendations are based upon data size, data distribution, and skewness.							
1139					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1140					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1141												
1142												
1143	Mercury											
1144												
1145						General Statistics						
1146					Total Number of Observations	58	Number of Distinct Observations	57				
1147							Number of Missing Observations	0				
1148					Minimum	5.9	Mean	383.1				
1149					Maximum	2530	Median	147				
1150					SD	576.8	Std. Error of Mean	75.74				
1151					Coefficient of Variation	1.506	Skewness	2.537				
1152												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1153	**Normal GOF Test**											
1154	Shapiro Wilk Test Statistic					0.615	**Shapiro Wilk GOF Test**					
1155	5% Shapiro Wilk P Value					0	Data Not Normal at 5% Significance Level					
1156	Lilliefors Test Statistic					0.275	**Lilliefors GOF Test**					
1157	5% Lilliefors Critical Value					0.116	Data Not Normal at 5% Significance Level					
1158	Data Not Normal at 5% Significance Level											
1159												
1160	**Assuming Normal Distribution**											
1161	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1162	95% Student's-t UCL					509.7	95% Adjusted-CLT UCL (Chen-1995)					534.6
1163							95% Modified-t UCL (Johnson-1978)					513.9
1164												
1165	**Gamma GOF Test**											
1166	A-D Test Statistic					1.884	**Anderson-Darling Gamma GOF Test**					
1167	5% A-D Critical Value					0.792	Data Not Gamma Distributed at 5% Significance Level					
1168	K-S Test Statistic					0.155	**Kolmogorov-Smirnov Gamma GOF Test**					
1169	5% K-S Critical Value					0.121	Data Not Gamma Distributed at 5% Significance Level					
1170	Data Not Gamma Distributed at 5% Significance Level											
1171												
1172	**Gamma Statistics**											
1173	k hat (MLE)					0.755	k star (bias corrected MLE)					0.728
1174	Theta hat (MLE)					507.2	Theta star (bias corrected MLE)					526.4
1175	nu hat (MLE)					87.61	nu star (bias corrected)					84.41
1176	MLE Mean (bias corrected)					383.1	MLE Sd (bias corrected)					449.1
1177							Approximate Chi Square Value (0.05)					64.24
1178	Adjusted Level of Significance					0.0459	Adjusted Chi Square Value					63.79
1179												
1180	**Assuming Gamma Distribution**											
1181	95% Approximate Gamma UCL (use when n>=50))					503.4	95% Adjusted Gamma UCL (use when n<50)					506.9
1182												
1183	**Lognormal GOF Test**											
1184	Shapiro Wilk Test Statistic					0.979	**Shapiro Wilk Lognormal GOF Test**					
1185	5% Shapiro Wilk P Value					0.664	Data appear Lognormal at 5% Significance Level					
1186	Lilliefors Test Statistic					0.0842	**Lilliefors Lognormal GOF Test**					
1187	5% Lilliefors Critical Value					0.116	Data appear Lognormal at 5% Significance Level					
1188	Data appear Lognormal at 5% Significance Level											
1189												
1190	**Lognormal Statistics**											
1191	Minimum of Logged Data					1.775	Mean of logged Data					5.156
1192	Maximum of Logged Data					7.836	SD of logged Data					1.273
1193												
1194	**Assuming Lognormal Distribution**											
1195	95% H-UCL					629.1	90% Chebyshev (MVUE) UCL					623.6
1196	95% Chebyshev (MVUE) UCL					733.5	97.5% Chebyshev (MVUE) UCL					886
1197	99% Chebyshev (MVUE) UCL					1186						
1198												
1199	**Nonparametric Distribution Free UCL Statistics**											
1200	Data appear to follow a Discernible Distribution at 5% Significance Level											
1201												
1202	**Nonparametric Distribution Free UCLs**											
1203	95% CLT UCL					507.7	95% Jackknife UCL					509.7
1204	95% Standard Bootstrap UCL					506.4	95% Bootstrap-t UCL					552.7
1205	95% Hall's Bootstrap UCL					526	95% Percentile Bootstrap UCL					513.6
1206	95% BCA Bootstrap UCL					538.9						
1207	90% Chebyshev(Mean, Sd) UCL					610.3	95% Chebyshev(Mean, Sd) UCL					713.2
1208	97.5% Chebyshev(Mean, Sd) UCL					856.1	99% Chebyshev(Mean, Sd) UCL					1137
1209												
1210	**Suggested UCL to Use**											
1211	95% H-UCL					629.1						
1212												
1213	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1214	Recommendations are based upon data size, data distribution, and skewness.											
1215	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1216	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1217												
1218	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.											
1219	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.											
1220	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.											
1221	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.											
1222												
1223	**Methyl Mercury**											
1224												
1225	**General Statistics**											
1226	Total Number of Observations					9		Number of Distinct Observations				8
1227	Number of Detects					7		Number of Non-Detects				2
1228	Number of Distinct Detects					7		Number of Distinct Non-Detects				1
1229	Minimum Detect					0.0025		Minimum Non-Detect				6.0500E-4
1230	Maximum Detect					0.00763		Maximum Non-Detect				6.0500E-4
1231	Variance Detects					3.2863E-6		Percent Non-Detects				22.22%
1232	Mean Detects					0.00536		SD Detects				0.00181
1233	Median Detects					0.00507		CV Detects				0.338
1234	Skewness Detects					-0.214		Kurtosis Detects				-0.645
1235	Mean of Logged Detects					-5.286		SD of Logged Detects				0.383
1236												
1237	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1238	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1239	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1240	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1241												
1242	**Normal GOF Test on Detects Only**											
1243	Shapiro Wilk Test Statistic					0.953		**Shapiro Wilk GOF Test**				
1244	5% Shapiro Wilk Critical Value					0.803		Detected Data appear Normal at 5% Significance Level				
1245	Lilliefors Test Statistic					0.148		**Lilliefors GOF Test**				
1246	5% Lilliefors Critical Value					0.304		Detected Data appear Normal at 5% Significance Level				
1247	Detected Data appear Normal at 5% Significance Level											
1248												
1249	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1250	KM Mean					0.0043		KM Standard Error of Mean				8.8915E-4
1251	KM SD					0.00247		95% KM (BCA) UCL				0.00551
1252	95% KM (t) UCL					0.00596		95% KM (Percentile Bootstrap) UCL				0.00559
1253	95% KM (z) UCL					0.00577		95% KM Bootstrap t UCL				0.00565
1254	90% KM Chebyshev UCL					0.00697		95% KM Chebyshev UCL				0.00818
1255	97.5% KM Chebyshev UCL					0.00986		99% KM Chebyshev UCL				0.0132
1256												
1257	**Gamma GOF Tests on Detected Observations Only**											
1258	A-D Test Statistic					0.281		**Anderson-Darling GOF Test**				
1259	5% A-D Critical Value					0.709		Detected data appear Gamma Distributed at 5% Significance Level				
1260	K-S Test Statistic					0.172		**Kolmogorov-Smirnov GOF**				
1261	5% K-S Critical Value					0.312		Detected data appear Gamma Distributed at 5% Significance Level				
1262	Detected data appear Gamma Distributed at 5% Significance Level											
1263												
1264	**Gamma Statistics on Detected Data Only**											
1265	k hat (MLE)					8.887		k star (bias corrected MLE)				5.173
1266	Theta hat (MLE)					6.0316E-4		Theta star (bias corrected MLE)				0.00104
1267	nu hat (MLE)					124.4		nu star (bias corrected)				72.43
1268	Mean (detects)					0.00536						
1269												
1270	**Gamma ROS Statistics using Imputed Non-Detects**											
1271	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1272	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1273	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1274	This is especially true when the sample size is small.											
1275	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1276	Minimum					0.0025		Mean				0.00639
1277	Maximum					0.01		Median				0.00619
1278	SD					0.00258		CV				0.404
1279	k hat (MLE)					6.264		k star (bias corrected MLE)				4.25
1280	Theta hat (MLE)					0.00102		Theta star (bias corrected MLE)				0.0015

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1281					nu hat (MLE)	112.7				nu star (bias corrected)		76.5
1282					Adjusted Level of Significance (β)	0.0231						
1283					Approximate Chi Square Value (76.50, α)	57.35				Adjusted Chi Square Value (76.50, β)		53.87
1284					95% Gamma Approximate UCL (use when n>=50)	0.00852				95% Gamma Adjusted UCL (use when n<50)		0.00908
1285												
1286					**Estimates of Gamma Parameters using KM Estimates**							
1287					Mean (KM)	0.0043				SD (KM)		0.00247
1288					Variance (KM)	6.0988E-6				SE of Mean (KM)		8.8915E-4
1289					k hat (KM)	3.036				k star (KM)		2.098
1290					nu hat (KM)	54.66				nu star (KM)		37.77
1291					theta hat (KM)	0.00142				theta star (KM)		0.00205
1292					80% gamma percentile (KM)	0.00641				90% gamma percentile (KM)		0.00828
1293					95% gamma percentile (KM)	0.0101				99% gamma percentile (KM)		0.014
1294												
1295					**Gamma Kaplan-Meier (KM) Statistics**							
1296					Approximate Chi Square Value (37.77, α)	24.7				Adjusted Chi Square Value (37.77, β)		22.49
1297					95% Gamma Approximate KM-UCL (use when n>=50)	0.00658				95% Gamma Adjusted KM-UCL (use when n<50)		0.00723
1298												
1299					**Lognormal GOF Test on Detected Observations Only**							
1300					Shapiro Wilk Test Statistic	0.917				**Shapiro Wilk GOF Test**		
1301					5% Shapiro Wilk Critical Value	0.803				Detected Data appear Lognormal at 5% Significance Level		
1302					Lilliefors Test Statistic	0.206				**Lilliefors GOF Test**		
1303					5% Lilliefors Critical Value	0.304				Detected Data appear Lognormal at 5% Significance Level		
1304					Detected Data appear Lognormal at 5% Significance Level							
1305												
1306					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1307					Mean in Original Scale	0.00462				Mean in Log Scale		-5.489
1308					SD in Original Scale	0.00215				SD in Log Scale		0.524
1309					95% t UCL (assumes normality of ROS data)	0.00596				95% Percentile Bootstrap UCL		0.00575
1310					95% BCA Bootstrap UCL	0.0058				95% Bootstrap t UCL		0.00589
1311					95% H-UCL (Log ROS)	0.00722						
1312												
1313					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1314					KM Mean (logged)	-5.758				KM Geo Mean		0.00316
1315					KM SD (logged)	0.937				95% Critical H Value (KM-Log)		3.1
1316					KM Standard Error of Mean (logged)	0.337				95% H-UCL (KM -Log)		0.0137
1317					KM SD (logged)	0.937				95% Critical H Value (KM-Log)		3.1
1318					KM Standard Error of Mean (logged)	0.337						
1319												
1320					**DL/2 Statistics**							
1321					**DL/2 Normal**					**DL/2 Log-Transformed**		
1322					Mean in Original Scale	0.00424				Mean in Log Scale		-5.912
1323					SD in Original Scale	0.00273				SD in Log Scale		1.286
1324					95% t UCL (Assumes normality)	0.00593				95% H-Stat UCL		0.0365
1325					DL/2 is not a recommended method, provided for comparisons and historical reasons							
1326												
1327					**Nonparametric Distribution Free UCL Statistics**							
1328					Detected Data appear Normal Distributed at 5% Significance Level							
1329												
1330					**Suggested UCL to Use**							
1331					95% KM (t) UCL	0.00596						
1332												
1333					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1334					Recommendations are based upon data size, data distribution, and skewness.							
1335					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1336					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1337												
1338	**Molybdenum**											
1339												
1340					**General Statistics**							
1341					Total Number of Observations	9				Number of Distinct Observations		4
1342					Number of Detects	0				Number of Non-Detects		9
1343					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
1344												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1345	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!											
1346	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!											
1347	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).											
1348												
1349	The data set for variable Molybdenum was not processed!											
1350												
1351												
1352												
1353	**Nickel**											
1354												
1355	**General Statistics**											
1356					Total Number of Observations	9				Number of Distinct Observations	9	
1357										Number of Missing Observations	0	
1358					Minimum	0.24				Mean	8.37	
1359					Maximum	26.6				Median	5.7	
1360					SD	8.756				Std. Error of Mean	2.919	
1361					Coefficient of Variation	1.046				Skewness	1.178	
1362												
1363	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1364	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1365	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1366	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1367												
1368	**Normal GOF Test**											
1369					Shapiro Wilk Test Statistic	0.875			**Shapiro Wilk GOF Test**			
1370					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1371					Lilliefors Test Statistic	0.189			**Lilliefors GOF Test**			
1372					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1373	Data appear Normal at 5% Significance Level											
1374												
1375	**Assuming Normal Distribution**											
1376	**95% Normal UCL**									**95% UCLs (Adjusted for Skewness)**		
1377					95% Student's-t UCL	13.8				95% Adjusted-CLT UCL (Chen-1995)	14.4	
1378										95% Modified-t UCL (Johnson-1978)	13.99	
1379												
1380	**Gamma GOF Test**											
1381					A-D Test Statistic	0.228			**Anderson-Darling Gamma GOF Test**			
1382					5% A-D Critical Value	0.753			Detected data appear Gamma Distributed at 5% Significance Level			
1383					K-S Test Statistic	0.164			**Kolmogorov-Smirnov Gamma GOF Test**			
1384					5% K-S Critical Value	0.29			Detected data appear Gamma Distributed at 5% Significance Level			
1385	Detected data appear Gamma Distributed at 5% Significance Level											
1386												
1387	**Gamma Statistics**											
1388					k hat (MLE)	0.735				k star (bias corrected MLE)	0.564	
1389					Theta hat (MLE)	11.38				Theta star (bias corrected MLE)	14.83	
1390					nu hat (MLE)	13.24				nu star (bias corrected)	10.16	
1391					MLE Mean (bias corrected)	8.37				MLE Sd (bias corrected)	11.14	
1392										Approximate Chi Square Value (0.05)	4.04	
1393					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	3.267	
1394												
1395	**Assuming Gamma Distribution**											
1396					95% Approximate Gamma UCL (use when n>=50))	21.04				95% Adjusted Gamma UCL (use when n<50)	26.02	
1397												
1398	**Lognormal GOF Test**											
1399					Shapiro Wilk Test Statistic	0.918			**Shapiro Wilk Lognormal GOF Test**			
1400					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
1401					Lilliefors Test Statistic	0.179			**Lilliefors Lognormal GOF Test**			
1402					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
1403	Data appear Lognormal at 5% Significance Level											
1404												
1405	**Lognormal Statistics**											
1406					Minimum of Logged Data	-1.427				Mean of logged Data	1.308	
1407					Maximum of Logged Data	3.281				SD of logged Data	1.65	
1408												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1409	**Assuming Lognormal Distribution**											
1410					95% H-UCL	240.2				90% Chebyshev (MVUE) UCL		29.74
1411					95% Chebyshev (MVUE) UCL	38.2				97.5% Chebyshev (MVUE) UCL		49.95
1412					99% Chebyshev (MVUE) UCL	73.03						
1413												
1414	**Nonparametric Distribution Free UCL Statistics**											
1415	Data appear to follow a Discernible Distribution at 5% Significance Level											
1416												
1417	**Nonparametric Distribution Free UCLs**											
1418					95% CLT UCL	13.17				95% Jackknife UCL		13.8
1419					95% Standard Bootstrap UCL	12.78				95% Bootstrap-t UCL		16.21
1420					95% Hall's Bootstrap UCL	15.11				95% Percentile Bootstrap UCL		13.14
1421					95% BCA Bootstrap UCL	13.86						
1422					90% Chebyshev(Mean, Sd) UCL	17.13				95% Chebyshev(Mean, Sd) UCL		21.09
1423					97.5% Chebyshev(Mean, Sd) UCL	26.6				99% Chebyshev(Mean, Sd) UCL		37.41
1424												
1425	**Suggested UCL to Use**											
1426					95% Student's-t UCL	13.8						
1427												
1428	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1429	Recommendations are based upon data size, data distribution, and skewness.											
1430	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1431	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1432												
1433												
1434	**Selenium**											
1435												
1436	**General Statistics**											
1437					Total Number of Observations	9				Number of Distinct Observations		7
1438					Number of Detects	3				Number of Non-Detects		6
1439					Number of Distinct Detects	3				Number of Distinct Non-Detects		4
1440					Minimum Detect	0.22				Minimum Non-Detect		0.95
1441					Maximum Detect	0.29				Maximum Non-Detect		1.15
1442					Variance Detects	0.00123				Percent Non-Detects		66.67%
1443					Mean Detects	0.253				SD Detects		0.0351
1444					Median Detects	0.25				CV Detects		0.139
1445					Skewness Detects	0.423				Kurtosis Detects		N/A
1446					Mean of Logged Detects	-1.379				SD of Logged Detects		0.138
1447												
1448	Warning: Data set has only 3 Detected Values.											
1449	This is not enough to compute meaningful or reliable statistics and estimates.											
1450												
1451												
1452	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1453	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1454	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1455	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1456												
1457	**Normal GOF Test on Detects Only**											
1458					Shapiro Wilk Test Statistic	0.993			**Shapiro Wilk GOF Test**			
1459					5% Shapiro Wilk Critical Value	0.767			Detected Data appear Normal at 5% Significance Level			
1460					Lilliefors Test Statistic	0.204			**Lilliefors GOF Test**			
1461					5% Lilliefors Critical Value	0.425			Detected Data appear Normal at 5% Significance Level			
1462	Detected Data appear Normal at 5% Significance Level											
1463												
1464	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1465					KM Mean	0.253				KM Standard Error of Mean		0.0203
1466					KM SD	0.0287				95% KM (BCA) UCL		N/A
1467					95% KM (t) UCL	0.291				95% KM (Percentile Bootstrap) UCL		N/A
1468					95% KM (z) UCL	0.287				95% KM Bootstrap t UCL		N/A
1469					90% KM Chebyshev UCL	0.314				95% KM Chebyshev UCL		0.342
1470					97.5% KM Chebyshev UCL	0.38				99% KM Chebyshev UCL		0.455
1471												
1472	**Gamma GOF Tests on Detected Observations Only**											

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1473	Not Enough Data to Perform GOF Test											
1474												
1475	Gamma Statistics on Detected Data Only											
1476						k hat (MLE)	78.5			k star (bias corrected MLE)	N/A	
1477						Theta hat (MLE)	0.00323			Theta star (bias corrected MLE)	N/A	
1478						nu hat (MLE)	471			nu star (bias corrected)	N/A	
1479						Mean (detects)	0.253					
1480												
1481	Gamma ROS Statistics using Imputed Non-Detects											
1482	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
1483	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
1484	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
1485	This is especially true when the sample size is small.											
1486	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
1487						Minimum	0.22			Mean	0.253	
1488						Maximum	0.29			Median	0.253	
1489						SD	0.0236			CV	0.0934	
1490						k hat (MLE)	129.3			k star (bias corrected MLE)	86.3	
1491						Theta hat (MLE)	0.00196			Theta star (bias corrected MLE)	0.00293	
1492						nu hat (MLE)	2328			nu star (bias corrected)	1553	
1493						Adjusted Level of Significance (β)	0.0231					
1494						Approximate Chi Square Value (N/A, α)	1463			Adjusted Chi Square Value (N/A, β)	1444	
1495						95% Gamma Approximate UCL (use when n>=50)	0.269			95% Gamma Adjusted UCL (use when n<50)	N/A	
1496												
1497	Estimates of Gamma Parameters using KM Estimates											
1498						Mean (KM)	0.253			SD (KM)	0.0287	
1499						Variance (KM)	8.2222E-4			SE of Mean (KM)	0.0203	
1500						k hat (KM)	78.05			k star (KM)	52.11	
1501						nu hat (KM)	1405			nu star (KM)	938	
1502						theta hat (KM)	0.00325			theta star (KM)	0.00486	
1503						80% gamma percentile (KM)	0.282			90% gamma percentile (KM)	0.299	
1504						95% gamma percentile (KM)	0.314			99% gamma percentile (KM)	0.342	
1505												
1506	Gamma Kaplan-Meier (KM) Statistics											
1507						Approximate Chi Square Value (937.98, α)	867.9			Adjusted Chi Square Value (937.98, β)	853.6	
1508						95% Gamma Approximate KM-UCL (use when n>=50)	0.274			95% Gamma Adjusted KM-UCL (use when n<50)	0.278	
1509												
1510	Lognormal GOF Test on Detected Observations Only											
1511						Shapiro Wilk Test Statistic	0.998			Shapiro Wilk GOF Test		
1512						5% Shapiro Wilk Critical Value	0.767			Detected Data appear Lognormal at 5% Significance Level		
1513						Lilliefors Test Statistic	0.186			Lilliefors GOF Test		
1514						5% Lilliefors Critical Value	0.425			Detected Data appear Lognormal at 5% Significance Level		
1515	Detected Data appear Lognormal at 5% Significance Level											
1516												
1517	Lognormal ROS Statistics Using Imputed Non-Detects											
1518						Mean in Original Scale	0.253			Mean in Log Scale	-1.379	
1519						SD in Original Scale	0.0236			SD in Log Scale	0.0931	
1520						95% t UCL (assumes normality of ROS data)	0.267			95% Percentile Bootstrap UCL	0.265	
1521						95% BCA Bootstrap UCL	0.265			95% Bootstrap t UCL	0.269	
1522						95% H-UCL (Log ROS)	N/A					
1523												
1524	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution											
1525						KM Mean (logged)	-1.379			KM Geo Mean	0.252	
1526						KM SD (logged)	0.113			95% Critical H Value (KM-Log)	1.832	
1527						KM Standard Error of Mean (logged)	0.0798			95% H-UCL (KM -Log)	0.273	
1528						KM SD (logged)	0.113			95% Critical H Value (KM-Log)	1.832	
1529						KM Standard Error of Mean (logged)	0.0798					
1530												
1531	DL/2 Statistics											
1532	DL/2 Normal									DL/2 Log-Transformed		
1533						Mean in Original Scale	0.446			Mean in Log Scale	-0.87	
1534						SD in Original Scale	0.148			SD in Log Scale	0.392	
1535						95% t UCL (Assumes normality)	0.537			95% H-Stat UCL	0.608	
1536	DL/2 is not a recommended method, provided for comparisons and historical reasons											

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1537												
1538	**Nonparametric Distribution Free UCL Statistics**											
1539	**Detected Data appear Normal Distributed at 5% Significance Level**											
1540												
1541	**Suggested UCL to Use**											
1542	95% KM (t) UCL	0.291										
1543	**Warning: Recommended UCL exceeds the maximum observation**											
1544												
1545	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1546	Recommendations are based upon data size, data distribution, and skewness.											
1547	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1548	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1549												
1550												
1551	**Silver**											
1552												
1553	**General Statistics**											
1554	Total Number of Observations	9					Number of Distinct Observations	7				
1555							Number of Missing Observations	0				
1556	Minimum	0.055					Mean	0.0736				
1557	Maximum	0.089					Median	0.076				
1558	SD	0.00946					Std. Error of Mean	0.00315				
1559	Coefficient of Variation	0.129					Skewness	-0.466				
1560												
1561	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
1562	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
1563	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
1564	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
1565												
1566	**Normal GOF Test**											
1567	Shapiro Wilk Test Statistic	0.948					**Shapiro Wilk GOF Test**					
1568	5% Shapiro Wilk Critical Value	0.829					Data appear Normal at 5% Significance Level					
1569	Lilliefors Test Statistic	0.204					**Lilliefors GOF Test**					
1570	5% Lilliefors Critical Value	0.274					Data appear Normal at 5% Significance Level					
1571	**Data appear Normal at 5% Significance Level**											
1572												
1573	**Assuming Normal Distribution**											
1574	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
1575	95% Student's-t UCL	0.0794					95% Adjusted-CLT UCL (Chen-1995)	0.0782				
1576							95% Modified-t UCL (Johnson-1978)	0.0793				
1577												
1578	**Gamma GOF Test**											
1579	A-D Test Statistic	0.373					**Anderson-Darling Gamma GOF Test**					
1580	5% A-D Critical Value	0.72					Detected data appear Gamma Distributed at 5% Significance Level					
1581	K-S Test Statistic	0.209					**Kolmogorov-Smirnov Gamma GOF Test**					
1582	5% K-S Critical Value	0.279					Detected data appear Gamma Distributed at 5% Significance Level					
1583	**Detected data appear Gamma Distributed at 5% Significance Level**											
1584												
1585	**Gamma Statistics**											
1586	k hat (MLE)	64.48					k star (bias corrected MLE)	43.06				
1587	Theta hat (MLE)	0.00114					Theta star (bias corrected MLE)	0.00171				
1588	nu hat (MLE)	1161					nu star (bias corrected)	775.1				
1589	MLE Mean (bias corrected)	0.0736					MLE Sd (bias corrected)	0.0112				
1590							Approximate Chi Square Value (0.05)	711.5				
1591	Adjusted Level of Significance	0.0231					Adjusted Chi Square Value	698.6				
1592												
1593	**Assuming Gamma Distribution**											
1594	95% Approximate Gamma UCL (use when n>=50))	0.0801					95% Adjusted Gamma UCL (use when n<50)	0.0816				
1595												
1596	**Lognormal GOF Test**											
1597	Shapiro Wilk Test Statistic	0.922					**Shapiro Wilk Lognormal GOF Test**					
1598	5% Shapiro Wilk Critical Value	0.829					Data appear Lognormal at 5% Significance Level					
1599	Lilliefors Test Statistic	0.227					**Lilliefors Lognormal GOF Test**					
1600	5% Lilliefors Critical Value	0.274					Data appear Lognormal at 5% Significance Level					

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1601	Data appear Lognormal at 5% Significance Level											
1602												
1603	Lognormal Statistics											
1604					Minimum of Logged Data	-2.9				Mean of logged Data		-2.617
1605					Maximum of Logged Data	-2.419				SD of logged Data		0.134
1606												
1607	Assuming Lognormal Distribution											
1608					95% H-UCL	0.0804				90% Chebyshev (MVUE) UCL		0.0835
1609					95% Chebyshev (MVUE) UCL	0.088				97.5% Chebyshev (MVUE) UCL		0.0942
1610					99% Chebyshev (MVUE) UCL	0.106						
1611												
1612	Nonparametric Distribution Free UCL Statistics											
1613	Data appear to follow a Discernible Distribution at 5% Significance Level											
1614												
1615	Nonparametric Distribution Free UCLs											
1616					95% CLT UCL	0.0787				95% Jackknife UCL		0.0794
1617					95% Standard Bootstrap UCL	0.0784				95% Bootstrap-t UCL		0.0787
1618					95% Hall's Bootstrap UCL	0.0789				95% Percentile Bootstrap UCL		0.0781
1619					95% BCA Bootstrap UCL	0.0779						
1620					90% Chebyshev(Mean, Sd) UCL	0.083				95% Chebyshev(Mean, Sd) UCL		0.0873
1621					97.5% Chebyshev(Mean, Sd) UCL	0.0933				99% Chebyshev(Mean, Sd) UCL		0.105
1622												
1623	Suggested UCL to Use											
1624					95% Student's-t UCL	0.0794						
1625												
1626	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1627	Recommendations are based upon data size, data distribution, and skewness.											
1628	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1629	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1630												
1631	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be											
1632	reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.											
1633												
1634												
1635	Thallium											
1636												
1637	General Statistics											
1638					Total Number of Observations	9				Number of Distinct Observations		7
1639					Number of Detects	2				Number of Non-Detects		7
1640					Number of Distinct Detects	2				Number of Distinct Non-Detects		5
1641					Minimum Detect	0.94				Minimum Non-Detect		0.195
1642					Maximum Detect	1.6				Maximum Non-Detect		0.225
1643					Variance Detects	0.218				Percent Non-Detects		77.78%
1644					Mean Detects	1.27				SD Detects		0.467
1645					Median Detects	1.27				CV Detects		0.367
1646					Skewness Detects	N/A				Kurtosis Detects		N/A
1647					Mean of Logged Detects	0.204				SD of Logged Detects		0.376
1648												
1649	Warning: Data set has only 2 Detected Values.											
1650	This is not enough to compute meaningful or reliable statistics and estimates.											
1651												
1652												
1653	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1654	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1655	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1656	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1657												
1658	Normal GOF Test on Detects Only											
1659	Not Enough Data to Perform GOF Test											
1660												
1661	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
1662					KM Mean	0.434				KM Standard Error of Mean		0.223
1663					KM SD	0.473				95% KM (BCA) UCL		N/A
1664					95% KM (t) UCL	0.849				95% KM (Percentile Bootstrap) UCL		N/A

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1665					95% KM (z) UCL	0.801				95% KM Bootstrap t UCL		N/A
1666					90% KM Chebyshev UCL	1.103				95% KM Chebyshev UCL		1.406
1667					97.5% KM Chebyshev UCL	1.827				99% KM Chebyshev UCL		2.653
1668												
1669					**Gamma GOF Tests on Detected Observations Only**							
1670					Not Enough Data to Perform GOF Test							
1671												
1672					**Gamma Statistics on Detected Data Only**							
1673					k hat (MLE)	14.47				k star (bias corrected MLE)		N/A
1674					Theta hat (MLE)	0.0878				Theta star (bias corrected MLE)		N/A
1675					nu hat (MLE)	57.88				nu star (bias corrected)		N/A
1676					Mean (detects)	1.27						
1677												
1678					**Estimates of Gamma Parameters using KM Estimates**							
1679					Mean (KM)	0.434				SD (KM)		0.473
1680					Variance (KM)	0.224				SE of Mean (KM)		0.223
1681					k hat (KM)	0.841				k star (KM)		0.635
1682					nu hat (KM)	15.13				nu star (KM)		11.42
1683					theta hat (KM)	0.516				theta star (KM)		0.684
1684					80% gamma percentile (KM)	0.715				90% gamma percentile (KM)		1.114
1685					95% gamma percentile (KM)	1.53				99% gamma percentile (KM)		2.531
1686												
1687					**Gamma Kaplan-Meier (KM) Statistics**							
1688										Adjusted Level of Significance (β)		0.0231
1689					Approximate Chi Square Value (11.42, α)	4.848				Adjusted Chi Square Value (11.42, β)		3.985
1690					95% Gamma Approximate KM-UCL (use when n>=50)	1.022				95% Gamma Adjusted KM-UCL (use when n<50)		1.244
1691												
1692					**Lognormal GOF Test on Detected Observations Only**							
1693					Not Enough Data to Perform GOF Test							
1694												
1695					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1696					Mean in Original Scale	0.414				Mean in Log Scale		-1.379
1697					SD in Original Scale	0.515				SD in Log Scale		0.964
1698					95% t UCL (assumes normality of ROS data)	0.734				95% Percentile Bootstrap UCL		0.677
1699					95% BCA Bootstrap UCL	0.81				95% Bootstrap t UCL		2.632
1700					95% H-UCL (Log ROS)	1.175						
1701												
1702					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1703					KM Mean (logged)	-1.226				KM Geo Mean		0.293
1704					KM SD (logged)	0.775				95% Critical H Value (KM-Log)		2.762
1705					KM Standard Error of Mean (logged)	0.365				95% H-UCL (KM -Log)		0.844
1706					KM SD (logged)	0.775				95% Critical H Value (KM-Log)		2.762
1707					KM Standard Error of Mean (logged)	0.365						
1708												
1709					**DL/2 Statistics**							
1710					**DL/2 Normal**					**DL/2 Log-Transformed**		
1711					Mean in Original Scale	0.364				Mean in Log Scale		-1.706
1712					SD in Original Scale	0.539				SD in Log Scale		1.092
1713					95% t UCL (Assumes normality)	0.699				95% H-Stat UCL		1.248
1714					DL/2 is not a recommended method, provided for comparisons and historical reasons							
1715												
1716					**Nonparametric Distribution Free UCL Statistics**							
1717					Data do not follow a Discernible Distribution at 5% Significance Level							
1718												
1719					**Suggested UCL to Use**							
1720					95% KM (t) UCL	0.849				KM H-UCL		0.844
1721					95% KM (BCA) UCL	N/A						
1722					Warning: One or more Recommended UCL(s) not available!							
1723												
1724					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1725					Recommendations are based upon data size, data distribution, and skewness.							
1726					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1727					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1728												

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1729												
1730	**Vanadium**											
1731												
1732						**General Statistics**						
1733					Total Number of Observations	9			Number of Distinct Observations	9		
1734									Number of Missing Observations	0		
1735					Minimum	10.5			Mean	21.82		
1736					Maximum	34.8			Median	21.5		
1737					SD	8.107			Std. Error of Mean	2.702		
1738					Coefficient of Variation	0.371			Skewness	0.324		
1739												
1740					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
1741					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
1742					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
1743					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
1744												
1745						**Normal GOF Test**						
1746					Shapiro Wilk Test Statistic	0.961		**Shapiro Wilk GOF Test**				
1747					5% Shapiro Wilk Critical Value	0.829		Data appear Normal at 5% Significance Level				
1748					Lilliefors Test Statistic	0.168		**Lilliefors GOF Test**				
1749					5% Lilliefors Critical Value	0.274		Data appear Normal at 5% Significance Level				
1750					Data appear Normal at 5% Significance Level							
1751												
1752						**Assuming Normal Distribution**						
1753					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
1754					95% Student's-t UCL	26.85			95% Adjusted-CLT UCL (Chen-1995)	26.58		
1755									95% Modified-t UCL (Johnson-1978)	26.9		
1756												
1757						**Gamma GOF Test**						
1758					A-D Test Statistic	0.187		**Anderson-Darling Gamma GOF Test**				
1759					5% A-D Critical Value	0.722		Detected data appear Gamma Distributed at 5% Significance Level				
1760					K-S Test Statistic	0.149		**Kolmogorov-Smirnov Gamma GOF Test**				
1761					5% K-S Critical Value	0.28		Detected data appear Gamma Distributed at 5% Significance Level				
1762					Detected data appear Gamma Distributed at 5% Significance Level							
1763												
1764						**Gamma Statistics**						
1765					k hat (MLE)	7.859			k star (bias corrected MLE)	5.313		
1766					Theta hat (MLE)	2.777			Theta star (bias corrected MLE)	4.107		
1767					nu hat (MLE)	141.5			nu star (bias corrected)	95.64		
1768					MLE Mean (bias corrected)	21.82			MLE Sd (bias corrected)	9.467		
1769									Approximate Chi Square Value (0.05)	74.08		
1770					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	70.09		
1771												
1772						**Assuming Gamma Distribution**						
1773					95% Approximate Gamma UCL (use when n>=50))	28.17			95% Adjusted Gamma UCL (use when n<50)	29.78		
1774												
1775						**Lognormal GOF Test**						
1776					Shapiro Wilk Test Statistic	0.971		**Shapiro Wilk Lognormal GOF Test**				
1777					5% Shapiro Wilk Critical Value	0.829		Data appear Lognormal at 5% Significance Level				
1778					Lilliefors Test Statistic	0.136		**Lilliefors Lognormal GOF Test**				
1779					5% Lilliefors Critical Value	0.274		Data appear Lognormal at 5% Significance Level				
1780					Data appear Lognormal at 5% Significance Level							
1781												
1782						**Lognormal Statistics**						
1783					Minimum of Logged Data	2.351			Mean of logged Data	3.018		
1784					Maximum of Logged Data	3.55			SD of logged Data	0.39		
1785												
1786						**Assuming Lognormal Distribution**						
1787					95% H-UCL	29.56			90% Chebyshev (MVUE) UCL	30.48		
1788					95% Chebyshev (MVUE) UCL	34.37			97.5% Chebyshev (MVUE) UCL	39.78		
1789					99% Chebyshev (MVUE) UCL	50.41						
1790												
1791						**Nonparametric Distribution Free UCL Statistics**						
1792					Data appear to follow a Discernible Distribution at 5% Significance Level							

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1793												
1794						Nonparametric Distribution Free UCLs						
1795					95% CLT UCL	26.27			95% Jackknife UCL	26.85		
1796					95% Standard Bootstrap UCL	26.11			95% Bootstrap-t UCL	27.49		
1797					95% Hall's Bootstrap UCL	26.51			95% Percentile Bootstrap UCL	26.09		
1798					95% BCA Bootstrap UCL	26.4						
1799					90% Chebyshev(Mean, Sd) UCL	29.93			95% Chebyshev(Mean, Sd) UCL	33.6		
1800					97.5% Chebyshev(Mean, Sd) UCL	38.7			99% Chebyshev(Mean, Sd) UCL	48.71		
1801												
1802						Suggested UCL to Use						
1803					95% Student's-t UCL	26.85						
1804												
1805						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1806						Recommendations are based upon data size, data distribution, and skewness.						
1807						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1808						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1809												
1810												
1811	Zinc											
1812												
1813						General Statistics						
1814					Total Number of Observations	9			Number of Distinct Observations	9		
1815									Number of Missing Observations	0		
1816					Minimum	2.6			Mean	8.656		
1817					Maximum	21.1			Median	7.9		
1818					SD	6.053			Std. Error of Mean	2.018		
1819					Coefficient of Variation	0.699			Skewness	1.129		
1820												
1821						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
1822						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
1823						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
1824						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						
1825												
1826						Normal GOF Test						
1827					Shapiro Wilk Test Statistic	0.897			Shapiro Wilk GOF Test			
1828					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1829					Lilliefors Test Statistic	0.172			Lilliefors GOF Test			
1830					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1831						Data appear Normal at 5% Significance Level						
1832												
1833						Assuming Normal Distribution						
1834					95% Normal UCL				95% UCLs (Adjusted for Skewness)			
1835					95% Student's-t UCL	12.41			95% Adjusted-CLT UCL (Chen-1995)	12.79		
1836									95% Modified-t UCL (Johnson-1978)	12.53		
1837												
1838						Gamma GOF Test						
1839					A-D Test Statistic	0.218			Anderson-Darling Gamma GOF Test			
1840					5% A-D Critical Value	0.728			Detected data appear Gamma Distributed at 5% Significance Level			
1841					K-S Test Statistic	0.157			Kolmogorov-Smirnov Gamma GOF Test			
1842					5% K-S Critical Value	0.282			Detected data appear Gamma Distributed at 5% Significance Level			
1843						Detected data appear Gamma Distributed at 5% Significance Level						
1844												
1845						Gamma Statistics						
1846					k hat (MLE)	2.43			k star (bias corrected MLE)	1.694		
1847					Theta hat (MLE)	3.563			Theta star (bias corrected MLE)	5.11		
1848					nu hat (MLE)	43.73			nu star (bias corrected)	30.49		
1849					MLE Mean (bias corrected)	8.656			MLE Sd (bias corrected)	6.651		
1850									Approximate Chi Square Value (0.05)	18.88		
1851					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	16.98		
1852												
1853						Assuming Gamma Distribution						
1854					95% Approximate Gamma UCL (use when n>=50))	13.98			95% Adjusted Gamma UCL (use when n<50)	15.54		
1855												
1856						Lognormal GOF Test						

Table E1-1
On-Mine Soil, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1857					Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**					
1858					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1859					Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**					
1860					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1861	Data appear Lognormal at 5% Significance Level											
1862												
1863	**Lognormal Statistics**											
1864					Minimum of Logged Data	0.956			Mean of logged Data			1.939
1865					Maximum of Logged Data	3.049			SD of logged Data			0.715
1866												
1867	**Assuming Lognormal Distribution**											
1868					95% H-UCL	17.51			90% Chebyshev (MVUE) UCL			15.03
1869					95% Chebyshev (MVUE) UCL	17.91			97.5% Chebyshev (MVUE) UCL			21.91
1870					99% Chebyshev (MVUE) UCL	29.76						
1871												
1872	**Nonparametric Distribution Free UCL Statistics**											
1873	Data appear to follow a Discernible Distribution at 5% Significance Level											
1874												
1875	**Nonparametric Distribution Free UCLs**											
1876					95% CLT UCL	11.97			95% Jackknife UCL			12.41
1877					95% Standard Bootstrap UCL	11.79			95% Bootstrap-t UCL			14.14
1878					95% Hall's Bootstrap UCL	15.72			95% Percentile Bootstrap UCL			11.87
1879					95% BCA Bootstrap UCL	12.78						
1880					90% Chebyshev(Mean, Sd) UCL	14.71			95% Chebyshev(Mean, Sd) UCL			17.45
1881					97.5% Chebyshev(Mean, Sd) UCL	21.25			99% Chebyshev(Mean, Sd) UCL			28.73
1882												
1883	**Suggested UCL to Use**											
1884					95% Student's-t UCL	12.41						
1885												
1886	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1887	Recommendations are based upon data size, data distribution, and skewness.											
1888	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1889	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1890												

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3				User Selected Options								
4				Date/Time of Computation	ProUCL 5.111/1/2019 12:22:54 PM							
5				From File	LakesSideSoil_UCLData_20191101.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Aluminum**											
12												
13	**General Statistics**											
14					Total Number of Observations	9			Number of Distinct Observations	9		
15									Number of Missing Observations	0		
16					Minimum	9570			Mean	11908		
17					Maximum	13700			Median	11900		
18					SD	1592			Std. Error of Mean	530.8		
19					Coefficient of Variation	0.134			Skewness	-0.198		
20												
21	**Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use**											
22	**guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.**											
23	**For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).**											
24	**Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1**											
25												
26	**Normal GOF Test**											
27					Shapiro Wilk Test Statistic	0.897			**Shapiro Wilk GOF Test**			
28					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
29					Lilliefors Test Statistic	0.178			**Lilliefors GOF Test**			
30					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
31	**Data appear Normal at 5% Significance Level**											
32												
33	**Assuming Normal Distribution**											
34					**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**			
35					95% Student's-t UCL	12895			95% Adjusted-CLT UCL (Chen-1995)	12744		
36									95% Modified-t UCL (Johnson-1978)	12889		
37												
38	**Gamma GOF Test**											
39					A-D Test Statistic	0.447			**Anderson-Darling Gamma GOF Test**			
40					5% A-D Critical Value	0.72			Detected data appear Gamma Distributed at 5% Significance Level			
41					K-S Test Statistic	0.196			**Kolmogorov-Smirnov Gamma GOF Test**			
42					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
43	**Detected data appear Gamma Distributed at 5% Significance Level**											
44												
45	**Gamma Statistics**											
46					k hat (MLE)	61.46			k star (bias corrected MLE)	41.05		
47					Theta hat (MLE)	193.8			Theta star (bias corrected MLE)	290.1		
48					nu hat (MLE)	1106			nu star (bias corrected)	738.8		
49					MLE Mean (bias corrected)	11908			MLE Sd (bias corrected)	1859		
50									Approximate Chi Square Value (0.05)	676.8		
51					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	664.2		
52												
53	**Assuming Gamma Distribution**											
54					95% Approximate Gamma UCL (use when n>=50))	13000			95% Adjusted Gamma UCL (use when n<50)	13246		
55												
56	**Lognormal GOF Test**											
57					Shapiro Wilk Test Statistic	0.898			**Shapiro Wilk Lognormal GOF Test**			
58					5% Shapiro Wilk Critical Value	0.829			Data appear Lognormal at 5% Significance Level			
59					Lilliefors Test Statistic	0.186			**Lilliefors Lognormal GOF Test**			
60					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
61	**Data appear Lognormal at 5% Significance Level**											
62												
63	**Lognormal Statistics**											
64					Minimum of Logged Data	9.166			Mean of logged Data	9.377		

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
65					Maximum of Logged Data	9.525				SD of logged Data		0.136
66												
67						**Assuming Lognormal Distribution**						
68					95% H-UCL	13034				90% Chebyshev (MVUE) UCL		13535
69					95% Chebyshev (MVUE) UCL	14271				97.5% Chebyshev (MVUE) UCL		15294
70					99% Chebyshev (MVUE) UCL	17301						
71												
72						**Nonparametric Distribution Free UCL Statistics**						
73						Data appear to follow a Discernible Distribution at 5% Significance Level						
74												
75						**Nonparametric Distribution Free UCLs**						
76					95% CLT UCL	12781				95% Jackknife UCL		12895
77					95% Standard Bootstrap UCL	12738				95% Bootstrap-t UCL		12801
78					95% Hall's Bootstrap UCL	12637				95% Percentile Bootstrap UCL		12733
79					95% BCA Bootstrap UCL	12678						
80					90% Chebyshev(Mean, Sd) UCL	13500				95% Chebyshev(Mean, Sd) UCL		14222
81					97.5% Chebyshev(Mean, Sd) UCL	15223				99% Chebyshev(Mean, Sd) UCL		17189
82												
83						**Suggested UCL to Use**						
84					95% Student's-t UCL	12895						
85												
86						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
87						Recommendations are based upon data size, data distribution, and skewness.						
88						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
89						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
90												
91						Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be						
92						reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.						
93												
94	**Antimony**											
95												
96						**General Statistics**						
97					Total Number of Observations	80				Number of Distinct Observations		46
98					Number of Detects	49				Number of Non-Detects		31
99					Number of Distinct Detects	40				Number of Distinct Non-Detects		7
100					Minimum Detect	0.49				Minimum Non-Detect		3
101					Maximum Detect	679				Maximum Non-Detect		3.8
102					Variance Detects	10550				Percent Non-Detects		38.75%
103					Mean Detects	26.71				SD Detects		102.7
104					Median Detects	1.9				CV Detects		3.845
105					Skewness Detects	5.828				Kurtosis Detects		35.9
106					Mean of Logged Detects	1.323				SD of Logged Detects		1.655
107												
108						**Normal GOF Test on Detects Only**						
109					Shapiro Wilk Test Statistic	0.274				**Shapiro Wilk GOF Test**		
110					5% Shapiro Wilk Critical Value	0.947				Detected Data Not Normal at 5% Significance Level		
111					Lilliefors Test Statistic	0.422				**Lilliefors GOF Test**		
112					5% Lilliefors Critical Value	0.126				Detected Data Not Normal at 5% Significance Level		
113						Detected Data Not Normal at 5% Significance Level						
114												
115						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
116					KM Mean	16.83				KM Standard Error of Mean		9.096
117					KM SD	80.53				95% KM (BCA) UCL		35.89
118					95% KM (t) UCL	31.97				95% KM (Percentile Bootstrap) UCL		33.15
119					95% KM (z) UCL	31.79				95% KM Bootstrap t UCL		131.4
120					90% KM Chebyshev UCL	44.11				95% KM Chebyshev UCL		56.48
121					97.5% KM Chebyshev UCL	73.63				99% KM Chebyshev UCL		107.3
122												
123						**Gamma GOF Tests on Detected Observations Only**						
124					A-D Test Statistic	5.515				**Anderson-Darling GOF Test**		
125					5% A-D Critical Value	0.852				Detected Data Not Gamma Distributed at 5% Significance Level		
126					K-S Test Statistic	0.219				**Kolmogorov-Smirnov GOF**		
127					5% K-S Critical Value	0.137				Detected Data Not Gamma Distributed at 5% Significance Level		
128						Detected Data Not Gamma Distributed at 5% Significance Level						

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

129												
130	**Gamma Statistics on Detected Data Only**											
131					k hat (MLE)	0.344			k star (bias corrected MLE)	0.336		
132					Theta hat (MLE)	77.69			Theta star (bias corrected MLE)	79.41		
133					nu hat (MLE)	33.69			nu star (bias corrected)	32.96		
134					Mean (detects)	26.71						
135												
136	**Gamma ROS Statistics using Imputed Non-Detects**											
137	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
138	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
139	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
140	This is especially true when the sample size is small.											
141	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
142					Minimum	0.01			Mean	16.43		
143					Maximum	679			Median	0.88		
144					SD	81.11			CV	4.937		
145					k hat (MLE)	0.199			k star (bias corrected MLE)	0.2		
146					Theta hat (MLE)	82.44			Theta star (bias corrected MLE)	82.08		
147					nu hat (MLE)	31.89			nu star (bias corrected)	32.02		
148					Adjusted Level of Significance (β)	0.047						
149					Approximate Chi Square Value (32.02, α)	20.09			Adjusted Chi Square Value (32.02, β)	19.92		
150					95% Gamma Approximate UCL (use when n>=50)	26.19			95% Gamma Adjusted UCL (use when n<50)	26.41		
151												
152	**Estimates of Gamma Parameters using KM Estimates**											
153					Mean (KM)	16.83			SD (KM)	80.53		
154					Variance (KM)	6484			SE of Mean (KM)	9.096		
155					k hat (KM)	0.0437			k star (KM)	0.0504		
156					nu hat (KM)	6.986			nu star (KM)	8.057		
157					theta hat (KM)	385.4			theta star (KM)	334.1		
158					80% gamma percentile (KM)	2.34			90% gamma percentile (KM)	25.92		
159					95% gamma percentile (KM)	89.72			99% gamma percentile (KM)	365		
160												
161	**Gamma Kaplan-Meier (KM) Statistics**											
162					Approximate Chi Square Value (8.06, α)	2.768			Adjusted Chi Square Value (8.06, β)	2.711		
163					95% Gamma Approximate KM-UCL (use when n>=50)	48.97			95% Gamma Adjusted KM-UCL (use when n<50)	50		
164												
165	**Lognormal GOF Test on Detected Observations Only**											
166					Shapiro Wilk Test Statistic	0.894			**Shapiro Wilk GOF Test**			
167					5% Shapiro Wilk Critical Value	0.947			Detected Data Not Lognormal at 5% Significance Level			
168					Lilliefors Test Statistic	0.179			**Lilliefors GOF Test**			
169					5% Lilliefors Critical Value	0.126			Detected Data Not Lognormal at 5% Significance Level			
170	Detected Data Not Lognormal at 5% Significance Level											
171												
172	**Lognormal ROS Statistics Using Imputed Non-Detects**											
173					Mean in Original Scale	17.03			Mean in Log Scale	0.904		
174					SD in Original Scale	81			SD in Log Scale	1.496		
175					95% t UCL (assumes normality of ROS data)	32.11			95% Percentile Bootstrap UCL	34.3		
176					95% BCA Bootstrap UCL	47.75			95% Bootstrap t UCL	125.8		
177					95% H-UCL (Log ROS)	12.15						
178												
179	**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**											
180					KM Mean (logged)	0.846			KM Geo Mean	2.331		
181					KM SD (logged)	1.441			95% Critical H Value (KM-Log)	2.747		
182					KM Standard Error of Mean (logged)	0.169			95% H-UCL (KM -Log)	10.28		
183					KM SD (logged)	1.441			95% Critical H Value (KM-Log)	2.747		
184					KM Standard Error of Mean (logged)	0.169						
185												
186	**DL/2 Statistics**											
187	**DL/2 Normal**								**DL/2 Log-Transformed**			
188					Mean in Original Scale	16.96			Mean in Log Scale	0.981		
189					SD in Original Scale	81.01			SD in Log Scale	1.361		
190					95% t UCL (Assumes normality)	32.04			95% H-Stat UCL	10.12		
191	DL/2 is not a recommended method, provided for comparisons and historical reasons											
192												

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
193	Nonparametric Distribution Free UCL Statistics											
194	Data do not follow a Discernible Distribution at 5% Significance Level											
195												
196	Suggested UCL to Use											
197					95% KM (Chebyshev) UCL	56.48						
198												
199	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
200	Recommendations are based upon data size, data distribution, and skewness.											
201	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
202	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
203												
204	Arsenic											
205												
206	General Statistics											
207					Total Number of Observations	331			Number of Distinct Observations	152		
208					Number of Detects	316			Number of Non-Detects	15		
209					Number of Distinct Detects	149			Number of Distinct Non-Detects	4		
210					Minimum Detect	0.53			Minimum Non-Detect	0.55		
211					Maximum Detect	222			Maximum Non-Detect	0.7		
212					Variance Detects	691.9			Percent Non-Detects	4.532%		
213					Mean Detects	13.42			SD Detects	26.3		
214					Median Detects	6.1			CV Detects	1.959		
215					Skewness Detects	4.795			Kurtosis Detects	26.96		
216					Mean of Logged Detects	1.944			SD of Logged Detects	0.963		
217												
218	Normal GOF Test on Detects Only											
219					Shapiro Wilk Test Statistic	0.424		Normal GOF Test on Detected Observations Only				
220					5% Shapiro Wilk P Value	0		Detected Data Not Normal at 5% Significance Level				
221					Lilliefors Test Statistic	0.312		Lilliefors GOF Test				
222					5% Lilliefors Critical Value	0.0502		Detected Data Not Normal at 5% Significance Level				
223	Detected Data Not Normal at 5% Significance Level											
224												
225	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
226					KM Mean	12.84			KM Standard Error of Mean	1.42		
227					KM SD	25.8			95% KM (BCA) UCL	15.29		
228					95% KM (t) UCL	15.18			95% KM (Percentile Bootstrap) UCL	15.35		
229					95% KM (z) UCL	15.18			95% KM Bootstrap t UCL	15.75		
230					90% KM Chebyshev UCL	17.1			95% KM Chebyshev UCL	19.03		
231					97.5% KM Chebyshev UCL	21.71			99% KM Chebyshev UCL	26.97		
232												
233	Gamma GOF Tests on Detected Observations Only											
234					A-D Test Statistic	26.76			Anderson-Darling GOF Test			
235					5% A-D Critical Value	0.789			Detected Data Not Gamma Distributed at 5% Significance Level			
236					K-S Test Statistic	0.248			Kolmogorov-Smirnov GOF			
237					5% K-S Critical Value	0.0527			Detected Data Not Gamma Distributed at 5% Significance Level			
238	Detected Data Not Gamma Distributed at 5% Significance Level											
239												
240	Gamma Statistics on Detected Data Only											
241					k hat (MLE)	0.896			k star (bias corrected MLE)	0.89		
242					Theta hat (MLE)	14.98			Theta star (bias corrected MLE)	15.09		
243					nu hat (MLE)	566.3			nu star (bias corrected)	562.3		
244					Mean (detects)	13.42						
245												
246	Gamma ROS Statistics using Imputed Non-Detects											
247	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
248	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
249	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
250	This is especially true when the sample size is small.											
251	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
252					Minimum	0.01			Mean	12.82		
253					Maximum	222			Median	5.9		
254					SD	25.85			CV	2.017		
255					k hat (MLE)	0.673			k star (bias corrected MLE)	0.669		
256					Theta hat (MLE)	19.05			Theta star (bias corrected MLE)	19.17		

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

257					nu hat (MLE)	445.4				nu star (bias corrected)		442.7
258					Adjusted Level of Significance (β)	0.0493						
259					Approximate Chi Square Value (442.70, α)	394.9				Adjusted Chi Square Value (442.70, β)		394.7
260					95% Gamma Approximate UCL (use when n>=50)	14.37				95% Gamma Adjusted UCL (use when n<50)		14.37
261												
262					**Estimates of Gamma Parameters using KM Estimates**							
263					Mean (KM)	12.84				SD (KM)		25.8
264					Variance (KM)	665.6				SE of Mean (KM)		1.42
265					k hat (KM)	0.248				k star (KM)		0.247
266					nu hat (KM)	164				nu star (KM)		163.8
267					theta hat (KM)	51.84				theta star (KM)		51.89
268					80% gamma percentile (KM)	18.58				90% gamma percentile (KM)		38.57
269					95% gamma percentile (KM)	62.34				99% gamma percentile (KM)		125.7
270												
271					**Gamma Kaplan-Meier (KM) Statistics**							
272					Approximate Chi Square Value (163.82, α)	135.2				Adjusted Chi Square Value (163.82, β)		135.1
273					95% Gamma Approximate KM-UCL (use when n>=50)	15.56				95% Gamma Adjusted KM-UCL (use when n<50)		15.57
274												
275					**Lognormal GOF Test on Detected Observations Only**							
276					Shapiro Wilk Approximate Test Statistic	0.912				**Shapiro Wilk GOF Test**		
277					5% Shapiro Wilk P Value	0				Detected Data Not Lognormal at 5% Significance Level		
278					Lilliefors Test Statistic	0.158				**Lilliefors GOF Test**		
279					5% Lilliefors Critical Value	0.0502				Detected Data Not Lognormal at 5% Significance Level		
280					**Detected Data Not Lognormal at 5% Significance Level**							
281												
282					**Lognormal ROS Statistics Using Imputed Non-Detects**							
283					Mean in Original Scale	12.85				Mean in Log Scale		1.846
284					SD in Original Scale	25.83				SD in Log Scale		1.045
285					95% t UCL (assumes normality of ROS data)	15.19				95% Percentile Bootstrap UCL		15.25
286					95% BCA Bootstrap UCL	15.51				95% Bootstrap t UCL		15.86
287					95% H-UCL (Log ROS)	12.38						
288												
289					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
290					KM Mean (logged)	1.828				KM Geo Mean		6.219
291					KM SD (logged)	1.081				95% Critical H Value (KM-Log)		2.188
292					KM Standard Error of Mean (logged)	0.0595				95% H-UCL (KM -Log)		12.71
293					KM SD (logged)	1.081				95% Critical H Value (KM-Log)		2.188
294					KM Standard Error of Mean (logged)	0.0595						
295												
296					**DL/2 Statistics**							
297					**DL/2 Normal**					**DL/2 Log-Transformed**		
298					Mean in Original Scale	12.83				Mean in Log Scale		1.8
299					SD in Original Scale	25.84				SD in Log Scale		1.15
300					95% t UCL (Assumes normality)	15.17				95% H-Stat UCL		13.51
301					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
302												
303					**Nonparametric Distribution Free UCL Statistics**							
304					**Data do not follow a Discernible Distribution at 5% Significance Level**							
305												
306					**Suggested UCL to Use**							
307					95% KM (Chebyshev) UCL	19.03						
308												
309					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
310					Recommendations are based upon data size, data distribution, and skewness.							
311					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
312					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
313												
314												
315	**Barium**											
316												
317					**General Statistics**							
318					Total Number of Observations	9				Number of Distinct Observations		9
319										Number of Missing Observations		0
320					Minimum	104				Mean		178

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
321					Maximum	350				Median		118
322					SD	100.5				Std. Error of Mean		33.5
323					Coefficient of Variation	0.565				Skewness		1.015
324												
325	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
326	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
327	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
328	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
329												
330	**Normal GOF Test**											
331					Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk GOF Test**					
332					5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level					
333					Lilliefors Test Statistic	0.381	**Lilliefors GOF Test**					
334					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
335	Data Not Normal at 5% Significance Level											
336												
337	**Assuming Normal Distribution**											
338	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
339					95% Student's-t UCL	240.3				95% Adjusted-CLT UCL (Chen-1995)		245.2
340										95% Modified-t UCL (Johnson-1978)		242.2
341												
342	**Gamma GOF Test**											
343					A-D Test Statistic	1.252	**Anderson-Darling Gamma GOF Test**					
344					5% A-D Critical Value	0.725	Data Not Gamma Distributed at 5% Significance Level					
345					K-S Test Statistic	0.383	**Kolmogorov-Smirnov Gamma GOF Test**					
346					5% K-S Critical Value	0.28	Data Not Gamma Distributed at 5% Significance Level					
347	Data Not Gamma Distributed at 5% Significance Level											
348												
349	**Gamma Statistics**											
350					k hat (MLE)	4.17				k star (bias corrected MLE)		2.854
351					Theta hat (MLE)	42.68				Theta star (bias corrected MLE)		62.36
352					nu hat (MLE)	75.06				nu star (bias corrected)		51.38
353					MLE Mean (bias corrected)	178				MLE Sd (bias corrected)		105.4
354										Approximate Chi Square Value (0.05)		35.92
355					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		33.21
356												
357	**Assuming Gamma Distribution**											
358					95% Approximate Gamma UCL (use when n>=50))	254.6				95% Adjusted Gamma UCL (use when n<50)		275.4
359												
360	**Lognormal GOF Test**											
361					Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk Lognormal GOF Test**					
362					5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level					
363					Lilliefors Test Statistic	0.363	**Lilliefors Lognormal GOF Test**					
364					5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level					
365	Data Not Lognormal at 5% Significance Level											
366												
367	**Lognormal Statistics**											
368					Minimum of Logged Data	4.644				Mean of logged Data		5.057
369					Maximum of Logged Data	5.858				SD of logged Data		0.509
370												
371	**Assuming Lognormal Distribution**											
372					95% H-UCL	267.6				90% Chebyshev (MVUE) UCL		266.9
373					95% Chebyshev (MVUE) UCL	308.1				97.5% Chebyshev (MVUE) UCL		365.2
374					99% Chebyshev (MVUE) UCL	477.5						
375												
376	**Nonparametric Distribution Free UCL Statistics**											
377	Data do not follow a Discernible Distribution (0.05)											
378												
379	**Nonparametric Distribution Free UCLs**											
380					95% CLT UCL	233.1				95% Jackknife UCL		240.3
381					95% Standard Bootstrap UCL	230.3				95% Bootstrap-t UCL		273.8
382					95% Hall's Bootstrap UCL	217.4				95% Percentile Bootstrap UCL		232.6
383					95% BCA Bootstrap UCL	236						
384					90% Chebyshev(Mean, Sd) UCL	278.5				95% Chebyshev(Mean, Sd) UCL		324

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

385				97.5% Chebyshev(Mean, Sd) UCL		387.2			99% Chebyshev(Mean, Sd) UCL			511.3
386												
387						Suggested UCL to Use						
388				95% Chebyshev (Mean, Sd) UCL		324						
389												
390						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
391						Recommendations are based upon data size, data distribution, and skewness.						
392						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
393						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
394												
395												
396	Beryllium											
397												
398						General Statistics						
399				Total Number of Observations		9			Number of Distinct Observations			8
400									Number of Missing Observations			0
401				Minimum		0.45			Mean			0.539
402				Maximum		0.62			Median			0.56
403				SD		0.0631			Std. Error of Mean			0.021
404				Coefficient of Variation		0.117			Skewness			-0.335
405												
406						Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use						
407						guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.						
408						For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).						
409						Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1						
410												
411						Normal GOF Test						
412				Shapiro Wilk Test Statistic		0.903			Shapiro Wilk GOF Test			
413				5% Shapiro Wilk Critical Value		0.829			Data appear Normal at 5% Significance Level			
414				Lilliefors Test Statistic		0.187			Lilliefors GOF Test			
415				5% Lilliefors Critical Value		0.274			Data appear Normal at 5% Significance Level			
416						Data appear Normal at 5% Significance Level						
417												
418						Assuming Normal Distribution						
419				95% Normal UCL					95% UCLs (Adjusted for Skewness)			
420				95% Student's-t UCL		0.578			95% Adjusted-CLT UCL (Chen-1995)			0.571
421									95% Modified-t UCL (Johnson-1978)			0.578
422												
423						Gamma GOF Test						
424				A-D Test Statistic		0.487			Anderson-Darling Gamma GOF Test			
425				5% A-D Critical Value		0.72			Detected data appear Gamma Distributed at 5% Significance Level			
426				K-S Test Statistic		0.205			Kolmogorov-Smirnov Gamma GOF Test			
427				5% K-S Critical Value		0.279			Detected data appear Gamma Distributed at 5% Significance Level			
428						Detected data appear Gamma Distributed at 5% Significance Level						
429												
430						Gamma Statistics						
431				k hat (MLE)		79.72			k star (bias corrected MLE)			53.22
432				Theta hat (MLE)		0.00676			Theta star (bias corrected MLE)			0.0101
433				nu hat (MLE)		1435			nu star (bias corrected)			958
434				MLE Mean (bias corrected)		0.539			MLE Sd (bias corrected)			0.0739
435									Approximate Chi Square Value (0.05)			887.1
436				Adjusted Level of Significance		0.0231			Adjusted Chi Square Value			872.7
437												
438						Assuming Gamma Distribution						
439				95% Approximate Gamma UCL (use when n>=50))		0.582			95% Adjusted Gamma UCL (use when n<50)			0.592
440												
441						Lognormal GOF Test						
442				Shapiro Wilk Test Statistic		0.895			Shapiro Wilk Lognormal GOF Test			
443				5% Shapiro Wilk Critical Value		0.829			Data appear Lognormal at 5% Significance Level			
444				Lilliefors Test Statistic		0.201			Lilliefors Lognormal GOF Test			
445				5% Lilliefors Critical Value		0.274			Data appear Lognormal at 5% Significance Level			
446						Data appear Lognormal at 5% Significance Level						
447												
448						Lognormal Statistics						

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
449					Minimum of Logged Data	-0.799				Mean of logged Data		-0.625
450					Maximum of Logged Data	-0.478				SD of logged Data		0.12
451												
452					Assuming Lognormal Distribution							
453					95% H-UCL	0.583				90% Chebyshev (MVUE) UCL		0.604
454					95% Chebyshev (MVUE) UCL	0.633				97.5% Chebyshev (MVUE) UCL		0.673
455					99% Chebyshev (MVUE) UCL	0.753						
456												
457					Nonparametric Distribution Free UCL Statistics							
458					Data appear to follow a Discernible Distribution at 5% Significance Level							
459												
460					Nonparametric Distribution Free UCLs							
461					95% CLT UCL	0.574				95% Jackknife UCL		0.578
462					95% Standard Bootstrap UCL	0.572				95% Bootstrap-t UCL		0.576
463					95% Hall's Bootstrap UCL	0.567				95% Percentile Bootstrap UCL		0.57
464					95% BCA Bootstrap UCL	0.57						
465					90% Chebyshev(Mean, Sd) UCL	0.602				95% Chebyshev(Mean, Sd) UCL		0.631
466					97.5% Chebyshev(Mean, Sd) UCL	0.67				99% Chebyshev(Mean, Sd) UCL		0.748
467												
468					Suggested UCL to Use							
469					95% Student's-t UCL	0.578						
470												
471					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
472					Recommendations are based upon data size, data distribution, and skewness.							
473					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
474					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
475												
476					Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be							
477					reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.							
478												
479	Cadmium											
480												
481					General Statistics							
482					Total Number of Observations	9				Number of Distinct Observations		6
483					Number of Detects	0				Number of Non-Detects		9
484					Number of Distinct Detects	0				Number of Distinct Non-Detects		6
485												
486					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
487					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
488					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
489												
490					The data set for variable Cadmium was not processed!							
491												
492												
493												
494	Chromium											
495												
496					General Statistics							
497					Total Number of Observations	9				Number of Distinct Observations		9
498										Number of Missing Observations		0
499					Minimum	48				Mean		70.6
500					Maximum	96.4				Median		64.9
501					SD	18.41				Std. Error of Mean		6.138
502					Coefficient of Variation	0.261				Skewness		0.333
503												
504					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
505					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
506					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
507					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
508												
509					Normal GOF Test							
510					Shapiro Wilk Test Statistic	0.907				Shapiro Wilk GOF Test		
511					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
512					Lilliefors Test Statistic	0.177				Lilliefors GOF Test		

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
513					5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level					
514	Data appear Normal at 5% Significance Level											
515												
516	Assuming Normal Distribution											
517	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
518					95% Student's-t UCL	82.01				95% Adjusted-CLT UCL (Chen-1995)		81.42
519										95% Modified-t UCL (Johnson-1978)		82.13
520												
521	Gamma GOF Test											
522					A-D Test Statistic	0.349	Anderson-Darling Gamma GOF Test					
523					5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level					
524					K-S Test Statistic	0.169	Kolmogorov-Smirnov Gamma GOF Test					
525					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
526	Detected data appear Gamma Distributed at 5% Significance Level											
527												
528	Gamma Statistics											
529					k hat (MLE)	16.64				k star (bias corrected MLE)		11.17
530					Theta hat (MLE)	4.243				Theta star (bias corrected MLE)		6.322
531					nu hat (MLE)	299.5				nu star (bias corrected)		201
532					MLE Mean (bias corrected)	70.6				MLE Sd (bias corrected)		21.13
533										Approximate Chi Square Value (0.05)		169.2
534					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		163
535												
536	Assuming Gamma Distribution											
537					95% Approximate Gamma UCL (use when n>=50))	83.87				95% Adjusted Gamma UCL (use when n<50)		87.04
538												
539	Lognormal GOF Test											
540					Shapiro Wilk Test Statistic	0.922	Shapiro Wilk Lognormal GOF Test					
541					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
542					Lilliefors Test Statistic	0.156	Lilliefors Lognormal GOF Test					
543					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
544	Data appear Lognormal at 5% Significance Level											
545												
546	Lognormal Statistics											
547					Minimum of Logged Data	3.871				Mean of logged Data		4.227
548					Maximum of Logged Data	4.569				SD of logged Data		0.262
549												
550	Assuming Lognormal Distribution											
551					95% H-UCL	85.05				90% Chebyshev (MVUE) UCL		89.16
552					95% Chebyshev (MVUE) UCL	97.57				97.5% Chebyshev (MVUE) UCL		109.2
553					99% Chebyshev (MVUE) UCL	132.2						
554												
555	Nonparametric Distribution Free UCL Statistics											
556	Data appear to follow a Discernible Distribution at 5% Significance Level											
557												
558	Nonparametric Distribution Free UCLs											
559					95% CLT UCL	80.7				95% Jackknife UCL		82.01
560					95% Standard Bootstrap UCL	80.21				95% Bootstrap-t UCL		82.78
561					95% Hall's Bootstrap UCL	79.42				95% Percentile Bootstrap UCL		80.51
562					95% BCA Bootstrap UCL	79.83						
563					90% Chebyshev(Mean, Sd) UCL	89.01				95% Chebyshev(Mean, Sd) UCL		97.36
564					97.5% Chebyshev(Mean, Sd) UCL	108.9				99% Chebyshev(Mean, Sd) UCL		131.7
565												
566	Suggested UCL to Use											
567					95% Student's-t UCL	82.01						
568												
569	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
570	Recommendations are based upon data size, data distribution, and skewness.											
571	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
572	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
573												
574												
575	Cobalt											
576												

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
577	**General Statistics**											
578	Total Number of Observations					9	Number of Distinct Observations					9
579							Number of Missing Observations					0
580	Minimum					11.2	Mean					14.71
581	Maximum					19.2	Median					13.7
582	SD					2.994	Std. Error of Mean					0.998
583	Coefficient of Variation					0.204	Skewness					0.535
584												
585	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
586	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
587	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
588	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
589												
590	**Normal GOF Test**											
591	Shapiro Wilk Test Statistic					0.877	**Shapiro Wilk GOF Test**					
592	5% Shapiro Wilk Critical Value					0.829	Data appear Normal at 5% Significance Level					
593	Lilliefors Test Statistic					0.197	**Lilliefors GOF Test**					
594	5% Lilliefors Critical Value					0.274	Data appear Normal at 5% Significance Level					
595	Data appear Normal at 5% Significance Level											
596												
597	**Assuming Normal Distribution**											
598	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
599	95% Student's-t UCL					16.57	95% Adjusted-CLT UCL (Chen-1995)					16.54
600							95% Modified-t UCL (Johnson-1978)					16.6
601												
602	**Gamma GOF Test**											
603	A-D Test Statistic					0.53	**Anderson-Darling Gamma GOF Test**					
604	5% A-D Critical Value					0.721	Detected data appear Gamma Distributed at 5% Significance Level					
605	K-S Test Statistic					0.212	**Kolmogorov-Smirnov Gamma GOF Test**					
606	5% K-S Critical Value					0.279	Detected data appear Gamma Distributed at 5% Significance Level					
607	Detected data appear Gamma Distributed at 5% Significance Level											
608												
609	**Gamma Statistics**											
610	k hat (MLE)					28.15	k star (bias corrected MLE)					18.84
611	Theta hat (MLE)					0.523	Theta star (bias corrected MLE)					0.781
612	nu hat (MLE)					506.7	nu star (bias corrected)					339.1
613	MLE Mean (bias corrected)					14.71	MLE Sd (bias corrected)					3.389
614							Approximate Chi Square Value (0.05)					297.5
615	Adjusted Level of Significance					0.0231	Adjusted Chi Square Value					289.2
616												
617	**Assuming Gamma Distribution**											
618	95% Approximate Gamma UCL (use when n>=50))					16.77	95% Adjusted Gamma UCL (use when n<50)					17.25
619												
620	**Lognormal GOF Test**											
621	Shapiro Wilk Test Statistic					0.897	**Shapiro Wilk Lognormal GOF Test**					
622	5% Shapiro Wilk Critical Value					0.829	Data appear Lognormal at 5% Significance Level					
623	Lilliefors Test Statistic					0.199	**Lilliefors Lognormal GOF Test**					
624	5% Lilliefors Critical Value					0.274	Data appear Lognormal at 5% Significance Level					
625	Data appear Lognormal at 5% Significance Level											
626												
627	**Lognormal Statistics**											
628	Minimum of Logged Data					2.416	Mean of logged Data					2.671
629	Maximum of Logged Data					2.955	SD of logged Data					0.199
630												
631	**Assuming Lognormal Distribution**											
632	95% H-UCL					16.86	90% Chebyshev (MVUE) UCL					17.64
633	95% Chebyshev (MVUE) UCL					18.97	97.5% Chebyshev (MVUE) UCL					20.81
634	99% Chebyshev (MVUE) UCL					24.44						
635												
636	**Nonparametric Distribution Free UCL Statistics**											
637	Data appear to follow a Discernible Distribution at 5% Significance Level											
638												
639	**Nonparametric Distribution Free UCLs**											
640	95% CLT UCL					16.35	95% Jackknife UCL					16.57

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
641					95% Standard Bootstrap UCL	16.25				95% Bootstrap-t UCL		16.97
642					95% Hall's Bootstrap UCL	16.08				95% Percentile Bootstrap UCL		16.28
643					95% BCA Bootstrap UCL	16.38						
644					90% Chebyshev(Mean, Sd) UCL	17.71				95% Chebyshev(Mean, Sd) UCL		19.06
645					97.5% Chebyshev(Mean, Sd) UCL	20.94				99% Chebyshev(Mean, Sd) UCL		24.64
646												
647						**Suggested UCL to Use**						
648					95% Student's-t UCL	16.57						
649												
650	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
651	Recommendations are based upon data size, data distribution, and skewness.											
652	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
653	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
654												
655												
656	**Copper**											
657												
658						**General Statistics**						
659					Total Number of Observations	9				Number of Distinct Observations		9
660										Number of Missing Observations		0
661					Minimum	26.2				Mean		36.83
662					Maximum	57.8				Median		33.8
663					SD	10.36				Std. Error of Mean		3.454
664					Coefficient of Variation	0.281				Skewness		1.165
665												
666	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
667	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
668	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
669	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
670												
671						**Normal GOF Test**						
672					Shapiro Wilk Test Statistic	0.884				**Shapiro Wilk GOF Test**		
673					5% Shapiro Wilk Critical Value	0.829				Data appear Normal at 5% Significance Level		
674					Lilliefors Test Statistic	0.274				**Lilliefors GOF Test**		
675					5% Lilliefors Critical Value	0.274				Data Not Normal at 5% Significance Level		
676	Data appear Approximate Normal at 5% Significance Level											
677												
678						**Assuming Normal Distribution**						
679					**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**		
680					95% Student's-t UCL	43.26				95% Adjusted-CLT UCL (Chen-1995)		43.95
681										95% Modified-t UCL (Johnson-1978)		43.48
682												
683						**Gamma GOF Test**						
684					A-D Test Statistic	0.395				**Anderson-Darling Gamma GOF Test**		
685					5% A-D Critical Value	0.721				Detected data appear Gamma Distributed at 5% Significance Level		
686					K-S Test Statistic	0.258				**Kolmogorov-Smirnov Gamma GOF Test**		
687					5% K-S Critical Value	0.279				Detected data appear Gamma Distributed at 5% Significance Level		
688	Detected data appear Gamma Distributed at 5% Significance Level											
689												
690						**Gamma Statistics**						
691					k hat (MLE)	15.88				k star (bias corrected MLE)		10.66
692					Theta hat (MLE)	2.32				Theta star (bias corrected MLE)		3.455
693					nu hat (MLE)	285.8				nu star (bias corrected)		191.9
694					MLE Mean (bias corrected)	36.83				MLE Sd (bias corrected)		11.28
695										Approximate Chi Square Value (0.05)		160.8
696					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value		154.8
697												
698						**Assuming Gamma Distribution**						
699					95% Approximate Gamma UCL (use when n>=50))	43.94				95% Adjusted Gamma UCL (use when n<50)		45.65
700												
701						**Lognormal GOF Test**						
702					Shapiro Wilk Test Statistic	0.93				**Shapiro Wilk Lognormal GOF Test**		
703					5% Shapiro Wilk Critical Value	0.829				Data appear Lognormal at 5% Significance Level		
704					Lilliefors Test Statistic	0.24				**Lilliefors Lognormal GOF Test**		

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
705					5% Lilliefors Critical Value	0.274			Data appear Lognormal at 5% Significance Level			
706					Data appear Lognormal at 5% Significance Level							
707												
708					Lognormal Statistics							
709					Minimum of Logged Data	3.266			Mean of logged Data			3.575
710					Maximum of Logged Data	4.057			SD of logged Data			0.261
711												
712					Assuming Lognormal Distribution							
713					95% H-UCL	44.29			90% Chebyshev (MVUE) UCL			46.43
714					95% Chebyshev (MVUE) UCL	50.8			97.5% Chebyshev (MVUE) UCL			56.87
715					99% Chebyshev (MVUE) UCL	68.8						
716												
717					Nonparametric Distribution Free UCL Statistics							
718					Data appear to follow a Discernible Distribution at 5% Significance Level							
719												
720					Nonparametric Distribution Free UCLs							
721					95% CLT UCL	42.51			95% Jackknife UCL			43.26
722					95% Standard Bootstrap UCL	42.11			95% Bootstrap-t UCL			47.21
723					95% Hall's Bootstrap UCL	47.86			95% Percentile Bootstrap UCL			42.46
724					95% BCA Bootstrap UCL	43.19						
725					90% Chebyshev(Mean, Sd) UCL	47.19			95% Chebyshev(Mean, Sd) UCL			51.89
726					97.5% Chebyshev(Mean, Sd) UCL	58.4			99% Chebyshev(Mean, Sd) UCL			71.2
727												
728					Suggested UCL to Use							
729					95% Student's-t UCL	43.26						
730												
731					When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test							
732					When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL							
733												
734					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
735					Recommendations are based upon data size, data distribution, and skewness.							
736					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
737					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
738												
739												
740	Iron											
741												
742					General Statistics							
743					Total Number of Observations	9			Number of Distinct Observations			9
744									Number of Missing Observations			0
745					Minimum	21100			Mean			24722
746					Maximum	28500			Median			24400
747					SD	2704			Std. Error of Mean			901.2
748					Coefficient of Variation	0.109			Skewness			0.312
749												
750					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
751					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							
752					For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).							
753					Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1							
754												
755					Normal GOF Test							
756					Shapiro Wilk Test Statistic	0.922			Shapiro Wilk GOF Test			
757					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
758					Lilliefors Test Statistic	0.194			Lilliefors GOF Test			
759					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
760					Data appear Normal at 5% Significance Level							
761												
762					Assuming Normal Distribution							
763					95% Normal UCL				95% UCLs (Adjusted for Skewness)			
764					95% Student's-t UCL	26398			95% Adjusted-CLT UCL (Chen-1995)			26305
765									95% Modified-t UCL (Johnson-1978)			26414
766												
767					Gamma GOF Test							
768					A-D Test Statistic	0.344			Anderson-Darling Gamma GOF Test			

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

769					5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level					
770					K-S Test Statistic	0.203	**Kolmogorov-Smirnov Gamma GOF Test**					
771					5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level					
772					Detected data appear Gamma Distributed at 5% Significance Level							
773												
774					**Gamma Statistics**							
775					k hat (MLE)	95.09	k star (bias corrected MLE)	63.47				
776					Theta hat (MLE)	260	Theta star (bias corrected MLE)	389.5				
777					nu hat (MLE)	1712	nu star (bias corrected)	1142				
778					MLE Mean (bias corrected)	24722	MLE Sd (bias corrected)	3103				
779							Approximate Chi Square Value (0.05)	1065				
780					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	1049				
781												
782					**Assuming Gamma Distribution**							
783				95% Approximate Gamma UCL (use when n>=50))		26521	95% Adjusted Gamma UCL (use when n<50)	26921				
784												
785					**Lognormal GOF Test**							
786					Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk Lognormal GOF Test**					
787					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
788					Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**					
789					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
790					Data appear Lognormal at 5% Significance Level							
791												
792					**Lognormal Statistics**							
793					Minimum of Logged Data	9.957	Mean of logged Data	10.11				
794					Maximum of Logged Data	10.26	SD of logged Data	0.109				
795												
796					**Assuming Lognormal Distribution**							
797					95% H-UCL	26538	90% Chebyshev (MVUE) UCL	27409				
798					95% Chebyshev (MVUE) UCL	28626	97.5% Chebyshev (MVUE) UCL	30316				
799					99% Chebyshev (MVUE) UCL	33635						
800												
801					**Nonparametric Distribution Free UCL Statistics**							
802					Data appear to follow a Discernible Distribution at 5% Significance Level							
803												
804					**Nonparametric Distribution Free UCLs**							
805					95% CLT UCL	26205	95% Jackknife UCL	26398				
806					95% Standard Bootstrap UCL	26117	95% Bootstrap-t UCL	26633				
807					95% Hall's Bootstrap UCL	26296	95% Percentile Bootstrap UCL	26067				
808					95% BCA Bootstrap UCL	26244						
809					90% Chebyshev(Mean, Sd) UCL	27426	95% Chebyshev(Mean, Sd) UCL	28650				
810					97.5% Chebyshev(Mean, Sd) UCL	30350	99% Chebyshev(Mean, Sd) UCL	33689				
811												
812					**Suggested UCL to Use**							
813					95% Student's-t UCL	26398						
814												
815					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
816					Recommendations are based upon data size, data distribution, and skewness.							
817					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
818					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
819												
820												
821	**Lead**											
822												
823					**General Statistics**							
824					Total Number of Observations	9	Number of Distinct Observations	9				
825							Number of Missing Observations	0				
826					Minimum	5.9	Mean	12.08				
827					Maximum	25.6	Median	9.9				
828					SD	6.184	Std. Error of Mean	2.061				
829					Coefficient of Variation	0.512	Skewness	1.486				
830												
831					Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use							
832					guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.							

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
833	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
834	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
835												
836	**Normal GOF Test**											
837					Shapiro Wilk Test Statistic	0.843	**Shapiro Wilk GOF Test**					
838					5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level					
839					Lilliefors Test Statistic	0.298	**Lilliefors GOF Test**					
840					5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level					
841	Data appear Approximate Normal at 5% Significance Level											
842												
843	**Assuming Normal Distribution**											
844	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
845					95% Student's-t UCL	15.91	95% Adjusted-CLT UCL (Chen-1995)					16.56
846							95% Modified-t UCL (Johnson-1978)					16.08
847												
848	**Gamma GOF Test**											
849					A-D Test Statistic	0.439	**Anderson-Darling Gamma GOF Test**					
850					5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level					
851					K-S Test Statistic	0.273	**Kolmogorov-Smirnov Gamma GOF Test**					
852					5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level					
853	Detected data appear Gamma Distributed at 5% Significance Level											
854												
855	**Gamma Statistics**											
856					k hat (MLE)	5.211	k star (bias corrected MLE)					3.548
857					Theta hat (MLE)	2.318	Theta star (bias corrected MLE)					3.404
858					nu hat (MLE)	93.8	nu star (bias corrected)					63.86
859					MLE Mean (bias corrected)	12.08	MLE Sd (bias corrected)					6.412
860							Approximate Chi Square Value (0.05)					46.48
861					Adjusted Level of Significance	0.0231	Adjusted Chi Square Value					43.37
862												
863	**Assuming Gamma Distribution**											
864	95% Approximate Gamma UCL (use when n>=50))					16.6	95% Adjusted Gamma UCL (use when n<50)					17.79
865												
866	**Lognormal GOF Test**											
867					Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**					
868					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
869					Lilliefors Test Statistic	0.245	**Lilliefors Lognormal GOF Test**					
870					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
871	Data appear Lognormal at 5% Significance Level											
872												
873	**Lognormal Statistics**											
874					Minimum of Logged Data	1.775	Mean of logged Data					2.392
875					Maximum of Logged Data	3.243	SD of logged Data					0.456
876												
877	**Assuming Lognormal Distribution**											
878					95% H-UCL	17.28	90% Chebyshev (MVUE) UCL					17.52
879					95% Chebyshev (MVUE) UCL	20.03	97.5% Chebyshev (MVUE) UCL					23.51
880					99% Chebyshev (MVUE) UCL	30.35						
881												
882	**Nonparametric Distribution Free UCL Statistics**											
883	Data appear to follow a Discernible Distribution at 5% Significance Level											
884												
885	**Nonparametric Distribution Free UCLs**											
886					95% CLT UCL	15.47	95% Jackknife UCL					15.91
887					95% Standard Bootstrap UCL	15.25	95% Bootstrap-t UCL					18.48
888					95% Hall's Bootstrap UCL	18.78	95% Percentile Bootstrap UCL					15.26
889					95% BCA Bootstrap UCL	16.39						
890					90% Chebyshev(Mean, Sd) UCL	18.26	95% Chebyshev(Mean, Sd) UCL					21.06
891					97.5% Chebyshev(Mean, Sd) UCL	24.95	99% Chebyshev(Mean, Sd) UCL					32.59
892												
893	**Suggested UCL to Use**											
894					95% Student's-t UCL	15.91						
895												
896	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test											

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	491	Mean	646
Maximum	803	Median	643
SD	116.3	Std. Error of Mean	38.76
Coefficient of Variation	0.18	Skewness	0.0951

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	718.1	95% Adjusted-CLT UCL (Chen-1995)	711.1
		95% Modified-t UCL (Johnson-1978)	718.3

Gamma GOF Test

A-D Test Statistic	0.32	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.191	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	34.42	k star (bias corrected MLE)	23.02
Theta hat (MLE)	18.77	Theta star (bias corrected MLE)	28.06
nu hat (MLE)	619.5	nu star (bias corrected)	414.3
MLE Mean (bias corrected)	646	MLE Sd (bias corrected)	134.6
		Approximate Chi Square Value (0.05)	368.2
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	358.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	727	95% Adjusted Gamma UCL (use when n<50)	745.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.175	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.196	Mean of logged Data	6.456
Maximum of Logged Data	6.688	SD of logged Data	0.182

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
961	**Assuming Lognormal Distribution**											
962					95% H-UCL	730.9				90% Chebyshev (MVUE) UCL		763.8
963					95% Chebyshev (MVUE) UCL	817.1				97.5% Chebyshev (MVUE) UCL		891.2
964					99% Chebyshev (MVUE) UCL	1037						
965												
966	**Nonparametric Distribution Free UCL Statistics**											
967	Data appear to follow a Discernible Distribution at 5% Significance Level											
968												
969	**Nonparametric Distribution Free UCLs**											
970					95% CLT UCL	709.8				95% Jackknife UCL		718.1
971					95% Standard Bootstrap UCL	705.5				95% Bootstrap-t UCL		721.8
972					95% Hall's Bootstrap UCL	698.9				95% Percentile Bootstrap UCL		706.1
973					95% BCA Bootstrap UCL	708.7						
974					90% Chebyshev(Mean, Sd) UCL	762.3				95% Chebyshev(Mean, Sd) UCL		815
975					97.5% Chebyshev(Mean, Sd) UCL	888.1				99% Chebyshev(Mean, Sd) UCL		1032
976												
977	**Suggested UCL to Use**											
978					95% Student's-t UCL	718.1						
979												
980	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
981	Recommendations are based upon data size, data distribution, and skewness.											
982	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
983	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
984												
985	**Mercury**											
986												
987	**General Statistics**											
988					Total Number of Observations	331				Number of Distinct Observations		236
989					Number of Detects	330				Number of Non-Detects		1
990					Number of Distinct Detects	235				Number of Distinct Non-Detects		1
991					Minimum Detect	0.07				Minimum Non-Detect		0.055
992					Maximum Detect	494				Maximum Non-Detect		0.055
993					Variance Detects	3633				Percent Non-Detects		0.302%
994					Mean Detects	33.97				SD Detects		60.28
995					Median Detects	11.4				CV Detects		1.775
996					Skewness Detects	3.55				Kurtosis Detects		16.02
997					Mean of Logged Detects	2.485				SD of Logged Detects		1.501
998												
999	**Normal GOF Test on Detects Only**											
1000					Shapiro Wilk Test Statistic	0.572			**Normal GOF Test on Detected Observations Only**			
1001					5% Shapiro Wilk P Value	0			Detected Data Not Normal at 5% Significance Level			
1002					Lilliefors Test Statistic	0.287			**Lilliefors GOF Test**			
1003					5% Lilliefors Critical Value	0.0492			Detected Data Not Normal at 5% Significance Level			
1004	Detected Data Not Normal at 5% Significance Level											
1005												
1006	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
1007					KM Mean	33.86				KM Standard Error of Mean		3.31
1008					KM SD	60.12				95% KM (BCA) UCL		39.85
1009					95% KM (t) UCL	39.32				95% KM (Percentile Bootstrap) UCL		39.42
1010					95% KM (z) UCL	39.31				95% KM Bootstrap t UCL		40
1011					90% KM Chebyshev UCL	43.79				95% KM Chebyshev UCL		48.29
1012					97.5% KM Chebyshev UCL	54.53				99% KM Chebyshev UCL		66.8
1013												
1014	**Gamma GOF Tests on Detected Observations Only**											
1015					A-D Test Statistic	8.967			**Anderson-Darling GOF Test**			
1016					5% A-D Critical Value	0.813			Detected Data Not Gamma Distributed at 5% Significance Level			
1017					K-S Test Statistic	0.129			**Kolmogorov-Smirnov GOF**			
1018					5% K-S Critical Value	0.0526			Detected Data Not Gamma Distributed at 5% Significance Level			
1019	Detected Data Not Gamma Distributed at 5% Significance Level											
1020												
1021	**Gamma Statistics on Detected Data Only**											
1022					k hat (MLE)	0.595				k star (bias corrected MLE)		0.591
1023					Theta hat (MLE)	57.13				Theta star (bias corrected MLE)		57.46
1024					nu hat (MLE)	392.4				nu star (bias corrected)		390.2

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1025					Mean (detects)	33.97						
1026												
1027					**Gamma ROS Statistics using Imputed Non-Detects**							
1028					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
1029					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
1030					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
1031					This is especially true when the sample size is small.							
1032					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
1033					Minimum	0.01				Mean	33.86	
1034					Maximum	494				Median	11.3	
1035					SD	60.22				CV	1.778	
1036					k hat (MLE)	0.586				k star (bias corrected MLE)	0.582	
1037					Theta hat (MLE)	57.83				Theta star (bias corrected MLE)	58.16	
1038					nu hat (MLE)	387.6				nu star (bias corrected)	385.5	
1039					Adjusted Level of Significance (β)	0.0493						
1040					Approximate Chi Square Value (385.46, α)	341				Adjusted Chi Square Value (385.46, β)	340.8	
1041					95% Gamma Approximate UCL (use when n>=50)	38.29				95% Gamma Adjusted UCL (use when n<50)	38.31	
1042												
1043					**Estimates of Gamma Parameters using KM Estimates**							
1044					Mean (KM)	33.86				SD (KM)	60.12	
1045					Variance (KM)	3615				SE of Mean (KM)	3.31	
1046					k hat (KM)	0.317				k star (KM)	0.316	
1047					nu hat (KM)	210				nu star (KM)	209.4	
1048					theta hat (KM)	106.7				theta star (KM)	107	
1049					80% gamma percentile (KM)	52.58				90% gamma percentile (KM)	99.21	
1050					95% gamma percentile (KM)	152.3				99% gamma percentile (KM)	289.3	
1051												
1052					**Gamma Kaplan-Meier (KM) Statistics**							
1053					Approximate Chi Square Value (209.44, α)	177				Adjusted Chi Square Value (209.44, β)	176.8	
1054					95% Gamma Approximate KM-UCL (use when n>=50)	40.08				95% Gamma Adjusted KM-UCL (use when n<50)	40.11	
1055												
1056					**Lognormal GOF Test on Detected Observations Only**							
1057					Shapiro Wilk Approximate Test Statistic	0.981				**Shapiro Wilk GOF Test**		
1058					5% Shapiro Wilk P Value	0.213				Detected Data appear Lognormal at 5% Significance Level		
1059					Lilliefors Test Statistic	0.0359				**Lilliefors GOF Test**		
1060					5% Lilliefors Critical Value	0.0492				Detected Data appear Lognormal at 5% Significance Level		
1061					Detected Data appear Lognormal at 5% Significance Level							
1062												
1063					**Lognormal ROS Statistics Using Imputed Non-Detects**							
1064					Mean in Original Scale	33.87				Mean in Log Scale	2.471	
1065					SD in Original Scale	60.22				SD in Log Scale	1.52	
1066					95% t UCL (assumes normality of ROS data)	39.32				95% Percentile Bootstrap UCL	39.69	
1067					95% BCA Bootstrap UCL	40.18				95% Bootstrap t UCL	40.23	
1068					95% H-UCL (Log ROS)	46.65						
1069												
1070					**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**							
1071					KM Mean (logged)	2.469				KM Geo Mean	11.8	
1072					KM SD (logged)	1.526				95% Critical H Value (KM-Log)	2.599	
1073					KM Standard Error of Mean (logged)	0.084				95% H-UCL (KM -Log)	47.02	
1074					KM SD (logged)	1.526				95% Critical H Value (KM-Log)	2.599	
1075					KM Standard Error of Mean (logged)	0.084						
1076												
1077					**DL/2 Statistics**							
1078					**DL/2 Normal**					**DL/2 Log-Transformed**		
1079					Mean in Original Scale	33.86				Mean in Log Scale	2.466	
1080					SD in Original Scale	60.22				SD in Log Scale	1.536	
1081					95% t UCL (Assumes normality)	39.32				95% H-Stat UCL	47.76	
1082					DL/2 is not a recommended method, provided for comparisons and historical reasons							
1083												
1084					**Nonparametric Distribution Free UCL Statistics**							
1085					Detected Data appear Lognormal Distributed at 5% Significance Level							
1086												
1087					**Suggested UCL to Use**							
1088					KM H-UCL	47.02						

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1089												
1090	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1091	Recommendations are based upon data size, data distribution, and skewness.											
1092	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1093	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1094												
1095												
1096	**Nickel**											
1097												
1098	**General Statistics**											
1099					Total Number of Observations	9			Number of Distinct Observations	9		
1100									Number of Missing Observations	0		
1101					Minimum	63.4			Mean	91.57		
1102					Maximum	126			Median	85.4		
1103					SD	21.06			Std. Error of Mean	7.02		
1104					Coefficient of Variation	0.23			Skewness	0.387		
1105												
1106	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1107	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1108	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1109	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1110												
1111	**Normal GOF Test**											
1112					Shapiro Wilk Test Statistic	0.949		**Shapiro Wilk GOF Test**				
1113					5% Shapiro Wilk Critical Value	0.829		Data appear Normal at 5% Significance Level				
1114					Lilliefors Test Statistic	0.171		**Lilliefors GOF Test**				
1115					5% Lilliefors Critical Value	0.274		Data appear Normal at 5% Significance Level				
1116	Data appear Normal at 5% Significance Level											
1117												
1118	**Assuming Normal Distribution**											
1119	**95% Normal UCL**							**95% UCLs (Adjusted for Skewness)**				
1120					95% Student's-t UCL	104.6			95% Adjusted-CLT UCL (Chen-1995)	104.1		
1121									95% Modified-t UCL (Johnson-1978)	104.8		
1122												
1123	**Gamma GOF Test**											
1124					A-D Test Statistic	0.254		**Anderson-Darling Gamma GOF Test**				
1125					5% A-D Critical Value	0.721		Detected data appear Gamma Distributed at 5% Significance Level				
1126					K-S Test Statistic	0.173		**Kolmogorov-Smirnov Gamma GOF Test**				
1127					5% K-S Critical Value	0.279		Detected data appear Gamma Distributed at 5% Significance Level				
1128	Detected data appear Gamma Distributed at 5% Significance Level											
1129												
1130	**Gamma Statistics**											
1131					k hat (MLE)	21.54			k star (bias corrected MLE)	14.44		
1132					Theta hat (MLE)	4.25			Theta star (bias corrected MLE)	6.343		
1133					nu hat (MLE)	387.8			nu star (bias corrected)	259.9		
1134					MLE Mean (bias corrected)	91.57			MLE Sd (bias corrected)	24.1		
1135									Approximate Chi Square Value (0.05)	223.5		
1136					Adjusted Level of Significance	0.0231			Adjusted Chi Square Value	216.4		
1137												
1138	**Assuming Gamma Distribution**											
1139					95% Approximate Gamma UCL (use when n>=50))	106.4			95% Adjusted Gamma UCL (use when n<50)	109.9		
1140												
1141	**Lognormal GOF Test**											
1142					Shapiro Wilk Test Statistic	0.963		**Shapiro Wilk Lognormal GOF Test**				
1143					5% Shapiro Wilk Critical Value	0.829		Data appear Lognormal at 5% Significance Level				
1144					Lilliefors Test Statistic	0.16		**Lilliefors Lognormal GOF Test**				
1145					5% Lilliefors Critical Value	0.274		Data appear Lognormal at 5% Significance Level				
1146	Data appear Lognormal at 5% Significance Level											
1147												
1148	**Lognormal Statistics**											
1149					Minimum of Logged Data	4.149			Mean of logged Data	4.494		
1150					Maximum of Logged Data	4.836			SD of logged Data	0.229		
1151												
1152	**Assuming Lognormal Distribution**											

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

1153					95% H-UCL	107.4				90% Chebyshev (MVUE) UCL		112.6
1154					95% Chebyshev (MVUE) UCL	122.2				97.5% Chebyshev (MVUE) UCL		135.4
1155					99% Chebyshev (MVUE) UCL	161.4						
1156												
1157					**Nonparametric Distribution Free UCL Statistics**							
1158					Data appear to follow a Discernible Distribution at 5% Significance Level							
1159												
1160					**Nonparametric Distribution Free UCLs**							
1161					95% CLT UCL	103.1				95% Jackknife UCL		104.6
1162					95% Standard Bootstrap UCL	102.3				95% Bootstrap-t UCL		108
1163					95% Hall's Bootstrap UCL	102.9				95% Percentile Bootstrap UCL		102.8
1164					95% BCA Bootstrap UCL	103.6						
1165					90% Chebyshev(Mean, Sd) UCL	112.6				95% Chebyshev(Mean, Sd) UCL		122.2
1166					97.5% Chebyshev(Mean, Sd) UCL	135.4				99% Chebyshev(Mean, Sd) UCL		161.4
1167												
1168					**Suggested UCL to Use**							
1169					95% Student's-t UCL	104.6						
1170												
1171					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
1172					Recommendations are based upon data size, data distribution, and skewness.							
1173					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
1174					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
1175												
1176												
1177	**Selenium**											
1178												
1179					**General Statistics**							
1180					Total Number of Observations	9				Number of Distinct Observations		4
1181					Number of Detects	0				Number of Non-Detects		9
1182					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
1183												
1184					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
1185					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
1186					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
1187												
1188					The data set for variable Selenium was not processed!							
1189												
1190												
1191	**Silver**											
1192												
1193					**General Statistics**							
1194					Total Number of Observations	9				Number of Distinct Observations		3
1195					Number of Detects	0				Number of Non-Detects		9
1196					Number of Distinct Detects	0				Number of Distinct Non-Detects		3
1197												
1198					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
1199					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
1200					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
1201												
1202					The data set for variable Silver was not processed!							
1203												
1204												
1205	**Thallium**											
1206												
1207					**General Statistics**							
1208					Total Number of Observations	9				Number of Distinct Observations		4
1209					Number of Detects	0				Number of Non-Detects		9
1210					Number of Distinct Detects	0				Number of Distinct Non-Detects		4
1211												
1212					Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!							
1213					Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!							
1214					The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).							
1215												
1216					The data set for variable Thallium was not processed!							

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Vanadium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	31.9	Mean	36.49
Maximum	41.3	Median	36.1
SD	3.482	Std. Error of Mean	1.161
Coefficient of Variation	0.0954	Skewness	0.176

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	38.65	95% Adjusted-CLT UCL (Chen-1995)	38.47
		95% Modified-t UCL (Johnson-1978)	38.66

Gamma GOF Test

A-D Test Statistic	0.291	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	124	k star (bias corrected MLE)	82.72
Theta hat (MLE)	0.294	Theta star (bias corrected MLE)	0.441
nu hat (MLE)	2232	nu star (bias corrected)	1489
MLE Mean (bias corrected)	36.49	MLE Sd (bias corrected)	4.012
		Approximate Chi Square Value (0.05)	1400
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	1382

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	38.8	95% Adjusted Gamma UCL (use when n<50)	39.31

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.463	Mean of logged Data	3.593
Maximum of Logged Data	3.721	SD of logged Data	0.0953

Assuming Lognormal Distribution

95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	39.97
95% Chebyshev (MVUE) UCL	41.54	97.5% Chebyshev (MVUE) UCL	43.73
99% Chebyshev (MVUE) UCL	48.03		

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1281	**Nonparametric Distribution Free UCL Statistics**											
1282	Data appear to follow a Discernible Distribution at 5% Significance Level											
1283												
1284	**Nonparametric Distribution Free UCLs**											
1285					95% CLT UCL	38.4				95% Jackknife UCL	38.65	
1286				95% Standard Bootstrap UCL		38.29				95% Bootstrap-t UCL	38.85	
1287				95% Hall's Bootstrap UCL		38.15				95% Percentile Bootstrap UCL	38.34	
1288				95% BCA Bootstrap UCL		38.19						
1289				90% Chebyshev(Mean, Sd) UCL		39.97				95% Chebyshev(Mean, Sd) UCL	41.55	
1290				97.5% Chebyshev(Mean, Sd) UCL		43.74				99% Chebyshev(Mean, Sd) UCL	48.04	
1291												
1292	**Suggested UCL to Use**											
1293					95% Student's-t UCL	38.65						
1294												
1295	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1296	Recommendations are based upon data size, data distribution, and skewness.											
1297	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1298	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
1299												
1300												
1301	**Zinc**											
1302												
1303	**General Statistics**											
1304					Total Number of Observations	9				Number of Distinct Observations	9	
1305										Number of Missing Observations	0	
1306					Minimum	47.9				Mean	72.82	
1307					Maximum	131				Median	66.6	
1308					SD	25.48				Std. Error of Mean	8.492	
1309					Coefficient of Variation	0.35				Skewness	1.651	
1310												
1311	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use											
1312	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.											
1313	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).											
1314	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
1315												
1316	**Normal GOF Test**											
1317					Shapiro Wilk Test Statistic	0.847			**Shapiro Wilk GOF Test**			
1318					5% Shapiro Wilk Critical Value	0.829			Data appear Normal at 5% Significance Level			
1319					Lilliefors Test Statistic	0.197			**Lilliefors GOF Test**			
1320					5% Lilliefors Critical Value	0.274			Data appear Normal at 5% Significance Level			
1321	Data appear Normal at 5% Significance Level											
1322												
1323	**Assuming Normal Distribution**											
1324	**95% Normal UCL**								**95% UCLs (Adjusted for Skewness)**			
1325					95% Student's-t UCL	88.61			95% Adjusted-CLT UCL (Chen-1995)		91.79	
1326									95% Modified-t UCL (Johnson-1978)		89.39	
1327												
1328	**Gamma GOF Test**											
1329					A-D Test Statistic	0.367			**Anderson-Darling Gamma GOF Test**			
1330					5% A-D Critical Value	0.722			Detected data appear Gamma Distributed at 5% Significance Level			
1331					K-S Test Statistic	0.162			**Kolmogorov-Smirnov Gamma GOF Test**			
1332					5% K-S Critical Value	0.279			Detected data appear Gamma Distributed at 5% Significance Level			
1333	Detected data appear Gamma Distributed at 5% Significance Level											
1334												
1335	**Gamma Statistics**											
1336					k hat (MLE)	11.03				k star (bias corrected MLE)	7.426	
1337					Theta hat (MLE)	6.603				Theta star (bias corrected MLE)	9.806	
1338					nu hat (MLE)	198.5				nu star (bias corrected)	133.7	
1339					MLE Mean (bias corrected)	72.82				MLE Sd (bias corrected)	26.72	
1340										Approximate Chi Square Value (0.05)	108	
1341					Adjusted Level of Significance	0.0231				Adjusted Chi Square Value	103.1	
1342												
1343	**Assuming Gamma Distribution**											
1344					95% Approximate Gamma UCL (use when n>=50))	90.16				95% Adjusted Gamma UCL (use when n<50)	94.42	

Table E1-2
Lakeside Residents and SBMM Road, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A	B	C	D	E	F	G	H	I	J	K	L
1345												
1346						**Lognormal GOF Test**						
1347					Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**					
1348					5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level					
1349					Lilliefors Test Statistic	0.142	**Lilliefors Lognormal GOF Test**					
1350					5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level					
1351						Data appear Lognormal at 5% Significance Level						
1352												
1353						**Lognormal Statistics**						
1354					Minimum of Logged Data	3.869			Mean of logged Data	4.242		
1355					Maximum of Logged Data	4.875			SD of logged Data	0.31		
1356												
1357						**Assuming Lognormal Distribution**						
1358					95% H-UCL	91.1			90% Chebyshev (MVUE) UCL	95.22		
1359					95% Chebyshev (MVUE) UCL	105.5			97.5% Chebyshev (MVUE) UCL	119.7		
1360					99% Chebyshev (MVUE) UCL	147.7						
1361												
1362						**Nonparametric Distribution Free UCL Statistics**						
1363						Data appear to follow a Discernible Distribution at 5% Significance Level						
1364												
1365						**Nonparametric Distribution Free UCLs**						
1366					95% CLT UCL	86.79			95% Jackknife UCL	88.61		
1367					95% Standard Bootstrap UCL	85.91			95% Bootstrap-t UCL	98.64		
1368					95% Hall's Bootstrap UCL	156.2			95% Percentile Bootstrap UCL	86.68		
1369					95% BCA Bootstrap UCL	92.27						
1370					90% Chebyshev(Mean, Sd) UCL	98.3			95% Chebyshev(Mean, Sd) UCL	109.8		
1371					97.5% Chebyshev(Mean, Sd) UCL	125.9			99% Chebyshev(Mean, Sd) UCL	157.3		
1372												
1373						**Suggested UCL to Use**						
1374					95% Student's-t UCL	88.61						
1375												
1376						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
1377						Recommendations are based upon data size, data distribution, and skewness.						
1378						These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).						
1379						However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.						
1380												

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/20/2019 11:42:54 AM
From File	SoilTopFill_Unclassified_ProUCLData_20191120.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	75	Number of Distinct Observations	58
		Number of Missing Observations	0
Minimum	5480	Mean	16653
Maximum	30100	Median	16600
SD	4217	Std. Error of Mean	486.9
Coefficient of Variation	0.253	Skewness	0.761

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.00529	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.102	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17464	95% Adjusted-CLT UCL (Chen-1995)	17499
		95% Modified-t UCL (Johnson-1978)	17471

Gamma GOF Test

A-D Test Statistic	0.952	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0884	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.103	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	15.6	k star (bias corrected MLE)	14.99
Theta hat (MLE)	1067	Theta star (bias corrected MLE)	1111
nu hat (MLE)	2341	nu star (bias corrected)	2248
MLE Mean (bias corrected)	16653	MLE Sd (bias corrected)	4301
		Approximate Chi Square Value (0.05)	2139
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	2137

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	17502	95% Adjusted Gamma UCL (use when n<50)	17519

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0141	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0975	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.102	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.609	Mean of logged Data	9.688
Maximum of Logged Data	10.31	SD of logged Data	0.263

Assuming Lognormal Distribution

95% H-UCL	17595	90% Chebyshev (MVUE) UCL	18222
95% Chebyshev (MVUE) UCL	18920	97.5% Chebyshev (MVUE) UCL	19890
99% Chebyshev (MVUE) UCL	21793		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	17454	95% Jackknife UCL	17464	
95% Standard Bootstrap UCL	17466	95% Bootstrap-t UCL	17560	
95% Hall's Bootstrap UCL	17526	95% Percentile Bootstrap UCL	17497	
95% BCA Bootstrap UCL	17456			
90% Chebyshev(Mean, Sd) UCL	18113	95% Chebyshev(Mean, Sd) UCL	18775	
97.5% Chebyshev(Mean, Sd) UCL	19694	99% Chebyshev(Mean, Sd) UCL	21497	
Suggested UCL to Use				
95% Student's-t UCL	17464			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	88	Number of Distinct Observations	23	
Number of Detects	35	Number of Non-Detects	53	
Number of Distinct Detects	22	Number of Distinct Non-Detects	1	
Minimum Detect	0.27	Minimum Non-Detect	3	
Maximum Detect	7.6	Maximum Non-Detect	3	
Variance Detects	4.475	Percent Non-Detects	60.23%	
Mean Detects	1.75	SD Detects	2.115	
Median Detects	1.2	CV Detects	1.209	
Skewness Detects	2.299	Kurtosis Detects	3.976	
Mean of Logged Detects	0.12	SD of Logged Detects	0.876	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.577	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.311	KM Standard Error of Mean	0.168	
KM SD	1.417	95% KM (BCA) UCL	1.601	
95% KM (t) UCL	1.59	95% KM (Percentile Bootstrap) UCL	1.593	
95% KM (z) UCL	1.587	95% KM Bootstrap t UCL	1.677	
90% KM Chebyshev UCL	1.815	95% KM Chebyshev UCL	2.044	
97.5% KM Chebyshev UCL	2.361	99% KM Chebyshev UCL	2.984	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.683	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.771	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.278	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.152	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.278	k star (bias corrected MLE)	1.188	
Theta hat (MLE)	1.369	Theta star (bias corrected MLE)	1.473	
nu hat (MLE)	89.49	nu star (bias corrected)	83.15	
Mean (detects)	1.75			

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.436	
Maximum	7.6	Median	1.1	
SD	1.616	CV	1.126	
k hat (MLE)	0.791	k star (bias corrected MLE)	0.771	
Theta hat (MLE)	1.815	Theta star (bias corrected MLE)	1.861	
nu hat (MLE)	139.2	nu star (bias corrected)	135.8	
Adjusted Level of Significance (β)	0.0473			
Approximate Chi Square Value (135.78, α)	109.9	Adjusted Chi Square Value (135.78, β)	109.5	
95% Gamma Approximate UCL (use when n>=50)	1.774	95% Gamma Adjusted UCL (use when n<50)	1.781	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.311	SD (KM)	1.417	
Variance (KM)	2.008	SE of Mean (KM)	0.168	
k hat (KM)	0.856	k star (KM)	0.834	
nu hat (KM)	150.6	nu star (KM)	146.8	
theta hat (KM)	1.532	theta star (KM)	1.571	
80% gamma percentile (KM)	2.137	90% gamma percentile (KM)	3.155	
95% gamma percentile (KM)	4.188	99% gamma percentile (KM)	6.621	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (146.79, α)	119.8	Adjusted Chi Square Value (146.79, β)	119.4	
95% Gamma Approximate KM-UCL (use when n>=50)	1.606	95% Gamma Adjusted KM-UCL (use when n<50)	1.611	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.202	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.148	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.39	Mean in Log Scale	0.00111	
SD in Original Scale	1.478	SD in Log Scale	0.772	
95% t UCL (assumes normality of ROS data)	1.652	95% Percentile Bootstrap UCL	1.672	
95% BCA Bootstrap UCL	1.718	95% Bootstrap t UCL	1.727	
95% H-UCL (Log ROS)	1.599			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.0263	KM Geo Mean	0.974	
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.019	
KM Standard Error of Mean (logged)	0.11	95% H-UCL (KM -Log)	1.464	
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.019	
KM Standard Error of Mean (logged)	0.11			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.599	Mean in Log Scale	0.292	
SD in Original Scale	1.328	SD in Log Scale	0.565	
95% t UCL (Assumes normality)	1.835	95% H-Stat UCL	1.761	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	2.044			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	91	Number of Distinct Observations	50
Number of Detects	73	Number of Non-Detects	18
Number of Distinct Detects	49	Number of Distinct Non-Detects	1
Minimum Detect	0.29	Minimum Non-Detect	0.5
Maximum Detect	7.2	Maximum Non-Detect	0.5
Variance Detects	5.961	Percent Non-Detects	19.78%
Mean Detects	2.509	SD Detects	2.441
Median Detects	1.1	CV Detects	0.973
Skewness Detects	0.896	Kurtosis Detects	-1.081
Mean of Logged Detects	0.455	SD of Logged Detects	0.956

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.702	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.095	KM Standard Error of Mean	0.246
KM SD	2.327	95% KM (BCA) UCL	2.49
95% KM (t) UCL	2.503	95% KM (Percentile Bootstrap) UCL	2.496
95% KM (z) UCL	2.499	95% KM Bootstrap t UCL	2.527
90% KM Chebyshev UCL	2.832	95% KM Chebyshev UCL	3.166
97.5% KM Chebyshev UCL	3.629	99% KM Chebyshev UCL	4.539

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.459	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.776	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.25	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.107	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.214	k star (bias corrected MLE)	1.173
Theta hat (MLE)	2.066	Theta star (bias corrected MLE)	2.138
nu hat (MLE)	177.3	nu star (bias corrected)	171.3
Mean (detects)	2.509		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.024
Maximum	7.2	Median	0.96
SD	2.395	CV	1.183
k hat (MLE)	0.571	k star (bias corrected MLE)	0.56
Theta hat (MLE)	3.541	Theta star (bias corrected MLE)	3.614
nu hat (MLE)	104	nu star (bias corrected)	101.9
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (101.91, α)	79.62	Adjusted Chi Square Value (101.91, β)	79.3
95% Gamma Approximate UCL (use when n>=50)	2.59	95% Gamma Adjusted UCL (use when n<50)	2.601

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	2.095	SD (KM)	2.327
Variance (KM)	5.413	SE of Mean (KM)	0.246
k hat (KM)	0.81	k star (KM)	0.791

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (KM)	147.5	nu star (KM)	144
	theta hat (KM)	2.584	theta star (KM)	2.648
	80% gamma percentile (KM)	3.425	90% gamma percentile (KM)	5.107
	95% gamma percentile (KM)	6.822	99% gamma percentile (KM)	10.88
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (143.98, α)	117.2	Adjusted Chi Square Value (143.98, β)	116.9
	95% Gamma Approximate KM-UCL (use when n>=50)	2.572	95% Gamma Adjusted KM-UCL (use when n<50)	2.581
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.839	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	8.455E-11	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.201	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	2.074	Mean in Log Scale	0.113
	SD in Original Scale	2.356	SD in Log Scale	1.12
	95% t UCL (assumes normality of ROS data)	2.484	95% Percentile Bootstrap UCL	2.463
	95% BCA Bootstrap UCL	2.531	95% Bootstrap t UCL	2.523
	95% H-UCL (Log ROS)	2.769		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	0.187	KM Geo Mean	1.206
	KM SD (logged)	1.009	95% Critical H Value (KM-Log)	2.254
	KM Standard Error of Mean (logged)	0.108	95% H-UCL (KM -Log)	2.551
	KM SD (logged)	1.009	95% Critical H Value (KM-Log)	2.254
	KM Standard Error of Mean (logged)	0.108		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	2.062	Mean in Log Scale	0.0905
	SD in Original Scale	2.364	SD in Log Scale	1.129
	95% t UCL (Assumes normality)	2.474	95% H-Stat UCL	2.745
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	3.166		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Barium			
	General Statistics			
	Total Number of Observations	75	Number of Distinct Observations	65
			Number of Missing Observations	0
	Minimum	32.2	Mean	112.8
	Maximum	362	Median	96
	SD	59.61	Std. Error of Mean	6.883
	Coefficient of Variation	0.528	Skewness	2.326
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.738	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	124.3		95% Adjusted-CLT UCL (Chen-1995)	126.1
			95% Modified-t UCL (Johnson-1978)	124.6
Gamma GOF Test				
A-D Test Statistic	3.396		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.197		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.103		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	5.289		k star (bias corrected MLE)	5.086
Theta hat (MLE)	21.34		Theta star (bias corrected MLE)	22.19
nu hat (MLE)	793.3		nu star (bias corrected)	762.9
MLE Mean (bias corrected)	112.8		MLE Sd (bias corrected)	50.04
			Approximate Chi Square Value (0.05)	699.8
Adjusted Level of Significance	0.0468		Adjusted Chi Square Value	698.7
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	123		95% Adjusted Gamma UCL (use when n<50)	123.2
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.927		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.5780E-4		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.163		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.102		Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.472		Mean of logged Data	4.629
Maximum of Logged Data	5.892		SD of logged Data	0.418
Assuming Lognormal Distribution				
95% H-UCL	122		90% Chebyshev (MVUE) UCL	128.4
95% Chebyshev (MVUE) UCL	136		97.5% Chebyshev (MVUE) UCL	146.5
99% Chebyshev (MVUE) UCL	167.3			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	124.2		95% Jackknife UCL	124.3
95% Standard Bootstrap UCL	123.9		95% Bootstrap-t UCL	127.3
95% Hall's Bootstrap UCL	127.1		95% Percentile Bootstrap UCL	124.7
95% BCA Bootstrap UCL	125.5			
90% Chebyshev(Mean, Sd) UCL	133.5		95% Chebyshev(Mean, Sd) UCL	142.8
97.5% Chebyshev(Mean, Sd) UCL	155.8		99% Chebyshev(Mean, Sd) UCL	181.3
Suggested UCL to Use				
95% Student's-t UCL	124.3		or 95% Modified-t UCL	124.6
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium				
General Statistics				
Total Number of Observations	75		Number of Distinct Observations	28
Number of Detects	49		Number of Non-Detects	26
Number of Distinct Detects	28		Number of Distinct Non-Detects	1

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	0.07	Minimum Non-Detect	0.25
Maximum Detect	7.3	Maximum Non-Detect	0.25
Variance Detects	1.043	Percent Non-Detects	34.67%
Mean Detects	0.508	SD Detects	1.021
Median Detects	0.27	CV Detects	2.012
Skewness Detects	6.386	Kurtosis Detects	42.97
Mean of Logged Detects	-1.109	SD of Logged Detects	0.712
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.308	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.334	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.401	KM Standard Error of Mean	0.097
KM SD	0.831	95% KM (BCA) UCL	0.599
95% KM (t) UCL	0.563	95% KM (Percentile Bootstrap) UCL	0.587
95% KM (z) UCL	0.561	95% KM Bootstrap t UCL	0.96
90% KM Chebyshev UCL	0.693	95% KM Chebyshev UCL	0.824
97.5% KM Chebyshev UCL	1.007	99% KM Chebyshev UCL	1.367
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.397	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.772	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.259	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.129	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.302	k star (bias corrected MLE)	1.236
Theta hat (MLE)	0.39	Theta star (bias corrected MLE)	0.411
nu hat (MLE)	127.6	nu star (bias corrected)	121.1
Mean (detects)	0.508		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.345
Maximum	7.3	Median	0.23
SD	0.853	CV	2.474
k hat (MLE)	0.593	k star (bias corrected MLE)	0.578
Theta hat (MLE)	0.582	Theta star (bias corrected MLE)	0.597
nu hat (MLE)	88.95	nu star (bias corrected)	86.73
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (86.73, α)	66.26	Adjusted Chi Square Value (86.73, β)	65.91
95% Gamma Approximate UCL (use when n>=50)	0.452	95% Gamma Adjusted UCL (use when n<50)	0.454
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.401	SD (KM)	0.831
Variance (KM)	0.69	SE of Mean (KM)	0.097
k hat (KM)	0.234	k star (KM)	0.233
nu hat (KM)	35.05	nu star (KM)	34.98
theta hat (KM)	1.718	theta star (KM)	1.721
80% gamma percentile (KM)	0.568	90% gamma percentile (KM)	1.21
95% gamma percentile (KM)	1.983	99% gamma percentile (KM)	4.062
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (34.98, α)	22.45	Adjusted Chi Square Value (34.98, β)	22.26
95% Gamma Approximate KM-UCL (use when n>=50)	0.626	95% Gamma Adjusted KM-UCL (use when n<50)	0.631

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.844	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.126	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.393	Mean in Log Scale	-1.347	
SD in Original Scale	0.838	SD in Log Scale	0.699	
95% t UCL (assumes normality of ROS data)	0.555	95% Percentile Bootstrap UCL	0.583	
95% BCA Bootstrap UCL	0.689	95% Bootstrap t UCL	0.948	
95% H-UCL (Log ROS)	0.39			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.293	KM Geo Mean	0.274	
KM SD (logged)	0.649	95% Critical H Value (KM-Log)	1.952	
KM Standard Error of Mean (logged)	0.0827	95% H-UCL (KM -Log)	0.393	
KM SD (logged)	0.649	95% Critical H Value (KM-Log)	1.952	
KM Standard Error of Mean (logged)	0.0827			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.375	Mean in Log Scale	-1.445	
SD in Original Scale	0.843	SD in Log Scale	0.739	
95% t UCL (Assumes normality)	0.537	95% H-Stat UCL	0.368	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.824			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	75	Number of Distinct Observations	11	
Number of Detects	14	Number of Non-Detects	61	
Number of Distinct Detects	10	Number of Distinct Non-Detects	1	
Minimum Detect	0.08	Minimum Non-Detect	0.25	
Maximum Detect	0.84	Maximum Non-Detect	0.25	
Variance Detects	0.039	Percent Non-Detects	81.33%	
Mean Detects	0.284	SD Detects	0.197	
Median Detects	0.24	CV Detects	0.696	
Skewness Detects	1.827	Kurtosis Detects	4.282	
Mean of Logged Detects	-1.452	SD of Logged Detects	0.637	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.193	KM Standard Error of Mean	0.0217	
KM SD	0.107	95% KM (BCA) UCL	0.229	
95% KM (t) UCL	0.229	95% KM (Percentile Bootstrap) UCL	0.231	
95% KM (z) UCL	0.229	95% KM Bootstrap t UCL	0.235	

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% KM Chebyshev UCL	0.258	95% KM Chebyshev UCL	0.288
97.5% KM Chebyshev UCL	0.329	99% KM Chebyshev UCL	0.409
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.289	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.169	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.231	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.763	k star (bias corrected MLE)	2.218
Theta hat (MLE)	0.103	Theta star (bias corrected MLE)	0.128
nu hat (MLE)	77.35	nu star (bias corrected)	62.11
Mean (detects)	0.284		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0136	Mean	0.192
Maximum	0.84	Median	0.172
SD	0.127	CV	0.66
k hat (MLE)	2.461	k star (bias corrected MLE)	2.372
Theta hat (MLE)	0.0779	Theta star (bias corrected MLE)	0.0808
nu hat (MLE)	369.2	nu star (bias corrected)	355.7
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (355.74, α)	313	Adjusted Chi Square Value (355.74, β)	312.3
95% Gamma Approximate UCL (use when n>=50)	0.218	95% Gamma Adjusted UCL (use when n<50)	0.218
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.193	SD (KM)	0.107
Variance (KM)	0.0114	SE of Mean (KM)	0.0217
k hat (KM)	3.268	k star (KM)	3.147
nu hat (KM)	490.3	nu star (KM)	472
theta hat (KM)	0.0591	theta star (KM)	0.0613
80% gamma percentile (KM)	0.274	90% gamma percentile (KM)	0.339
95% gamma percentile (KM)	0.4	99% gamma percentile (KM)	0.531
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (471.99, α)	422.6	Adjusted Chi Square Value (471.99, β)	421.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.216	95% Gamma Adjusted KM-UCL (use when n<50)	0.216
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.195	Mean in Log Scale	-1.769
SD in Original Scale	0.115	SD in Log Scale	0.509
95% t UCL (assumes normality of ROS data)	0.217	95% Percentile Bootstrap UCL	0.219
95% BCA Bootstrap UCL	0.222	95% Bootstrap t UCL	0.222
95% H-UCL (Log ROS)	0.217		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.755	KM Geo Mean	0.173
KM SD (logged)	0.454	95% Critical H Value (KM-Log)	1.827
KM Standard Error of Mean (logged)	0.126	95% H-UCL (KM -Log)	0.211
KM SD (logged)	0.454	95% Critical H Value (KM-Log)	1.827
KM Standard Error of Mean (logged)	0.126		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.155	Mean in Log Scale	-1.962
	SD in Original Scale	0.104	SD in Log Scale	0.363
	95% t UCL (Assumes normality)	0.175	95% H-Stat UCL	0.162
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Gamma Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM Approximate Gamma UCL	0.216	95% GROS Approximate Gamma UCL	0.218
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Chromium			
	General Statistics			
	Total Number of Observations	75	Number of Distinct Observations	65
			Number of Missing Observations	0
	Minimum	5.7	Mean	36.4
	Maximum	134	Median	18.1
	SD	36.3	Std. Error of Mean	4.191
	Coefficient of Variation	0.997	Skewness	1.408
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.7	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	43.38	95% Adjusted-CLT UCL (Chen-1995)	44.02
			95% Modified-t UCL (Johnson-1978)	43.49
	Gamma GOF Test			
	A-D Test Statistic	6.685	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.772	Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.276	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level	
	Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	1.412	k star (bias corrected MLE)	1.365
	Theta hat (MLE)	25.77	Theta star (bias corrected MLE)	26.67
	nu hat (MLE)	211.8	nu star (bias corrected)	204.7
	MLE Mean (bias corrected)	36.4	MLE Sd (bias corrected)	31.16
			Approximate Chi Square Value (0.05)	172.6
	Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	172
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	43.17	95% Adjusted Gamma UCL (use when n<50)	43.31
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk P Value	3.768E-11	Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.227	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level	

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.74	Mean of logged Data	3.2	
Maximum of Logged Data	4.898	SD of logged Data	0.839	
Assuming Lognormal Distribution				
95% H-UCL	42.87	90% Chebyshev (MVUE) UCL	46.18	
95% Chebyshev (MVUE) UCL	51.38	97.5% Chebyshev (MVUE) UCL	58.61	
99% Chebyshev (MVUE) UCL	72.81			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	43.29	95% Jackknife UCL	43.38	
95% Standard Bootstrap UCL	43.14	95% Bootstrap-t UCL	44.2	
95% Hall's Bootstrap UCL	44.31	95% Percentile Bootstrap UCL	43.48	
95% BCA Bootstrap UCL	44.68			
90% Chebyshev(Mean, Sd) UCL	48.97	95% Chebyshev(Mean, Sd) UCL	54.67	
97.5% Chebyshev(Mean, Sd) UCL	62.57	99% Chebyshev(Mean, Sd) UCL	78.1	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	54.67			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt				
General Statistics				
Total Number of Observations	75	Number of Distinct Observations	52	
Number of Detects	70	Number of Non-Detects	5	
Number of Distinct Detects	51	Number of Distinct Non-Detects	1	
Minimum Detect	1.4	Minimum Non-Detect	2.5	
Maximum Detect	49.3	Maximum Non-Detect	2.5	
Variance Detects	62	Percent Non-Detects	6.667%	
Mean Detects	8.731	SD Detects	7.874	
Median Detects	5.6	CV Detects	0.902	
Skewness Detects	2.478	Kurtosis Detects	9.295	
Mean of Logged Detects	1.867	SD of Logged Detects	0.753	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.748	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	2.220E-16	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.106	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	8.276	KM Standard Error of Mean	0.901	
KM SD	7.743	95% KM (BCA) UCL	9.934	
95% KM (t) UCL	9.776	95% KM (Percentile Bootstrap) UCL	9.81	
95% KM (z) UCL	9.758	95% KM Bootstrap t UCL	10.22	
90% KM Chebyshev UCL	10.98	95% KM Chebyshev UCL	12.2	
97.5% KM Chebyshev UCL	13.9	99% KM Chebyshev UCL	17.24	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.645	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.156	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.108	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	1.814	k star (bias corrected MLE)	1.745	
Theta hat (MLE)	4.814	Theta star (bias corrected MLE)	5.002	
nu hat (MLE)	253.9	nu star (bias corrected)	244.4	
Mean (detects)	8.731			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	8.15	
Maximum	49.3	Median	5.1	
SD	7.913	CV	0.971	
k hat (MLE)	0.884	k star (bias corrected MLE)	0.857	
Theta hat (MLE)	9.22	Theta star (bias corrected MLE)	9.505	
nu hat (MLE)	132.6	nu star (bias corrected)	128.6	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (128.62, α)	103.4	Adjusted Chi Square Value (128.62, β)	103	
95% Gamma Approximate UCL (use when n>=50)	10.14	95% Gamma Adjusted UCL (use when n<50)	10.18	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	8.276	SD (KM)	7.743	
Variance (KM)	59.96	SE of Mean (KM)	0.901	
k hat (KM)	1.142	k star (KM)	1.106	
nu hat (KM)	171.3	nu star (KM)	165.8	
theta hat (KM)	7.245	theta star (KM)	7.486	
80% gamma percentile (KM)	13.21	90% gamma percentile (KM)	18.59	
95% gamma percentile (KM)	23.93	99% gamma percentile (KM)	36.25	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (165.83, α)	137.1	Adjusted Chi Square Value (165.83, β)	136.5	
95% Gamma Approximate KM-UCL (use when n>=50)	10.01	95% Gamma Adjusted KM-UCL (use when n<50)	10.05	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.939	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.00321	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.106	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	8.248	Mean in Log Scale	1.767	
SD in Original Scale	7.819	SD in Log Scale	0.821	
95% t UCL (assumes normality of ROS data)	9.752	95% Percentile Bootstrap UCL	9.776	
95% BCA Bootstrap UCL	9.937	95% Bootstrap t UCL	10.01	
95% H-UCL (Log ROS)	10.01			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.783	KM Geo Mean	5.95	
KM SD (logged)	0.789	95% Critical H Value (KM-Log)	2.065	
KM Standard Error of Mean (logged)	0.0924	95% H-UCL (KM -Log)	9.815	
KM SD (logged)	0.789	95% Critical H Value (KM-Log)	2.065	
KM Standard Error of Mean (logged)	0.0924			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	8.233	Mean in Log Scale	1.757	
SD in Original Scale	7.832	SD in Log Scale	0.836	
95% t UCL (Assumes normality)	9.739	95% H-Stat UCL	10.09	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	12.2			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper				
General Statistics				
Total Number of Observations	75	Number of Distinct Observations	51	
		Number of Missing Observations	0	
Minimum	4	Mean	16.43	
Maximum	55.2	Median	9.1	
SD	14.55	Std. Error of Mean	1.68	
Coefficient of Variation	0.885	Skewness	1.342	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.636	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.4	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	19.23	95% Adjusted-CLT UCL (Chen-1995)	19.48	
		95% Modified-t UCL (Johnson-1978)	19.28	
Gamma GOF Test				
A-D Test Statistic	11.22	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.765	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.362	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.105	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.86	k star (bias corrected MLE)	1.795	
Theta hat (MLE)	8.834	Theta star (bias corrected MLE)	9.156	
nu hat (MLE)	279.1	nu star (bias corrected)	269.2	
MLE Mean (bias corrected)	16.43	MLE Sd (bias corrected)	12.27	
		Approximate Chi Square Value (0.05)	232.2	
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	231.6	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	19.05	95% Adjusted Gamma UCL (use when n<50)	19.11	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.73	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.326	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.386	Mean of logged Data	2.507	
Maximum of Logged Data	4.011	SD of logged Data	0.705	
Assuming Lognormal Distribution				
95% H-UCL	18.52	90% Chebyshev (MVUE) UCL	19.89	
95% Chebyshev (MVUE) UCL	21.8	97.5% Chebyshev (MVUE) UCL	24.46	

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	29.67		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	19.2	95% Jackknife UCL	19.23
95% Standard Bootstrap UCL	19.22	95% Bootstrap-t UCL	19.45
95% Hall's Bootstrap UCL	19.46	95% Percentile Bootstrap UCL	19.23
95% BCA Bootstrap UCL	19.52		
90% Chebyshev(Mean, Sd) UCL	21.48	95% Chebyshev(Mean, Sd) UCL	23.76
97.5% Chebyshev(Mean, Sd) UCL	26.93	99% Chebyshev(Mean, Sd) UCL	33.15
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	23.76		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Hexavalent Chromium			
General Statistics			
Total Number of Observations	16	Number of Distinct Observations	15
Number of Detects	8	Number of Non-Detects	8
Number of Distinct Detects	8	Number of Distinct Non-Detects	7
Minimum Detect	0.88	Minimum Non-Detect	5.5
Maximum Detect	23	Maximum Non-Detect	27.5
Variance Detects	57.63	Percent Non-Detects	50%
Mean Detects	4.259	SD Detects	7.591
Median Detects	1.75	CV Detects	1.782
Skewness Detects	2.801	Kurtosis Detects	7.883
Mean of Logged Detects	0.738	SD of Logged Detects	1.036
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.485	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.477	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	3.111	KM Standard Error of Mean	1.589
KM SD	5.54	95% KM (BCA) UCL	6.166
95% KM (t) UCL	5.896	95% KM (Percentile Bootstrap) UCL	5.941
95% KM (z) UCL	5.724	95% KM Bootstrap t UCL	19.83
90% KM Chebyshev UCL	7.877	95% KM Chebyshev UCL	10.04
97.5% KM Chebyshev UCL	13.03	99% KM Chebyshev UCL	18.92
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.439	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.742	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.425	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.303	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.83	k star (bias corrected MLE)	0.602
Theta hat (MLE)	5.129	Theta star (bias corrected MLE)	7.071
nu hat (MLE)	13.28	nu star (bias corrected)	9.636
Mean (detects)	4.259		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01		Mean	2.868
Maximum	23		Median	1.45
SD	5.419		CV	1.89
k hat (MLE)	0.771		k star (bias corrected MLE)	0.668
Theta hat (MLE)	3.721		Theta star (bias corrected MLE)	4.294
nu hat (MLE)	24.66		nu star (bias corrected)	21.37
Adjusted Level of Significance (β)	0.0335			
Approximate Chi Square Value (21.37, α)	11.87		Adjusted Chi Square Value (21.37, β)	11.07
95% Gamma Approximate UCL (use when n>=50)	5.164		95% Gamma Adjusted UCL (use when n<50)	5.538
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	3.111		SD (KM)	5.54
Variance (KM)	30.69		SE of Mean (KM)	1.589
k hat (KM)	0.315		k star (KM)	0.298
nu hat (KM)	10.09		nu star (KM)	9.535
theta hat (KM)	9.864		theta star (KM)	10.44
80% gamma percentile (KM)	4.763		90% gamma percentile (KM)	9.184
95% gamma percentile (KM)	14.26		99% gamma percentile (KM)	27.48
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (9.53, α)	3.653		Adjusted Chi Square Value (9.53, β)	3.249
95% Gamma Approximate KM-UCL (use when n>=50)	8.121		95% Gamma Adjusted KM-UCL (use when n<50)	9.13
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.743		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818		Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.338		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283		Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	3.01		Mean in Log Scale	0.642
SD in Original Scale	5.35		SD in Log Scale	0.729
95% t UCL (assumes normality of ROS data)	5.355		95% Percentile Bootstrap UCL	5.623
95% BCA Bootstrap UCL	7.035		95% Bootstrap t UCL	22.02
95% H-UCL (Log ROS)	3.836			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.591		KM Geo Mean	1.805
KM SD (logged)	0.789		95% Critical H Value (KM-Log)	2.397
KM Standard Error of Mean (logged)	0.244		95% H-UCL (KM -Log)	4.017
KM SD (logged)	0.789		95% Critical H Value (KM-Log)	2.397
KM Standard Error of Mean (logged)	0.244			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	6.379		Mean in Log Scale	1.34
SD in Original Scale	6.498		SD in Log Scale	1.066
95% t UCL (Assumes normality)	9.227		95% H-Stat UCL	14.59
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	10.04			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Iron

General Statistics			
Total Number of Observations	75	Number of Distinct Observations	59
		Number of Missing Observations	0
Minimum	4350	Mean	16677
Maximum	42800	Median	12300
SD	9893	Std. Error of Mean	1142
Coefficient of Variation	0.593	Skewness	1.258
Normal GOF Test			
Shapiro Wilk Test Statistic	0.791	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	8.438E-15	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	18580	95% Adjusted-CLT UCL (Chen-1995)	18733
		95% Modified-t UCL (Johnson-1978)	18607
Gamma GOF Test			
A-D Test Statistic	3.859	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.757	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.172	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.602	k star (bias corrected MLE)	3.466
Theta hat (MLE)	4630	Theta star (bias corrected MLE)	4811
nu hat (MLE)	540.2	nu star (bias corrected)	520
MLE Mean (bias corrected)	16677	MLE Sd (bias corrected)	8957
		Approximate Chi Square Value (0.05)	468.1
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	467.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18525	95% Adjusted Gamma UCL (use when n<50)	18563
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	7.7352E-6	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.378	Mean of logged Data	9.577
Maximum of Logged Data	10.66	SD of logged Data	0.522
Assuming Lognormal Distribution			
95% H-UCL	18517	90% Chebyshev (MVUE) UCL	19657
95% Chebyshev (MVUE) UCL	21088	97.5% Chebyshev (MVUE) UCL	23074
99% Chebyshev (MVUE) UCL	26976		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	18556	95% Jackknife UCL	18580
95% Standard Bootstrap UCL	18522	95% Bootstrap-t UCL	18977
95% Hall's Bootstrap UCL	18714	95% Percentile Bootstrap UCL	18615

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	95% BCA Bootstrap UCL	18577		
	90% Chebyshev(Mean, Sd) UCL	20104	95% Chebyshev(Mean, Sd) UCL	21656
	97.5% Chebyshev(Mean, Sd) UCL	23811	99% Chebyshev(Mean, Sd) UCL	28043
	Suggested UCL to Use			
	95% Chebyshev (Mean, Sd) UCL	21656		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Lead			
	General Statistics			
	Total Number of Observations	75	Number of Distinct Observations	41
			Number of Missing Observations	0
	Minimum	1.4	Mean	5.176
	Maximum	28.3	Median	3.5
	SD	4.125	Std. Error of Mean	0.476
	Coefficient of Variation	0.797	Skewness	3.035
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.688	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.281	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	5.969	95% Adjusted-CLT UCL (Chen-1995)	6.138
			95% Modified-t UCL (Johnson-1978)	5.997
	Gamma GOF Test			
	A-D Test Statistic	4.407	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.76	Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.231	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
	Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	2.706	k star (bias corrected MLE)	2.606
	Theta hat (MLE)	1.913	Theta star (bias corrected MLE)	1.986
	nu hat (MLE)	405.8	nu star (bias corrected)	390.9
	MLE Mean (bias corrected)	5.176	MLE Sd (bias corrected)	3.206
			Approximate Chi Square Value (0.05)	346.1
	Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	345.3
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	5.846	95% Adjusted Gamma UCL (use when n<50)	5.86
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk P Value	1.8170E-6	Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.192	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level	
	Data Not Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	0.336	Mean of logged Data	1.448
	Maximum of Logged Data	3.343	SD of logged Data	0.58
	Assuming Lognormal Distribution			

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL	5.723	90% Chebyshev (MVUE) UCL	6.1
95% Chebyshev (MVUE) UCL	6.59	97.5% Chebyshev (MVUE) UCL	7.269
99% Chebyshev (MVUE) UCL	8.603		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5.959	95% Jackknife UCL	5.969
95% Standard Bootstrap UCL	5.973	95% Bootstrap-t UCL	6.224
95% Hall's Bootstrap UCL	6.471	95% Percentile Bootstrap UCL	5.988
95% BCA Bootstrap UCL	6.152		
90% Chebyshev(Mean, Sd) UCL	6.605	95% Chebyshev(Mean, Sd) UCL	7.252
97.5% Chebyshev(Mean, Sd) UCL	8.151	99% Chebyshev(Mean, Sd) UCL	9.915
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	7.252		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	75	Number of Distinct Observations	64
		Number of Missing Observations	0
Minimum	90	Mean	353.9
Maximum	1930	Median	225
SD	296.1	Std. Error of Mean	34.19
Coefficient of Variation	0.837	Skewness	3.077
Normal GOF Test			
Shapiro Wilk Test Statistic	0.666	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	410.9	95% Adjusted-CLT UCL (Chen-1995)	423.1
		95% Modified-t UCL (Johnson-1978)	412.9
Gamma GOF Test			
A-D Test Statistic	4.41	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.54	k star (bias corrected MLE)	2.447
Theta hat (MLE)	139.3	Theta star (bias corrected MLE)	144.6
nu hat (MLE)	381	nu star (bias corrected)	367.1
MLE Mean (bias corrected)	353.9	MLE Sd (bias corrected)	226.2
		Approximate Chi Square Value (0.05)	323.7
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	322.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	401.4	95% Adjusted Gamma UCL (use when n<50)	402.4
Lognormal GOF Test			

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	1.0550E-6	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.5	Mean of logged Data	5.66	
Maximum of Logged Data	7.565	SD of logged Data	0.596	
Assuming Lognormal Distribution				
95% H-UCL	391.6	90% Chebyshev (MVUE) UCL	417.8	
95% Chebyshev (MVUE) UCL	452.2	97.5% Chebyshev (MVUE) UCL	500	
99% Chebyshev (MVUE) UCL	593.7			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	410.2	95% Jackknife UCL	410.9	
95% Standard Bootstrap UCL	410.6	95% Bootstrap-t UCL	429.5	
95% Hall's Bootstrap UCL	446	95% Percentile Bootstrap UCL	418.3	
95% BCA Bootstrap UCL	429.7			
90% Chebyshev(Mean, Sd) UCL	456.5	95% Chebyshev(Mean, Sd) UCL	503	
97.5% Chebyshev(Mean, Sd) UCL	567.4	99% Chebyshev(Mean, Sd) UCL	694.1	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	503			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury				
General Statistics				
Total Number of Observations	91	Number of Distinct Observations	21	
Number of Detects	83	Number of Non-Detects	8	
Number of Distinct Detects	21	Number of Distinct Non-Detects	1	
Minimum Detect	0.04	Minimum Non-Detect	0.05	
Maximum Detect	9.3	Maximum Non-Detect	0.05	
Variance Detects	1.027	Percent Non-Detects	8.791%	
Mean Detects	0.236	SD Detects	1.014	
Median Detects	0.11	CV Detects	4.301	
Skewness Detects	8.942	Kurtosis Detects	80.83	
Mean of Logged Detects	-2.197	SD of Logged Detects	0.715	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.159	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.458	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0974	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.218	KM Standard Error of Mean	0.102	
KM SD	0.964	95% KM (BCA) UCL	0.416	
95% KM (t) UCL	0.387	95% KM (Percentile Bootstrap) UCL	0.416	
95% KM (z) UCL	0.386	95% KM Bootstrap t UCL	2.134	
90% KM Chebyshev UCL	0.523	95% KM Chebyshev UCL	0.661	
97.5% KM Chebyshev UCL	0.853	99% KM Chebyshev UCL	1.23	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	14.78	**Anderson-Darling GOF Test**		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% A-D Critical Value	0.791	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.366	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.102	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.791	k star (bias corrected MLE)	0.771
	Theta hat (MLE)	0.298	Theta star (bias corrected MLE)	0.306
	nu hat (MLE)	131.3	nu star (bias corrected)	127.9
	Mean (detects)	0.236		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.216
	Maximum	9.3	Median	0.1
	SD	0.97	CV	4.492
	k hat (MLE)	0.692	k star (bias corrected MLE)	0.676
	Theta hat (MLE)	0.312	Theta star (bias corrected MLE)	0.319
	nu hat (MLE)	125.9	nu star (bias corrected)	123.1
	Adjusted Level of Significance (β)	0.0474		
	Approximate Chi Square Value (123.09, α)	98.47	Adjusted Chi Square Value (123.09, β)	98.11
	95% Gamma Approximate UCL (use when n>=50)	0.27	95% Gamma Adjusted UCL (use when n<50)	0.271
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.218	SD (KM)	0.964
	Variance (KM)	0.929	SE of Mean (KM)	0.102
	k hat (KM)	0.0514	k star (KM)	0.057
	nu hat (KM)	9.353	nu star (KM)	10.38
	theta hat (KM)	4.251	theta star (KM)	3.831
	80% gamma percentile (KM)	0.0455	90% gamma percentile (KM)	0.39
	95% gamma percentile (KM)	1.21	99% gamma percentile (KM)	4.504
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (10.38, α)	4.179	Adjusted Chi Square Value (10.38, β)	4.116
	95% Gamma Approximate KM-UCL (use when n>=50)	0.542	95% Gamma Adjusted KM-UCL (use when n<50)	0.551
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.761	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0974	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.218	Mean in Log Scale	-2.312
	SD in Original Scale	0.969	SD in Log Scale	0.781
	95% t UCL (assumes normality of ROS data)	0.386	95% Percentile Bootstrap UCL	0.415
	95% BCA Bootstrap UCL	0.543	95% Bootstrap t UCL	2.09
	95% H-UCL (Log ROS)	0.159		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-2.286	KM Geo Mean	0.102
	KM SD (logged)	0.738	95% Critical H Value (KM-Log)	2.041
	KM Standard Error of Mean (logged)	0.0778	95% H-UCL (KM -Log)	0.156
	KM SD (logged)	0.738	95% Critical H Value (KM-Log)	2.041
	KM Standard Error of Mean (logged)	0.0778		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.217	Mean in Log Scale	-2.328
	SD in Original Scale	0.969	SD in Log Scale	0.804

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (Assumes normality)	0.386	95% H-Stat UCL	0.161
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.661		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	75	Number of Distinct Observations	60
		Number of Missing Observations	0
Minimum	2.8	Mean	37.82
Maximum	194	Median	9
SD	55.27	Std. Error of Mean	6.382
Coefficient of Variation	1.461	Skewness	1.554
Normal GOF Test			
Shapiro Wilk Test Statistic	0.62	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.374	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	48.45	95% Adjusted-CLT UCL (Chen-1995)	49.54
		95% Modified-t UCL (Johnson-1978)	48.64
Gamma GOF Test			
A-D Test Statistic	9.5	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.801	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.341	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.108	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.666	k star (bias corrected MLE)	0.648
Theta hat (MLE)	56.81	Theta star (bias corrected MLE)	58.37
nu hat (MLE)	99.85	nu star (bias corrected)	97.19
MLE Mean (bias corrected)	37.82	MLE Sd (bias corrected)	46.98
		Approximate Chi Square Value (0.05)	75.45
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	75.08
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	48.72	95% Adjusted Gamma UCL (use when n<50)	48.96
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	5.551E-16	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.03	Mean of logged Data	2.719
Maximum of Logged Data	5.268	SD of logged Data	1.262

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Assuming Lognormal Distribution			
	95% H-UCL	48.7	90% Chebyshev (MVUE) UCL	51.46
	95% Chebyshev (MVUE) UCL	59.82	97.5% Chebyshev (MVUE) UCL	71.44
	99% Chebyshev (MVUE) UCL	94.25		
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution (0.05)			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	48.32	95% Jackknife UCL	48.45
	95% Standard Bootstrap UCL	48.34	95% Bootstrap-t UCL	50.28
	95% Hall's Bootstrap UCL	49.59	95% Percentile Bootstrap UCL	48.05
	95% BCA Bootstrap UCL	49.51		
	90% Chebyshev(Mean, Sd) UCL	56.97	95% Chebyshev(Mean, Sd) UCL	65.64
	97.5% Chebyshev(Mean, Sd) UCL	77.68	99% Chebyshev(Mean, Sd) UCL	101.3
	Suggested UCL to Use			
	95% Chebyshev (Mean, Sd) UCL	65.64		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Selenium			
	General Statistics			
	Total Number of Observations	75	Number of Distinct Observations	6
	Number of Detects	7	Number of Non-Detects	68
	Number of Distinct Detects	5	Number of Distinct Non-Detects	1
	Minimum Detect	0.34	Minimum Non-Detect	1.75
	Maximum Detect	1.1	Maximum Non-Detect	1.75
	Variance Detects	0.144	Percent Non-Detects	90.67%
	Mean Detects	0.696	SD Detects	0.38
	Median Detects	0.46	CV Detects	0.546
	Skewness Detects	0.341	Kurtosis Detects	-2.756
	Mean of Logged Detects	-0.497	SD of Logged Detects	0.561
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.724	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	
	Detected Data appear Approximate Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.696	KM Standard Error of Mean	0.144
	KM SD	0.352	95% KM (BCA) UCL	0.94
	95% KM (t) UCL	0.935	95% KM (Percentile Bootstrap) UCL	0.94
	95% KM (z) UCL	0.932	95% KM Bootstrap t UCL	1.054
	90% KM Chebyshev UCL	1.126	95% KM Chebyshev UCL	1.321
	97.5% KM Chebyshev UCL	1.592	99% KM Chebyshev UCL	2.124
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.954	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.71	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.302	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data follow Appr. Gamma Distribution at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	3.887	k star (bias corrected MLE)	2.316
	Theta hat (MLE)	0.179	Theta star (bias corrected MLE)	0.3

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	54.41	nu star (bias corrected)	32.43
	Mean (detects)	0.696		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.0575	Mean	0.719
	Maximum	1.947	Median	0.649
	SD	0.408	CV	0.567
	k hat (MLE)	2.827	k star (bias corrected MLE)	2.723
	Theta hat (MLE)	0.254	Theta star (bias corrected MLE)	0.264
	nu hat (MLE)	424	nu star (bias corrected)	408.4
	Adjusted Level of Significance (β)	0.0468		
	Approximate Chi Square Value (408.41, α)	362.6	Adjusted Chi Square Value (408.41, β)	361.7
	95% Gamma Approximate UCL (use when n>=50)	0.81	95% Gamma Adjusted UCL (use when n<50)	0.812
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.696	SD (KM)	0.352
	Variance (KM)	0.124	SE of Mean (KM)	0.144
	k hat (KM)	3.914	k star (KM)	3.767
	nu hat (KM)	587.1	nu star (KM)	565
	theta hat (KM)	0.178	theta star (KM)	0.185
	80% gamma percentile (KM)	0.966	90% gamma percentile (KM)	1.176
	95% gamma percentile (KM)	1.37	99% gamma percentile (KM)	1.786
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (565.00, α)	510.9	Adjusted Chi Square Value (565.00, β)	509.9
	95% Gamma Approximate KM-UCL (use when n>=50)	0.769	95% Gamma Adjusted KM-UCL (use when n<50)	0.771
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.762	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.283	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.725	Mean in Log Scale	-0.497
	SD in Original Scale	0.453	SD in Log Scale	0.601
	95% t UCL (assumes normality of ROS data)	0.812	95% Percentile Bootstrap UCL	0.814
	95% BCA Bootstrap UCL	0.822	95% Bootstrap t UCL	0.822
	95% H-UCL (Log ROS)	0.833		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-0.497	KM Geo Mean	0.608
	KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.867
	KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	0.779
	KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.867
	KM Standard Error of Mean (logged)	0.212		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.858	Mean in Log Scale	-0.167
	SD in Original Scale	0.12	SD in Log Scale	0.192
	95% t UCL (Assumes normality)	0.881	95% H-Stat UCL	0.895
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Normal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (t) UCL	0.935		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Silver

General Statistics

Total Number of Observations	75	Number of Distinct Observations	7
Number of Detects	29	Number of Non-Detects	46
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.09	Minimum Non-Detect	0.5
Maximum Detect	0.14	Maximum Non-Detect	0.5
Variance Detects	2.1182E-4	Percent Non-Detects	61.33%
Mean Detects	0.108	SD Detects	0.0146
Median Detects	0.11	CV Detects	0.135
Skewness Detects	0.751	Kurtosis Detects	-0.0118
Mean of Logged Detects	-2.238	SD of Logged Detects	0.131

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.193	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.108	KM Standard Error of Mean	0.0027
KM SD	0.0143	95% KM (BCA) UCL	0.112
95% KM (t) UCL	0.112	95% KM (Percentile Bootstrap) UCL	0.112
95% KM (z) UCL	0.112	95% KM Bootstrap t UCL	0.113
90% KM Chebyshev UCL	0.116	95% KM Chebyshev UCL	0.119
97.5% KM Chebyshev UCL	0.124	99% KM Chebyshev UCL	0.134

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.956	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.744	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.162	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	59.21	k star (bias corrected MLE)	53.11
Theta hat (MLE)	0.00182	Theta star (bias corrected MLE)	0.00203
nu hat (MLE)	3434	nu star (bias corrected)	3080
Mean (detects)	0.108		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0788	Mean	0.108
Maximum	0.141	Median	0.107
SD	0.0143	CV	0.133
k hat (MLE)	57.97	k star (bias corrected MLE)	55.66
Theta hat (MLE)	0.00186	Theta star (bias corrected MLE)	0.00193
nu hat (MLE)	8696	nu star (bias corrected)	8350
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (N/A, α)	8138	Adjusted Chi Square Value (N/A, β)	8134

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	0.11	95% Gamma Adjusted UCL (use when n<50)	0.11
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.108	SD (KM)	0.0143
Variance (KM)	2.0452E-4	SE of Mean (KM)	0.0027
k hat (KM)	56.6	k star (KM)	54.34
nu hat (KM)	8489	nu star (KM)	8151
theta hat (KM)	0.0019	theta star (KM)	0.00198
80% gamma percentile (KM)	0.12	90% gamma percentile (KM)	0.127
95% gamma percentile (KM)	0.133	99% gamma percentile (KM)	0.144
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	7942	Adjusted Chi Square Value (N/A, β)	7938
95% Gamma Approximate KM-UCL (use when n>=50)	0.11	95% Gamma Adjusted KM-UCL (use when n<50)	0.11
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.108	Mean in Log Scale	-2.238
SD in Original Scale	0.0141	SD in Log Scale	0.129
95% t UCL (assumes normality of ROS data)	0.11	95% Percentile Bootstrap UCL	0.11
95% BCA Bootstrap UCL	0.11	95% Bootstrap t UCL	0.11
95% H-UCL (Log ROS)	0.11		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.238	KM Geo Mean	0.107
KM SD (logged)	0.129	95% Critical H Value (KM-Log)	1.685
KM Standard Error of Mean (logged)	0.0244	95% H-UCL (KM -Log)	0.11
KM SD (logged)	0.129	95% Critical H Value (KM-Log)	1.685
KM Standard Error of Mean (logged)	0.0244		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.195	Mean in Log Scale	-1.716
SD in Original Scale	0.0704	SD in Log Scale	0.425
95% t UCL (Assumes normality)	0.208	95% H-Stat UCL	0.215
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.112	KM H-UCL	0.11
95% KM (BCA) UCL	0.112		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	75	Number of Distinct Observations	12
Number of Detects	16	Number of Non-Detects	59
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	0.87	Minimum Non-Detect	1.25
Maximum Detect	3.1	Maximum Non-Detect	1.25
Variance Detects	0.391	Percent Non-Detects	78.67%
Mean Detects	2.317	SD Detects	0.626

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Median Detects	2.5	CV Detects	0.27
Skewness Detects	-1.102	Kurtosis Detects	0.473
Mean of Logged Detects	0.794	SD of Logged Detects	0.342
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.179	KM Standard Error of Mean	0.0782
KM SD	0.655	95% KM (BCA) UCL	1.579
95% KM (t) UCL	1.309	95% KM (Percentile Bootstrap) UCL	1.547
95% KM (z) UCL	1.307	95% KM Bootstrap t UCL	1.302
90% KM Chebyshev UCL	1.413	95% KM Chebyshev UCL	1.519
97.5% KM Chebyshev UCL	1.667	99% KM Chebyshev UCL	1.956
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.097	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.739	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.218	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.215	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	10.93	k star (bias corrected MLE)	8.919
Theta hat (MLE)	0.212	Theta star (bias corrected MLE)	0.26
nu hat (MLE)	349.6	nu star (bias corrected)	285.4
Mean (detects)	2.317		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.198
Maximum	3.1	Median	1.096
SD	0.798	CV	0.666
k hat (MLE)	1.313	k star (bias corrected MLE)	1.269
Theta hat (MLE)	0.912	Theta star (bias corrected MLE)	0.944
nu hat (MLE)	196.9	nu star (bias corrected)	190.4
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (190.38, α)	159.5	Adjusted Chi Square Value (190.38, β)	158.9
95% Gamma Approximate UCL (use when n>=50)	1.43	95% Gamma Adjusted UCL (use when n<50)	1.435
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.179	SD (KM)	0.655
Variance (KM)	0.43	SE of Mean (KM)	0.0782
k hat (KM)	3.234	k star (KM)	3.113
nu hat (KM)	485.1	nu star (KM)	467
theta hat (KM)	0.364	theta star (KM)	0.379
80% gamma percentile (KM)	1.674	90% gamma percentile (KM)	2.074
95% gamma percentile (KM)	2.447	99% gamma percentile (KM)	3.255
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (467.01, α)	417.9	Adjusted Chi Square Value (467.01, β)	417
95% Gamma Approximate KM-UCL (use when n>=50)	1.317	95% Gamma Adjusted KM-UCL (use when n<50)	1.32
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.801	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.233	**Lilliefors GOF Test**	

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.213	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.266	Mean in Log Scale	0.0949	
SD in Original Scale	0.697	SD in Log Scale	0.535	
95% t UCL (assumes normality of ROS data)	1.4	95% Percentile Bootstrap UCL	1.403	
95% BCA Bootstrap UCL	1.413	95% Bootstrap t UCL	1.406	
95% H-UCL (Log ROS)	1.426			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.0598	KM Geo Mean	1.062	
KM SD (logged)	0.412	95% Critical H Value (KM-Log)	1.803	
KM Standard Error of Mean (logged)	0.0491	95% H-UCL (KM -Log)	1.26	
KM SD (logged)	0.412	95% Critical H Value (KM-Log)	1.803	
KM Standard Error of Mean (logged)	0.0491			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.986	Mean in Log Scale	-0.2	
SD in Original Scale	0.752	SD in Log Scale	0.544	
95% t UCL (Assumes normality)	1.131	95% H-Stat UCL	1.068	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	1.309			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				
General Statistics				
Total Number of Observations	75	Number of Distinct Observations	66	
		Number of Missing Observations	0	
Minimum	8.8	Mean	32.11	
Maximum	121	Median	26.7	
SD	16.87	Std. Error of Mean	1.948	
Coefficient of Variation	0.525	Skewness	2.524	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.782	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.887E-15	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	35.36	95% Adjusted-CLT UCL (Chen-1995)	35.93	
		95% Modified-t UCL (Johnson-1978)	35.45	
Gamma GOF Test				
A-D Test Statistic	2.49	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.168	**Kolmogorov-Smirnov Gamma GOF Test**		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.103	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	5.18	k star (bias corrected MLE)	4.982	
Theta hat (MLE)	6.199	Theta star (bias corrected MLE)	6.446	
nu hat (MLE)	777.1	nu star (bias corrected)	747.3	
MLE Mean (bias corrected)	32.11	MLE Sd (bias corrected)	14.39	
		Approximate Chi Square Value (0.05)	684.9	
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	683.7	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	35.04	95% Adjusted Gamma UCL (use when n<50)	35.1	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.0274	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.134	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.175	Mean of logged Data	3.37	
Maximum of Logged Data	4.796	SD of logged Data	0.428	
Assuming Lognormal Distribution				
95% H-UCL	34.87	90% Chebyshev (MVUE) UCL	36.73	
95% Chebyshev (MVUE) UCL	38.95	97.5% Chebyshev (MVUE) UCL	42.04	
99% Chebyshev (MVUE) UCL	48.1			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	35.32	95% Jackknife UCL	35.36	
95% Standard Bootstrap UCL	35.28	95% Bootstrap-t UCL	36.18	
95% Hall's Bootstrap UCL	37.09	95% Percentile Bootstrap UCL	35.57	
95% BCA Bootstrap UCL	35.99			
90% Chebyshev(Mean, Sd) UCL	37.96	95% Chebyshev(Mean, Sd) UCL	40.61	
97.5% Chebyshev(Mean, Sd) UCL	44.28	99% Chebyshev(Mean, Sd) UCL	51.5	
Suggested UCL to Use				
95% Student's-t UCL	35.36	or 95% Modified-t UCL	35.45	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	75	Number of Distinct Observations	53	
		Number of Missing Observations	0	
Minimum	5.7	Mean	30.04	
Maximum	167	Median	13.3	
SD	32.76	Std. Error of Mean	3.783	
Coefficient of Variation	1.091	Skewness	1.884	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.647	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.37	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.102	Data Not Normal at 5% Significance Level		

Table E1-3
Elem Indian Colony (Unexcavated Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	36.34		95% Adjusted-CLT UCL (Chen-1995)	37.14
			95% Modified-t UCL (Johnson-1978)	36.48
Gamma GOF Test				
A-D Test Statistic	9.861		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.773		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.332		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.105		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.358		k star (bias corrected MLE)	1.312
Theta hat (MLE)	22.13		Theta star (bias corrected MLE)	22.89
nu hat (MLE)	203.6		nu star (bias corrected)	196.8
MLE Mean (bias corrected)	30.04		MLE Sd (bias corrected)	26.22
			Approximate Chi Square Value (0.05)	165.4
Adjusted Level of Significance	0.0468		Adjusted Chi Square Value	164.8
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	35.75		95% Adjusted Gamma UCL (use when n<50)	35.87
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.769		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk P Value	2.220E-16		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.285		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.102		Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.74		Mean of logged Data	2.991
Maximum of Logged Data	5.118		SD of logged Data	0.826
Assuming Lognormal Distribution				
95% H-UCL	34.26		90% Chebyshev (MVUE) UCL	36.9
95% Chebyshev (MVUE) UCL	41		97.5% Chebyshev (MVUE) UCL	46.7
99% Chebyshev (MVUE) UCL	57.89			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	36.26		95% Jackknife UCL	36.34
95% Standard Bootstrap UCL	36.14		95% Bootstrap-t UCL	37.29
95% Hall's Bootstrap UCL	37.29		95% Percentile Bootstrap UCL	36.15
95% BCA Bootstrap UCL	37.48			
90% Chebyshev(Mean, Sd) UCL	41.39		95% Chebyshev(Mean, Sd) UCL	46.53
97.5% Chebyshev(Mean, Sd) UCL	53.66		99% Chebyshev(Mean, Sd) UCL	67.68
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	46.53			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/20/2019 1:20:45 PM
From File	SoilConfirmation_ProUCLData_20191120.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	38	Number of Distinct Observations	37
		Number of Missing Observations	0
Minimum	104	Mean	24346
Maximum	73100	Median	21150
SD	14350	Std. Error of Mean	2328
Coefficient of Variation	0.589	Skewness	1.326

Normal GOF Test

Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.938	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	28274	95% Adjusted-CLT UCL (Chen-1995)	28710
		95% Modified-t UCL (Johnson-1978)	28357

Gamma GOF Test

A-D Test Statistic	0.9	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.145	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.172	k star (bias corrected MLE)	2.018
Theta hat (MLE)	11208	Theta star (bias corrected MLE)	12063
nu hat (MLE)	165.1	nu star (bias corrected)	153.4
MLE Mean (bias corrected)	24346	MLE Sd (bias corrected)	17138
		Approximate Chi Square Value (0.05)	125.8
Adjusted Level of Significance	0.0434	Adjusted Chi Square Value	124.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	29695	95% Adjusted Gamma UCL (use when n<50)	29942

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.66	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.938	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.142	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.644	Mean of logged Data	9.853
Maximum of Logged Data	11.2	SD of logged Data	1.007

Assuming Lognormal Distribution

95% H-UCL	46974	90% Chebyshev (MVUE) UCL	48614
95% Chebyshev (MVUE) UCL	56615	97.5% Chebyshev (MVUE) UCL	67720
99% Chebyshev (MVUE) UCL	89534		

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	28175	95% Jackknife UCL	28274	
95% Standard Bootstrap UCL	28208	95% Bootstrap-t UCL	28720	
95% Hall's Bootstrap UCL	29205	95% Percentile Bootstrap UCL	28193	
95% BCA Bootstrap UCL	28665			
90% Chebyshev(Mean, Sd) UCL	31330	95% Chebyshev(Mean, Sd) UCL	34493	
97.5% Chebyshev(Mean, Sd) UCL	38884	99% Chebyshev(Mean, Sd) UCL	47508	
Suggested UCL to Use				
95% Adjusted Gamma UCL	29942			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	69	Number of Distinct Observations	44	
Number of Detects	43	Number of Non-Detects	26	
Number of Distinct Detects	33	Number of Distinct Non-Detects	11	
Minimum Detect	0.41	Minimum Non-Detect	0.225	
Maximum Detect	55.6	Maximum Non-Detect	3	
Variance Detects	79.99	Percent Non-Detects	37.68%	
Mean Detects	4.037	SD Detects	8.944	
Median Detects	1.9	CV Detects	2.216	
Skewness Detects	5.116	Kurtosis Detects	28.06	
Mean of Logged Detects	0.712	SD of Logged Detects	0.961	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.366	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.943	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.374	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.134	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	2.794	KM Standard Error of Mean	0.875	
KM SD	7.173	95% KM (BCA) UCL	4.749	
95% KM (t) UCL	4.254	95% KM (Percentile Bootstrap) UCL	4.305	
95% KM (z) UCL	4.234	95% KM Bootstrap t UCL	8.424	
90% KM Chebyshev UCL	5.42	95% KM Chebyshev UCL	6.61	
97.5% KM Chebyshev UCL	8.261	99% KM Chebyshev UCL	11.5	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.372	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.784	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.21	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.14	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.86	k star (bias corrected MLE)	0.816	
Theta hat (MLE)	4.691	Theta star (bias corrected MLE)	4.947	
nu hat (MLE)	74	nu star (bias corrected)	70.17	
Mean (detects)	4.037			

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01		Mean	2.695
Maximum	55.6		Median	1
SD	7.275		CV	2.699
k hat (MLE)	0.353		k star (bias corrected MLE)	0.348
Theta hat (MLE)	7.629		Theta star (bias corrected MLE)	7.754
nu hat (MLE)	48.75		nu star (bias corrected)	47.97
Adjusted Level of Significance (β)	0.0465			
Approximate Chi Square Value (47.97, α)	33.07		Adjusted Chi Square Value (47.97, β)	32.81
95% Gamma Approximate UCL (use when n>=50)	3.909		95% Gamma Adjusted UCL (use when n<50)	3.941
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	2.794		SD (KM)	7.173
Variance (KM)	51.45		SE of Mean (KM)	0.875
k hat (KM)	0.152		k star (KM)	0.155
nu hat (KM)	20.95		nu star (KM)	21.37
theta hat (KM)	18.41		theta star (KM)	18.05
80% gamma percentile (KM)	3.12		90% gamma percentile (KM)	8.321
95% gamma percentile (KM)	15.28		99% gamma percentile (KM)	35.36
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (21.37, α)	11.87		Adjusted Chi Square Value (21.37, β)	11.71
95% Gamma Approximate KM-UCL (use when n>=50)	5.032		95% Gamma Adjusted KM-UCL (use when n<50)	5.097
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.923		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.943		Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0909		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.134		Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	2.794		Mean in Log Scale	0.188
SD in Original Scale	7.224		SD in Log Scale	1.139
95% t UCL (assumes normality of ROS data)	4.244		95% Percentile Bootstrap UCL	4.44
95% BCA Bootstrap UCL	5.124		95% Bootstrap t UCL	8.728
95% H-UCL (Log ROS)	3.133			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.158		KM Geo Mean	1.171
KM SD (logged)	1.179		95% Critical H Value (KM-Log)	2.181
KM Standard Error of Mean (logged)	0.155		95% H-UCL (KM -Log)	3.204
KM SD (logged)	1.179		95% Critical H Value (KM-Log)	2.181
KM Standard Error of Mean (logged)	0.155			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	2.863		Mean in Log Scale	0.209
SD in Original Scale	7.203		SD in Log Scale	1.244
95% t UCL (Assumes normality)	4.309		95% H-Stat UCL	3.671
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	3.204			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	90	Number of Distinct Observations	55
Number of Detects	85	Number of Non-Detects	5
Number of Distinct Detects	50	Number of Distinct Non-Detects	5
Minimum Detect	0.54	Minimum Non-Detect	0.27
Maximum Detect	55.3	Maximum Non-Detect	0.6
Variance Detects	64.62	Percent Non-Detects	5.556%
Mean Detects	4.279	SD Detects	8.039
Median Detects	2.5	CV Detects	1.879
Skewness Detects	5.702	Kurtosis Detects	33.82
Mean of Logged Detects	0.988	SD of Logged Detects	0.791

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.357	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.321	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0962	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.057	KM Standard Error of Mean	0.829
KM SD	7.82	95% KM (BCA) UCL	5.633
95% KM (t) UCL	5.435	95% KM (Percentile Bootstrap) UCL	5.67
95% KM (z) UCL	5.421	95% KM Bootstrap t UCL	8.461
90% KM Chebyshev UCL	6.545	95% KM Chebyshev UCL	7.671
97.5% KM Chebyshev UCL	9.235	99% KM Chebyshev UCL	12.31

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.326	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.777	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0994	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.213	k star (bias corrected MLE)	1.178
Theta hat (MLE)	3.527	Theta star (bias corrected MLE)	3.631
nu hat (MLE)	206.3	nu star (bias corrected)	200.3
Mean (detects)	4.279		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.042
Maximum	55.3	Median	2.5
SD	7.871	CV	1.947
k hat (MLE)	0.822	k star (bias corrected MLE)	0.802
Theta hat (MLE)	4.917	Theta star (bias corrected MLE)	5.039
nu hat (MLE)	148	nu star (bias corrected)	144.4
Adjusted Level of Significance (β)	0.0473		
Approximate Chi Square Value (144.38, α)	117.6	Adjusted Chi Square Value (144.38, β)	117.2
95% Gamma Approximate UCL (use when n>=50)	4.962	95% Gamma Adjusted UCL (use when n<50)	4.978

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.057	SD (KM)	7.82
Variance (KM)	61.15	SE of Mean (KM)	0.829
k hat (KM)	0.269	k star (KM)	0.268

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (KM)	48.45	nu star (KM)	48.16
	theta hat (KM)	15.07	theta star (KM)	15.16
	80% gamma percentile (KM)	6.027	90% gamma percentile (KM)	12.11
	95% gamma percentile (KM)	19.24	99% gamma percentile (KM)	38.03
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (48.16, α)	33.23	Adjusted Chi Square Value (48.16, β)	33.03
	95% Gamma Approximate KM-UCL (use when n>=50)	5.879	95% Gamma Adjusted KM-UCL (use when n<50)	5.915
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.929	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	9.7749E-5	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0952	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0962	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	4.067	Mean in Log Scale	0.889
	SD in Original Scale	7.859	SD in Log Scale	0.871
	95% t UCL (assumes normality of ROS data)	5.444	95% Percentile Bootstrap UCL	5.638
	95% BCA Bootstrap UCL	6.333	95% Bootstrap t UCL	8.368
	95% H-UCL (Log ROS)	4.324		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	0.862	KM Geo Mean	2.368
	KM SD (logged)	0.925	95% Critical H Value (KM-Log)	2.174
	KM Standard Error of Mean (logged)	0.0981	95% H-UCL (KM -Log)	4.494
	KM SD (logged)	0.925	95% Critical H Value (KM-Log)	2.174
	KM Standard Error of Mean (logged)	0.0981		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	4.053	Mean in Log Scale	0.843
	SD in Original Scale	7.866	SD in Log Scale	0.979
	95% t UCL (Assumes normality)	5.431	95% H-Stat UCL	4.722
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	4.494		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Barium			
	General Statistics			
	Total Number of Observations	38	Number of Distinct Observations	33
			Number of Missing Observations	0
	Minimum	78.4	Mean	242.3
	Maximum	576	Median	219.5
	SD	104.6	Std. Error of Mean	16.97
	Coefficient of Variation	0.432	Skewness	1.151
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.938	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	270.9		95% Adjusted-CLT UCL (Chen-1995)	273.6
			95% Modified-t UCL (Johnson-1978)	271.4
Gamma GOF Test				
A-D Test Statistic	0.445		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.104		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.143		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	5.823		k star (bias corrected MLE)	5.381
Theta hat (MLE)	41.6		Theta star (bias corrected MLE)	45.02
nu hat (MLE)	442.6		nu star (bias corrected)	409
MLE Mean (bias corrected)	242.3		MLE Sd (bias corrected)	104.4
			Approximate Chi Square Value (0.05)	363.1
Adjusted Level of Significance	0.0434		Adjusted Chi Square Value	361.3
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	272.9		95% Adjusted Gamma UCL (use when n<50)	274.2
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.97		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.938		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.142		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.362		Mean of logged Data	5.402
Maximum of Logged Data	6.356		SD of logged Data	0.434
Assuming Lognormal Distribution				
95% H-UCL	278.4		90% Chebyshev (MVUE) UCL	296.2
95% Chebyshev (MVUE) UCL	320.2		97.5% Chebyshev (MVUE) UCL	353.7
99% Chebyshev (MVUE) UCL	419.3			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	270.2		95% Jackknife UCL	270.9
95% Standard Bootstrap UCL	270.5		95% Bootstrap-t UCL	275.1
95% Hall's Bootstrap UCL	276.2		95% Percentile Bootstrap UCL	272.1
95% BCA Bootstrap UCL	272.6			
90% Chebyshev(Mean, Sd) UCL	293.2		95% Chebyshev(Mean, Sd) UCL	316.3
97.5% Chebyshev(Mean, Sd) UCL	348.3		99% Chebyshev(Mean, Sd) UCL	411.2
Suggested UCL to Use				
95% Adjusted Gamma UCL	274.2			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium				
General Statistics				
Total Number of Observations	38		Number of Distinct Observations	25
Number of Detects	16		Number of Non-Detects	22
Number of Distinct Detects	14		Number of Distinct Non-Detects	13

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	0.18	Minimum Non-Detect	0.035
Maximum Detect	0.81	Maximum Non-Detect	0.325
Variance Detects	0.0343	Percent Non-Detects	57.89%
Mean Detects	0.494	SD Detects	0.185
Median Detects	0.44	CV Detects	0.375
Skewness Detects	0.291	Kurtosis Detects	-0.562
Mean of Logged Detects	-0.778	SD of Logged Detects	0.411
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.234	KM Standard Error of Mean	0.0428
KM SD	0.252	95% KM (BCA) UCL	0.311
95% KM (t) UCL	0.306	95% KM (Percentile Bootstrap) UCL	0.311
95% KM (z) UCL	0.305	95% KM Bootstrap t UCL	0.316
90% KM Chebyshev UCL	0.363	95% KM Chebyshev UCL	0.421
97.5% KM Chebyshev UCL	0.501	99% KM Chebyshev UCL	0.66
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.323	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	6.997	k star (bias corrected MLE)	5.727
Theta hat (MLE)	0.0707	Theta star (bias corrected MLE)	0.0863
nu hat (MLE)	223.9	nu star (bias corrected)	183.3
Mean (detects)	0.494		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.252
Maximum	0.81	Median	0.128
SD	0.245	CV	0.972
k hat (MLE)	0.886	k star (bias corrected MLE)	0.833
Theta hat (MLE)	0.284	Theta star (bias corrected MLE)	0.302
nu hat (MLE)	67.31	nu star (bias corrected)	63.33
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (63.33, α)	46.02	Adjusted Chi Square Value (63.33, β)	45.41
95% Gamma Approximate UCL (use when n>=50)	0.346	95% Gamma Adjusted UCL (use when n<50)	0.351
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.234	SD (KM)	0.252
Variance (KM)	0.0637	SE of Mean (KM)	0.0428
k hat (KM)	0.861	k star (KM)	0.811
nu hat (KM)	65.45	nu star (KM)	61.62
theta hat (KM)	0.272	theta star (KM)	0.289
80% gamma percentile (KM)	0.382	90% gamma percentile (KM)	0.567
95% gamma percentile (KM)	0.756	99% gamma percentile (KM)	1.2
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (61.62, α)	44.57	Adjusted Chi Square Value (61.62, β)	43.96
95% Gamma Approximate KM-UCL (use when n>=50)	0.324	95% Gamma Adjusted KM-UCL (use when n<50)	0.328

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.298	Mean in Log Scale	-1.421	
SD in Original Scale	0.208	SD in Log Scale	0.644	
95% t UCL (assumes normality of ROS data)	0.355	95% Percentile Bootstrap UCL	0.354	
95% BCA Bootstrap UCL	0.365	95% Bootstrap t UCL	0.361	
95% H-UCL (Log ROS)	0.368			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.206	KM Geo Mean	0.11	
KM SD (logged)	1.284	95% Critical H Value (KM-Log)	2.742	
KM Standard Error of Mean (logged)	0.228	95% H-UCL (KM -Log)	0.448	
KM SD (logged)	1.284	95% Critical H Value (KM-Log)	2.742	
KM Standard Error of Mean (logged)	0.228			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.264	Mean in Log Scale	-1.777	
SD in Original Scale	0.234	SD in Log Scale	1.033	
95% t UCL (Assumes normality)	0.328	95% H-Stat UCL	0.436	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.306			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	29	
Number of Detects	23	Number of Non-Detects	15	
Number of Distinct Detects	20	Number of Distinct Non-Detects	11	
Minimum Detect	0.12	Minimum Non-Detect	0.035	
Maximum Detect	0.85	Maximum Non-Detect	0.21	
Variance Detects	0.0407	Percent Non-Detects	39.47%	
Mean Detects	0.404	SD Detects	0.202	
Median Detects	0.41	CV Detects	0.499	
Skewness Detects	0.524	Kurtosis Detects	-0.327	
Mean of Logged Detects	-1.04	SD of Logged Detects	0.552	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.18	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.261	KM Standard Error of Mean	0.0391	
KM SD	0.235	95% KM (BCA) UCL	0.327	
95% KM (t) UCL	0.327	95% KM (Percentile Bootstrap) UCL	0.324	
95% KM (z) UCL	0.325	95% KM Bootstrap t UCL	0.331	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% KM Chebyshev UCL	0.378	95% KM Chebyshev UCL	0.431
97.5% KM Chebyshev UCL	0.505	99% KM Chebyshev UCL	0.65
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.341	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.902	k star (bias corrected MLE)	3.422
Theta hat (MLE)	0.104	Theta star (bias corrected MLE)	0.118
nu hat (MLE)	179.5	nu star (bias corrected)	157.4
Mean (detects)	0.404		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.26
Maximum	0.85	Median	0.185
SD	0.239	CV	0.918
k hat (MLE)	0.894	k star (bias corrected MLE)	0.841
Theta hat (MLE)	0.291	Theta star (bias corrected MLE)	0.309
nu hat (MLE)	67.94	nu star (bias corrected)	63.91
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (63.91, α)	46.52	Adjusted Chi Square Value (63.91, β)	45.9
95% Gamma Approximate UCL (use when n>=50)	0.357	95% Gamma Adjusted UCL (use when n<50)	0.362
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.261	SD (KM)	0.235
Variance (KM)	0.0552	SE of Mean (KM)	0.0391
k hat (KM)	1.236	k star (KM)	1.156
nu hat (KM)	93.9	nu star (KM)	87.82
theta hat (KM)	0.211	theta star (KM)	0.226
80% gamma percentile (KM)	0.415	90% gamma percentile (KM)	0.58
95% gamma percentile (KM)	0.743	99% gamma percentile (KM)	1.119
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (87.82, α)	67.22	Adjusted Chi Square Value (87.82, β)	66.47
95% Gamma Approximate KM-UCL (use when n>=50)	0.341	95% Gamma Adjusted KM-UCL (use when n<50)	0.345
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.285	Mean in Log Scale	-1.54
SD in Original Scale	0.216	SD in Log Scale	0.768
95% t UCL (assumes normality of ROS data)	0.344	95% Percentile Bootstrap UCL	0.341
95% BCA Bootstrap UCL	0.345	95% Bootstrap t UCL	0.357
95% H-UCL (Log ROS)	0.378		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.919	KM Geo Mean	0.147
KM SD (logged)	1.186	95% Critical H Value (KM-Log)	2.618
KM Standard Error of Mean (logged)	0.2	95% H-UCL (KM -Log)	0.495
KM SD (logged)	1.186	95% Critical H Value (KM-Log)	2.618
KM Standard Error of Mean (logged)	0.2		

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	0.262		Mean in Log Scale	-1.963
SD in Original Scale	0.238		SD in Log Scale	1.305
95% t UCL (Assumes normality)	0.327		95% H-Stat UCL	0.596
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.327			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Chromium				
General Statistics				
Total Number of Observations	38		Number of Distinct Observations	37
			Number of Missing Observations	0
Minimum	3.6		Mean	62.84
Maximum	183		Median	59.15
SD	31.38		Std. Error of Mean	5.091
Coefficient of Variation	0.499		Skewness	1.613
Normal GOF Test				
Shapiro Wilk Test Statistic	0.869		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.938		Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.167		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.142		Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	71.43		95% Adjusted-CLT UCL (Chen-1995)	72.64
			95% Modified-t UCL (Johnson-1978)	71.65
Gamma GOF Test				
A-D Test Statistic	1.611		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.144		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.57		k star (bias corrected MLE)	3.306
Theta hat (MLE)	17.6		Theta star (bias corrected MLE)	19.01
nu hat (MLE)	271.4		nu star (bias corrected)	251.3
MLE Mean (bias corrected)	62.84		MLE Sd (bias corrected)	34.56
			Approximate Chi Square Value (0.05)	215.6
Adjusted Level of Significance	0.0434		Adjusted Chi Square Value	214.2
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	73.25		95% Adjusted Gamma UCL (use when n<50)	73.72
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.802		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.938		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.248		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.142		Data Not Lognormal at 5% Significance Level	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.281	Mean of logged Data	3.994	
Maximum of Logged Data	5.209	SD of logged Data	0.644	
Assuming Lognormal Distribution				
95% H-UCL	82.82	90% Chebyshev (MVUE) UCL	88.73	
95% Chebyshev (MVUE) UCL	98.86	97.5% Chebyshev (MVUE) UCL	112.9	
99% Chebyshev (MVUE) UCL	140.6			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	71.22	95% Jackknife UCL	71.43	
95% Standard Bootstrap UCL	70.99	95% Bootstrap-t UCL	73.92	
95% Hall's Bootstrap UCL	76.49	95% Percentile Bootstrap UCL	70.91	
95% BCA Bootstrap UCL	72.06			
90% Chebyshev(Mean, Sd) UCL	78.12	95% Chebyshev(Mean, Sd) UCL	85.03	
97.5% Chebyshev(Mean, Sd) UCL	94.64	99% Chebyshev(Mean, Sd) UCL	113.5	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	85.03			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	34	
Number of Detects	36	Number of Non-Detects	2	
Number of Distinct Detects	32	Number of Distinct Non-Detects	2	
Minimum Detect	0.49	Minimum Non-Detect	0.115	
Maximum Detect	19.5	Maximum Non-Detect	2.5	
Variance Detects	22.97	Percent Non-Detects	5.263%	
Mean Detects	7.689	SD Detects	4.792	
Median Detects	8.25	CV Detects	0.623	
Skewness Detects	0.422	Kurtosis Detects	-0.0785	
Mean of Logged Detects	1.731	SD of Logged Detects	0.953	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.935	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0798	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.145	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	7.315	KM Standard Error of Mean	0.801	
KM SD	4.867	95% KM (BCA) UCL	8.703	
95% KM (t) UCL	8.666	95% KM (Percentile Bootstrap) UCL	8.655	
95% KM (z) UCL	8.633	95% KM Bootstrap t UCL	8.762	
90% KM Chebyshev UCL	9.718	95% KM Chebyshev UCL	10.81	
97.5% KM Chebyshev UCL	12.32	99% KM Chebyshev UCL	15.28	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.02	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.763	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.177	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.149	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	1.77	k star (bias corrected MLE)	1.641	
Theta hat (MLE)	4.344	Theta star (bias corrected MLE)	4.686	
nu hat (MLE)	127.4	nu star (bias corrected)	118.1	
Mean (detects)	7.689			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.49	Mean	7.374	
Maximum	19.5	Median	7.6	
SD	4.856	CV	0.658	
k hat (MLE)	1.645	k star (bias corrected MLE)	1.532	
Theta hat (MLE)	4.484	Theta star (bias corrected MLE)	4.812	
nu hat (MLE)	125	nu star (bias corrected)	116.5	
Adjusted Level of Significance (β)	0.0434			
Approximate Chi Square Value (116.46, α)	92.55	Adjusted Chi Square Value (116.46, β)	91.66	
95% Gamma Approximate UCL (use when n>=50)	9.28	95% Gamma Adjusted UCL (use when n<50)	9.369	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	7.315	SD (KM)	4.867	
Variance (KM)	23.69	SE of Mean (KM)	0.801	
k hat (KM)	2.259	k star (KM)	2.098	
nu hat (KM)	171.7	nu star (KM)	159.5	
theta hat (KM)	3.238	theta star (KM)	3.486	
80% gamma percentile (KM)	10.89	90% gamma percentile (KM)	14.07	
95% gamma percentile (KM)	17.09	99% gamma percentile (KM)	23.78	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (159.49, α)	131.3	Adjusted Chi Square Value (159.49, β)	130.2	
95% Gamma Approximate KM-UCL (use when n>=50)	8.886	95% Gamma Adjusted KM-UCL (use when n<50)	8.959	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.86	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.145	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	7.341	Mean in Log Scale	1.638	
SD in Original Scale	4.896	SD in Log Scale	1.017	
95% t UCL (assumes normality of ROS data)	8.681	95% Percentile Bootstrap UCL	8.688	
95% BCA Bootstrap UCL	8.615	95% Bootstrap t UCL	8.776	
95% H-UCL (Log ROS)	12.92			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.578	KM Geo Mean	4.843	
KM SD (logged)	1.155	95% Critical H Value (KM-Log)	2.579	
KM Standard Error of Mean (logged)	0.192	95% H-UCL (KM -Log)	15.4	
KM SD (logged)	1.155	95% Critical H Value (KM-Log)	2.579	
KM Standard Error of Mean (logged)	0.192			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	7.318	Mean in Log Scale	1.571	
SD in Original Scale	4.927	SD in Log Scale	1.21	
95% t UCL (Assumes normality)	8.667	95% H-Stat UCL	16.93	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	8.666			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	37	
		Number of Missing Observations	0	
Minimum	5.2	Mean	67.49	
Maximum	237	Median	57.3	
SD	52.02	Std. Error of Mean	8.439	
Coefficient of Variation	0.771	Skewness	1.234	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.886	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	81.73	95% Adjusted-CLT UCL (Chen-1995)	83.18	
		95% Modified-t UCL (Johnson-1978)	82.01	
Gamma GOF Test				
A-D Test Statistic	0.474	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.139	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.145	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.714	k star (bias corrected MLE)	1.596	
Theta hat (MLE)	39.39	Theta star (bias corrected MLE)	42.29	
nu hat (MLE)	130.2	nu star (bias corrected)	121.3	
MLE Mean (bias corrected)	67.49	MLE Sd (bias corrected)	53.43	
		Approximate Chi Square Value (0.05)	96.85	
Adjusted Level of Significance	0.0434	Adjusted Chi Square Value	95.95	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	84.51	95% Adjusted Gamma UCL (use when n<50)	85.31	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.128	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.142	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.649	Mean of logged Data	3.893	
Maximum of Logged Data	5.468	SD of logged Data	0.871	
Assuming Lognormal Distribution				
95% H-UCL	98.9	90% Chebyshev (MVUE) UCL	104.5	
95% Chebyshev (MVUE) UCL	119.8	97.5% Chebyshev (MVUE) UCL	141.1	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	182.8		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	81.37	95% Jackknife UCL	81.73
95% Standard Bootstrap UCL	81.01	95% Bootstrap-t UCL	84
95% Hall's Bootstrap UCL	85.11	95% Percentile Bootstrap UCL	81.82
95% BCA Bootstrap UCL	82.35		
90% Chebyshev(Mean, Sd) UCL	92.81	95% Chebyshev(Mean, Sd) UCL	104.3
97.5% Chebyshev(Mean, Sd) UCL	120.2	99% Chebyshev(Mean, Sd) UCL	151.5
Suggested UCL to Use			
95% Adjusted Gamma UCL	85.31		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	68	Number of Distinct Observations	58
		Number of Missing Observations	0
Minimum	4260	Mean	21486
Maximum	43600	Median	19400
SD	9286	Std. Error of Mean	1126
Coefficient of Variation	0.432	Skewness	0.511
Normal GOF Test			
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0189	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.122	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23365	95% Adjusted-CLT UCL (Chen-1995)	23413
		95% Modified-t UCL (Johnson-1978)	23376
Gamma GOF Test			
A-D Test Statistic	0.592	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0773	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.108	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.909	k star (bias corrected MLE)	4.702
Theta hat (MLE)	4377	Theta star (bias corrected MLE)	4569
nu hat (MLE)	667.6	nu star (bias corrected)	639.5
MLE Mean (bias corrected)	21486	MLE Sd (bias corrected)	9908
		Approximate Chi Square Value (0.05)	581.9
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	580.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	23616	95% Adjusted Gamma UCL (use when n<50)	23664
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00253	Data Not Lognormal at 5% Significance Level	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.106	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	8.357	Mean of logged Data	9.87	
Maximum of Logged Data	10.68	SD of logged Data	0.492	
Assuming Lognormal Distribution				
95% H-UCL	24416	90% Chebyshev (MVUE) UCL	25887	
95% Chebyshev (MVUE) UCL	27744	97.5% Chebyshev (MVUE) UCL	30323	
99% Chebyshev (MVUE) UCL	35387			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	23339	95% Jackknife UCL	23365	
95% Standard Bootstrap UCL	23311	95% Bootstrap-t UCL	23498	
95% Hall's Bootstrap UCL	23513	95% Percentile Bootstrap UCL	23415	
95% BCA Bootstrap UCL	23399			
90% Chebyshev(Mean, Sd) UCL	24865	95% Chebyshev(Mean, Sd) UCL	26395	
97.5% Chebyshev(Mean, Sd) UCL	28519	99% Chebyshev(Mean, Sd) UCL	32691	
Suggested UCL to Use				
95% Approximate Gamma UCL	23616			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead				
General Statistics				
Total Number of Observations	39	Number of Distinct Observations	34	
Number of Detects	37	Number of Non-Detects	2	
Number of Distinct Detects	32	Number of Distinct Non-Detects	2	
Minimum Detect	2.9	Minimum Non-Detect	1.1	
Maximum Detect	54.7	Maximum Non-Detect	1.2	
Variance Detects	85.12	Percent Non-Detects	5.128%	
Mean Detects	15.12	SD Detects	9.226	
Median Detects	12.1	CV Detects	0.61	
Skewness Detects	2.314	Kurtosis Detects	8.431	
Mean of Logged Detects	2.567	SD of Logged Detects	0.556	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.81	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.152	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	14.4	KM Standard Error of Mean	1.524	
KM SD	9.388	95% KM (BCA) UCL	17.26	
95% KM (t) UCL	16.97	95% KM (Percentile Bootstrap) UCL	17.05	
95% KM (z) UCL	16.91	95% KM Bootstrap t UCL	17.65	
90% KM Chebyshev UCL	18.97	95% KM Chebyshev UCL	21.05	
97.5% KM Chebyshev UCL	23.92	99% KM Chebyshev UCL	29.57	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.622	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.12	**Kolmogorov-Smirnov GOF**		

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.146	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.509	k star (bias corrected MLE)	3.243	
Theta hat (MLE)	4.309	Theta star (bias corrected MLE)	4.663	
nu hat (MLE)	259.7	nu star (bias corrected)	240	
Mean (detects)	15.12			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.802	Mean	14.39	
Maximum	54.7	Median	11.6	
SD	9.533	CV	0.663	
k hat (MLE)	2.215	k star (bias corrected MLE)	2.062	
Theta hat (MLE)	6.495	Theta star (bias corrected MLE)	6.978	
nu hat (MLE)	172.8	nu star (bias corrected)	160.8	
Adjusted Level of Significance (β)	0.0437			
Approximate Chi Square Value (160.83, α)	132.5	Adjusted Chi Square Value (160.83, β)	131.5	
95% Gamma Approximate UCL (use when n>=50)	17.46	95% Gamma Adjusted UCL (use when n<50)	17.6	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	14.4	SD (KM)	9.388	
Variance (KM)	88.14	SE of Mean (KM)	1.524	
k hat (KM)	2.354	k star (KM)	2.19	
nu hat (KM)	183.6	nu star (KM)	170.8	
theta hat (KM)	6.119	theta star (KM)	6.578	
80% gamma percentile (KM)	21.33	90% gamma percentile (KM)	27.42	
95% gamma percentile (KM)	33.21	99% gamma percentile (KM)	45.96	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (170.79, α)	141.6	Adjusted Chi Square Value (170.79, β)	140.5	
95% Gamma Approximate KM-UCL (use when n>=50)	17.38	95% Gamma Adjusted KM-UCL (use when n<50)	17.5	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	14.53	Mean in Log Scale	2.5	
SD in Original Scale	9.344	SD in Log Scale	0.614	
95% t UCL (assumes normality of ROS data)	17.05	95% Percentile Bootstrap UCL	16.96	
95% BCA Bootstrap UCL	17.53	95% Bootstrap t UCL	17.88	
95% H-UCL (Log ROS)	17.98			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.44	KM Geo Mean	11.48	
KM SD (logged)	0.763	95% Critical H Value (KM-Log)	2.149	
KM Standard Error of Mean (logged)	0.124	95% H-UCL (KM -Log)	20.04	
KM SD (logged)	0.763	95% Critical H Value (KM-Log)	2.149	
KM Standard Error of Mean (logged)	0.124			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	14.38	Mean in Log Scale	2.407	
SD in Original Scale	9.55	SD in Log Scale	0.883	
95% t UCL (Assumes normality)	16.95	95% H-Stat UCL	22.69	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Adjusted Gamma UCL	17.5	95% GROS Adjusted Gamma UCL	17.6	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Manganese				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	38	
		Number of Missing Observations	0	
Minimum	1.1	Mean	458.8	
Maximum	1370	Median	461.5	
SD	318.7	Std. Error of Mean	51.71	
Coefficient of Variation	0.695	Skewness	0.429	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0886	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.142	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	546	95% Adjusted-CLT UCL (Chen-1995)	547.7	
		95% Modified-t UCL (Johnson-1978)	546.6	
Gamma GOF Test				
A-D Test Statistic	1.678	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.777	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.212	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.147	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.041	k star (bias corrected MLE)	0.976	
Theta hat (MLE)	440.9	Theta star (bias corrected MLE)	470.1	
nu hat (MLE)	79.08	nu star (bias corrected)	74.17	
MLE Mean (bias corrected)	458.8	MLE Sd (bias corrected)	464.4	
		Approximate Chi Square Value (0.05)	55.34	
Adjusted Level of Significance	0.0434	Adjusted Chi Square Value	54.66	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	614.9	95% Adjusted Gamma UCL (use when n<50)	622.5	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.784	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.241	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.142	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.0953	Mean of logged Data	5.576	
Maximum of Logged Data	7.223	SD of logged Data	1.506	
Assuming Lognormal Distribution				
95% H-UCL	1742	90% Chebyshev (MVUE) UCL	1510	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Chebyshev (MVUE) UCL	1843	97.5% Chebyshev (MVUE) UCL	2305
99% Chebyshev (MVUE) UCL	3213		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	543.8	95% Jackknife UCL	546
95% Standard Bootstrap UCL	543.4	95% Bootstrap-t UCL	549.7
95% Hall's Bootstrap UCL	552.5	95% Percentile Bootstrap UCL	542.5
95% BCA Bootstrap UCL	550.6		
90% Chebyshev(Mean, Sd) UCL	613.9	95% Chebyshev(Mean, Sd) UCL	684.2
97.5% Chebyshev(Mean, Sd) UCL	781.7	99% Chebyshev(Mean, Sd) UCL	973.2

Suggested UCL to Use

95% Student's-t UCL 546

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury

General Statistics

Total Number of Observations	90	Number of Distinct Observations	75
		Number of Missing Observations	0
Minimum	0.14	Mean	10.38
Maximum	114	Median	5.95
SD	15.12	Std. Error of Mean	1.594
Coefficient of Variation	1.457	Skewness	4.26

Normal GOF Test

Shapiro Wilk Test Statistic	0.621	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0936	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.03	95% Adjusted-CLT UCL (Chen-1995)	13.76
		95% Modified-t UCL (Johnson-1978)	13.14

Gamma GOF Test

A-D Test Statistic	0.406	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.794	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0546	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0979	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.747	k star (bias corrected MLE)	0.729
Theta hat (MLE)	13.9	Theta star (bias corrected MLE)	14.23
nu hat (MLE)	134.4	nu star (bias corrected)	131.2
MLE Mean (bias corrected)	10.38	MLE Sd (bias corrected)	12.15
		Approximate Chi Square Value (0.05)	105.8
Adjusted Level of Significance	0.0473	Adjusted Chi Square Value	105.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	12.87	95% Adjusted Gamma UCL (use when n<50)	12.92

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk P Value	0.0209	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.115	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.0936	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.966	Mean of logged Data	1.537	
Maximum of Logged Data	4.736	SD of logged Data	1.44	
Assuming Lognormal Distribution				
95% H-UCL	19.84	90% Chebyshev (MVUE) UCL	20.75	
95% Chebyshev (MVUE) UCL	24.33	97.5% Chebyshev (MVUE) UCL	29.31	
99% Chebyshev (MVUE) UCL	39.1			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	13	95% Jackknife UCL	13.03	
95% Standard Bootstrap UCL	12.92	95% Bootstrap-t UCL	14.31	
95% Hall's Bootstrap UCL	18.27	95% Percentile Bootstrap UCL	13.28	
95% BCA Bootstrap UCL	13.89			
90% Chebyshev(Mean, Sd) UCL	15.16	95% Chebyshev(Mean, Sd) UCL	17.32	
97.5% Chebyshev(Mean, Sd) UCL	20.33	99% Chebyshev(Mean, Sd) UCL	26.24	
Suggested UCL to Use				
95% Approximate Gamma UCL	12.87			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nickel				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	37	
Number of Detects	37	Number of Non-Detects	1	
Number of Distinct Detects	36	Number of Distinct Non-Detects	1	
Minimum Detect	1.7	Minimum Non-Detect	0.145	
Maximum Detect	108	Maximum Non-Detect	0.145	
Variance Detects	426.4	Percent Non-Detects	2.632%	
Mean Detects	21.66	SD Detects	20.65	
Median Detects	16	CV Detects	0.954	
Skewness Detects	2.53	Kurtosis Detects	8.272	
Mean of Logged Detects	2.708	SD of Logged Detects	0.907	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	21.09	KM Standard Error of Mean	3.354	
KM SD	20.39	95% KM (BCA) UCL	27.19	
95% KM (t) UCL	26.75	95% KM (Percentile Bootstrap) UCL	26.72	
95% KM (z) UCL	26.61	95% KM Bootstrap t UCL	29.55	
90% KM Chebyshev UCL	31.15	95% KM Chebyshev UCL	35.71	
97.5% KM Chebyshev UCL	42.03	99% KM Chebyshev UCL	54.46	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.258	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level		

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

K-S Test Statistic	0.0769	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.148	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.504	k star (bias corrected MLE)	1.401	
Theta hat (MLE)	14.39	Theta star (bias corrected MLE)	15.46	
nu hat (MLE)	111.3	nu star (bias corrected)	103.6	
Mean (detects)	21.66			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	21.09	
Maximum	108	Median	15.8	
SD	20.67	CV	0.98	
k hat (MLE)	1.073	k star (bias corrected MLE)	1.006	
Theta hat (MLE)	19.65	Theta star (bias corrected MLE)	20.96	
nu hat (MLE)	81.55	nu star (bias corrected)	76.45	
Adjusted Level of Significance (β)	0.0434			
Approximate Chi Square Value (76.45, α)	57.31	Adjusted Chi Square Value (76.45, β)	56.62	
95% Gamma Approximate UCL (use when n>=50)	28.13	95% Gamma Adjusted UCL (use when n<50)	28.47	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	21.09	SD (KM)	20.39	
Variance (KM)	415.8	SE of Mean (KM)	3.354	
k hat (KM)	1.07	k star (KM)	1.003	
nu hat (KM)	81.3	nu star (KM)	76.21	
theta hat (KM)	19.72	theta star (KM)	21.03	
80% gamma percentile (KM)	33.94	90% gamma percentile (KM)	48.53	
95% gamma percentile (KM)	63.12	99% gamma percentile (KM)	96.99	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (76.21, α)	57.1	Adjusted Chi Square Value (76.21, β)	56.42	
95% Gamma Approximate KM-UCL (use when n>=50)	28.15	95% Gamma Adjusted KM-UCL (use when n<50)	28.49	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0924	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	21.13	Mean in Log Scale	2.647	
SD in Original Scale	20.63	SD in Log Scale	0.97	
95% t UCL (assumes normality of ROS data)	26.77	95% Percentile Bootstrap UCL	26.86	
95% BCA Bootstrap UCL	28.58	95% Bootstrap t UCL	28.96	
95% H-UCL (Log ROS)	32.89			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.585	KM Geo Mean	13.27	
KM SD (logged)	1.154	95% Critical H Value (KM-Log)	2.577	
KM Standard Error of Mean (logged)	0.19	95% H-UCL (KM -Log)	42.08	
KM SD (logged)	1.154	95% Critical H Value (KM-Log)	2.577	
KM Standard Error of Mean (logged)	0.19			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	21.09	Mean in Log Scale	2.567	
SD in Original Scale	20.67	SD in Log Scale	1.244	
95% t UCL (Assumes normality)	26.75	95% H-Stat UCL	49.01	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Adjusted Gamma UCL	28.49	95% GROS Adjusted Gamma UCL	28.47	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium				
General Statistics				
Total Number of Observations	39	Number of Distinct Observations	27	
Number of Detects	20	Number of Non-Detects	19	
Number of Distinct Detects	18	Number of Distinct Non-Detects	9	
Minimum Detect	0.48	Minimum Non-Detect	0.23	
Maximum Detect	1.1	Maximum Non-Detect	1.75	
Variance Detects	0.0364	Percent Non-Detects	48.72%	
Mean Detects	0.825	SD Detects	0.191	
Median Detects	0.85	CV Detects	0.231	
Skewness Detects	-0.424	Kurtosis Detects	-0.871	
Mean of Logged Detects	-0.221	SD of Logged Detects	0.253	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.943	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.119	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.192	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.64	KM Standard Error of Mean	0.0601	
KM SD	0.316	95% KM (BCA) UCL	0.742	
95% KM (t) UCL	0.742	95% KM (Percentile Bootstrap) UCL	0.731	
95% KM (z) UCL	0.739	95% KM Bootstrap t UCL	0.734	
90% KM Chebyshev UCL	0.821	95% KM Chebyshev UCL	0.902	
97.5% KM Chebyshev UCL	1.016	99% KM Chebyshev UCL	1.239	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.575	Anderson-Darling GOF Test		
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.151	Kolmogorov-Smirnov GOF		
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	17.69	k star (bias corrected MLE)	15.07	
Theta hat (MLE)	0.0466	Theta star (bias corrected MLE)	0.0547	
nu hat (MLE)	707.8	nu star (bias corrected)	602.9	
Mean (detects)	0.825			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.383	Mean	0.706	
Maximum	1.1	Median	0.71	
SD	0.228	CV	0.323	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	9.56	k star (bias corrected MLE)	8.842
Theta hat (MLE)	0.0739	Theta star (bias corrected MLE)	0.0799
nu hat (MLE)	745.7	nu star (bias corrected)	689.7
Adjusted Level of Significance (β)	0.0437		
Approximate Chi Square Value (689.68, α)	629.7	Adjusted Chi Square Value (689.68, β)	627.5
95% Gamma Approximate UCL (use when n>=50)	0.774	95% Gamma Adjusted UCL (use when n<50)	0.776
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.64	SD (KM)	0.316
Variance (KM)	0.0996	SE of Mean (KM)	0.0601
k hat (KM)	4.117	k star (KM)	3.817
nu hat (KM)	321.1	nu star (KM)	297.8
theta hat (KM)	0.156	theta star (KM)	0.168
80% gamma percentile (KM)	0.888	90% gamma percentile (KM)	1.08
95% gamma percentile (KM)	1.257	99% gamma percentile (KM)	1.636
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (297.76, α)	258.8	Adjusted Chi Square Value (297.76, β)	257.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.737	95% Gamma Adjusted KM-UCL (use when n<50)	0.741
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.709	Mean in Log Scale	-0.394
SD in Original Scale	0.225	SD in Log Scale	0.323
95% t UCL (assumes normality of ROS data)	0.77	95% Percentile Bootstrap UCL	0.766
95% BCA Bootstrap UCL	0.773	95% Bootstrap t UCL	0.775
95% H-UCL (Log ROS)	0.781		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.608	KM Geo Mean	0.544
KM SD (logged)	0.613	95% Critical H Value (KM-Log)	2.009
KM Standard Error of Mean (logged)	0.117	95% H-UCL (KM -Log)	0.802
KM SD (logged)	0.613	95% Critical H Value (KM-Log)	2.009
KM Standard Error of Mean (logged)	0.117		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.678	Mean in Log Scale	-0.613
SD in Original Scale	0.332	SD in Log Scale	0.803
95% t UCL (Assumes normality)	0.768	95% H-Stat UCL	0.994
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.742		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Silver			
General Statistics			
Total Number of Observations	38	Number of Distinct Observations	15
Number of Detects	9	Number of Non-Detects	29
Number of Distinct Detects	6	Number of Distinct Non-Detects	10

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	0.09	Minimum Non-Detect	0.05
Maximum Detect	0.17	Maximum Non-Detect	0.1
Variance Detects	6.6944E-4	Percent Non-Detects	76.32%
Mean Detects	0.122	SD Detects	0.0259
Median Detects	0.12	CV Detects	0.212
Skewness Detects	0.466	Kurtosis Detects	-0.0201
Mean of Logged Detects	-2.122	SD of Logged Detects	0.211
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0672	KM Standard Error of Mean	0.00567
KM SD	0.0329	95% KM (BCA) UCL	0.0779
95% KM (t) UCL	0.0767	95% KM (Percentile Bootstrap) UCL	0.0758
95% KM (z) UCL	0.0765	95% KM Bootstrap t UCL	0.0772
90% KM Chebyshev UCL	0.0842	95% KM Chebyshev UCL	0.0919
97.5% KM Chebyshev UCL	0.103	99% KM Chebyshev UCL	0.124
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.254	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	25.46	k star (bias corrected MLE)	17.05
Theta hat (MLE)	0.0048	Theta star (bias corrected MLE)	0.00717
nu hat (MLE)	458.3	nu star (bias corrected)	306.9
Mean (detects)	0.122		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0555
Maximum	0.17	Median	0.0431
SD	0.0432	CV	0.777
k hat (MLE)	1.707	k star (bias corrected MLE)	1.59
Theta hat (MLE)	0.0325	Theta star (bias corrected MLE)	0.0349
nu hat (MLE)	129.7	nu star (bias corrected)	120.8
Adjusted Level of Significance (β)	0.0434		
Approximate Chi Square Value (120.83, α)	96.45	Adjusted Chi Square Value (120.83, β)	95.55
95% Gamma Approximate UCL (use when n>=50)	0.0696	95% Gamma Adjusted UCL (use when n<50)	0.0702
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0672	SD (KM)	0.0329
Variance (KM)	0.00108	SE of Mean (KM)	0.00567
k hat (KM)	4.162	k star (KM)	3.851
nu hat (KM)	316.3	nu star (KM)	292.7
theta hat (KM)	0.0161	theta star (KM)	0.0174
80% gamma percentile (KM)	0.093	90% gamma percentile (KM)	0.113
95% gamma percentile (KM)	0.132	99% gamma percentile (KM)	0.171
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (292.70, α)	254.1	Adjusted Chi Square Value (292.70, β)	252.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.0774	95% Gamma Adjusted KM-UCL (use when n<50)	0.0778

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0705	Mean in Log Scale	-2.745	
SD in Original Scale	0.0335	SD in Log Scale	0.424	
95% t UCL (assumes normality of ROS data)	0.0797	95% Percentile Bootstrap UCL	0.0793	
95% BCA Bootstrap UCL	0.0813	95% Bootstrap t UCL	0.0816	
95% H-UCL (Log ROS)	0.08			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.788	KM Geo Mean	0.0616	
KM SD (logged)	0.384	95% Critical H Value (KM-Log)	1.836	
KM Standard Error of Mean (logged)	0.0662	95% H-UCL (KM -Log)	0.0744	
KM SD (logged)	0.384	95% Critical H Value (KM-Log)	1.836	
KM Standard Error of Mean (logged)	0.0662			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0538	Mean in Log Scale	-3.134	
SD in Original Scale	0.041	SD in Log Scale	0.607	
95% t UCL (Assumes normality)	0.065	95% H-Stat UCL	0.0639	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.0767			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Thallium				
General Statistics				
Total Number of Observations	32	Number of Distinct Observations	25	
Number of Detects	15	Number of Non-Detects	17	
Number of Distinct Detects	15	Number of Distinct Non-Detects	10	
Minimum Detect	0.46	Minimum Non-Detect	0.225	
Maximum Detect	7.1	Maximum Non-Detect	1.25	
Variance Detects	3.393	Percent Non-Detects	53.13%	
Mean Detects	2.789	SD Detects	1.842	
Median Detects	2.4	CV Detects	0.66	
Skewness Detects	0.959	Kurtosis Detects	0.702	
Mean of Logged Detects	0.789	SD of Logged Detects	0.771	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.22	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.468	KM Standard Error of Mean	0.321	
KM SD	1.745	95% KM (BCA) UCL	2.037	
95% KM (t) UCL	2.013	95% KM (Percentile Bootstrap) UCL	2.014	
95% KM (z) UCL	1.997	95% KM Bootstrap t UCL	2.116	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% KM Chebyshev UCL	2.432	95% KM Chebyshev UCL	2.869
97.5% KM Chebyshev UCL	3.475	99% KM Chebyshev UCL	4.665
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.215	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.136	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.224	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.262	k star (bias corrected MLE)	1.854
Theta hat (MLE)	1.233	Theta star (bias corrected MLE)	1.504
nu hat (MLE)	67.87	nu star (bias corrected)	55.63
Mean (detects)	2.789		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.35
Maximum	7.1	Median	0.427
SD	1.855	CV	1.375
k hat (MLE)	0.324	k star (bias corrected MLE)	0.315
Theta hat (MLE)	4.162	Theta star (bias corrected MLE)	4.289
nu hat (MLE)	20.75	nu star (bias corrected)	20.14
Adjusted Level of Significance (β)	0.0416		
Approximate Chi Square Value (20.14, α)	10.96	Adjusted Chi Square Value (20.14, β)	10.59
95% Gamma Approximate UCL (use when n>=50)	2.481	95% Gamma Adjusted UCL (use when n<50)	2.567
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.468	SD (KM)	1.745
Variance (KM)	3.047	SE of Mean (KM)	0.321
k hat (KM)	0.708	k star (KM)	0.662
nu hat (KM)	45.28	nu star (KM)	42.37
theta hat (KM)	2.075	theta star (KM)	2.218
80% gamma percentile (KM)	2.417	90% gamma percentile (KM)	3.734
95% gamma percentile (KM)	5.099	99% gamma percentile (KM)	8.373
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (42.37, α)	28.45	Adjusted Chi Square Value (42.37, β)	27.84
95% Gamma Approximate KM-UCL (use when n>=50)	2.187	95% Gamma Adjusted KM-UCL (use when n<50)	2.235
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.502	Mean in Log Scale	-0.229
SD in Original Scale	1.75	SD in Log Scale	1.159
95% t UCL (assumes normality of ROS data)	2.027	95% Percentile Bootstrap UCL	2.025
95% BCA Bootstrap UCL	2.118	95% Bootstrap t UCL	2.21
95% H-UCL (Log ROS)	2.69		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.329	KM Geo Mean	0.72
KM SD (logged)	1.206	95% Critical H Value (KM-Log)	2.689
KM Standard Error of Mean (logged)	0.232	95% H-UCL (KM -Log)	2.668
KM SD (logged)	1.206	95% Critical H Value (KM-Log)	2.689
KM Standard Error of Mean (logged)	0.232		

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	1.53		Mean in Log Scale	-0.204
SD in Original Scale	1.734		SD in Log Scale	1.198
95% t UCL (Assumes normality)	2.049		95% H-Stat UCL	2.972
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	2.013			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				
General Statistics				
Total Number of Observations	69		Number of Distinct Observations	64
			Number of Missing Observations	0
Minimum	1.5		Mean	83.79
Maximum	186		Median	81.7
SD	34.62		Std. Error of Mean	4.168
Coefficient of Variation	0.413		Skewness	0.32
Normal GOF Test				
Shapiro Wilk Test Statistic	0.985		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.851		Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0672		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107		Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	90.74		95% Adjusted-CLT UCL (Chen-1995)	90.82
			95% Modified-t UCL (Johnson-1978)	90.77
Gamma GOF Test				
A-D Test Statistic	1.649		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.756		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.131		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.108		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.872		k star (bias corrected MLE)	3.714
Theta hat (MLE)	21.64		Theta star (bias corrected MLE)	22.56
nu hat (MLE)	534.4		nu star (bias corrected)	512.5
MLE Mean (bias corrected)	83.79		MLE Sd (bias corrected)	43.48
			Approximate Chi Square Value (0.05)	461
Adjusted Level of Significance	0.0465		Adjusted Chi Square Value	459.9
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	93.16		95% Adjusted Gamma UCL (use when n<50)	93.36
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.741		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	2.220E-16		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.107		Data Not Lognormal at 5% Significance Level	

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.405	Mean of logged Data	4.294	
Maximum of Logged Data	5.226	SD of logged Data	0.668	
Assuming Lognormal Distribution				
95% H-UCL	107.5	90% Chebyshev (MVUE) UCL	115.1	
95% Chebyshev (MVUE) UCL	126	97.5% Chebyshev (MVUE) UCL	141.1	
99% Chebyshev (MVUE) UCL	170.7			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	90.65	95% Jackknife UCL	90.74	
95% Standard Bootstrap UCL	90.49	95% Bootstrap-t UCL	90.94	
95% Hall's Bootstrap UCL	90.94	95% Percentile Bootstrap UCL	90.63	
95% BCA Bootstrap UCL	90.72			
90% Chebyshev(Mean, Sd) UCL	96.3	95% Chebyshev(Mean, Sd) UCL	102	
97.5% Chebyshev(Mean, Sd) UCL	109.8	99% Chebyshev(Mean, Sd) UCL	125.3	
Suggested UCL to Use				
95% Student's-t UCL	90.74			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	39	Number of Distinct Observations	38	
Number of Detects	38	Number of Non-Detects	1	
Number of Distinct Detects	37	Number of Distinct Non-Detects	1	
Minimum Detect	4.4	Minimum Non-Detect	1.75	
Maximum Detect	219	Maximum Non-Detect	1.75	
Variance Detects	1555	Percent Non-Detects	2.564%	
Mean Detects	43.53	SD Detects	39.44	
Median Detects	35.35	CV Detects	0.906	
Skewness Detects	2.783	Kurtosis Detects	10.28	
Mean of Logged Detects	3.459	SD of Logged Detects	0.835	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.142	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	42.46	KM Standard Error of Mean	6.325	
KM SD	38.98	95% KM (BCA) UCL	54.94	
95% KM (t) UCL	53.12	95% KM (Percentile Bootstrap) UCL	53.48	
95% KM (z) UCL	52.86	95% KM Bootstrap t UCL	58.2	
90% KM Chebyshev UCL	61.43	95% KM Chebyshev UCL	70.03	
97.5% KM Chebyshev UCL	81.96	99% KM Chebyshev UCL	105.4	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.426	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.763	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.108	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.145	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	1.738	k star (bias corrected MLE)	1.618	
Theta hat (MLE)	25.05	Theta star (bias corrected MLE)	26.9	
nu hat (MLE)	132.1	nu star (bias corrected)	123	
Mean (detects)	43.53			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	42.41	
Maximum	219	Median	34.5	
SD	39.54	CV	0.932	
k hat (MLE)	1.147	k star (bias corrected MLE)	1.076	
Theta hat (MLE)	36.96	Theta star (bias corrected MLE)	39.41	
nu hat (MLE)	89.5	nu star (bias corrected)	83.95	
Adjusted Level of Significance (β)	0.0437			
Approximate Chi Square Value (83.95, α)	63.83	Adjusted Chi Square Value (83.95, β)	63.14	
95% Gamma Approximate UCL (use when n>=50)	55.78	95% Gamma Adjusted UCL (use when n<50)	56.39	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	42.46	SD (KM)	38.98	
Variance (KM)	1519	SE of Mean (KM)	6.325	
k hat (KM)	1.187	k star (KM)	1.112	
nu hat (KM)	92.55	nu star (KM)	86.76	
theta hat (KM)	35.78	theta star (KM)	38.17	
80% gamma percentile (KM)	67.71	90% gamma percentile (KM)	95.23	
95% gamma percentile (KM)	122.5	99% gamma percentile (KM)	185.4	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (86.76, α)	66.29	Adjusted Chi Square Value (86.76, β)	65.59	
95% Gamma Approximate KM-UCL (use when n>=50)	55.57	95% Gamma Adjusted KM-UCL (use when n<50)	56.17	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.142	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	42.51	Mean in Log Scale	3.405	
SD in Original Scale	39.43	SD in Log Scale	0.89	
95% t UCL (assumes normality of ROS data)	53.16	95% Percentile Bootstrap UCL	53.8	
95% BCA Bootstrap UCL	55.86	95% Bootstrap t UCL	58.12	
95% H-UCL (Log ROS)	62.19			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	3.385	KM Geo Mean	29.51	
KM SD (logged)	0.934	95% Critical H Value (KM-Log)	2.326	
KM Standard Error of Mean (logged)	0.152	95% H-UCL (KM -Log)	64.89	
KM SD (logged)	0.934	95% Critical H Value (KM-Log)	2.326	
KM Standard Error of Mean (logged)	0.152			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	42.44	Mean in Log Scale	3.367	
SD in Original Scale	39.51	SD in Log Scale	1.005	
95% t UCL (Assumes normality)	53.1	95% H-Stat UCL	71.11	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-4
Elem Indian Colony (Fill Areas), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Detected Data appear Gamma Distributed at 5% Significance Level											
	Suggested UCL to Use											
	95% KM Adjusted Gamma UCL					56.17		95% GROS Adjusted Gamma UCL				56.39
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
	Recommendations are based upon data size, data distribution, and skewness.											
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/9/2019 11:20:57 AM
From File	BkgSoilAndesite_UCLData_20191009.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	21	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	9480	Mean	20760
Maximum	38100	Median	18500
SD	8574	Std. Error of Mean	1871
Coefficient of Variation	0.413	Skewness	0.638

Normal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23987	95% Adjusted-CLT UCL (Chen-1995)	24116
		95% Modified-t UCL (Johnson-1978)	24030

Gamma GOF Test

A-D Test Statistic	0.254	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0983	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.322	k star (bias corrected MLE)	5.451
Theta hat (MLE)	3284	Theta star (bias corrected MLE)	3809
nu hat (MLE)	265.5	nu star (bias corrected)	228.9
MLE Mean (bias corrected)	20760	MLE Sd (bias corrected)	8892
		Approximate Chi Square Value (0.05)	194.9
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	192.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	24384	95% Adjusted Gamma UCL (use when n<50)	24689

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0864	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	9.157	Mean of logged Data	9.86
Maximum of Logged Data	10.55	SD of logged Data	0.416

Assuming Lognormal Distribution

95% H-UCL	24938	90% Chebyshev (MVUE) UCL	26579
95% Chebyshev (MVUE) UCL	29208	97.5% Chebyshev (MVUE) UCL	32857
99% Chebyshev (MVUE) UCL	40023		

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	23838	95% Jackknife UCL	23987	
95% Standard Bootstrap UCL	23683	95% Bootstrap-t UCL	24574	
95% Hall's Bootstrap UCL	24013	95% Percentile Bootstrap UCL	23818	
95% BCA Bootstrap UCL	24051			
90% Chebyshev(Mean, Sd) UCL	26373	95% Chebyshev(Mean, Sd) UCL	28916	
97.5% Chebyshev(Mean, Sd) UCL	32445	99% Chebyshev(Mean, Sd) UCL	39377	
Suggested UCL to Use				
95% Student's-t UCL	23987			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	35	
Number of Detects	24	Number of Non-Detects	18	
Number of Distinct Detects	23	Number of Distinct Non-Detects	12	
Minimum Detect	0.07	Minimum Non-Detect	0.6	
Maximum Detect	7.9	Maximum Non-Detect	3.7	
Variance Detects	4.103	Percent Non-Detects	42.86%	
Mean Detects	1.677	SD Detects	2.025	
Median Detects	0.846	CV Detects	1.208	
Skewness Detects	1.925	Kurtosis Detects	3.459	
Mean of Logged Detects	-0.164	SD of Logged Detects	1.273	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.194	KM Standard Error of Mean	0.267	
KM SD	1.643	95% KM (BCA) UCL	1.687	
95% KM (t) UCL	1.644	95% KM (Percentile Bootstrap) UCL	1.64	
95% KM (z) UCL	1.634	95% KM Bootstrap t UCL	1.816	
90% KM Chebyshev UCL	1.996	95% KM Chebyshev UCL	2.359	
97.5% KM Chebyshev UCL	2.864	99% KM Chebyshev UCL	3.854	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.34	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.778	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.126	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.184	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.863	k star (bias corrected MLE)	0.783	
Theta hat (MLE)	1.944	Theta star (bias corrected MLE)	2.143	
nu hat (MLE)	41.41	nu star (bias corrected)	37.57	
Mean (detects)	1.677			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.087	
Maximum	7.9	Median	0.434	
SD	1.681	CV	1.547	
k hat (MLE)	0.529	k star (bias corrected MLE)	0.507	
Theta hat (MLE)	2.053	Theta star (bias corrected MLE)	2.142	
nu hat (MLE)	44.47	nu star (bias corrected)	42.62	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (42.62, α)	28.66	Adjusted Chi Square Value (42.62, β)	28.25	
95% Gamma Approximate UCL (use when n>=50)	1.617	95% Gamma Adjusted UCL (use when n<50)	1.64	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.194	SD (KM)	1.643	
Variance (KM)	2.699	SE of Mean (KM)	0.267	
k hat (KM)	0.528	k star (KM)	0.506	
nu hat (KM)	44.37	nu star (KM)	42.53	
theta hat (KM)	2.261	theta star (KM)	2.358	
80% gamma percentile (KM)	1.962	90% gamma percentile (KM)	3.222	
95% gamma percentile (KM)	4.566	99% gamma percentile (KM)	7.868	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (42.53, α)	28.58	Adjusted Chi Square Value (42.53, β)	28.17	
95% Gamma Approximate KM-UCL (use when n>=50)	1.777	95% Gamma Adjusted KM-UCL (use when n<50)	1.803	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0688	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.136	Mean in Log Scale	-0.52	
SD in Original Scale	1.649	SD in Log Scale	1.09	
95% t UCL (assumes normality of ROS data)	1.564	95% Percentile Bootstrap UCL	1.602	
95% BCA Bootstrap UCL	1.672	95% Bootstrap t UCL	1.871	
95% H-UCL (Log ROS)	1.636			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.54	KM Geo Mean	0.583	
KM SD (logged)	1.209	95% Critical H Value (KM-Log)	2.598	
KM Standard Error of Mean (logged)	0.229	95% H-UCL (KM -Log)	1.978	
KM SD (logged)	1.209	95% Critical H Value (KM-Log)	2.598	
KM Standard Error of Mean (logged)	0.229			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.422	Mean in Log Scale	-0.155	
SD in Original Scale	1.595	SD in Log Scale	1.069	
95% t UCL (Assumes normality)	1.836	95% H-Stat UCL	2.275	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	1.803			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Arsenic

General Statistics			
Total Number of Observations	42	Number of Distinct Observations	36
Number of Detects	32	Number of Non-Detects	10
Number of Distinct Detects	30	Number of Distinct Non-Detects	6
Minimum Detect	1.2	Minimum Non-Detect	0.6
Maximum Detect	30	Maximum Non-Detect	7.5
Variance Detects	51.9	Percent Non-Detects	23.81%
Mean Detects	7.486	SD Detects	7.204
Median Detects	5.005	CV Detects	0.962
Skewness Detects	1.881	Kurtosis Detects	2.94
Mean of Logged Detects	1.665	SD of Logged Detects	0.823

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.743	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.93	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.154	Detected Data Not Normal at 5% Significance Level
Detected Data Not Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	6.167	KM Standard Error of Mean	1.047
KM SD	6.656	95% KM (BCA) UCL	7.81
95% KM (t) UCL	7.93	95% KM (Percentile Bootstrap) UCL	7.974
95% KM (z) UCL	7.89	95% KM Bootstrap t UCL	8.584
90% KM Chebyshev UCL	9.309	95% KM Chebyshev UCL	10.73
97.5% KM Chebyshev UCL	12.71	99% KM Chebyshev UCL	16.59

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	1.056	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.158	Detected Data Not Gamma Distributed at 5% Significance Level
Detected Data Not Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.581	k star (bias corrected MLE)	1.454
Theta hat (MLE)	4.734	Theta star (bias corrected MLE)	5.149
nu hat (MLE)	101.2	nu star (bias corrected)	93.05
Mean (detects)	7.486		

Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	5.892
Maximum	30	Median	4.2
SD	6.929	CV	1.176
k hat (MLE)	0.554	k star (bias corrected MLE)	0.531
Theta hat (MLE)	10.63	Theta star (bias corrected MLE)	11.1
nu hat (MLE)	46.58	nu star (bias corrected)	44.58
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (44.58, α)	30.27	Adjusted Chi Square Value (44.58, β)	29.85
95% Gamma Approximate UCL (use when n>=50)	8.679	95% Gamma Adjusted UCL (use when n<50)	8.801

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.167	SD (KM)	6.656
Variance (KM)	44.3	SE of Mean (KM)	1.047
k hat (KM)	0.859	k star (KM)	0.813
nu hat (KM)	72.12	nu star (KM)	68.31
theta hat (KM)	7.183	theta star (KM)	7.584

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	80% gamma percentile (KM)	10.07	90% gamma percentile (KM)	14.94
	95% gamma percentile (KM)	19.89	99% gamma percentile (KM)	31.57
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (68.31, α)	50.28	Adjusted Chi Square Value (68.31, β)	49.73
	95% Gamma Approximate KM-UCL (use when n>=50)	8.378	95% Gamma Adjusted KM-UCL (use when n<50)	8.471
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.93	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.154	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	6.155	Mean in Log Scale	1.387
	SD in Original Scale	6.73	SD in Log Scale	0.915
	95% t UCL (assumes normality of ROS data)	7.903	95% Percentile Bootstrap UCL	7.997
	95% BCA Bootstrap UCL	8.297	95% Bootstrap t UCL	8.582
	95% H-UCL (Log ROS)	8.414		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	1.368	KM Geo Mean	3.928
	KM SD (logged)	0.953	95% Critical H Value (KM-Log)	2.306
	KM Standard Error of Mean (logged)	0.157	95% H-UCL (KM -Log)	8.714
	KM SD (logged)	0.953	95% Critical H Value (KM-Log)	2.306
	KM Standard Error of Mean (logged)	0.157		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	6.148	Mean in Log Scale	1.356
	SD in Original Scale	6.738	SD in Log Scale	0.995
	95% t UCL (Assumes normality)	7.898	95% H-Stat UCL	9.177
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	8.714		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Barium			
	General Statistics			
	Total Number of Observations	24	Number of Distinct Observations	22
			Number of Missing Observations	0
	Minimum	98.5	Mean	244
	Maximum	489	Median	242
	SD	87	Std. Error of Mean	17.76
	Coefficient of Variation	0.357	Skewness	0.828
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level	
	Data appear Normal at 5% Significance Level			
	Assuming Normal Distribution			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	274.5	95% Adjusted-CLT UCL (Chen-1995)	276.4
		95% Modified-t UCL (Johnson-1978)	275
Gamma GOF Test			
A-D Test Statistic	0.491	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.148	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.144	k star (bias corrected MLE)	7.153
Theta hat (MLE)	29.96	Theta star (bias corrected MLE)	34.11
nu hat (MLE)	390.9	nu star (bias corrected)	343.4
MLE Mean (bias corrected)	244	MLE Sd (bias corrected)	91.24
		Approximate Chi Square Value (0.05)	301.4
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	298.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	278	95% Adjusted Gamma UCL (use when n<50)	280.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.59	Mean of logged Data	5.435
Maximum of Logged Data	6.192	SD of logged Data	0.371
Assuming Lognormal Distribution			
95% H-UCL	283.9	90% Chebyshev (MVUE) UCL	301.7
95% Chebyshev (MVUE) UCL	327.4	97.5% Chebyshev (MVUE) UCL	363.2
99% Chebyshev (MVUE) UCL	433.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	273.2	95% Jackknife UCL	274.5
95% Standard Bootstrap UCL	273.6	95% Bootstrap-t UCL	277.2
95% Hall's Bootstrap UCL	285.4	95% Percentile Bootstrap UCL	273.4
95% BCA Bootstrap UCL	274.8		
90% Chebyshev(Mean, Sd) UCL	297.3	95% Chebyshev(Mean, Sd) UCL	321.4
97.5% Chebyshev(Mean, Sd) UCL	354.9	99% Chebyshev(Mean, Sd) UCL	420.7
Suggested UCL to Use			
95% Student's-t UCL	274.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	0.41	Mean	1.072
Maximum	3.29	Median	0.873

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD	0.693	Std. Error of Mean	0.141
Coefficient of Variation	0.647	Skewness	2.008
Normal GOF Test			
Shapiro Wilk Test Statistic	0.735	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.314	95% Adjusted-CLT UCL (Chen-1995)	1.366
		95% Modified-t UCL (Johnson-1978)	1.324
Gamma GOF Test			
A-D Test Statistic	1.485	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.261	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.179	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.607	k star (bias corrected MLE)	3.184
Theta hat (MLE)	0.297	Theta star (bias corrected MLE)	0.337
nu hat (MLE)	173.2	nu star (bias corrected)	152.8
MLE Mean (bias corrected)	1.072	MLE Sd (bias corrected)	0.6
		Approximate Chi Square Value (0.05)	125.3
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	123.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1.307	95% Adjusted Gamma UCL (use when n<50)	1.326
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.177	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.892	Mean of logged Data	-0.0759
Maximum of Logged Data	1.191	SD of logged Data	0.516
Assuming Lognormal Distribution			
95% H-UCL	1.312	90% Chebyshev (MVUE) UCL	1.399
95% Chebyshev (MVUE) UCL	1.555	97.5% Chebyshev (MVUE) UCL	1.773
99% Chebyshev (MVUE) UCL	2.201		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.304	95% Jackknife UCL	1.314
95% Standard Bootstrap UCL	1.3	95% Bootstrap-t UCL	1.438
95% Hall's Bootstrap UCL	1.384	95% Percentile Bootstrap UCL	1.311
95% BCA Bootstrap UCL	1.346		
90% Chebyshev(Mean, Sd) UCL	1.496	95% Chebyshev(Mean, Sd) UCL	1.688
97.5% Chebyshev(Mean, Sd) UCL	1.955	99% Chebyshev(Mean, Sd) UCL	2.479
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	1.688		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Boron

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	5.9	Mean	59.49
Maximum	324	Median	24.6
SD	101.8	Std. Error of Mean	26.29
Coefficient of Variation	1.711	Skewness	2.337

Normal GOF Test

Shapiro Wilk Test Statistic	0.54	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.383	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	105.8	95% Adjusted-CLT UCL (Chen-1995)	119.7
		95% Modified-t UCL (Johnson-1978)	108.4

Gamma GOF Test

A-D Test Statistic	1.448	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.78	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.267	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.231	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.686	k star (bias corrected MLE)	0.593
Theta hat (MLE)	86.77	Theta star (bias corrected MLE)	100.3
nu hat (MLE)	20.57	nu star (bias corrected)	17.79
MLE Mean (bias corrected)	59.49	MLE Sd (bias corrected)	77.26
		Approximate Chi Square Value (0.05)	9.238
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	8.488

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	114.6	95% Adjusted Gamma UCL (use when n<50)	124.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.159	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.775	Mean of logged Data	3.202
Maximum of Logged Data	5.781	SD of logged Data	1.248

Assuming Lognormal Distribution

95% H-UCL	153.5	90% Chebyshev (MVUE) UCL	102.8
95% Chebyshev (MVUE) UCL	127	97.5% Chebyshev (MVUE) UCL	160.6
99% Chebyshev (MVUE) UCL	226.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	102.7	95% Jackknife UCL	105.8

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Standard Bootstrap UCL	101.8	95% Bootstrap-t UCL	350.9
95% Hall's Bootstrap UCL	353	95% Percentile Bootstrap UCL	101.3
95% BCA Bootstrap UCL	118		
90% Chebyshev(Mean, Sd) UCL	138.4	95% Chebyshev(Mean, Sd) UCL	174.1
97.5% Chebyshev(Mean, Sd) UCL	223.7	99% Chebyshev(Mean, Sd) UCL	321

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	174.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	24	Number of Distinct Observations	20
Number of Detects	19	Number of Non-Detects	5
Number of Distinct Detects	17	Number of Distinct Non-Detects	4
Minimum Detect	0.04	Minimum Non-Detect	0.035
Maximum Detect	0.7	Maximum Non-Detect	0.175
Variance Detects	0.0225	Percent Non-Detects	20.83%
Mean Detects	0.191	SD Detects	0.15
Median Detects	0.166	CV Detects	0.786
Skewness Detects	2.427	Kurtosis Detects	7.182
Mean of Logged Detects	-1.872	SD of Logged Detects	0.658

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.749	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.161	KM Standard Error of Mean	0.03
KM SD	0.143	95% KM (BCA) UCL	0.213
95% KM (t) UCL	0.213	95% KM (Percentile Bootstrap) UCL	0.213
95% KM (z) UCL	0.211	95% KM Bootstrap t UCL	0.242
90% KM Chebyshev UCL	0.251	95% KM Chebyshev UCL	0.292
97.5% KM Chebyshev UCL	0.349	99% KM Chebyshev UCL	0.46

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.476	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2	Detected Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.472	k star (bias corrected MLE)	2.117
Theta hat (MLE)	0.0772	Theta star (bias corrected MLE)	0.0902
nu hat (MLE)	93.93	nu star (bias corrected)	80.43
Mean (detects)	0.191		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.156
Maximum	0.7	Median	0.128
SD	0.15	CV	0.966

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	1.137	k star (bias corrected MLE)	1.023
Theta hat (MLE)	0.137	Theta star (bias corrected MLE)	0.152
nu hat (MLE)	54.6	nu star (bias corrected)	49.1
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (49.10, α)	34.02	Adjusted Chi Square Value (49.10, β)	33.13
95% Gamma Approximate UCL (use when n>=50)	0.225	95% Gamma Adjusted UCL (use when n<50)	0.231
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.161	SD (KM)	0.143
Variance (KM)	0.0204	SE of Mean (KM)	0.03
k hat (KM)	1.275	k star (KM)	1.143
nu hat (KM)	61.19	nu star (KM)	54.87
theta hat (KM)	0.127	theta star (KM)	0.141
80% gamma percentile (KM)	0.257	90% gamma percentile (KM)	0.359
95% gamma percentile (KM)	0.461	99% gamma percentile (KM)	0.695
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (54.87, α)	38.85	Adjusted Chi Square Value (54.87, β)	37.9
95% Gamma Approximate KM-UCL (use when n>=50)	0.228	95% Gamma Adjusted KM-UCL (use when n<50)	0.233
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.161	Mean in Log Scale	-2.129
SD in Original Scale	0.146	SD in Log Scale	0.793
95% t UCL (assumes normality of ROS data)	0.212	95% Percentile Bootstrap UCL	0.213
95% BCA Bootstrap UCL	0.232	95% Bootstrap t UCL	0.25
95% H-UCL (Log ROS)	0.238		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.137	KM Geo Mean	0.118
KM SD (logged)	0.794	95% Critical H Value (KM-Log)	2.284
KM Standard Error of Mean (logged)	0.169	95% H-UCL (KM -Log)	0.236
KM SD (logged)	0.794	95% Critical H Value (KM-Log)	2.284
KM Standard Error of Mean (logged)	0.169		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.159	Mean in Log Scale	-2.206
SD in Original Scale	0.148	SD in Log Scale	0.927
95% t UCL (Assumes normality)	0.211	95% H-Stat UCL	0.271
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.233	95% GROS Adjusted Gamma UCL	0.231
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chromium			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	24	Number of Distinct Observations	24	
		Number of Missing Observations	0	
Minimum	22.5	Mean	48.4	
Maximum	77.2	Median	46.95	
SD	13.35	Std. Error of Mean	2.726	
Coefficient of Variation	0.276	Skewness	0.523	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	53.08	95% Adjusted-CLT UCL (Chen-1995)	53.2	
		95% Modified-t UCL (Johnson-1978)	53.12	
Gamma GOF Test				
A-D Test Statistic	0.287	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.113	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	13.58	k star (bias corrected MLE)	11.91	
Theta hat (MLE)	3.563	Theta star (bias corrected MLE)	4.063	
nu hat (MLE)	652.1	nu star (bias corrected)	571.9	
MLE Mean (bias corrected)	48.4	MLE Sd (bias corrected)	14.02	
		Approximate Chi Square Value (0.05)	517.4	
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	513.8	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	53.5	95% Adjusted Gamma UCL (use when n<50)	53.88	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.113	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.114	Mean of logged Data	3.842	
Maximum of Logged Data	4.346	SD of logged Data	0.283	
Assuming Lognormal Distribution				
95% H-UCL	54.04	90% Chebyshev (MVUE) UCL	56.98	
95% Chebyshev (MVUE) UCL	60.84	97.5% Chebyshev (MVUE) UCL	66.2	
99% Chebyshev (MVUE) UCL	76.72			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	52.89	95% Jackknife UCL	53.08	
95% Standard Bootstrap UCL	52.8	95% Bootstrap-t UCL	53.78	
95% Hall's Bootstrap UCL	53.5	95% Percentile Bootstrap UCL	52.81	
95% BCA Bootstrap UCL	53.12			
90% Chebyshev(Mean, Sd) UCL	56.58	95% Chebyshev(Mean, Sd) UCL	60.29	
97.5% Chebyshev(Mean, Sd) UCL	65.43	99% Chebyshev(Mean, Sd) UCL	75.53	

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Student's-t UCL	53.08			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt				
General Statistics				
Total Number of Observations	24	Number of Distinct Observations	23	
		Number of Missing Observations	0	
Minimum	6.39	Mean	14.62	
Maximum	32	Median	13.8	
SD	6.063	Std. Error of Mean	1.238	
Coefficient of Variation	0.415	Skewness	1.012	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	16.74	95% Adjusted-CLT UCL (Chen-1995)	16.93	
		95% Modified-t UCL (Johnson-1978)	16.79	
Gamma GOF Test				
A-D Test Statistic	0.233	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0902	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	6.345	k star (bias corrected MLE)	5.579	
Theta hat (MLE)	2.304	Theta star (bias corrected MLE)	2.621	
nu hat (MLE)	304.5	nu star (bias corrected)	267.8	
MLE Mean (bias corrected)	14.62	MLE Sd (bias corrected)	6.19	
		Approximate Chi Square Value (0.05)	230.9	
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	228.5	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	16.96	95% Adjusted Gamma UCL (use when n<50)	17.14	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0966	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.855	Mean of logged Data	2.602	
Maximum of Logged Data	3.466	SD of logged Data	0.416	
Assuming Lognormal Distribution				
95% H-UCL	17.35	90% Chebyshev (MVUE) UCL	18.48	
95% Chebyshev (MVUE) UCL	20.22	97.5% Chebyshev (MVUE) UCL	22.63	
99% Chebyshev (MVUE) UCL	27.37			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	16.66	95% Jackknife UCL	16.74	
95% Standard Bootstrap UCL	16.6	95% Bootstrap-t UCL	17.08	
95% Hall's Bootstrap UCL	17.2	95% Percentile Bootstrap UCL	16.78	
95% BCA Bootstrap UCL	16.79			
90% Chebyshev(Mean, Sd) UCL	18.33	95% Chebyshev(Mean, Sd) UCL	20.02	
97.5% Chebyshev(Mean, Sd) UCL	22.35	99% Chebyshev(Mean, Sd) UCL	26.94	
Suggested UCL to Use				
95% Student's-t UCL	16.74			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper				
General Statistics				
Total Number of Observations	24	Number of Distinct Observations	23	
		Number of Missing Observations	0	
Minimum	16.1	Mean	28.79	
Maximum	78.6	Median	23.3	
SD	13.96	Std. Error of Mean	2.85	
Coefficient of Variation	0.485	Skewness	2.302	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.756	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.177	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	33.67	95% Adjusted-CLT UCL (Chen-1995)	34.91	
		95% Modified-t UCL (Johnson-1978)	33.89	
Gamma GOF Test				
A-D Test Statistic	1.021	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.177	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	6.302	k star (bias corrected MLE)	5.542	
Theta hat (MLE)	4.568	Theta star (bias corrected MLE)	5.194	
nu hat (MLE)	302.5	nu star (bias corrected)	266	
MLE Mean (bias corrected)	28.79	MLE Sd (bias corrected)	12.23	
		Approximate Chi Square Value (0.05)	229.2	
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	226.9	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	33.4	95% Adjusted Gamma UCL (use when n<50)	33.76	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.166	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level		

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.779	Mean of logged Data	3.279	
Maximum of Logged Data	4.364	SD of logged Data	0.385	
Assuming Lognormal Distribution				
95% H-UCL	33.25	90% Chebyshev (MVUE) UCL	35.37	
95% Chebyshev (MVUE) UCL	38.49	97.5% Chebyshev (MVUE) UCL	42.82	
99% Chebyshev (MVUE) UCL	51.32			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	33.48	95% Jackknife UCL	33.67	
95% Standard Bootstrap UCL	33.47	95% Bootstrap-t UCL	36.85	
95% Hall's Bootstrap UCL	50.39	95% Percentile Bootstrap UCL	33.65	
95% BCA Bootstrap UCL	35.08			
90% Chebyshev(Mean, Sd) UCL	37.34	95% Chebyshev(Mean, Sd) UCL	41.21	
97.5% Chebyshev(Mean, Sd) UCL	46.58	99% Chebyshev(Mean, Sd) UCL	57.14	
Suggested UCL to Use				
95% Adjusted Gamma UCL	33.76			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron				
General Statistics				
Total Number of Observations	21	Number of Distinct Observations	20	
		Number of Missing Observations	0	
Minimum	8290	Mean	24233	
Maximum	40600	Median	24600	
SD	7900	Std. Error of Mean	1724	
Coefficient of Variation	0.326	Skewness	-0.239	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0943	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	27206	95% Adjusted-CLT UCL (Chen-1995)	26973	
		95% Modified-t UCL (Johnson-1978)	27191	
Gamma GOF Test				
A-D Test Statistic	0.585	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	8.05	k star (bias corrected MLE)	6.932	

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Theta hat (MLE)	3010	Theta star (bias corrected MLE)	3496
nu hat (MLE)	338.1	nu star (bias corrected)	291.1
MLE Mean (bias corrected)	24233	MLE Sd (bias corrected)	9204
		Approximate Chi Square Value (0.05)	252.6
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	249.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	27928	95% Adjusted Gamma UCL (use when n<50)	28236
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.023	Mean of logged Data	10.03
Maximum of Logged Data	10.61	SD of logged Data	0.391
Assuming Lognormal Distribution			
95% H-UCL	28993	90% Chebyshev (MVUE) UCL	30876
95% Chebyshev (MVUE) UCL	33782	97.5% Chebyshev (MVUE) UCL	37816
99% Chebyshev (MVUE) UCL	45740		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	27068	95% Jackknife UCL	27206
95% Standard Bootstrap UCL	26979	95% Bootstrap-t UCL	27104
95% Hall's Bootstrap UCL	27066	95% Percentile Bootstrap UCL	27024
95% BCA Bootstrap UCL	26861		
90% Chebyshev(Mean, Sd) UCL	29405	95% Chebyshev(Mean, Sd) UCL	31747
97.5% Chebyshev(Mean, Sd) UCL	34999	99% Chebyshev(Mean, Sd) UCL	41385
Suggested UCL to Use			
95% Student's-t UCL	27206		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Lead			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	5.75	Mean	12.89
Maximum	25	Median	12.3
SD	4.725	Std. Error of Mean	0.964
Coefficient of Variation	0.367	Skewness	0.923
Normal GOF Test			
Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	14.54		95% Adjusted-CLT UCL (Chen-1995)	14.67
			95% Modified-t UCL (Johnson-1978)	14.57
Gamma GOF Test				
A-D Test Statistic	0.25		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.11		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.178		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	8.314		k star (bias corrected MLE)	7.303
Theta hat (MLE)	1.55		Theta star (bias corrected MLE)	1.765
nu hat (MLE)	399.1		nu star (bias corrected)	350.5
MLE Mean (bias corrected)	12.89		MLE Sd (bias corrected)	4.77
			Approximate Chi Square Value (0.05)	308.2
Adjusted Level of Significance	0.0392		Adjusted Chi Square Value	305.4
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	14.66		95% Adjusted Gamma UCL (use when n<50)	14.8
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.986		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.916		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0955		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.177		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.749		Mean of logged Data	2.495
Maximum of Logged Data	3.219		SD of logged Data	0.357
Assuming Lognormal Distribution				
95% H-UCL	14.85		90% Chebyshev (MVUE) UCL	15.76
95% Chebyshev (MVUE) UCL	17.07		97.5% Chebyshev (MVUE) UCL	18.88
99% Chebyshev (MVUE) UCL	22.43			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	14.48		95% Jackknife UCL	14.54
95% Standard Bootstrap UCL	14.4		95% Bootstrap-t UCL	14.73
95% Hall's Bootstrap UCL	14.83		95% Percentile Bootstrap UCL	14.4
95% BCA Bootstrap UCL	14.69			
90% Chebyshev(Mean, Sd) UCL	15.78		95% Chebyshev(Mean, Sd) UCL	17.09
97.5% Chebyshev(Mean, Sd) UCL	18.91		99% Chebyshev(Mean, Sd) UCL	22.49
Suggested UCL to Use				
95% Student's-t UCL	14.54			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lithium				
General Statistics				
Total Number of Observations	15		Number of Distinct Observations	15
			Number of Missing Observations	0
Minimum	11		Mean	25.33

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum	109	Median	15
SD	26.5	Std. Error of Mean	6.841
Coefficient of Variation	1.046	Skewness	2.744
Normal GOF Test			
Shapiro Wilk Test Statistic	0.565	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.348	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	37.38	95% Adjusted-CLT UCL (Chen-1995)	41.76
		95% Modified-t UCL (Johnson-1978)	38.18
Gamma GOF Test			
A-D Test Statistic	2.011	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.327	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.224	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.976	k star (bias corrected MLE)	1.625
Theta hat (MLE)	12.82	Theta star (bias corrected MLE)	15.58
nu hat (MLE)	59.28	nu star (bias corrected)	48.75
MLE Mean (bias corrected)	25.33	MLE Sd (bias corrected)	19.87
		Approximate Chi Square Value (0.05)	33.73
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	32.19
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	36.61	95% Adjusted Gamma UCL (use when n<50)	38.36
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.755	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.288	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.398	Mean of logged Data	2.958
Maximum of Logged Data	4.691	SD of logged Data	0.655
Assuming Lognormal Distribution			
95% H-UCL	35.37	90% Chebyshev (MVUE) UCL	35.95
95% Chebyshev (MVUE) UCL	41.6	97.5% Chebyshev (MVUE) UCL	49.44
99% Chebyshev (MVUE) UCL	64.85		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	36.58	95% Jackknife UCL	37.38
95% Standard Bootstrap UCL	36.16	95% Bootstrap-t UCL	77.38
95% Hall's Bootstrap UCL	84.34	95% Percentile Bootstrap UCL	37.6
95% BCA Bootstrap UCL	43.03		
90% Chebyshev(Mean, Sd) UCL	45.85	95% Chebyshev(Mean, Sd) UCL	55.15
97.5% Chebyshev(Mean, Sd) UCL	68.05	99% Chebyshev(Mean, Sd) UCL	93.4
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	55.15		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese

General Statistics

Total Number of Observations	24	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	135	Mean	995.7
Maximum	1910	Median	1080
SD	559.4	Std. Error of Mean	114.2
Coefficient of Variation	0.562	Skewness	-0.0568

Normal GOF Test

Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1191	95% Adjusted-CLT UCL (Chen-1995)	1182
		95% Modified-t UCL (Johnson-1978)	1191

Gamma GOF Test

A-D Test Statistic	1.025	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.18	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.154	k star (bias corrected MLE)	1.912
Theta hat (MLE)	462.3	Theta star (bias corrected MLE)	520.7
nu hat (MLE)	103.4	nu star (bias corrected)	91.79
MLE Mean (bias corrected)	995.7	MLE Sd (bias corrected)	720
		Approximate Chi Square Value (0.05)	70.69
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	69.39

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1293	95% Adjusted Gamma UCL (use when n<50)	1317

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.916	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.177	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.905	Mean of logged Data	6.654
Maximum of Logged Data	7.555	SD of logged Data	0.842

Assuming Lognormal Distribution

95% H-UCL	1667	90% Chebyshev (MVUE) UCL	1700
95% Chebyshev (MVUE) UCL	1978	97.5% Chebyshev (MVUE) UCL	2365
99% Chebyshev (MVUE) UCL	3125		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	1183	95% Jackknife UCL	1191
95% Standard Bootstrap UCL	1176	95% Bootstrap-t UCL	1191
95% Hall's Bootstrap UCL	1180	95% Percentile Bootstrap UCL	1179
95% BCA Bootstrap UCL	1181		
90% Chebyshev(Mean, Sd) UCL	1338	95% Chebyshev(Mean, Sd) UCL	1493
97.5% Chebyshev(Mean, Sd) UCL	1709	99% Chebyshev(Mean, Sd) UCL	2132

Suggested UCL to Use

95% Student's-t UCL	1191

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Mercury

General Statistics

Total Number of Observations	42	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	0.65	Mean	11.75
Maximum	28.8	Median	11.05
SD	7.455	Std. Error of Mean	1.15
Coefficient of Variation	0.635	Skewness	0.493

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.942	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.0994	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.135	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.68	95% Adjusted-CLT UCL (Chen-1995)	13.73
		95% Modified-t UCL (Johnson-1978)	13.7

Gamma GOF Test

A-D Test Statistic	0.364	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.107	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.138	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.97	k star (bias corrected MLE)	1.845
Theta hat (MLE)	5.964	Theta star (bias corrected MLE)	6.367
nu hat (MLE)	165.5	nu star (bias corrected)	155
MLE Mean (bias corrected)	11.75	MLE Sd (bias corrected)	8.649
		Approximate Chi Square Value (0.05)	127.2
Adjusted Level of Significance	0.0443	Adjusted Chi Square Value	126.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	14.31	95% Adjusted Gamma UCL (use when n<50)	14.41

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.876	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.942	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.135	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Lognormal Statistics			
	Minimum of Logged Data	-0.431	Mean of logged Data	2.189
	Maximum of Logged Data	3.36	SD of logged Data	0.863
	Assuming Lognormal Distribution			
	95% H-UCL	17.45	90% Chebyshev (MVUE) UCL	18.58
	95% Chebyshev (MVUE) UCL	21.2	97.5% Chebyshev (MVUE) UCL	24.83
	99% Chebyshev (MVUE) UCL	31.97		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	13.64	95% Jackknife UCL	13.68
	95% Standard Bootstrap UCL	13.61	95% Bootstrap-t UCL	13.66
	95% Hall's Bootstrap UCL	13.74	95% Percentile Bootstrap UCL	13.61
	95% BCA Bootstrap UCL	13.69		
	90% Chebyshev(Mean, Sd) UCL	15.2	95% Chebyshev(Mean, Sd) UCL	16.76
	97.5% Chebyshev(Mean, Sd) UCL	18.93	99% Chebyshev(Mean, Sd) UCL	23.19
	Suggested UCL to Use			
	95% Student's-t UCL	13.68		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Molybdenum			
	General Statistics			
	Total Number of Observations	18	Number of Distinct Observations	17
	Number of Detects	15	Number of Non-Detects	3
	Number of Distinct Detects	14	Number of Distinct Non-Detects	3
	Minimum Detect	0.082	Minimum Non-Detect	0.06
	Maximum Detect	0.799	Maximum Non-Detect	0.09
	Variance Detects	0.0538	Percent Non-Detects	16.67%
	Mean Detects	0.368	SD Detects	0.232
	Median Detects	0.329	CV Detects	0.63
	Skewness Detects	0.557	Kurtosis Detects	-0.632
	Mean of Logged Detects	-1.223	SD of Logged Detects	0.739
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.881	Detected Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.22	Detected Data appear Normal at 5% Significance Level	
	Detected Data appear Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.318	KM Standard Error of Mean	0.0571
	KM SD	0.234	95% KM (BCA) UCL	0.41
	95% KM (t) UCL	0.417	95% KM (Percentile Bootstrap) UCL	0.409
	95% KM (z) UCL	0.411	95% KM Bootstrap t UCL	0.434
	90% KM Chebyshev UCL	0.489	95% KM Chebyshev UCL	0.566
	97.5% KM Chebyshev UCL	0.674	99% KM Chebyshev UCL	0.885
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.238	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.112	**Kolmogorov-Smirnov GOF**	

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% K-S Critical Value	0.224	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	2.39	k star (bias corrected MLE)	1.956
	Theta hat (MLE)	0.154	Theta star (bias corrected MLE)	0.188
	nu hat (MLE)	71.69	nu star (bias corrected)	58.69
	Mean (detects)	0.368		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.31
	Maximum	0.799	Median	0.269
	SD	0.249	CV	0.803
	k hat (MLE)	1.066	k star (bias corrected MLE)	0.925
	Theta hat (MLE)	0.291	Theta star (bias corrected MLE)	0.335
	nu hat (MLE)	38.38	nu star (bias corrected)	33.31
	Adjusted Level of Significance (β)	0.0357		
	Approximate Chi Square Value (33.31, α)	21.12	Adjusted Chi Square Value (33.31, β)	20.19
	95% Gamma Approximate UCL (use when n>=50)	0.489	95% Gamma Adjusted UCL (use when n<50)	0.512
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.318	SD (KM)	0.234
	Variance (KM)	0.0547	SE of Mean (KM)	0.0571
	k hat (KM)	1.843	k star (KM)	1.573
	nu hat (KM)	66.36	nu star (KM)	56.63
	theta hat (KM)	0.172	theta star (KM)	0.202
	80% gamma percentile (KM)	0.489	90% gamma percentile (KM)	0.654
	95% gamma percentile (KM)	0.814	99% gamma percentile (KM)	1.174
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (56.63, α)	40.34	Adjusted Chi Square Value (56.63, β)	39.02
	95% Gamma Approximate KM-UCL (use when n>=50)	0.446	95% Gamma Adjusted KM-UCL (use when n<50)	0.461
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.317	Mean in Log Scale	-1.488
	SD in Original Scale	0.241	SD in Log Scale	0.91
	95% t UCL (assumes normality of ROS data)	0.416	95% Percentile Bootstrap UCL	0.409
	95% BCA Bootstrap UCL	0.423	95% Bootstrap t UCL	0.434
	95% H-UCL (Log ROS)	0.594		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-1.478	KM Geo Mean	0.228
	KM SD (logged)	0.868	95% Critical H Value (KM-Log)	2.452
	KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	0.557
	KM SD (logged)	0.868	95% Critical H Value (KM-Log)	2.452
	KM Standard Error of Mean (logged)	0.212		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.313	Mean in Log Scale	-1.576
	SD in Original Scale	0.246	SD in Log Scale	1.057
	95% t UCL (Assumes normality)	0.414	95% H-Stat UCL	0.726
	DL/2 is not a recommended method, provided for comparisons and historical reasons			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Normal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (t) UCL	0.417		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Nickel			
	General Statistics			
	Total Number of Observations	24	Number of Distinct Observations	22
			Number of Missing Observations	0
	Minimum	13.5	Mean	36.06
	Maximum	121	Median	30.3
	SD	22.12	Std. Error of Mean	4.515
	Coefficient of Variation	0.613	Skewness	2.664
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.736	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.916	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.224	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.177	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	43.8	95% Adjusted-CLT UCL (Chen-1995)	46.11
			95% Modified-t UCL (Johnson-1978)	44.21
	Gamma GOF Test			
	A-D Test Statistic	0.643	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.172	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.179	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	4.183	k star (bias corrected MLE)	3.688
	Theta hat (MLE)	8.62	Theta star (bias corrected MLE)	9.777
	nu hat (MLE)	200.8	nu star (bias corrected)	177
	MLE Mean (bias corrected)	36.06	MLE Sd (bias corrected)	18.78
			Approximate Chi Square Value (0.05)	147.3
	Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	145.3
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50)	43.35	95% Adjusted Gamma UCL (use when n<50)	43.92
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.137	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	2.603	Mean of logged Data	3.461
	Maximum of Logged Data	4.796	SD of logged Data	0.479
	Assuming Lognormal Distribution			

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL	43.44	90% Chebyshev (MVUE) UCL	46.33
95% Chebyshev (MVUE) UCL	51.22	97.5% Chebyshev (MVUE) UCL	58.01
99% Chebyshev (MVUE) UCL	71.35		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	43.48	95% Jackknife UCL	43.8
95% Standard Bootstrap UCL	43.38	95% Bootstrap-t UCL	49.04
95% Hall's Bootstrap UCL	77.96	95% Percentile Bootstrap UCL	43.58
95% BCA Bootstrap UCL	45.92		
90% Chebyshev(Mean, Sd) UCL	49.6	95% Chebyshev(Mean, Sd) UCL	55.74
97.5% Chebyshev(Mean, Sd) UCL	64.25	99% Chebyshev(Mean, Sd) UCL	80.98
Suggested UCL to Use			
95% Adjusted Gamma UCL	43.92		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	23
Number of Detects	19	Number of Non-Detects	5
Number of Distinct Detects	19	Number of Distinct Non-Detects	4
Minimum Detect	0.7	Minimum Non-Detect	0.175
Maximum Detect	12.8	Maximum Non-Detect	0.5
Variance Detects	10.3	Percent Non-Detects	20.83%
Mean Detects	3.268	SD Detects	3.209
Median Detects	2.19	CV Detects	0.982
Skewness Detects	2.216	Kurtosis Detects	4.515
Mean of Logged Detects	0.866	SD of Logged Detects	0.776
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.689	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.624	KM Standard Error of Mean	0.64
KM SD	3.05	95% KM (BCA) UCL	3.774
95% KM (t) UCL	3.72	95% KM (Percentile Bootstrap) UCL	3.696
95% KM (z) UCL	3.676	95% KM Bootstrap t UCL	4.601
90% KM Chebyshev UCL	4.542	95% KM Chebyshev UCL	5.412
97.5% KM Chebyshev UCL	6.618	99% KM Chebyshev UCL	8.988
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.98	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.755	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.202	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.721	k star (bias corrected MLE)	1.484
Theta hat (MLE)	1.899	Theta star (bias corrected MLE)	2.202
nu hat (MLE)	65.38	nu star (bias corrected)	56.39
Mean (detects)	3.268		

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	2.589	
Maximum	12.8	Median	1.93	
SD	3.144	CV	1.214	
k hat (MLE)	0.516	k star (bias corrected MLE)	0.479	
Theta hat (MLE)	5.018	Theta star (bias corrected MLE)	5.402	
nu hat (MLE)	24.77	nu star (bias corrected)	23.01	
Adjusted Level of Significance (β)	0.0392			
Approximate Chi Square Value (23.01, α)	13.09	Adjusted Chi Square Value (23.01, β)	12.57	
95% Gamma Approximate UCL (use when n>=50)	4.549	95% Gamma Adjusted UCL (use when n<50)	4.739	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	2.624	SD (KM)	3.05	
Variance (KM)	9.303	SE of Mean (KM)	0.64	
k hat (KM)	0.74	k star (KM)	0.675	
nu hat (KM)	35.51	nu star (KM)	32.41	
theta hat (KM)	3.546	theta star (KM)	3.886	
80% gamma percentile (KM)	4.317	90% gamma percentile (KM)	6.641	
95% gamma percentile (KM)	9.047	99% gamma percentile (KM)	14.81	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (32.41, α)	20.4	Adjusted Chi Square Value (32.41, β)	19.73	
95% Gamma Approximate KM-UCL (use when n>=50)	4.169	95% Gamma Adjusted KM-UCL (use when n<50)	4.31	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.197	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	2.674	Mean in Log Scale	0.501	
SD in Original Scale	3.076	SD in Log Scale	1.002	
95% t UCL (assumes normality of ROS data)	3.75	95% Percentile Bootstrap UCL	3.826	
95% BCA Bootstrap UCL	4.043	95% Bootstrap t UCL	4.773	
95% H-UCL (Log ROS)	4.643			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.323	KM Geo Mean	1.381	
KM SD (logged)	1.255	95% Critical H Value (KM-Log)	2.902	
KM Standard Error of Mean (logged)	0.263	95% H-UCL (KM -Log)	6.484	
KM SD (logged)	1.255	95% Critical H Value (KM-Log)	2.902	
KM Standard Error of Mean (logged)	0.263			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	2.621	Mean in Log Scale	0.284	
SD in Original Scale	3.118	SD in Log Scale	1.364	
95% t UCL (Assumes normality)	3.712	95% H-Stat UCL	8.053	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	6.484			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Silver

General Statistics

Total Number of Observations	24	Number of Distinct Observations	21
Number of Detects	22	Number of Non-Detects	2
Number of Distinct Detects	20	Number of Distinct Non-Detects	2
Minimum Detect	0.036	Minimum Non-Detect	0.055
Maximum Detect	0.49	Maximum Non-Detect	0.105
Variance Detects	0.0121	Percent Non-Detects	8.333%
Mean Detects	0.12	SD Detects	0.11
Median Detects	0.0775	CV Detects	0.916
Skewness Detects	2.21	Kurtosis Detects	5.315
Mean of Logged Detects	-2.396	SD of Logged Detects	0.707

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.716	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.115	KM Standard Error of Mean	0.0219
KM SD	0.105	95% KM (BCA) UCL	0.154
95% KM (t) UCL	0.152	95% KM (Percentile Bootstrap) UCL	0.151
95% KM (z) UCL	0.151	95% KM Bootstrap t UCL	0.181
90% KM Chebyshev UCL	0.18	95% KM Chebyshev UCL	0.21
97.5% KM Chebyshev UCL	0.251	99% KM Chebyshev UCL	0.332

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.152	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.209	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.188	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.955	k star (bias corrected MLE)	1.718
Theta hat (MLE)	0.0615	Theta star (bias corrected MLE)	0.0699
nu hat (MLE)	86	nu star (bias corrected)	75.61
Mean (detects)	0.12		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.113
Maximum	0.49	Median	0.072
SD	0.108	CV	0.958
k hat (MLE)	1.677	k star (bias corrected MLE)	1.495
Theta hat (MLE)	0.0673	Theta star (bias corrected MLE)	0.0755
nu hat (MLE)	80.51	nu star (bias corrected)	71.78
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (71.78, α)	53.27	Adjusted Chi Square Value (71.78, β)	52.15
95% Gamma Approximate UCL (use when n>=50)	0.152	95% Gamma Adjusted UCL (use when n<50)	0.155

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.115	SD (KM)	0.105
Variance (KM)	0.011	SE of Mean (KM)	0.0219

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	k hat (KM)	1.198	k star (KM)	1.076
	nu hat (KM)	57.5	nu star (KM)	51.65
	theta hat (KM)	0.0957	theta star (KM)	0.107
	80% gamma percentile (KM)	0.183	90% gamma percentile (KM)	0.259
	95% gamma percentile (KM)	0.335	99% gamma percentile (KM)	0.509
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (51.65, α)	36.14	Adjusted Chi Square Value (51.65, β)	35.23
	95% Gamma Approximate KM-UCL (use when n>=50)	0.164	95% Gamma Adjusted KM-UCL (use when n<50)	0.168
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.114	Mean in Log Scale	-2.446
	SD in Original Scale	0.107	SD in Log Scale	0.701
	95% t UCL (assumes normality of ROS data)	0.152	95% Percentile Bootstrap UCL	0.152
	95% BCA Bootstrap UCL	0.163	95% Bootstrap t UCL	0.178
	95% H-UCL (Log ROS)	0.152		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-2.444	KM Geo Mean	0.0868
	KM SD (logged)	0.685	95% Critical H Value (KM-Log)	2.162
	KM Standard Error of Mean (logged)	0.144	95% H-UCL (KM -Log)	0.15
	KM SD (logged)	0.685	95% Critical H Value (KM-Log)	2.162
	KM Standard Error of Mean (logged)	0.144		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.114	Mean in Log Scale	-2.469
	SD in Original Scale	0.108	SD in Log Scale	0.726
	95% t UCL (Assumes normality)	0.151	95% H-Stat UCL	0.154
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	0.15		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Thallium			
	General Statistics			
	Total Number of Observations	24	Number of Distinct Observations	18
	Number of Detects	18	Number of Non-Detects	6
	Number of Distinct Detects	15	Number of Distinct Non-Detects	3
	Minimum Detect	0.057	Minimum Non-Detect	1.2
	Maximum Detect	0.336	Maximum Non-Detect	1.35
	Variance Detects	0.0047	Percent Non-Detects	25%
	Mean Detects	0.155	SD Detects	0.0686
	Median Detects	0.127	CV Detects	0.441
	Skewness Detects	1.179	Kurtosis Detects	1.403
	Mean of Logged Detects	-1.947	SD of Logged Detects	0.422
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**	

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.25	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.202	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.155	KM Standard Error of Mean	0.0162
	KM SD	0.0666	95% KM (BCA) UCL	0.181
	95% KM (t) UCL	0.183	95% KM (Percentile Bootstrap) UCL	0.181
	95% KM (z) UCL	0.182	95% KM Bootstrap t UCL	0.187
	90% KM Chebyshev UCL	0.204	95% KM Chebyshev UCL	0.226
	97.5% KM Chebyshev UCL	0.256	99% KM Chebyshev UCL	0.316
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.541	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.217	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.204	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected data follow Appr. Gamma Distribution at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	6.046	k star (bias corrected MLE)	5.075
	Theta hat (MLE)	0.0257	Theta star (bias corrected MLE)	0.0306
	nu hat (MLE)	217.6	nu star (bias corrected)	182.7
	Mean (detects)	0.155		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.057	Mean	0.154
	Maximum	0.336	Median	0.131
	SD	0.0621	CV	0.403
	k hat (MLE)	7.116	k star (bias corrected MLE)	6.254
	Theta hat (MLE)	0.0217	Theta star (bias corrected MLE)	0.0246
	nu hat (MLE)	341.6	nu star (bias corrected)	300.2
	Adjusted Level of Significance (β)	0.0392		
	Approximate Chi Square Value (300.21, α)	261.1	Adjusted Chi Square Value (300.21, β)	258.5
	95% Gamma Approximate UCL (use when n>=50)	0.177	95% Gamma Adjusted UCL (use when n<50)	0.179
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.155	SD (KM)	0.0666
	Variance (KM)	0.00444	SE of Mean (KM)	0.0162
	k hat (KM)	5.434	k star (KM)	4.782
	nu hat (KM)	260.8	nu star (KM)	229.6
	theta hat (KM)	0.0286	theta star (KM)	0.0325
	80% gamma percentile (KM)	0.21	90% gamma percentile (KM)	0.25
	95% gamma percentile (KM)	0.288	99% gamma percentile (KM)	0.366
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (229.55, α)	195.5	Adjusted Chi Square Value (229.55, β)	193.3
	95% Gamma Approximate KM-UCL (use when n>=50)	0.182	95% Gamma Adjusted KM-UCL (use when n<50)	0.184
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.202	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.153	Mean in Log Scale	-1.947
	SD in Original Scale	0.0617	SD in Log Scale	0.383

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (assumes normality of ROS data)	0.175	95% Percentile Bootstrap UCL	0.175
95% BCA Bootstrap UCL	0.177	95% Bootstrap t UCL	0.181
95% H-UCL (Log ROS)	0.178		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.947	KM Geo Mean	0.143
KM SD (logged)	0.411	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0996	95% H-UCL (KM -Log)	0.183
KM SD (logged)	0.411	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0996		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.278	Mean in Log Scale	-1.57
SD in Original Scale	0.225	SD in Log Scale	0.76
95% t UCL (Assumes normality)	0.357	95% H-Stat UCL	0.397
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.184	95% GROS Adjusted Gamma UCL	0.179
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	24	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	12.5	Mean	56.75
Maximum	130	Median	51.4
SD	29.3	Std. Error of Mean	5.981
Coefficient of Variation	0.516	Skewness	0.82
Normal GOF Test			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	67	95% Adjusted-CLT UCL (Chen-1995)	67.65
		95% Modified-t UCL (Johnson-1978)	67.16
Gamma GOF Test			
A-D Test Statistic	0.173	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0818	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.179	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.866	k star (bias corrected MLE)	3.411
Theta hat (MLE)	14.68	Theta star (bias corrected MLE)	16.64

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	185.6	nu star (bias corrected)	163.7
	MLE Mean (bias corrected)	56.75	MLE Sd (bias corrected)	30.73
			Approximate Chi Square Value (0.05)	135.1
	Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	133.3
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	68.75	95% Adjusted Gamma UCL (use when n<50)	69.69
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0984	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	2.526	Mean of logged Data	3.904
	Maximum of Logged Data	4.868	SD of logged Data	0.551
	Assuming Lognormal Distribution			
	95% H-UCL	72.88	90% Chebyshev (MVUE) UCL	77.6
	95% Chebyshev (MVUE) UCL	86.79	97.5% Chebyshev (MVUE) UCL	99.55
	99% Chebyshev (MVUE) UCL	124.6		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	66.58	95% Jackknife UCL	67
	95% Standard Bootstrap UCL	66.35	95% Bootstrap-t UCL	68.27
	95% Hall's Bootstrap UCL	68.41	95% Percentile Bootstrap UCL	66.35
	95% BCA Bootstrap UCL	66.96		
	90% Chebyshev(Mean, Sd) UCL	74.69	95% Chebyshev(Mean, Sd) UCL	82.82
	97.5% Chebyshev(Mean, Sd) UCL	94.1	99% Chebyshev(Mean, Sd) UCL	116.3
	Suggested UCL to Use			
	95% Student's-t UCL	67		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Zinc			
	General Statistics			
	Total Number of Observations	24	Number of Distinct Observations	23
			Number of Missing Observations	0
	Minimum	30.5	Mean	76.73
	Maximum	127	Median	71.05
	SD	26.91	Std. Error of Mean	5.492
	Coefficient of Variation	0.351	Skewness	0.392
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.916	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.177	Data appear Normal at 5% Significance Level	
	Data appear Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	86.14	95% Adjusted-CLT UCL (Chen-1995)	86.23
			95% Modified-t UCL (Johnson-1978)	86.22

Table E1-5
PMB - Andesite, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Test				
A-D Test Statistic	0.32	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.11	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	8.053	k star (bias corrected MLE)	7.075	
Theta hat (MLE)	9.528	Theta star (bias corrected MLE)	10.85	
nu hat (MLE)	386.6	nu star (bias corrected)	339.6	
MLE Mean (bias corrected)	76.73	MLE Sd (bias corrected)	28.85	
		Approximate Chi Square Value (0.05)	297.9	
Adjusted Level of Significance	0.0392	Adjusted Chi Square Value	295.1	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	87.47	95% Adjusted Gamma UCL (use when n<50)	88.28	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.916	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.129	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.418	Mean of logged Data	4.277	
Maximum of Logged Data	4.844	SD of logged Data	0.375	
Assuming Lognormal Distribution				
95% H-UCL	89.51	90% Chebyshev (MVUE) UCL	95.15	
95% Chebyshev (MVUE) UCL	103.4	97.5% Chebyshev (MVUE) UCL	114.7	
99% Chebyshev (MVUE) UCL	137.1			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	85.76	95% Jackknife UCL	86.14	
95% Standard Bootstrap UCL	85.4	95% Bootstrap-t UCL	86.64	
95% Hall's Bootstrap UCL	86.51	95% Percentile Bootstrap UCL	85.88	
95% BCA Bootstrap UCL	86.14			
90% Chebyshev(Mean, Sd) UCL	93.21	95% Chebyshev(Mean, Sd) UCL	100.7	
97.5% Chebyshev(Mean, Sd) UCL	111	99% Chebyshev(Mean, Sd) UCL	131.4	
Suggested UCL to Use				
95% Student's-t UCL	86.14			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.110/9/2019 10:03:55 AM
From File	BkgSoilFranciscan_UCLData_20191009.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	52	Number of Distinct Observations	51
		Number of Missing Observations	0
Minimum	3510	Mean	9108
Maximum	16600	Median	8570
SD	3095	Std. Error of Mean	429.2
Coefficient of Variation	0.34	Skewness	0.395

Normal GOF Test

Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.27	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0895	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9827	95% Adjusted-CLT UCL (Chen-1995)	9839
		95% Modified-t UCL (Johnson-1978)	9831

Gamma GOF Test

A-D Test Statistic	0.257	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0692	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.123	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	8.573	k star (bias corrected MLE)	8.092
Theta hat (MLE)	1062	Theta star (bias corrected MLE)	1126
nu hat (MLE)	891.6	nu star (bias corrected)	841.5
MLE Mean (bias corrected)	9108	MLE Sd (bias corrected)	3202
		Approximate Chi Square Value (0.05)	775.2
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	773.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	9887	95% Adjusted Gamma UCL (use when n<50)	9910

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.495	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.073	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.163	Mean of logged Data	9.057
Maximum of Logged Data	9.717	SD of logged Data	0.356

Assuming Lognormal Distribution

95% H-UCL	9977	90% Chebyshev (MVUE) UCL	10516
95% Chebyshev (MVUE) UCL	11144	97.5% Chebyshev (MVUE) UCL	12016
99% Chebyshev (MVUE) UCL	13728		

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	9814	95% Jackknife UCL	9827	
95% Standard Bootstrap UCL	9816	95% Bootstrap-t UCL	9851	
95% Hall's Bootstrap UCL	9880	95% Percentile Bootstrap UCL	9832	
95% BCA Bootstrap UCL	9824			
90% Chebyshev(Mean, Sd) UCL	10395	95% Chebyshev(Mean, Sd) UCL	10978	
97.5% Chebyshev(Mean, Sd) UCL	11788	99% Chebyshev(Mean, Sd) UCL	13378	
Suggested UCL to Use				
95% Student's-t UCL	9827			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	96	Number of Distinct Observations	68	
Number of Detects	63	Number of Non-Detects	33	
Number of Distinct Detects	57	Number of Distinct Non-Detects	12	
Minimum Detect	0.037	Minimum Non-Detect	0.295	
Maximum Detect	8	Maximum Non-Detect	3.7	
Variance Detects	2.681	Percent Non-Detects	34.38%	
Mean Detects	1.996	SD Detects	1.637	
Median Detects	1.5	CV Detects	0.82	
Skewness Detects	1.901	Kurtosis Detects	4.155	
Mean of Logged Detects	0.339	SD of Logged Detects	1.005	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.815	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	1.581E-10	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.111	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.419	KM Standard Error of Mean	0.164	
KM SD	1.565	95% KM (BCA) UCL	1.69	
95% KM (t) UCL	1.691	95% KM (Percentile Bootstrap) UCL	1.693	
95% KM (z) UCL	1.688	95% KM Bootstrap t UCL	1.728	
90% KM Chebyshev UCL	1.91	95% KM Chebyshev UCL	2.132	
97.5% KM Chebyshev UCL	2.441	99% KM Chebyshev UCL	3.047	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.884	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.768	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0973	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.114	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.565	k star (bias corrected MLE)	1.501	
Theta hat (MLE)	1.276	Theta star (bias corrected MLE)	1.33	
nu hat (MLE)	197.2	nu star (bias corrected)	189.1	
Mean (detects)	1.996			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.374	
Maximum	8	Median	0.916	
SD	1.588	CV	1.156	
k hat (MLE)	0.546	k star (bias corrected MLE)	0.536	
Theta hat (MLE)	2.515	Theta star (bias corrected MLE)	2.563	
nu hat (MLE)	104.9	nu star (bias corrected)	102.9	
Adjusted Level of Significance (β)	0.0475			
Approximate Chi Square Value (102.93, α)	80.52	Adjusted Chi Square Value (102.93, β)	80.22	
95% Gamma Approximate UCL (use when n>=50)	1.756	95% Gamma Adjusted UCL (use when n<50)	1.763	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.419	SD (KM)	1.565	
Variance (KM)	2.449	SE of Mean (KM)	0.164	
k hat (KM)	0.822	k star (KM)	0.804	
nu hat (KM)	157.9	nu star (KM)	154.3	
theta hat (KM)	1.725	theta star (KM)	1.766	
80% gamma percentile (KM)	2.319	90% gamma percentile (KM)	3.447	
95% gamma percentile (KM)	4.596	99% gamma percentile (KM)	7.308	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (154.31, α)	126.6	Adjusted Chi Square Value (154.31, β)	126.2	
95% Gamma Approximate KM-UCL (use when n>=50)	1.73	95% Gamma Adjusted KM-UCL (use when n<50)	1.735	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.866	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.9062E-7	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.111	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.424	Mean in Log Scale	-0.21	
SD in Original Scale	1.547	SD in Log Scale	1.163	
95% t UCL (assumes normality of ROS data)	1.687	95% Percentile Bootstrap UCL	1.694	
95% BCA Bootstrap UCL	1.738	95% Bootstrap t UCL	1.754	
95% H-UCL (Log ROS)	2.128			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.471	KM Geo Mean	0.625	
KM SD (logged)	1.574	95% Critical H Value (KM-Log)	2.879	
KM Standard Error of Mean (logged)	0.203	95% H-UCL (KM -Log)	3.432	
KM SD (logged)	1.574	95% Critical H Value (KM-Log)	2.879	
KM Standard Error of Mean (logged)	0.203			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.488	Mean in Log Scale	-0.102	
SD in Original Scale	1.528	SD in Log Scale	1.09	
95% t UCL (Assumes normality)	1.747	95% H-Stat UCL	2.125	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Approximate Gamma UCL	1.73	95% GROS Approximate Gamma UCL	1.756	
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	96	Number of Distinct Observations	75
Number of Detects	71	Number of Non-Detects	25
Number of Distinct Detects	66	Number of Distinct Non-Detects	9
Minimum Detect	1.59	Minimum Non-Detect	0.295
Maximum Detect	78	Maximum Non-Detect	7.5
Variance Detects	93.66	Percent Non-Detects	26.04%
Mean Detects	7.394	SD Detects	9.678
Median Detects	4.85	CV Detects	1.309
Skewness Detects	5.872	Kurtosis Detects	41.25
Mean of Logged Detects	1.717	SD of Logged Detects	0.629

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.44	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.323	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.105	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	5.958	KM Standard Error of Mean	0.893
KM SD	8.655	95% KM (BCA) UCL	7.699
95% KM (t) UCL	7.442	95% KM (Percentile Bootstrap) UCL	7.558
95% KM (z) UCL	7.427	95% KM Bootstrap t UCL	8.731
90% KM Chebyshev UCL	8.638	95% KM Chebyshev UCL	9.852
97.5% KM Chebyshev UCL	11.54	99% KM Chebyshev UCL	14.85

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.84	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.245	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.107	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.915	k star (bias corrected MLE)	1.844
Theta hat (MLE)	3.861	Theta star (bias corrected MLE)	4.011
nu hat (MLE)	272	nu star (bias corrected)	261.8
Mean (detects)	7.394		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.614
Maximum	78	Median	4.175
SD	8.873	CV	1.58
k hat (MLE)	0.475	k star (bias corrected MLE)	0.467
Theta hat (MLE)	11.82	Theta star (bias corrected MLE)	12.02
nu hat (MLE)	91.16	nu star (bias corrected)	89.65
Adjusted Level of Significance (β)	0.0475		
Approximate Chi Square Value (89.65, α)	68.82	Adjusted Chi Square Value (89.65, β)	68.54
95% Gamma Approximate UCL (use when n>=50)	7.314	95% Gamma Adjusted UCL (use when n<50)	7.343

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	5.958	SD (KM)	8.655
Variance (KM)	74.91	SE of Mean (KM)	0.893

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (KM)	0.474	k star (KM)	0.466
nu hat (KM)	90.97	nu star (KM)	89.46
theta hat (KM)	12.57	theta star (KM)	12.79
80% gamma percentile (KM)	9.747	90% gamma percentile (KM)	16.35
95% gamma percentile (KM)	23.47	99% gamma percentile (KM)	41.08
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (89.46, α)	68.66	Adjusted Chi Square Value (89.46, β)	68.38
95% Gamma Approximate KM-UCL (use when n>=50)	7.763	95% Gamma Adjusted KM-UCL (use when n<50)	7.795
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.3044E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.105	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.045	Mean in Log Scale	1.45
SD in Original Scale	8.636	SD in Log Scale	0.74
95% t UCL (assumes normality of ROS data)	7.509	95% Percentile Bootstrap UCL	7.679
95% BCA Bootstrap UCL	8.494	95% Bootstrap t UCL	8.841
95% H-UCL (Log ROS)	6.552		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.273	KM Geo Mean	3.571
KM SD (logged)	1.111	95% Critical H Value (KM-Log)	2.363
KM Standard Error of Mean (logged)	0.13	95% H-UCL (KM -Log)	8.669
KM SD (logged)	1.111	95% Critical H Value (KM-Log)	2.363
KM Standard Error of Mean (logged)	0.13		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.915	Mean in Log Scale	1.309
SD in Original Scale	8.697	SD in Log Scale	1.034
95% t UCL (Assumes normality)	7.389	95% H-Stat UCL	8.053
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.852		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	52	Number of Distinct Observations	49
		Number of Missing Observations	0
Minimum	50	Mean	141
Maximum	316	Median	132.5
SD	69.34	Std. Error of Mean	9.616
Coefficient of Variation	0.492	Skewness	1.092
Normal GOF Test			
Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.5785E-5	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	157.1		95% Adjusted-CLT UCL (Chen-1995)	158.4
			95% Modified-t UCL (Johnson-1978)	157.4
Gamma GOF Test				
A-D Test Statistic	0.581		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.754		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0939		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.124		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	4.679		k star (bias corrected MLE)	4.422
Theta hat (MLE)	30.14		Theta star (bias corrected MLE)	31.89
nu hat (MLE)	486.7		nu star (bias corrected)	459.9
MLE Mean (bias corrected)	141		MLE Sd (bias corrected)	67.07
			Approximate Chi Square Value (0.05)	411.2
Adjusted Level of Significance	0.0454		Adjusted Chi Square Value	409.9
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	157.7		95% Adjusted Gamma UCL (use when n<50)	158.3
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.962		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk P Value	0.183		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0708		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.122		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.912		Mean of logged Data	4.838
Maximum of Logged Data	5.756		SD of logged Data	0.475
Assuming Lognormal Distribution				
95% H-UCL	160		90% Chebyshev (MVUE) UCL	170.2
95% Chebyshev (MVUE) UCL	183.4		97.5% Chebyshev (MVUE) UCL	201.7
99% Chebyshev (MVUE) UCL	237.7			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	156.9		95% Jackknife UCL	157.1
95% Standard Bootstrap UCL	156.9		95% Bootstrap-t UCL	159.4
95% Hall's Bootstrap UCL	159.3		95% Percentile Bootstrap UCL	156.3
95% BCA Bootstrap UCL	159			
90% Chebyshev(Mean, Sd) UCL	169.9		95% Chebyshev(Mean, Sd) UCL	183
97.5% Chebyshev(Mean, Sd) UCL	201.1		99% Chebyshev(Mean, Sd) UCL	236.7
Suggested UCL to Use				
95% Approximate Gamma UCL	157.7			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium				
General Statistics				
Total Number of Observations	52		Number of Distinct Observations	51
Number of Detects	47		Number of Non-Detects	5

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Number of Distinct Detects	46	Number of Distinct Non-Detects	5
Minimum Detect	0.04	Minimum Non-Detect	0.105
Maximum Detect	0.909	Maximum Non-Detect	0.225
Variance Detects	0.0341	Percent Non-Detects	9.615%
Mean Detects	0.436	SD Detects	0.185
Median Detects	0.454	CV Detects	0.424
Skewness Detects	-0.23	Kurtosis Detects	0.229
Mean of Logged Detects	-0.975	SD of Logged Detects	0.641
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.402	KM Standard Error of Mean	0.0284
KM SD	0.202	95% KM (BCA) UCL	0.446
95% KM (t) UCL	0.45	95% KM (Percentile Bootstrap) UCL	0.449
95% KM (z) UCL	0.449	95% KM Bootstrap t UCL	0.448
90% KM Chebyshev UCL	0.487	95% KM Chebyshev UCL	0.526
97.5% KM Chebyshev UCL	0.579	99% KM Chebyshev UCL	0.685
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.165	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.199	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.13	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.621	k star (bias corrected MLE)	3.404
Theta hat (MLE)	0.12	Theta star (bias corrected MLE)	0.128
nu hat (MLE)	340.3	nu star (bias corrected)	320
Mean (detects)	0.436		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.04	Mean	0.412
Maximum	0.909	Median	0.417
SD	0.19	CV	0.46
k hat (MLE)	3.413	k star (bias corrected MLE)	3.229
Theta hat (MLE)	0.121	Theta star (bias corrected MLE)	0.128
nu hat (MLE)	355	nu star (bias corrected)	335.8
Adjusted Level of Significance (β)	0.0454		
Approximate Chi Square Value (335.81, α)	294.3	Adjusted Chi Square Value (335.81, β)	293.2
95% Gamma Approximate UCL (use when n>=50)	0.471	95% Gamma Adjusted UCL (use when n<50)	0.472
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.402	SD (KM)	0.202
Variance (KM)	0.0409	SE of Mean (KM)	0.0284
k hat (KM)	3.948	k star (KM)	3.733
nu hat (KM)	410.6	nu star (KM)	388.2
theta hat (KM)	0.102	theta star (KM)	0.108
80% gamma percentile (KM)	0.559	90% gamma percentile (KM)	0.681
95% gamma percentile (KM)	0.794	99% gamma percentile (KM)	1.036
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (388.25, α)	343.6	Adjusted Chi Square Value (388.25, β)	342.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.454	95% Gamma Adjusted KM-UCL (use when n<50)	0.456

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.128	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.408	Mean in Log Scale	-1.067	
SD in Original Scale	0.196	SD in Log Scale	0.672	
95% t UCL (assumes normality of ROS data)	0.453	95% Percentile Bootstrap UCL	0.45	
95% BCA Bootstrap UCL	0.452	95% Bootstrap t UCL	0.452	
95% H-UCL (Log ROS)	0.521			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.125	KM Geo Mean	0.325	
KM SD (logged)	0.767	95% Critical H Value (KM-Log)	2.085	
KM Standard Error of Mean (logged)	0.11	95% H-UCL (KM -Log)	0.545	
KM SD (logged)	0.767	95% Critical H Value (KM-Log)	2.085	
KM Standard Error of Mean (logged)	0.11			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.402	Mean in Log Scale	-1.117	
SD in Original Scale	0.204	SD in Log Scale	0.755	
95% t UCL (Assumes normality)	0.45	95% H-Stat UCL	0.542	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.45			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations	47	
Number of Detects	42	Number of Non-Detects	10	
Number of Distinct Detects	38	Number of Distinct Non-Detects	10	
Minimum Detect	0.012	Minimum Non-Detect	0.018	
Maximum Detect	0.34	Maximum Non-Detect	0.27	
Variance Detects	0.00401	Percent Non-Detects	19.23%	
Mean Detects	0.0777	SD Detects	0.0633	
Median Detects	0.063	CV Detects	0.815	
Skewness Detects	2.65	Kurtosis Detects	8.377	
Mean of Logged Detects	-2.784	SD of Logged Detects	0.669	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.71	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.135	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0704	KM Standard Error of Mean	0.00843	
KM SD	0.0593	95% KM (BCA) UCL	0.0862	
95% KM (t) UCL	0.0845	95% KM (Percentile Bootstrap) UCL	0.0857	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% KM (z) UCL	0.0843	95% KM Bootstrap t UCL	0.0914
90% KM Chebyshev UCL	0.0957	95% KM Chebyshev UCL	0.107
97.5% KM Chebyshev UCL	0.123	99% KM Chebyshev UCL	0.154
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.79	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.143	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.138	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.338	k star (bias corrected MLE)	2.187
Theta hat (MLE)	0.0332	Theta star (bias corrected MLE)	0.0355
nu hat (MLE)	196.4	nu star (bias corrected)	183.7
Mean (detects)	0.0777		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.069
Maximum	0.34	Median	0.055
SD	0.06	CV	0.869
k hat (MLE)	2.006	k star (bias corrected MLE)	1.903
Theta hat (MLE)	0.0344	Theta star (bias corrected MLE)	0.0363
nu hat (MLE)	208.6	nu star (bias corrected)	197.9
Adjusted Level of Significance (β)	0.0454		
Approximate Chi Square Value (197.89, α)	166.3	Adjusted Chi Square Value (197.89, β)	165.5
95% Gamma Approximate UCL (use when n>=50)	0.0821	95% Gamma Adjusted UCL (use when n<50)	0.0825
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0704	SD (KM)	0.0593
Variance (KM)	0.00352	SE of Mean (KM)	0.00843
k hat (KM)	1.409	k star (KM)	1.341
nu hat (KM)	146.6	nu star (KM)	139.5
theta hat (KM)	0.0499	theta star (KM)	0.0525
80% gamma percentile (KM)	0.11	90% gamma percentile (KM)	0.151
95% gamma percentile (KM)	0.19	99% gamma percentile (KM)	0.281
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (139.46, α)	113.2	Adjusted Chi Square Value (139.46, β)	112.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.0868	95% Gamma Adjusted KM-UCL (use when n<50)	0.0873
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0699	Mean in Log Scale	-2.895
SD in Original Scale	0.0593	SD in Log Scale	0.668
95% t UCL (assumes normality of ROS data)	0.0837	95% Percentile Bootstrap UCL	0.0845
95% BCA Bootstrap UCL	0.0864	95% Bootstrap t UCL	0.0918
95% H-UCL (Log ROS)	0.0834		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.91	KM Geo Mean	0.0545
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.037
KM Standard Error of Mean (logged)	0.105	95% H-UCL (KM -Log)	0.086
KM SD (logged)	0.712	95% Critical H Value (KM-Log)	2.037

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Standard Error of Mean (logged)	0.105		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0719	Mean in Log Scale	-2.895
SD in Original Scale	0.0606	SD in Log Scale	0.735
95% t UCL (Assumes normality)	0.086	95% H-Stat UCL	0.0895
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.086		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chromium			
General Statistics			
Total Number of Observations	52	Number of Distinct Observations	50
		Number of Missing Observations	0
Minimum	10.7	Mean	40.45
Maximum	97.7	Median	35.55
SD	20.93	Std. Error of Mean	2.903
Coefficient of Variation	0.518	Skewness	1.198
Normal GOF Test			
Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.3202E-6	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	45.31	95% Adjusted-CLT UCL (Chen-1995)	45.74
		95% Modified-t UCL (Johnson-1978)	45.39
Gamma GOF Test			
A-D Test Statistic	0.867	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.124	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.328	k star (bias corrected MLE)	4.091
Theta hat (MLE)	9.345	Theta star (bias corrected MLE)	9.886
nu hat (MLE)	450.2	nu star (bias corrected)	425.5
MLE Mean (bias corrected)	40.45	MLE Sd (bias corrected)	20
		Approximate Chi Square Value (0.05)	378.7
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	377.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	45.45	95% Adjusted Gamma UCL (use when n<50)	45.6
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.341	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0841	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.37		Mean of logged Data	3.58
Maximum of Logged Data	4.582		SD of logged Data	0.494
Assuming Lognormal Distribution				
95% H-UCL	46.14		90% Chebyshev (MVUE) UCL	49.14
95% Chebyshev (MVUE) UCL	53.08		97.5% Chebyshev (MVUE) UCL	58.56
99% Chebyshev (MVUE) UCL	69.32			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	45.22		95% Jackknife UCL	45.31
95% Standard Bootstrap UCL	45.32		95% Bootstrap-t UCL	46.22
95% Hall's Bootstrap UCL	45.53		95% Percentile Bootstrap UCL	45.2
95% BCA Bootstrap UCL	45.4			
90% Chebyshev(Mean, Sd) UCL	49.16		95% Chebyshev(Mean, Sd) UCL	53.1
97.5% Chebyshev(Mean, Sd) UCL	58.58		99% Chebyshev(Mean, Sd) UCL	69.33
Suggested UCL to Use				
95% Approximate Gamma UCL	45.45			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt				
General Statistics				
Total Number of Observations	52		Number of Distinct Observations	50
			Number of Missing Observations	0
Minimum	0.522		Mean	13.73
Maximum	37.3		Median	12.1
SD	9.177		Std. Error of Mean	1.273
Coefficient of Variation	0.668		Skewness	0.718
Normal GOF Test				
Shapiro Wilk Test Statistic	0.934		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.00841		Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.148		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122		Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.86		95% Adjusted-CLT UCL (Chen-1995)	15.96
			95% Modified-t UCL (Johnson-1978)	15.89
Gamma GOF Test				
A-D Test Statistic	0.728		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.766		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.114		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.125		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.686		k star (bias corrected MLE)	1.601

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Theta hat (MLE)	8.147	Theta star (bias corrected MLE)	8.577
nu hat (MLE)	175.3	nu star (bias corrected)	166.5
MLE Mean (bias corrected)	13.73	MLE Sd (bias corrected)	10.85
		Approximate Chi Square Value (0.05)	137.7
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	136.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	16.61	95% Adjusted Gamma UCL (use when n<50)	16.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.5963E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.172	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.65	Mean of logged Data	2.295
Maximum of Logged Data	3.619	SD of logged Data	0.974
Assuming Lognormal Distribution			
95% H-UCL	21.76	90% Chebyshev (MVUE) UCL	23.19
95% Chebyshev (MVUE) UCL	26.57	97.5% Chebyshev (MVUE) UCL	31.26
99% Chebyshev (MVUE) UCL	40.47		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.83	95% Jackknife UCL	15.86
95% Standard Bootstrap UCL	15.83	95% Bootstrap-t UCL	16.14
95% Hall's Bootstrap UCL	16.06	95% Percentile Bootstrap UCL	15.82
95% BCA Bootstrap UCL	15.85		
90% Chebyshev(Mean, Sd) UCL	17.55	95% Chebyshev(Mean, Sd) UCL	19.28
97.5% Chebyshev(Mean, Sd) UCL	21.68	99% Chebyshev(Mean, Sd) UCL	26.39
Suggested UCL to Use			
95% Approximate Gamma UCL	16.61		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	52	Number of Distinct Observations	47
		Number of Missing Observations	0
Minimum	12.2	Mean	28.29
Maximum	53.3	Median	28.25
SD	9.119	Std. Error of Mean	1.265
Coefficient of Variation	0.322	Skewness	0.487
Normal GOF Test			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.312	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0888	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	30.41	95% Adjusted-CLT UCL (Chen-1995)	30.46

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

			95% Modified-t UCL (Johnson-1978)	30.42
	Gamma GOF Test			
	A-D Test Statistic	0.235	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.076	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.123	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	9.662	k star (bias corrected MLE)	9.118
	Theta hat (MLE)	2.928	Theta star (bias corrected MLE)	3.103
	nu hat (MLE)	1005	nu star (bias corrected)	948.2
	MLE Mean (bias corrected)	28.29	MLE Sd (bias corrected)	9.369
			Approximate Chi Square Value (0.05)	877.8
	Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	875.8
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	30.56	95% Adjusted Gamma UCL (use when n<50)	30.63
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk P Value	0.511	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0973	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	2.501	Mean of logged Data	3.29
	Maximum of Logged Data	3.976	SD of logged Data	0.334
	Assuming Lognormal Distribution			
	95% H-UCL	30.77	90% Chebyshev (MVUE) UCL	32.37
	95% Chebyshev (MVUE) UCL	34.19	97.5% Chebyshev (MVUE) UCL	36.72
	99% Chebyshev (MVUE) UCL	41.69		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	30.37	95% Jackknife UCL	30.41
	95% Standard Bootstrap UCL	30.34	95% Bootstrap-t UCL	30.51
	95% Hall's Bootstrap UCL	30.36	95% Percentile Bootstrap UCL	30.39
	95% BCA Bootstrap UCL	30.57		
	90% Chebyshev(Mean, Sd) UCL	32.08	95% Chebyshev(Mean, Sd) UCL	33.8
	97.5% Chebyshev(Mean, Sd) UCL	36.19	99% Chebyshev(Mean, Sd) UCL	40.87
	Suggested UCL to Use			
	95% Student's-t UCL	30.41		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Iron			
	General Statistics			
	Total Number of Observations	52	Number of Distinct Observations	46
			Number of Missing Observations	0
	Minimum	1990	Mean	22820
	Maximum	37900	Median	23000
	SD	8028	Std. Error of Mean	1113
	Coefficient of Variation	0.352	Skewness	-0.231

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test				
Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.712	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0644	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	24685	95% Adjusted-CLT UCL (Chen-1995)	24613	
		95% Modified-t UCL (Johnson-1978)	24679	
Gamma GOF Test				
A-D Test Statistic	0.959	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.123	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	5.859	k star (bias corrected MLE)	5.534	
Theta hat (MLE)	3895	Theta star (bias corrected MLE)	4123	
nu hat (MLE)	609.4	nu star (bias corrected)	575.5	
MLE Mean (bias corrected)	22820	MLE Sd (bias corrected)	9700	
		Approximate Chi Square Value (0.05)	520.9	
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	519.4	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	25214	95% Adjusted Gamma UCL (use when n<50)	25285	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	4.4340E-8	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.164	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	7.596	Mean of logged Data	9.948	
Maximum of Logged Data	10.54	SD of logged Data	0.49	
Assuming Lognormal Distribution				
95% H-UCL	26801	90% Chebyshev (MVUE) UCL	28535	
95% Chebyshev (MVUE) UCL	30811	97.5% Chebyshev (MVUE) UCL	33971	
99% Chebyshev (MVUE) UCL	40178			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	24651	95% Jackknife UCL	24685	
95% Standard Bootstrap UCL	24676	95% Bootstrap-t UCL	24706	
95% Hall's Bootstrap UCL	24671	95% Percentile Bootstrap UCL	24662	
95% BCA Bootstrap UCL	24651			
90% Chebyshev(Mean, Sd) UCL	26160	95% Chebyshev(Mean, Sd) UCL	27672	
97.5% Chebyshev(Mean, Sd) UCL	29772	99% Chebyshev(Mean, Sd) UCL	33896	
Suggested UCL to Use				
95% Student's-t UCL	24685			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Lead

General Statistics

Total Number of Observations	52	Number of Distinct Observations	41
		Number of Missing Observations	0
Minimum	4.6	Mean	11.24
Maximum	46.7	Median	11
SD	5.584	Std. Error of Mean	0.774
Coefficient of Variation	0.497	Skewness	5.134

Normal GOF Test

Shapiro Wilk Test Statistic	0.548	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.234	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.53	95% Adjusted-CLT UCL (Chen-1995)	13.1
		95% Modified-t UCL (Johnson-1978)	12.62

Gamma GOF Test

A-D Test Statistic	2.255	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.123	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.853	k star (bias corrected MLE)	7.413
Theta hat (MLE)	1.431	Theta star (bias corrected MLE)	1.516
nu hat (MLE)	816.7	nu star (bias corrected)	770.9
MLE Mean (bias corrected)	11.24	MLE Sd (bias corrected)	4.127
		Approximate Chi Square Value (0.05)	707.5
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	705.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	12.24	95% Adjusted Gamma UCL (use when n<50)	12.27

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	2.7469E-5	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.526	Mean of logged Data	2.354
Maximum of Logged Data	3.844	SD of logged Data	0.331

Assuming Lognormal Distribution

95% H-UCL	12.05	90% Chebyshev (MVUE) UCL	12.67
95% Chebyshev (MVUE) UCL	13.38	97.5% Chebyshev (MVUE) UCL	14.36
99% Chebyshev (MVUE) UCL	16.29		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	12.51	95% Jackknife UCL	12.53
95% Standard Bootstrap UCL	12.47	95% Bootstrap-t UCL	13.7
95% Hall's Bootstrap UCL	18.08	95% Percentile Bootstrap UCL	12.71
95% BCA Bootstrap UCL	13.29		
90% Chebyshev(Mean, Sd) UCL	13.56	95% Chebyshev(Mean, Sd) UCL	14.61
97.5% Chebyshev(Mean, Sd) UCL	16.07	99% Chebyshev(Mean, Sd) UCL	18.94

Suggested UCL to Use

95% Student's-t UCL	12.53	or 95% Modified-t UCL	12.62
or 95% H-UCL	12.05		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Lithium

General Statistics

Total Number of Observations	40	Number of Distinct Observations	39
		Number of Missing Observations	0
Minimum	1.13	Mean	9.536
Maximum	17.4	Median	9.915
SD	4.231	Std. Error of Mean	0.669
Coefficient of Variation	0.444	Skewness	-0.0701

Normal GOF Test

Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0942	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.66	95% Adjusted-CLT UCL (Chen-1995)	10.63
		95% Modified-t UCL (Johnson-1978)	10.66

Gamma GOF Test

A-D Test Statistic	0.705	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.133	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.14	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.948	k star (bias corrected MLE)	3.668
Theta hat (MLE)	2.416	Theta star (bias corrected MLE)	2.6
nu hat (MLE)	315.8	nu star (bias corrected)	293.5
MLE Mean (bias corrected)	9.536	MLE Sd (bias corrected)	4.979
		Approximate Chi Square Value (0.05)	254.8
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	253.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	10.98	95% Adjusted Gamma UCL (use when n<50)	11.04

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.122	Mean of logged Data	2.123	
Maximum of Logged Data	2.856	SD of logged Data	0.581	
Assuming Lognormal Distribution				
95% H-UCL	11.9	90% Chebyshev (MVUE) UCL	12.73	
95% Chebyshev (MVUE) UCL	14.04	97.5% Chebyshev (MVUE) UCL	15.85	
99% Chebyshev (MVUE) UCL	19.41			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	10.64	95% Jackknife UCL	10.66	
95% Standard Bootstrap UCL	10.62	95% Bootstrap-t UCL	10.7	
95% Hall's Bootstrap UCL	10.61	95% Percentile Bootstrap UCL	10.6	
95% BCA Bootstrap UCL	10.67			
90% Chebyshev(Mean, Sd) UCL	11.54	95% Chebyshev(Mean, Sd) UCL	12.45	
97.5% Chebyshev(Mean, Sd) UCL	13.71	99% Chebyshev(Mean, Sd) UCL	16.19	
Suggested UCL to Use				
95% Student's-t UCL	10.66			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be				
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Manganese				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations	50	
		Number of Missing Observations	0	
Minimum	11.4	Mean	780.4	
Maximum	2470	Median	737	
SD	534.4	Std. Error of Mean	74.11	
Coefficient of Variation	0.685	Skewness	0.937	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.00759	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	904.6	95% Adjusted-CLT UCL (Chen-1995)	912.6	
		95% Modified-t UCL (Johnson-1978)	906.2	
Gamma GOF Test				
A-D Test Statistic	0.96	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.767	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.147	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.125	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics				
k hat (MLE)	1.55	k star (bias corrected MLE)	1.474	
Theta hat (MLE)	503.4	Theta star (bias corrected MLE)	529.5	
nu hat (MLE)	161.3	nu star (bias corrected)	153.3	
MLE Mean (bias corrected)	780.4	MLE Sd (bias corrected)	642.9	
		Approximate Chi Square Value (0.05)	125.7	
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	125	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	952	95% Adjusted Gamma UCL (use when n<50)	957.4	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	4.3151E-6	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.434	Mean of logged Data	6.304	
Maximum of Logged Data	7.812	SD of logged Data	1.057	
Assuming Lognormal Distribution				
95% H-UCL	1358	90% Chebyshev (MVUE) UCL	1434	
95% Chebyshev (MVUE) UCL	1658	97.5% Chebyshev (MVUE) UCL	1968	
99% Chebyshev (MVUE) UCL	2578			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	902.4	95% Jackknife UCL	904.6	
95% Standard Bootstrap UCL	899.1	95% Bootstrap-t UCL	915.4	
95% Hall's Bootstrap UCL	925.9	95% Percentile Bootstrap UCL	902.8	
95% BCA Bootstrap UCL	906.1			
90% Chebyshev(Mean, Sd) UCL	1003	95% Chebyshev(Mean, Sd) UCL	1103	
97.5% Chebyshev(Mean, Sd) UCL	1243	99% Chebyshev(Mean, Sd) UCL	1518	
Suggested UCL to Use				
95% Student's-t UCL	904.6			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury				
General Statistics				
Total Number of Observations	96	Number of Distinct Observations	91	
Number of Detects	92	Number of Non-Detects	4	
Number of Distinct Detects	87	Number of Distinct Non-Detects	4	
Minimum Detect	0.49	Minimum Non-Detect	0.0115	
Maximum Detect	205	Maximum Non-Detect	0.016	
Variance Detects	899.8	Percent Non-Detects	4.167%	
Mean Detects	28.94	SD Detects	30	
Median Detects	21.8	CV Detects	1.037	
Skewness Detects	2.829	Kurtosis Detects	12.51	
Mean of Logged Detects	2.875	SD of Logged Detects	1.105	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.765	**Normal GOF Test on Detected Observations Only**		

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0926	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	27.73	KM Standard Error of Mean	3.055	
KM SD	29.77	95% KM (BCA) UCL	33.62	
95% KM (t) UCL	32.81	95% KM (Percentile Bootstrap) UCL	33.06	
95% KM (z) UCL	32.76	95% KM Bootstrap t UCL	34.03	
90% KM Chebyshev UCL	36.9	95% KM Chebyshev UCL	41.05	
97.5% KM Chebyshev UCL	46.81	99% KM Chebyshev UCL	58.13	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.236	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.779	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0532	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0957	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.158	k star (bias corrected MLE)	1.128	
Theta hat (MLE)	24.99	Theta star (bias corrected MLE)	25.66	
nu hat (MLE)	213.1	nu star (bias corrected)	207.5	
Mean (detects)	28.94			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	27.73	
Maximum	205	Median	20.55	
SD	29.93	CV	1.079	
k hat (MLE)	0.784	k star (bias corrected MLE)	0.766	
Theta hat (MLE)	35.39	Theta star (bias corrected MLE)	36.2	
nu hat (MLE)	150.5	nu star (bias corrected)	147.1	
Adjusted Level of Significance (β)	0.0475			
Approximate Chi Square Value (147.11, α)	120.1	Adjusted Chi Square Value (147.11, β)	119.7	
95% Gamma Approximate UCL (use when n>=50)	33.98	95% Gamma Adjusted UCL (use when n<50)	34.08	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	27.73	SD (KM)	29.77	
Variance (KM)	886.3	SE of Mean (KM)	3.055	
k hat (KM)	0.868	k star (KM)	0.848	
nu hat (KM)	166.6	nu star (KM)	162.7	
theta hat (KM)	31.96	theta star (KM)	32.72	
80% gamma percentile (KM)	45.17	90% gamma percentile (KM)	66.5	
95% gamma percentile (KM)	88.12	99% gamma percentile (KM)	138.9	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (162.74, α)	134.2	Adjusted Chi Square Value (162.74, β)	133.9	
95% Gamma Approximate KM-UCL (use when n>=50)	33.62	95% Gamma Adjusted KM-UCL (use when n<50)	33.72	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.968	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.126	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0935	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0926	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	27.79	Mean in Log Scale	2.768	
SD in Original Scale	29.88	SD in Log Scale	1.198	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (assumes normality of ROS data)	32.86	95% Percentile Bootstrap UCL	32.93
95% BCA Bootstrap UCL	33.93	95% Bootstrap t UCL	34.22
95% H-UCL (Log ROS)	44.14		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.569	KM Geo Mean	13.05
KM SD (logged)	1.819	95% Critical H Value (KM-Log)	3.179
KM Standard Error of Mean (logged)	0.187	95% H-UCL (KM -Log)	123.6
KM SD (logged)	1.819	95% Critical H Value (KM-Log)	3.179
KM Standard Error of Mean (logged)	0.187		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	27.73	Mean in Log Scale	2.547
SD in Original Scale	29.93	SD in Log Scale	1.915
95% t UCL (Assumes normality)	32.81	95% H-Stat UCL	152.8
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	33.62	95% GROS Approximate Gamma UCL	33.98
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Molybdenum			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	38
		Number of Missing Observations	0
Minimum	0.047	Mean	0.328
Maximum	0.686	Median	0.313
SD	0.146	Std. Error of Mean	0.0231
Coefficient of Variation	0.447	Skewness	0.493
Normal GOF Test			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.139	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.367	95% Adjusted-CLT UCL (Chen-1995)	0.368
		95% Modified-t UCL (Johnson-1978)	0.367
Gamma GOF Test			
A-D Test Statistic	0.562	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.108	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.14	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.181	k star (bias corrected MLE)	3.884
Theta hat (MLE)	0.0784	Theta star (bias corrected MLE)	0.0844
nu hat (MLE)	334.5	nu star (bias corrected)	310.8
MLE Mean (bias corrected)	0.328	MLE Sd (bias corrected)	0.166
		Approximate Chi Square Value (0.05)	270.9

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance	0.044	Adjusted Chi Square Value	269.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.376	95% Adjusted Gamma UCL (use when n<50)	0.378
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.139	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.058	Mean of logged Data	-1.24
Maximum of Logged Data	-0.377	SD of logged Data	0.564
Assuming Lognormal Distribution			
95% H-UCL	0.406	90% Chebyshev (MVUE) UCL	0.434
95% Chebyshev (MVUE) UCL	0.477	97.5% Chebyshev (MVUE) UCL	0.537
99% Chebyshev (MVUE) UCL	0.656		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.366	95% Jackknife UCL	0.367
95% Standard Bootstrap UCL	0.366	95% Bootstrap-t UCL	0.368
95% Hall's Bootstrap UCL	0.369	95% Percentile Bootstrap UCL	0.364
95% BCA Bootstrap UCL	0.365		
90% Chebyshev(Mean, Sd) UCL	0.397	95% Chebyshev(Mean, Sd) UCL	0.429
97.5% Chebyshev(Mean, Sd) UCL	0.472	99% Chebyshev(Mean, Sd) UCL	0.558
Suggested UCL to Use			
95% Student's-t UCL	0.367		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	52	Number of Distinct Observations	50
		Number of Missing Observations	0
Minimum	4.36	Mean	40.19
Maximum	127	Median	37.9
SD	23.7	Std. Error of Mean	3.287
Coefficient of Variation	0.59	Skewness	1.093
Normal GOF Test			
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0122	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	45.7	95% Adjusted-CLT UCL (Chen-1995)	46.13
		95% Modified-t UCL (Johnson-1978)	45.78
Gamma GOF Test			
A-D Test Statistic	0.247	**Anderson-Darling Gamma GOF Test**	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.0652	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.124	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	2.711	k star (bias corrected MLE)	2.568
	Theta hat (MLE)	14.82	Theta star (bias corrected MLE)	15.65
	nu hat (MLE)	282	nu star (bias corrected)	267.1
	MLE Mean (bias corrected)	40.19	MLE Sd (bias corrected)	25.08
			Approximate Chi Square Value (0.05)	230.2
	Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	229.2
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	46.63	95% Adjusted Gamma UCL (use when n<50)	46.82
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk P Value	0.0735	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.107	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	1.472	Mean of logged Data	3.498
	Maximum of Logged Data	4.844	SD of logged Data	0.687
	Assuming Lognormal Distribution			
	95% H-UCL	50.82	90% Chebyshev (MVUE) UCL	54.62
	95% Chebyshev (MVUE) UCL	60.5	97.5% Chebyshev (MVUE) UCL	68.67
	99% Chebyshev (MVUE) UCL	84.72		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	45.6	95% Jackknife UCL	45.7
	95% Standard Bootstrap UCL	45.44	95% Bootstrap-t UCL	46.14
	95% Hall's Bootstrap UCL	46.5	95% Percentile Bootstrap UCL	45.49
	95% BCA Bootstrap UCL	46.22		
	90% Chebyshev(Mean, Sd) UCL	50.06	95% Chebyshev(Mean, Sd) UCL	54.52
	97.5% Chebyshev(Mean, Sd) UCL	60.72	99% Chebyshev(Mean, Sd) UCL	72.9
	Suggested UCL to Use			
	95% Student's-t UCL	45.7		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Selenium			
	General Statistics			
	Total Number of Observations	52	Number of Distinct Observations	45
	Number of Detects	49	Number of Non-Detects	3
	Number of Distinct Detects	42	Number of Distinct Non-Detects	3
	Minimum Detect	0.71	Minimum Non-Detect	0.475
	Maximum Detect	4.13	Maximum Non-Detect	0.55
	Variance Detects	0.434	Percent Non-Detects	5.769%
	Mean Detects	1.47	SD Detects	0.659

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Median Detects	1.27	CV Detects	0.448
Skewness Detects	1.96	Kurtosis Detects	5.134
Mean of Logged Detects	0.307	SD of Logged Detects	0.384
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.412	KM Standard Error of Mean	0.0945
KM SD	0.674	95% KM (BCA) UCL	1.579
95% KM (t) UCL	1.571	95% KM (Percentile Bootstrap) UCL	1.578
95% KM (z) UCL	1.568	95% KM Bootstrap t UCL	1.603
90% KM Chebyshev UCL	1.696	95% KM Chebyshev UCL	1.824
97.5% KM Chebyshev UCL	2.002	99% KM Chebyshev UCL	2.352
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.803	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.752	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.127	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	6.557	k star (bias corrected MLE)	6.169
Theta hat (MLE)	0.224	Theta star (bias corrected MLE)	0.238
nu hat (MLE)	642.6	nu star (bias corrected)	604.6
Mean (detects)	1.47		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.324	Mean	1.404
Maximum	4.13	Median	1.25
SD	0.694	CV	0.494
k hat (MLE)	4.511	k star (bias corrected MLE)	4.263
Theta hat (MLE)	0.311	Theta star (bias corrected MLE)	0.329
nu hat (MLE)	469.1	nu star (bias corrected)	443.4
Adjusted Level of Significance (β)	0.0454		
Approximate Chi Square Value (443.37, α)	395.5	Adjusted Chi Square Value (443.37, β)	394.3
95% Gamma Approximate UCL (use when n>=50)	1.573	95% Gamma Adjusted UCL (use when n<50)	1.578
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.412	SD (KM)	0.674
Variance (KM)	0.454	SE of Mean (KM)	0.0945
k hat (KM)	4.39	k star (KM)	4.149
nu hat (KM)	456.6	nu star (KM)	431.5
theta hat (KM)	0.322	theta star (KM)	0.34
80% gamma percentile (KM)	1.939	90% gamma percentile (KM)	2.342
95% gamma percentile (KM)	2.711	99% gamma percentile (KM)	3.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (431.54, α)	384.4	Adjusted Chi Square Value (431.54, β)	383.1
95% Gamma Approximate KM-UCL (use when n>=50)	1.586	95% Gamma Adjusted KM-UCL (use when n<50)	1.591
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	**Lilliefors GOF Test**	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.126	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.417	Mean in Log Scale	0.255	
SD in Original Scale	0.675	SD in Log Scale	0.429	
95% t UCL (assumes normality of ROS data)	1.574	95% Percentile Bootstrap UCL	1.574	
95% BCA Bootstrap UCL	1.603	95% Bootstrap t UCL	1.612	
95% H-UCL (Log ROS)	1.58			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.246	KM Geo Mean	1.279	
KM SD (logged)	0.443	95% Critical H Value (KM-Log)	1.846	
KM Standard Error of Mean (logged)	0.0621	95% H-UCL (KM -Log)	1.583	
KM SD (logged)	0.443	95% Critical H Value (KM-Log)	1.846	
KM Standard Error of Mean (logged)	0.0621			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.4	Mean in Log Scale	0.21	
SD in Original Scale	0.701	SD in Log Scale	0.545	
95% t UCL (Assumes normality)	1.562	95% H-Stat UCL	1.655	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Approximate Gamma UCL	1.586	95% GROS Approximate Gamma UCL	1.573	
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Silver				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations	35	
Number of Detects	46	Number of Non-Detects	6	
Number of Distinct Detects	30	Number of Distinct Non-Detects	5	
Minimum Detect	0.023	Minimum Non-Detect	0.052	
Maximum Detect	0.257	Maximum Non-Detect	0.55	
Variance Detects	0.00232	Percent Non-Detects	11.54%	
Mean Detects	0.0558	SD Detects	0.0482	
Median Detects	0.038	CV Detects	0.864	
Skewness Detects	2.444	Kurtosis Detects	6.441	
Mean of Logged Detects	-3.112	SD of Logged Detects	0.609	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.665	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.129	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0553	KM Standard Error of Mean	0.00697	
KM SD	0.0473	95% KM (BCA) UCL	0.0679	
95% KM (t) UCL	0.067	95% KM (Percentile Bootstrap) UCL	0.0671	
95% KM (z) UCL	0.0668	95% KM Bootstrap t UCL	0.0724	
90% KM Chebyshev UCL	0.0762	95% KM Chebyshev UCL	0.0857	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

97.5% KM Chebyshev UCL	0.0989	99% KM Chebyshev UCL	0.125
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.522	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.132	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.373	k star (bias corrected MLE)	2.232
Theta hat (MLE)	0.0235	Theta star (bias corrected MLE)	0.025
nu hat (MLE)	218.3	nu star (bias corrected)	205.4
Mean (detects)	0.0558		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.023	Mean	0.0545
Maximum	0.257	Median	0.0385
SD	0.0456	CV	0.835
k hat (MLE)	2.59	k star (bias corrected MLE)	2.453
Theta hat (MLE)	0.0211	Theta star (bias corrected MLE)	0.0222
nu hat (MLE)	269.3	nu star (bias corrected)	255.1
Adjusted Level of Significance (β)	0.0454		
Approximate Chi Square Value (255.13, α)	219.1	Adjusted Chi Square Value (255.13, β)	218.2
95% Gamma Approximate UCL (use when n>=50)	0.0635	95% Gamma Adjusted UCL (use when n<50)	0.0638
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0553	SD (KM)	0.0473
Variance (KM)	0.00223	SE of Mean (KM)	0.00697
k hat (KM)	1.371	k star (KM)	1.304
nu hat (KM)	142.6	nu star (KM)	135.7
theta hat (KM)	0.0404	theta star (KM)	0.0424
80% gamma percentile (KM)	0.0869	90% gamma percentile (KM)	0.119
95% gamma percentile (KM)	0.151	99% gamma percentile (KM)	0.224
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (135.66, α)	109.7	Adjusted Chi Square Value (135.66, β)	109.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.0684	95% Gamma Adjusted KM-UCL (use when n<50)	0.0688
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.129	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0544	Mean in Log Scale	-3.116
SD in Original Scale	0.0455	SD in Log Scale	0.575
95% t UCL (assumes normality of ROS data)	0.0649	95% Percentile Bootstrap UCL	0.0656
95% BCA Bootstrap UCL	0.0673	95% Bootstrap t UCL	0.0686
95% H-UCL (Log ROS)	0.0611		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.118	KM Geo Mean	0.0443
KM SD (logged)	0.599	95% Critical H Value (KM-Log)	1.947
KM Standard Error of Mean (logged)	0.0885	95% H-UCL (KM -Log)	0.0623
KM SD (logged)	0.599	95% Critical H Value (KM-Log)	1.947
KM Standard Error of Mean (logged)	0.0885		

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0729	Mean in Log Scale	-2.961	
SD in Original Scale	0.0717	SD in Log Scale	0.766	
95% t UCL (Assumes normality)	0.0895	95% H-Stat UCL	0.0868	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.0857			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Thallium				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations	45	
Number of Detects	40	Number of Non-Detects	12	
Number of Distinct Detects	38	Number of Distinct Non-Detects	7	
Minimum Detect	0.04	Minimum Non-Detect	0.9	
Maximum Detect	0.117	Maximum Non-Detect	1.35	
Variance Detects	3.6073E-4	Percent Non-Detects	23.08%	
Mean Detects	0.0673	SD Detects	0.019	
Median Detects	0.0658	CV Detects	0.282	
Skewness Detects	0.578	Kurtosis Detects	-0.0837	
Mean of Logged Detects	-2.736	SD of Logged Detects	0.281	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0822	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.139	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0673	KM Standard Error of Mean	0.003	
KM SD	0.0188	95% KM (BCA) UCL	0.0722	
95% KM (t) UCL	0.0724	95% KM (Percentile Bootstrap) UCL	0.0722	
95% KM (z) UCL	0.0723	95% KM Bootstrap t UCL	0.0725	
90% KM Chebyshev UCL	0.0763	95% KM Chebyshev UCL	0.0804	
97.5% KM Chebyshev UCL	0.0861	99% KM Chebyshev UCL	0.0972	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.234	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0919	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.139	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	13.22	k star (bias corrected MLE)	12.24	
Theta hat (MLE)	0.00509	Theta star (bias corrected MLE)	0.0055	
nu hat (MLE)	1057	nu star (bias corrected)	979.4	
Mean (detects)	0.0673			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.04	Mean	0.0671	
Maximum	0.117	Median	0.0658	
SD	0.0171	CV	0.255	
k hat (MLE)	16.06	k star (bias corrected MLE)	15.15	
Theta hat (MLE)	0.00418	Theta star (bias corrected MLE)	0.00443	
nu hat (MLE)	1670	nu star (bias corrected)	1575	
Adjusted Level of Significance (β)	0.0454			
Approximate Chi Square Value (N/A, α)	1484	Adjusted Chi Square Value (N/A, β)	1482	
95% Gamma Approximate UCL (use when n>=50)	0.0712	95% Gamma Adjusted UCL (use when n<50)	0.0713	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.0673	SD (KM)	0.0188	
Variance (KM)	3.5171E-4	SE of Mean (KM)	0.003	
k hat (KM)	12.89	k star (KM)	12.16	
nu hat (KM)	1341	nu star (KM)	1265	
theta hat (KM)	0.00522	theta star (KM)	0.00554	
80% gamma percentile (KM)	0.0828	90% gamma percentile (KM)	0.093	
95% gamma percentile (KM)	0.102	99% gamma percentile (KM)	0.12	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (N/A, α)	1183	Adjusted Chi Square Value (N/A, β)	1181	
95% Gamma Approximate KM-UCL (use when n>=50)	0.072	95% Gamma Adjusted KM-UCL (use when n<50)	0.0721	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0923	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.139	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0669	Mean in Log Scale	-2.736	
SD in Original Scale	0.0171	SD in Log Scale	0.253	
95% t UCL (assumes normality of ROS data)	0.0709	95% Percentile Bootstrap UCL	0.0708	
95% BCA Bootstrap UCL	0.0713	95% Bootstrap t UCL	0.0711	
95% H-UCL (Log ROS)	0.0711			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.736	KM Geo Mean	0.0648	
KM SD (logged)	0.277	95% Critical H Value (KM-Log)	1.717	
KM Standard Error of Mean (logged)	0.0444	95% H-UCL (KM -Log)	0.072	
KM SD (logged)	0.277	95% Critical H Value (KM-Log)	1.717	
KM Standard Error of Mean (logged)	0.0444			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.19	Mean in Log Scale	-2.224	
SD in Original Scale	0.229	SD in Log Scale	0.977	
95% t UCL (Assumes normality)	0.244	95% H-Stat UCL	0.238	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.0724			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	52	Number of Distinct Observations	51	
		Number of Missing Observations	0	
Minimum	15.2	Mean	36.8	
Maximum	71.8	Median	34.65	
SD	11.52	Std. Error of Mean	1.598	
Coefficient of Variation	0.313	Skewness	0.951	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.00441	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	39.47	95% Adjusted-CLT UCL (Chen-1995)	39.65	
		95% Modified-t UCL (Johnson-1978)	39.51	
Gamma GOF Test				
A-D Test Statistic	0.652	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0944	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.123	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	10.77	k star (bias corrected MLE)	10.16	
Theta hat (MLE)	3.418	Theta star (bias corrected MLE)	3.623	
nu hat (MLE)	1120	nu star (bias corrected)	1056	
MLE Mean (bias corrected)	36.8	MLE Sd (bias corrected)	11.55	
		Approximate Chi Square Value (0.05)	981.9	
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	979.9	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	39.59	95% Adjusted Gamma UCL (use when n<50)	39.67	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.149	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.721	Mean of logged Data	3.558	
Maximum of Logged Data	4.274	SD of logged Data	0.314	
Assuming Lognormal Distribution				
95% H-UCL	39.77	90% Chebyshev (MVUE) UCL	41.75	
95% Chebyshev (MVUE) UCL	43.97	97.5% Chebyshev (MVUE) UCL	47.06	
99% Chebyshev (MVUE) UCL	53.13			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	39.42	95% Jackknife UCL	39.47	
95% Standard Bootstrap UCL	39.44	95% Bootstrap-t UCL	39.7	
95% Hall's Bootstrap UCL	39.71	95% Percentile Bootstrap UCL	39.58	
95% BCA Bootstrap UCL	39.62			
90% Chebyshev(Mean, Sd) UCL	41.59	95% Chebyshev(Mean, Sd) UCL	43.76	
97.5% Chebyshev(Mean, Sd) UCL	46.77	99% Chebyshev(Mean, Sd) UCL	52.69	

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Student's-t UCL	39.47			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations	48	
		Number of Missing Observations	0	
Minimum	2.8	Mean	49.9	
Maximum	92.5	Median	53.4	
SD	21.19	Std. Error of Mean	2.938	
Coefficient of Variation	0.425	Skewness	-0.292	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.326	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.112	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.122	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	54.82	95% Adjusted-CLT UCL (Chen-1995)	54.6	
		95% Modified-t UCL (Johnson-1978)	54.8	
Gamma GOF Test				
A-D Test Statistic	1.848	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.183	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.124	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.507	k star (bias corrected MLE)	3.317	
Theta hat (MLE)	14.23	Theta star (bias corrected MLE)	15.04	
nu hat (MLE)	364.7	nu star (bias corrected)	345	
MLE Mean (bias corrected)	49.9	MLE Sd (bias corrected)	27.4	
		Approximate Chi Square Value (0.05)	303	
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	301.9	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	56.82	95% Adjusted Gamma UCL (use when n<50)	57.03	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	2.7151E-9	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.212	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.122	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.03	Mean of logged Data	3.761	
Maximum of Logged Data	4.527	SD of logged Data	0.668	
Assuming Lognormal Distribution				

Table E1-6
Franciscan (PMB), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL	64.76	90% Chebyshev (MVUE) UCL	69.57
95% Chebyshev (MVUE) UCL	76.88	97.5% Chebyshev (MVUE) UCL	87.02
99% Chebyshev (MVUE) UCL	107		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	54.73	95% Jackknife UCL	54.82
95% Standard Bootstrap UCL	54.64	95% Bootstrap-t UCL	54.47
95% Hall's Bootstrap UCL	54.77	95% Percentile Bootstrap UCL	54.59
95% BCA Bootstrap UCL	54.61		
90% Chebyshev(Mean, Sd) UCL	58.71	95% Chebyshev(Mean, Sd) UCL	62.7
97.5% Chebyshev(Mean, Sd) UCL	68.25	99% Chebyshev(Mean, Sd) UCL	79.13
Suggested UCL to Use			
95% Student's-t UCL	54.82		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.18/12/2019 12:18:01 PM
From File	ProUCLData_DW_20190812.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	4
Number of Detects	19	Number of Non-Detects	55
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	10	Minimum Non-Detect	10
Maximum Detect	60	Maximum Non-Detect	10
Variance Detects	148	Percent Non-Detects	74.32%
Mean Detects	14.21	SD Detects	12.16
Median Detects	10	CV Detects	0.856
Skewness Detects	3.414	Kurtosis Detects	12.26
Mean of Logged Detects	2.491	SD of Logged Detects	0.484

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.411	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.477	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	11.08	KM Standard Error of Mean	0.749
KM SD	6.275	95% KM (BCA) UCL	N/A
95% KM (t) UCL	12.33	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	12.31	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	13.33	95% KM Chebyshev UCL	14.35
97.5% KM Chebyshev UCL	15.76	99% KM Chebyshev UCL	18.54

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.043	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.747	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.499	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.2	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.229	k star (bias corrected MLE)	2.754
Theta hat (MLE)	4.402	Theta star (bias corrected MLE)	5.16
nu hat (MLE)	122.7	nu star (bias corrected)	104.6
Mean (detects)	14.21		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.715
Maximum	60	Median	0.01
SD	8.669	CV	2.333
k hat (MLE)	0.192	k star (bias corrected MLE)	0.193
Theta hat (MLE)	19.37	Theta star (bias corrected MLE)	19.25
nu hat (MLE)	28.38	nu star (bias corrected)	28.57
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (28.57, α)	17.37	Adjusted Chi Square Value (28.57, β)	17.2

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	6.11	95% Gamma Adjusted UCL (use when n<50)	6.171
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	11.08	SD (KM)	6.275
Variance (KM)	39.37	SE of Mean (KM)	0.749
k hat (KM)	3.119	k star (KM)	3.001
nu hat (KM)	461.6	nu star (KM)	444.2
theta hat (KM)	3.553	theta star (KM)	3.692
80% gamma percentile (KM)	15.8	90% gamma percentile (KM)	19.66
95% gamma percentile (KM)	23.25	99% gamma percentile (KM)	31.04
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (444.19, α)	396.3	Adjusted Chi Square Value (444.19, β)	395.4
95% Gamma Approximate KM-UCL (use when n>=50)	12.42	95% Gamma Adjusted KM-UCL (use when n<50)	12.45
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.46	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.494	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.135	Mean in Log Scale	1.419
SD in Original Scale	7.848	SD in Log Scale	0.857
95% t UCL (assumes normality of ROS data)	7.655	95% Percentile Bootstrap UCL	7.675
95% BCA Bootstrap UCL	8.163	95% Bootstrap t UCL	8.86
95% H-UCL (Log ROS)	7.378		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.351	KM Geo Mean	10.5
KM SD (logged)	0.253	95% Critical H Value (KM-Log)	1.727
KM Standard Error of Mean (logged)	0.0302	95% H-UCL (KM -Log)	11.4
KM SD (logged)	0.253	95% Critical H Value (KM-Log)	1.727
KM Standard Error of Mean (logged)	0.0302		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	7.365	Mean in Log Scale	1.836
SD in Original Scale	7.273	SD in Log Scale	0.456
95% t UCL (Assumes normality)	8.773	95% H-Stat UCL	7.672
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	12.33	KM H-UCL	11.4
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum_Total			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	11
Number of Detects	57	Number of Non-Detects	17
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	10	Minimum Non-Detect	10
Maximum Detect	190	Maximum Non-Detect	10
Variance Detects	1190	Percent Non-Detects	22.97%

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean Detects	33.33	SD Detects	34.5
Median Detects	20	CV Detects	1.035
Skewness Detects	3.111	Kurtosis Detects	10.9
Mean of Logged Detects	3.204	SD of Logged Detects	0.72
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.622	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.117	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	27.97	KM Standard Error of Mean	3.704
KM SD	31.58	95% KM (BCA) UCL	34.19
95% KM (t) UCL	34.14	95% KM (Percentile Bootstrap) UCL	34.46
95% KM (z) UCL	34.06	95% KM Bootstrap t UCL	37.01
90% KM Chebyshev UCL	39.08	95% KM Chebyshev UCL	44.12
97.5% KM Chebyshev UCL	51.1	99% KM Chebyshev UCL	64.82
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.918	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.242	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.12	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.803	k star (bias corrected MLE)	1.72
Theta hat (MLE)	18.49	Theta star (bias corrected MLE)	19.38
nu hat (MLE)	205.6	nu star (bias corrected)	196.1
Mean (detects)	33.33		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	25.68
Maximum	190	Median	20
SD	33.35	CV	1.299
k hat (MLE)	0.364	k star (bias corrected MLE)	0.358
Theta hat (MLE)	70.54	Theta star (bias corrected MLE)	71.67
nu hat (MLE)	53.88	nu star (bias corrected)	53.03
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (53.03, α)	37.3	Adjusted Chi Square Value (53.03, β)	37.04
95% Gamma Approximate UCL (use when n>=50)	36.51	95% Gamma Adjusted UCL (use when n<50)	36.76
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	27.97	SD (KM)	31.58
Variance (KM)	997.2	SE of Mean (KM)	3.704
k hat (KM)	0.785	k star (KM)	0.762
nu hat (KM)	116.1	nu star (KM)	112.8
theta hat (KM)	35.65	theta star (KM)	36.72
80% gamma percentile (KM)	45.83	90% gamma percentile (KM)	68.82
95% gamma percentile (KM)	92.35	99% gamma percentile (KM)	148.1
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (112.75, α)	89.24	Adjusted Chi Square Value (112.75, β)	88.83
95% Gamma Approximate KM-UCL (use when n>=50)	35.34	95% Gamma Adjusted KM-UCL (use when n<50)	35.51
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.889	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.8296E-5	Detected Data Not Lognormal at 5% Significance Level	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.117	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	26.85	Mean in Log Scale	2.826	
SD in Original Scale	32.51	SD in Log Scale	0.959	
95% t UCL (assumes normality of ROS data)	33.14	95% Percentile Bootstrap UCL	33.04	
95% BCA Bootstrap UCL	34.99	95% Bootstrap t UCL	35.68	
95% H-UCL (Log ROS)	34.32			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.997	KM Geo Mean	20.03	
KM SD (logged)	0.733	95% Critical H Value (KM-Log)	2.013	
KM Standard Error of Mean (logged)	0.0859	95% H-UCL (KM -Log)	31.13	
KM SD (logged)	0.733	95% Critical H Value (KM-Log)	2.013	
KM Standard Error of Mean (logged)	0.0859			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	26.82	Mean in Log Scale	2.838	
SD in Original Scale	32.52	SD in Log Scale	0.924	
95% t UCL (Assumes normality)	33.12	95% H-Stat UCL	33.16	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	44.12			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony_FLT				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	74	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Antimony_FLT was not processed!				
Antimony_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	74	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Antimony_Total was not processed!				
Arsenic_FLT				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	74	Number of Distinct Observations	40	
Number of Detects	67	Number of Non-Detects	7	
Number of Distinct Detects	39	Number of Distinct Non-Detects	1	
Minimum Detect	0.78	Minimum Non-Detect	0.5	
Maximum Detect	6.7	Maximum Non-Detect	0.5	
Variance Detects	4.035	Percent Non-Detects	9.459%	
Mean Detects	3.003	SD Detects	2.009	
Median Detects	1.9	CV Detects	0.669	
Skewness Detects	0.555	Kurtosis Detects	-1.116	
Mean of Logged Detects	0.854	SD of Logged Detects	0.727	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.842	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	1.4332E-9	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.108	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	2.766	KM Standard Error of Mean	0.238	
KM SD	2.034	95% KM (BCA) UCL	3.142	
95% KM (t) UCL	3.163	95% KM (Percentile Bootstrap) UCL	3.159	
95% KM (z) UCL	3.158	95% KM Bootstrap t UCL	3.188	
90% KM Chebyshev UCL	3.48	95% KM Chebyshev UCL	3.804	
97.5% KM Chebyshev UCL	4.253	99% KM Chebyshev UCL	5.136	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.73	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.19	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.11	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.186	k star (bias corrected MLE)	2.098	
Theta hat (MLE)	1.374	Theta star (bias corrected MLE)	1.431	
nu hat (MLE)	292.9	nu star (bias corrected)	281.1	
Mean (detects)	3.003			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	2.74	
Maximum	6.7	Median	1.6	
SD	2.078	CV	0.759	
k hat (MLE)	1.326	k star (bias corrected MLE)	1.282	
Theta hat (MLE)	2.066	Theta star (bias corrected MLE)	2.138	
nu hat (MLE)	196.3	nu star (bias corrected)	189.7	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (189.68, α)	158.8	Adjusted Chi Square Value (189.68, β)	158.3	
95% Gamma Approximate UCL (use when n>=50)	3.272	95% Gamma Adjusted UCL (use when n<50)	3.284	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	2.766	SD (KM)	2.034	
Variance (KM)	4.135	SE of Mean (KM)	0.238	
k hat (KM)	1.85	k star (KM)	1.784	
nu hat (KM)	273.8	nu star (KM)	264	
theta hat (KM)	1.495	theta star (KM)	1.55	
80% gamma percentile (KM)	4.197	90% gamma percentile (KM)	5.527	
95% gamma percentile (KM)	6.805	99% gamma percentile (KM)	9.659	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (264.02, α)	227.4	Adjusted Chi Square Value (264.02, β)	226.7
95% Gamma Approximate KM-UCL (use when n>=50)	3.211	95% Gamma Adjusted KM-UCL (use when n<50)	3.221
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.875	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.0831E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.108	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.763	Mean in Log Scale	0.7
SD in Original Scale	2.05	SD in Log Scale	0.844
95% t UCL (assumes normality of ROS data)	3.16	95% Percentile Bootstrap UCL	3.162
95% BCA Bootstrap UCL	3.193	95% Bootstrap t UCL	3.182
95% H-UCL (Log ROS)	3.543		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.707	KM Geo Mean	2.028
KM SD (logged)	0.822	95% Critical H Value (KM-Log)	2.094
KM Standard Error of Mean (logged)	0.0963	95% H-UCL (KM -Log)	3.479
KM SD (logged)	0.822	95% Critical H Value (KM-Log)	2.094
KM Standard Error of Mean (logged)	0.0963		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.742	Mean in Log Scale	0.642
SD in Original Scale	2.075	SD in Log Scale	0.955
95% t UCL (Assumes normality)	3.144	95% H-Stat UCL	3.841
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	3.804		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_Total			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	40
Number of Detects	67	Number of Non-Detects	7
Number of Distinct Detects	39	Number of Distinct Non-Detects	1
Minimum Detect	0.74	Minimum Non-Detect	0.5
Maximum Detect	6.8	Maximum Non-Detect	0.5
Variance Detects	4.087	Percent Non-Detects	9.459%
Mean Detects	3.039	SD Detects	2.022
Median Detects	2.1	CV Detects	0.665
Skewness Detects	0.556	Kurtosis Detects	-1.137
Mean of Logged Detects	0.87	SD of Logged Detects	0.718
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.842	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	1.4393E-9	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.223	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.108	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.799	KM Standard Error of Mean	0.24
KM SD	2.049	95% KM (BCA) UCL	3.233
95% KM (t) UCL	3.199	95% KM (Percentile Bootstrap) UCL	3.197
95% KM (z) UCL	3.194	95% KM Bootstrap t UCL	3.21
90% KM Chebyshev UCL	3.519	95% KM Chebyshev UCL	3.845
97.5% KM Chebyshev UCL	4.298	99% KM Chebyshev UCL	5.187
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.709	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.183	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.11	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.225	k star (bias corrected MLE)	2.135
Theta hat (MLE)	1.366	Theta star (bias corrected MLE)	1.423
nu hat (MLE)	298.1	nu star (bias corrected)	286.1
Mean (detects)	3.039		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	2.774
Maximum	6.8	Median	1.65
SD	2.093	CV	0.755
k hat (MLE)	1.343	k star (bias corrected MLE)	1.298
Theta hat (MLE)	2.065	Theta star (bias corrected MLE)	2.137
nu hat (MLE)	198.8	nu star (bias corrected)	192.1
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (192.06, α)	161	Adjusted Chi Square Value (192.06, β)	160.4
95% Gamma Approximate UCL (use when n>=50)	3.309	95% Gamma Adjusted UCL (use when n<50)	3.321
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.799	SD (KM)	2.049
Variance (KM)	4.197	SE of Mean (KM)	0.24
k hat (KM)	1.867	k star (KM)	1.8
nu hat (KM)	276.3	nu star (KM)	266.4
theta hat (KM)	1.5	theta star (KM)	1.555
80% gamma percentile (KM)	4.243	90% gamma percentile (KM)	5.582
95% gamma percentile (KM)	6.867	99% gamma percentile (KM)	9.736
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (266.39, α)	229.6	Adjusted Chi Square Value (266.39, β)	228.9
95% Gamma Approximate KM-UCL (use when n>=50)	3.248	95% Gamma Adjusted KM-UCL (use when n<50)	3.257
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.8274E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.108	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2.798	Mean in Log Scale	0.718
SD in Original Scale	2.064	SD in Log Scale	0.835
95% t UCL (assumes normality of ROS data)	3.198	95% Percentile Bootstrap UCL	3.207
95% BCA Bootstrap UCL	3.208	95% Bootstrap t UCL	3.236
95% H-UCL (Log ROS)	3.568		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	0.722	KM Geo Mean	2.059
KM SD (logged)	0.818	95% Critical H Value (KM-Log)	2.09
KM Standard Error of Mean (logged)	0.0958	95% H-UCL (KM -Log)	3.516
KM SD (logged)	0.818	95% Critical H Value (KM-Log)	2.09
KM Standard Error of Mean (logged)	0.0958		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.775	Mean in Log Scale	0.657
SD in Original Scale	2.091	SD in Log Scale	0.953
95% t UCL (Assumes normality)	3.18	95% H-Stat UCL	3.887

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	3.845		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Barium_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	27	Mean	69.65
Maximum	180	Median	69
SD	23.73	Std. Error of Mean	2.759
Coefficient of Variation	0.341	Skewness	1.669

Normal GOF Test

Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.2631E-9	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	74.24	95% Adjusted-CLT UCL (Chen-1995)	74.76
		95% Modified-t UCL (Johnson-1978)	74.33

Gamma GOF Test

A-D Test Statistic	2.312	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.17	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	9.753	k star (bias corrected MLE)	9.367
Theta hat (MLE)	7.141	Theta star (bias corrected MLE)	7.436
nu hat (MLE)	1443	nu star (bias corrected)	1386
MLE Mean (bias corrected)	69.65	MLE Sd (bias corrected)	22.76
		Approximate Chi Square Value (0.05)	1301
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	1299

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	74.22	95% Adjusted Gamma UCL (use when n<50)	74.32

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.001	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.188	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.296	Mean of logged Data	4.191	
Maximum of Logged Data	5.193	SD of logged Data	0.326	
Assuming Lognormal Distribution				
95% H-UCL	74.56	90% Chebyshev (MVUE) UCL	77.78	
95% Chebyshev (MVUE) UCL	81.45	97.5% Chebyshev (MVUE) UCL	86.55	
99% Chebyshev (MVUE) UCL	96.57			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	74.19	95% Jackknife UCL	74.24	
95% Standard Bootstrap UCL	74.14	95% Bootstrap-t UCL	74.97	
95% Hall's Bootstrap UCL	75.15	95% Percentile Bootstrap UCL	74.16	
95% BCA Bootstrap UCL	75.05			
90% Chebyshev(Mean, Sd) UCL	77.92	95% Chebyshev(Mean, Sd) UCL	81.67	
97.5% Chebyshev(Mean, Sd) UCL	86.88	99% Chebyshev(Mean, Sd) UCL	97.1	
Suggested UCL to Use				
95% Student's-t UCL	74.24	or 95% Modified-t UCL	74.33	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Barium_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	37	
		Number of Missing Observations	0	
Minimum	28	Mean	70.47	
Maximum	180	Median	70	
SD	23.34	Std. Error of Mean	2.714	
Coefficient of Variation	0.331	Skewness	1.628	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	2.3637E-8	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	74.99	95% Adjusted-CLT UCL (Chen-1995)	75.49	
		95% Modified-t UCL (Johnson-1978)	75.08	
Gamma GOF Test				
A-D Test Statistic	2.207	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics				
k hat (MLE)	10.22	k star (bias corrected MLE)	9.814	
Theta hat (MLE)	6.896	Theta star (bias corrected MLE)	7.181	
nu hat (MLE)	1512	nu star (bias corrected)	1453	
MLE Mean (bias corrected)	70.47	MLE Sd (bias corrected)	22.5	
		Approximate Chi Square Value (0.05)	1365	
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	1363	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	74.99	95% Adjusted Gamma UCL (use when n<50)	75.08	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.938	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.00184	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.168	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.332	Mean of logged Data	4.206	
Maximum of Logged Data	5.193	SD of logged Data	0.319	
Assuming Lognormal Distribution				
95% H-UCL	75.33	90% Chebyshev (MVUE) UCL	78.51	
95% Chebyshev (MVUE) UCL	82.14	97.5% Chebyshev (MVUE) UCL	87.18	
99% Chebyshev (MVUE) UCL	97.08			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	74.94	95% Jackknife UCL	74.99	
95% Standard Bootstrap UCL	74.95	95% Bootstrap-t UCL	75.81	
95% Hall's Bootstrap UCL	76.29	95% Percentile Bootstrap UCL	74.93	
95% BCA Bootstrap UCL	75.36			
90% Chebyshev(Mean, Sd) UCL	78.61	95% Chebyshev(Mean, Sd) UCL	82.3	
97.5% Chebyshev(Mean, Sd) UCL	87.42	99% Chebyshev(Mean, Sd) UCL	97.47	
Suggested UCL to Use				
95% Student's-t UCL	74.99	or 95% Modified-t UCL	75.08	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium_FLT				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	74	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Beryllium_FLT was not processed!				
Beryllium_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	74	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium_Total was not processed!

Boron_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	80	Mean	986.6
Maximum	2700	Median	1100
SD	373.6	Std. Error of Mean	43.43
Coefficient of Variation	0.379	Skewness	0.0587

Normal GOF Test

Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1059	95% Adjusted-CLT UCL (Chen-1995)	1058
		95% Modified-t UCL (Johnson-1978)	1059

Gamma GOF Test

A-D Test Statistic	12.96	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.758	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.355	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.239	k star (bias corrected MLE)	3.116
Theta hat (MLE)	304.6	Theta star (bias corrected MLE)	316.6
nu hat (MLE)	479.3	nu star (bias corrected)	461.2
MLE Mean (bias corrected)	986.6	MLE Sd (bias corrected)	558.9
		Approximate Chi Square Value (0.05)	412.4
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	411.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1103	95% Adjusted Gamma UCL (use when n<50)	1106

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.532	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.393	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.382	Mean of logged Data	6.732
Maximum of Logged Data	7.901	SD of logged Data	0.752

Assuming Lognormal Distribution

95% H-UCL	1331	90% Chebyshev (MVUE) UCL	1432
95% Chebyshev (MVUE) UCL	1578	97.5% Chebyshev (MVUE) UCL	1782
99% Chebyshev (MVUE) UCL	2182		

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	1058	95% Jackknife UCL	1059	
95% Standard Bootstrap UCL	1056	95% Bootstrap-t UCL	1062	
95% Hall's Bootstrap UCL	1064	95% Percentile Bootstrap UCL	1057	
95% BCA Bootstrap UCL	1056			
90% Chebyshev(Mean, Sd) UCL	1117	95% Chebyshev(Mean, Sd) UCL	1176	
97.5% Chebyshev(Mean, Sd) UCL	1258	99% Chebyshev(Mean, Sd) UCL	1419	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	1176			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Boron_Total				
General Statistics				
Total Number of Observations	4	Number of Distinct Observations	2	
		Number of Missing Observations	0	
Minimum	90	Mean	95	
Maximum	100	Median	95	
SD	5.774	Std. Error of Mean	2.887	
Coefficient of Variation	0.0608	Skewness	0	
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use				
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.				
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).				
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test				
Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.307	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	101.8	95% Adjusted-CLT UCL (Chen-1995)	99.75	
		95% Modified-t UCL (Johnson-1978)	101.8	
Gamma GOF Test				
A-D Test Statistic	0.719	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.657	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.341	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	360.7	k star (bias corrected MLE)	90.33	
Theta hat (MLE)	0.263	Theta star (bias corrected MLE)	1.052	
nu hat (MLE)	2885	nu star (bias corrected)	722.7	
MLE Mean (bias corrected)	95	MLE Sd (bias corrected)	9.995	
		Approximate Chi Square Value (0.05)	661.3	
Adjusted Level of Significance	N/A	Adjusted Chi Square Value	N/A	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	103.8	95% Adjusted Gamma UCL (use when n<50)	N/A	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.307	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.375	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.5	Mean of logged Data	4.552	
Maximum of Logged Data	4.605	SD of logged Data	0.0608	
Assuming Lognormal Distribution				
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	103.7	
95% Chebyshev (MVUE) UCL	107.6	97.5% Chebyshev (MVUE) UCL	113	
99% Chebyshev (MVUE) UCL	123.7			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	99.75	95% Jackknife UCL	N/A	
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A	
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	103.7	95% Chebyshev(Mean, Sd) UCL	107.6	
97.5% Chebyshev(Mean, Sd) UCL	113	99% Chebyshev(Mean, Sd) UCL	123.7	
Suggested UCL to Use				
95% Student's-t UCL	101.8			
Recommended UCL exceeds the maximum observation				
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium_FLT				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	74	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Cadmium_FLT was not processed!				
Cadmium_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	2	
Number of Detects	1	Number of Non-Detects	73	
Number of Distinct Detects	1	Number of Distinct Non-Detects	1	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Cadmium_Total was not processed!

Chromium_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	74
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chromium_FLT was not processed!

Chromium_Total

General Statistics

Total Number of Observations	74	Number of Distinct Observations	2
Number of Detects	1	Number of Non-Detects	73
Number of Distinct Detects	1	Number of Distinct Non-Detects	1

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chromium_Total was not processed!

Cobalt_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	2
Number of Detects	1	Number of Non-Detects	73
Number of Distinct Detects	1	Number of Distinct Non-Detects	1

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt_FLT was not processed!

Cobalt_Total

General Statistics

Total Number of Observations	74	Number of Distinct Observations	4
Number of Detects	3	Number of Non-Detects	71
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	0.27	Minimum Non-Detect	0.25
Maximum Detect	0.44	Maximum Non-Detect	0.25
Variance Detects	0.00863	Percent Non-Detects	95.95%
Mean Detects	0.333	SD Detects	0.0929
Median Detects	0.29	CV Detects	0.279
Skewness Detects	1.642	Kurtosis Detects	N/A
Mean of Logged Detects	-1.123	SD of Logged Detects	0.264

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.837	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.346	**Lilliefors GOF Test**

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.253	KM Standard Error of Mean	0.00319
KM SD	0.0224	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.259	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.259	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.263	95% KM Chebyshev UCL	0.267
97.5% KM Chebyshev UCL	0.273	99% KM Chebyshev UCL	0.285
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	20.9	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.016	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	125.4	nu star (bias corrected)	N/A
Mean (detects)	0.333		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0278
Maximum	0.44	Median	0.01
SD	0.0685	CV	2.465
k hat (MLE)	0.786	k star (bias corrected MLE)	0.763
Theta hat (MLE)	0.0354	Theta star (bias corrected MLE)	0.0364
nu hat (MLE)	116.3	nu star (bias corrected)	112.9
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (112.88, α)	89.36	Adjusted Chi Square Value (112.88, β)	88.94
95% Gamma Approximate UCL (use when n>=50)	0.0351	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.253	SD (KM)	0.0224
Variance (KM)	5.0345E-4	SE of Mean (KM)	0.00319
k hat (KM)	127.5	k star (KM)	122.4
nu hat (KM)	18873	nu star (KM)	18109
theta hat (KM)	0.00199	theta star (KM)	0.00207
80% gamma percentile (KM)	0.272	90% gamma percentile (KM)	0.283
95% gamma percentile (KM)	0.292	99% gamma percentile (KM)	0.31
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	17797	Adjusted Chi Square Value (N/A, β)	17791
95% Gamma Approximate KM-UCL (use when n>=50)	0.258	95% Gamma Adjusted KM-UCL (use when n<50)	0.258
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0553	Mean in Log Scale	-3.476
SD in Original Scale	0.0721	SD in Log Scale	1.094
95% t UCL (assumes normality of ROS data)	0.0693	95% Percentile Bootstrap UCL	0.0698
95% BCA Bootstrap UCL	0.0735	95% Bootstrap t UCL	0.0753
95% H-UCL (Log ROS)	0.076		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.376	KM Geo Mean	0.253

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD (logged)	0.0677	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.00964	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0677	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.00964		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.133	Mean in Log Scale	-2.041
SD in Original Scale	0.0441	SD in Log Scale	0.195
95% t UCL (Assumes normality)	0.142	95% H-Stat UCL	0.138

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.259		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	48
Number of Detects	63	Number of Non-Detects	11
Number of Distinct Detects	42	Number of Distinct Non-Detects	8
Minimum Detect	1	Minimum Non-Detect	0.6
Maximum Detect	120	Maximum Non-Detect	4.25
Variance Detects	562.7	Percent Non-Detects	14.86%
Mean Detects	10.78	SD Detects	23.72
Median Detects	2.7	CV Detects	2.201
Skewness Detects	3.646	Kurtosis Detects	13.78
Mean of Logged Detects	1.36	SD of Logged Detects	1.181

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.443	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.364	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	9.308	KM Standard Error of Mean	2.578
KM SD	22	95% KM (BCA) UCL	14.08
95% KM (t) UCL	13.6	95% KM (Percentile Bootstrap) UCL	13.54
95% KM (z) UCL	13.55	95% KM Bootstrap t UCL	16.79
90% KM Chebyshev UCL	17.04	95% KM Chebyshev UCL	20.54
97.5% KM Chebyshev UCL	25.41	99% KM Chebyshev UCL	34.96

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	7.508	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.806	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.269	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.118	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.606	k star (bias corrected MLE)	0.588
Theta hat (MLE)	17.78	Theta star (bias corrected MLE)	18.33
nu hat (MLE)	76.39	nu star (bias corrected)	74.09
Mean (detects)	10.78		

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01		Mean	9.179
Maximum	120		Median	2.3
SD	22.2		CV	2.418
k hat (MLE)	0.38		k star (bias corrected MLE)	0.374
Theta hat (MLE)	24.12		Theta star (bias corrected MLE)	24.54
nu hat (MLE)	56.31		nu star (bias corrected)	55.36
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (55.36, α)	39.26		Adjusted Chi Square Value (55.36, β)	38.99
95% Gamma Approximate UCL (use when n>=50)	12.94		95% Gamma Adjusted UCL (use when n<50)	13.03
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	9.308		SD (KM)	22
Variance (KM)	483.9		SE of Mean (KM)	2.578
k hat (KM)	0.179		k star (KM)	0.181
nu hat (KM)	26.5		nu star (KM)	26.76
theta hat (KM)	51.98		theta star (KM)	51.48
80% gamma percentile (KM)	11.58		90% gamma percentile (KM)	28.08
95% gamma percentile (KM)	49.19		99% gamma percentile (KM)	108.3
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (26.76, α)	15.96		Adjusted Chi Square Value (26.76, β)	15.8
95% Gamma Approximate KM-UCL (use when n>=50)	15.6		95% Gamma Adjusted KM-UCL (use when n<50)	15.76
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.833		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.9091E-9		Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.168		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111		Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	9.267		Mean in Log Scale	1.045
SD in Original Scale	22.16		SD in Log Scale	1.353
95% t UCL (assumes normality of ROS data)	13.56		95% Percentile Bootstrap UCL	13.71
95% BCA Bootstrap UCL	15.31		95% Bootstrap t UCL	17.33
95% H-UCL (Log ROS)	10.77			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.119		KM Geo Mean	3.061
KM SD (logged)	1.239		95% Critical H Value (KM-Log)	2.502
KM Standard Error of Mean (logged)	0.146		95% H-UCL (KM -Log)	9.476
KM SD (logged)	1.239		95% Critical H Value (KM-Log)	2.502
KM Standard Error of Mean (logged)	0.146			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	9.286		Mean in Log Scale	1.082
SD in Original Scale	22.16		SD in Log Scale	1.298
95% t UCL (Assumes normality)	13.58		95% H-Stat UCL	10.13
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	20.54			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	54	
Number of Detects	63	Number of Non-Detects	11	
Number of Distinct Detects	44	Number of Distinct Non-Detects	10	
Minimum Detect	1.3	Minimum Non-Detect	0.65	
Maximum Detect	120	Maximum Non-Detect	5.5	
Variance Detects	602.9	Percent Non-Detects	14.86%	
Mean Detects	15.02	SD Detects	24.55	
Median Detects	4	CV Detects	1.635	
Skewness Detects	2.495	Kurtosis Detects	6.237	
Mean of Logged Detects	1.826	SD of Logged Detects	1.216	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.599	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.338	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.111	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	12.93	KM Standard Error of Mean	2.698	
KM SD	23.02	95% KM (BCA) UCL	17.51	
95% KM (t) UCL	17.43	95% KM (Percentile Bootstrap) UCL	17.42	
95% KM (z) UCL	17.37	95% KM Bootstrap t UCL	19.01	
90% KM Chebyshev UCL	21.03	95% KM Chebyshev UCL	24.69	
97.5% KM Chebyshev UCL	29.78	99% KM Chebyshev UCL	39.78	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	5.833	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.26	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.117	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.686	k star (bias corrected MLE)	0.664	
Theta hat (MLE)	21.88	Theta star (bias corrected MLE)	22.61	
nu hat (MLE)	86.48	nu star (bias corrected)	83.7	
Mean (detects)	15.02			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	12.79	
Maximum	120	Median	3.35	
SD	23.26	CV	1.819	
k hat (MLE)	0.393	k star (bias corrected MLE)	0.386	
Theta hat (MLE)	32.52	Theta star (bias corrected MLE)	33.11	
nu hat (MLE)	58.19	nu star (bias corrected)	57.17	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (57.17, α)	40.79	Adjusted Chi Square Value (57.17, β)	40.51	
95% Gamma Approximate UCL (use when n>=50)	17.92	95% Gamma Adjusted UCL (use when n<50)	18.04	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	12.93	SD (KM)	23.02	
Variance (KM)	530.1	SE of Mean (KM)	2.698	
k hat (KM)	0.315	k star (KM)	0.312	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

nu hat (KM)	46.68	nu star (KM)	46.12
theta hat (KM)	41	theta star (KM)	41.49
80% gamma percentile (KM)	20.01	90% gamma percentile (KM)	37.96
95% gamma percentile (KM)	58.43	99% gamma percentile (KM)	111.4
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (46.12, α)	31.54	Adjusted Chi Square Value (46.12, β)	31.3
95% Gamma Approximate KM-UCL (use when n>=50)	18.91	95% Gamma Adjusted KM-UCL (use when n<50)	19.05
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.857	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.3297E-8	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.208	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.111	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	12.89	Mean in Log Scale	1.476
SD in Original Scale	23.2	SD in Log Scale	1.418
95% t UCL (assumes normality of ROS data)	17.38	95% Percentile Bootstrap UCL	17.82
95% BCA Bootstrap UCL	18.06	95% Bootstrap t UCL	18.54
95% H-UCL (Log ROS)	18.7		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.529	KM Geo Mean	4.615
KM SD (logged)	1.333	95% Critical H Value (KM-Log)	2.606
KM Standard Error of Mean (logged)	0.157	95% H-UCL (KM -Log)	16.86
KM SD (logged)	1.333	95% Critical H Value (KM-Log)	2.606
KM Standard Error of Mean (logged)	0.157		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	12.91	Mean in Log Scale	1.504
SD in Original Scale	23.19	SD in Log Scale	1.38
95% t UCL (Assumes normality)	17.4	95% H-Stat UCL	17.93
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	24.69		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_FLT			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	74
Number of Distinct Detects	0	Number of Distinct Non-Detects	1
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Iron_FLT was not processed!			
Iron_Total			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	74	Number of Distinct Observations	9	
Number of Detects	28	Number of Non-Detects	46	
Number of Distinct Detects	9	Number of Distinct Non-Detects	1	
Minimum Detect	50	Minimum Non-Detect	50	
Maximum Detect	280	Maximum Non-Detect	50	
Variance Detects	3121	Percent Non-Detects	62.16%	
Mean Detects	86.07	SD Detects	55.87	
Median Detects	70	CV Detects	0.649	
Skewness Detects	2.416	Kurtosis Detects	5.738	
Mean of Logged Detects	4.326	SD of Logged Detects	0.467	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.654	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	63.65	KM Standard Error of Mean	4.5	
KM SD	38.01	95% KM (BCA) UCL	71.76	
95% KM (t) UCL	71.15	95% KM (Percentile Bootstrap) UCL	71.76	
95% KM (z) UCL	71.05	95% KM Bootstrap t UCL	76.2	
90% KM Chebyshev UCL	77.15	95% KM Chebyshev UCL	83.26	
97.5% KM Chebyshev UCL	91.75	99% KM Chebyshev UCL	108.4	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.462	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.75	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.27	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.166	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	4.022	k star (bias corrected MLE)	3.615	
Theta hat (MLE)	21.4	Theta star (bias corrected MLE)	23.81	
nu hat (MLE)	225.2	nu star (bias corrected)	202.4	
Mean (detects)	86.07			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	33.8	
Maximum	280	Median	0.101	
SD	53.44	CV	1.581	
k hat (MLE)	0.187	k star (bias corrected MLE)	0.189	
Theta hat (MLE)	180.3	Theta star (bias corrected MLE)	179	
nu hat (MLE)	27.74	nu star (bias corrected)	27.95	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (27.95, α)	16.89	Adjusted Chi Square Value (27.95, β)	16.72	
95% Gamma Approximate UCL (use when n>=50)	55.94	95% Gamma Adjusted UCL (use when n<50)	56.51	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	63.65	SD (KM)	38.01	
Variance (KM)	1445	SE of Mean (KM)	4.5	
k hat (KM)	2.804	k star (KM)	2.699	
nu hat (KM)	415	nu star (KM)	399.5	
theta hat (KM)	22.7	theta star (KM)	23.58	
80% gamma percentile (KM)	91.94	90% gamma percentile (KM)	115.6	
95% gamma percentile (KM)	137.7	99% gamma percentile (KM)	186.1	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (399.50, α)	354.2	Adjusted Chi Square Value (399.50, β)	353.3
95% Gamma Approximate KM-UCL (use when n>=50)	71.8	95% Gamma Adjusted KM-UCL (use when n<50)	71.97
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.805	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	45.49	Mean in Log Scale	3.439
SD in Original Scale	47.24	SD in Log Scale	0.873
95% t UCL (assumes normality of ROS data)	54.64	95% Percentile Bootstrap UCL	54.63
95% BCA Bootstrap UCL	57.3	95% Bootstrap t UCL	57.03
95% H-UCL (Log ROS)	56.71		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.069	KM Geo Mean	58.47
KM SD (logged)	0.346	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.041	95% H-UCL (KM -Log)	66.69
KM SD (logged)	0.346	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.041		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	48.11	Mean in Log Scale	3.638
SD in Original Scale	45.21	SD in Log Scale	0.611
95% t UCL (Assumes normality)	56.86	95% H-Stat UCL	52.55
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	71.15	KM H-UCL	66.69
95% KM (BCA) UCL	71.76		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lead_FLT			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	4
Number of Detects	3	Number of Non-Detects	71
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	1
Maximum Detect	1.7	Maximum Non-Detect	1
Variance Detects	0.0933	Percent Non-Detects	95.95%
Mean Detects	1.433	SD Detects	0.306
Median Detects	1.5	CV Detects	0.213
Skewness Detects	-0.935	Kurtosis Detects	N/A
Mean of Logged Detects	0.344	SD of Logged Detects	0.224
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.018	KM Standard Error of Mean	0.0141	
KM SD	0.0991	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	1.041	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	1.041	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	1.06	95% KM Chebyshev UCL	1.079	
97.5% KM Chebyshev UCL	1.106	99% KM Chebyshev UCL	1.158	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	31.03	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.0462	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	186.2	nu star (bias corrected)	N/A	
Mean (detects)	1.433			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.119	
Maximum	1.7	Median	0.01	
SD	0.32	CV	2.677	
k hat (MLE)	0.367	k star (bias corrected MLE)	0.361	
Theta hat (MLE)	0.326	Theta star (bias corrected MLE)	0.331	
nu hat (MLE)	54.25	nu star (bias corrected)	53.38	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (53.38, α)	37.6	Adjusted Chi Square Value (53.38, β)	37.33	
95% Gamma Approximate UCL (use when n>=50)	0.169	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.018	SD (KM)	0.0991	
Variance (KM)	0.00983	SE of Mean (KM)	0.0141	
k hat (KM)	105.4	k star (KM)	101.1	
nu hat (KM)	15595	nu star (KM)	14964	
theta hat (KM)	0.00966	theta star (KM)	0.0101	
80% gamma percentile (KM)	1.102	90% gamma percentile (KM)	1.149	
95% gamma percentile (KM)	1.19	99% gamma percentile (KM)	1.268	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (N/A, α)	14681	Adjusted Chi Square Value (N/A, β)	14675	
95% Gamma Approximate KM-UCL (use when n>=50)	1.037	95% Gamma Adjusted KM-UCL (use when n<50)	1.038	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.304	Mean in Log Scale	-1.586	
SD in Original Scale	0.31	SD in Log Scale	0.897	
95% t UCL (assumes normality of ROS data)	0.364	95% Percentile Bootstrap UCL	0.367	
95% BCA Bootstrap UCL	0.378	95% Bootstrap t UCL	0.381	
95% H-UCL (Log ROS)	0.384			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	0.0139	KM Geo Mean	1.014
KM SD (logged)	0.0772	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.011	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0772	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.011		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.538	Mean in Log Scale	-0.651
SD in Original Scale	0.192	SD in Log Scale	0.209
95% t UCL (Assumes normality)	0.575	95% H-Stat UCL	0.556

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.041		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Lead_Total

General Statistics

Total Number of Observations	74	Number of Distinct Observations	12
Number of Detects	14	Number of Non-Detects	60
Number of Distinct Detects	12	Number of Distinct Non-Detects	1
Minimum Detect	1	Minimum Non-Detect	1
Maximum Detect	9.6	Maximum Non-Detect	1
Variance Detects	5.396	Percent Non-Detects	81.08%
Mean Detects	2.436	SD Detects	2.323
Median Detects	1.5	CV Detects	0.954
Skewness Detects	2.673	Kurtosis Detects	7.51
Mean of Logged Detects	0.646	SD of Logged Detects	0.637

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.618	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.272	KM Standard Error of Mean	0.136
KM SD	1.124	95% KM (BCA) UCL	1.536
95% KM (t) UCL	1.498	95% KM (Percentile Bootstrap) UCL	1.522
95% KM (z) UCL	1.495	95% KM Bootstrap t UCL	1.966
90% KM Chebyshev UCL	1.679	95% KM Chebyshev UCL	1.863
97.5% KM Chebyshev UCL	2.119	99% KM Chebyshev UCL	2.621

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.333	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.745	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.25	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.231	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.2	k star (bias corrected MLE)	1.776
Theta hat (MLE)	1.107	Theta star (bias corrected MLE)	1.371
nu hat (MLE)	61.61	nu star (bias corrected)	49.74
Mean (detects)	2.436		

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.469	
Maximum	9.6	Median	0.01	
SD	1.37	CV	2.921	
k hat (MLE)	0.249	k star (bias corrected MLE)	0.248	
Theta hat (MLE)	1.883	Theta star (bias corrected MLE)	1.891	
nu hat (MLE)	36.85	nu star (bias corrected)	36.69	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (36.69, α)	23.83	Adjusted Chi Square Value (36.69, β)	23.62	
95% Gamma Approximate UCL (use when n>=50)	0.722	95% Gamma Adjusted UCL (use when n<50)	0.728	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.272	SD (KM)	1.124	
Variance (KM)	1.264	SE of Mean (KM)	0.136	
k hat (KM)	1.279	k star (KM)	1.236	
nu hat (KM)	189.3	nu star (KM)	183	
theta hat (KM)	0.994	theta star (KM)	1.029	
80% gamma percentile (KM)	2.008	90% gamma percentile (KM)	2.779	
95% gamma percentile (KM)	3.537	99% gamma percentile (KM)	5.273	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (182.96, α)	152.7	Adjusted Chi Square Value (182.96, β)	152.1	
95% Gamma Approximate KM-UCL (use when n>=50)	1.524	95% Gamma Adjusted KM-UCL (use when n<50)	1.529	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.633	Mean in Log Scale	-1.572	
SD in Original Scale	1.327	SD in Log Scale	1.535	
95% t UCL (assumes normality of ROS data)	0.89	95% Percentile Bootstrap UCL	0.905	
95% BCA Bootstrap UCL	0.992	95% Bootstrap t UCL	1.125	
95% H-UCL (Log ROS)	1.122			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.122	KM Geo Mean	1.13	
KM SD (logged)	0.368	95% Critical H Value (KM-Log)	1.779	
KM Standard Error of Mean (logged)	0.0444	95% H-UCL (KM -Log)	1.305	
KM SD (logged)	0.368	95% Critical H Value (KM-Log)	1.779	
KM Standard Error of Mean (logged)	0.0444			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.866	Mean in Log Scale	-0.44	
SD in Original Scale	1.242	SD in Log Scale	0.593	
95% t UCL (Assumes normality)	1.107	95% H-Stat UCL	0.877	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	1.305			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lithium_FLT				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	12	
Number of Detects	73	Number of Non-Detects	1	
Number of Distinct Detects	11	Number of Distinct Non-Detects	1	
Minimum Detect	12	Minimum Non-Detect	5	
Maximum Detect	36	Maximum Non-Detect	5	
Variance Detects	11.05	Percent Non-Detects	1.351%	
Mean Detects	19.62	SD Detects	3.323	
Median Detects	20	CV Detects	0.169	
Skewness Detects	1.017	Kurtosis Detects	7.665	
Mean of Logged Detects	2.962	SD of Logged Detects	0.171	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.866	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	7.8771E-9	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	19.42	KM Standard Error of Mean	0.432	
KM SD	3.687	95% KM (BCA) UCL	20.08	
95% KM (t) UCL	20.14	95% KM (Percentile Bootstrap) UCL	20.12	
95% KM (z) UCL	20.13	95% KM Bootstrap t UCL	20.13	
90% KM Chebyshev UCL	20.71	95% KM Chebyshev UCL	21.3	
97.5% KM Chebyshev UCL	22.11	99% KM Chebyshev UCL	23.71	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.81	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.171	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.104	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	35.74	k star (bias corrected MLE)	34.28	
Theta hat (MLE)	0.549	Theta star (bias corrected MLE)	0.572	
nu hat (MLE)	5218	nu star (bias corrected)	5005	
Mean (detects)	19.62			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	12	Mean	19.52	
Maximum	36	Median	20	
SD	3.401	CV	0.174	
k hat (MLE)	33.44	k star (bias corrected MLE)	32.1	
Theta hat (MLE)	0.584	Theta star (bias corrected MLE)	0.608	
nu hat (MLE)	4950	nu star (bias corrected)	4750	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (N/A, α)	4591	Adjusted Chi Square Value (N/A, β)	4588	
95% Gamma Approximate UCL (use when n>=50)	20.2	95% Gamma Adjusted UCL (use when n<50)	20.21	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	19.42	SD (KM)	3.687	
Variance (KM)	13.59	SE of Mean (KM)	0.432	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (KM)	27.74	k star (KM)	26.62
nu hat (KM)	4105	nu star (KM)	3940
theta hat (KM)	0.7	theta star (KM)	0.729
80% gamma percentile (KM)	22.5	90% gamma percentile (KM)	24.37
95% gamma percentile (KM)	26	99% gamma percentile (KM)	29.23
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	3795	Adjusted Chi Square Value (N/A, β)	3792
95% Gamma Approximate KM-UCL (use when n>=50)	20.16	95% Gamma Adjusted KM-UCL (use when n<50)	20.18
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.885	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.1506E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	19.52	Mean in Log Scale	2.957
SD in Original Scale	3.398	SD in Log Scale	0.176
95% t UCL (assumes normality of ROS data)	20.18	95% Percentile Bootstrap UCL	20.2
95% BCA Bootstrap UCL	20.18	95% Bootstrap t UCL	20.23
95% H-UCL (Log ROS)	20.23		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.944	KM Geo Mean	18.99
KM SD (logged)	0.23	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.0269	95% H-UCL (KM -Log)	20.42
KM SD (logged)	0.23	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.0269		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	19.39	Mean in Log Scale	2.935
SD in Original Scale	3.854	SD in Log Scale	0.292
95% t UCL (Assumes normality)	20.13	95% H-Stat UCL	20.84
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	20.14	KM H-UCL	20.42
95% KM (BCA) UCL	20.08		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lithium_Total			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	12
Number of Detects	73	Number of Non-Detects	1
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	12	Minimum Non-Detect	5
Maximum Detect	35	Maximum Non-Detect	5
Variance Detects	11.01	Percent Non-Detects	1.351%
Mean Detects	19.73	SD Detects	3.318
Median Detects	20	CV Detects	0.168
Skewness Detects	0.682	Kurtosis Detects	5.682
Mean of Logged Detects	2.968	SD of Logged Detects	0.172
Normal GOF Test on Detects Only			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Shapiro Wilk Test Statistic	0.891	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	5.9726E-7	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	19.53	KM Standard Error of Mean	0.432	
KM SD	3.688	95% KM (BCA) UCL	20.24	
95% KM (t) UCL	20.25	95% KM (Percentile Bootstrap) UCL	20.22	
95% KM (z) UCL	20.24	95% KM Bootstrap t UCL	20.24	
90% KM Chebyshev UCL	20.82	95% KM Chebyshev UCL	21.41	
97.5% KM Chebyshev UCL	22.22	99% KM Chebyshev UCL	23.82	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.377	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.147	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.104	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	35.43	k star (bias corrected MLE)	33.98	
Theta hat (MLE)	0.557	Theta star (bias corrected MLE)	0.58	
nu hat (MLE)	5173	nu star (bias corrected)	4962	
Mean (detects)	19.73			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	12	Mean	19.63	
Maximum	35	Median	20	
SD	3.399	CV	0.173	
k hat (MLE)	33.12	k star (bias corrected MLE)	31.79	
Theta hat (MLE)	0.593	Theta star (bias corrected MLE)	0.617	
nu hat (MLE)	4902	nu star (bias corrected)	4705	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (N/A, α)	4546	Adjusted Chi Square Value (N/A, β)	4543	
95% Gamma Approximate UCL (use when n>=50)	20.31	95% Gamma Adjusted UCL (use when n<50)	20.33	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	19.53	SD (KM)	3.688	
Variance (KM)	13.6	SE of Mean (KM)	0.432	
k hat (KM)	28.04	k star (KM)	26.91	
nu hat (KM)	4149	nu star (KM)	3982	
theta hat (KM)	0.697	theta star (KM)	0.726	
80% gamma percentile (KM)	22.6	90% gamma percentile (KM)	24.48	
95% gamma percentile (KM)	26.1	99% gamma percentile (KM)	29.33	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (N/A, α)	3837	Adjusted Chi Square Value (N/A, β)	3834	
95% Gamma Approximate KM-UCL (use when n>=50)	20.27	95% Gamma Adjusted KM-UCL (use when n<50)	20.28	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.895	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.2891E-6	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	19.63	Mean in Log Scale	2.962	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	3.396	SD in Log Scale	0.178
95% t UCL (assumes normality of ROS data)	20.29	95% Percentile Bootstrap UCL	20.25
95% BCA Bootstrap UCL	20.28	95% Bootstrap t UCL	20.29
95% H-UCL (Log ROS)	20.35		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.949	KM Geo Mean	19.09
KM SD (logged)	0.231	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.027	95% H-UCL (KM -Log)	20.54
KM SD (logged)	0.231	95% Critical H Value (KM-Log)	1.718
KM Standard Error of Mean (logged)	0.027		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	19.49	Mean in Log Scale	2.94
SD in Original Scale	3.856	SD in Log Scale	0.293
95% t UCL (Assumes normality)	20.24	95% H-Stat UCL	20.97
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	20.25	KM H-UCL	20.54
95% KM (BCA) UCL	20.24		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_FLT			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	31
Number of Detects	52	Number of Non-Detects	22
Number of Distinct Detects	30	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	1
Maximum Detect	80	Maximum Non-Detect	1
Variance Detects	162.8	Percent Non-Detects	29.73%
Mean Detects	5.446	SD Detects	12.76
Median Detects	2.25	CV Detects	2.343
Skewness Detects	4.948	Kurtosis Detects	25.84
Mean of Logged Detects	0.994	SD of Logged Detects	0.887
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.347	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.367	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	4.124	KM Standard Error of Mean	1.266
KM SD	10.79	95% KM (BCA) UCL	6.541
95% KM (t) UCL	6.234	95% KM (Percentile Bootstrap) UCL	6.436
95% KM (z) UCL	6.207	95% KM Bootstrap t UCL	11.97
90% KM Chebyshev UCL	7.923	95% KM Chebyshev UCL	9.643
97.5% KM Chebyshev UCL	12.03	99% KM Chebyshev UCL	16.72
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.154	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.316	**Kolmogorov-Smirnov GOF**	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% K-S Critical Value				0.128	Detected Data Not Gamma Distributed at 5% Significance Level						
	Detected Data Not Gamma Distributed at 5% Significance Level											
	Gamma Statistics on Detected Data Only											
	k hat (MLE)				0.842	k star (bias corrected MLE)						0.806
	Theta hat (MLE)				6.47	Theta star (bias corrected MLE)						6.757
	nu hat (MLE)				87.54	nu star (bias corrected)						83.82
	Mean (detects)				5.446							
	Gamma ROS Statistics using Imputed Non-Detects											
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
	This is especially true when the sample size is small.											
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
	Minimum				0.01	Mean						3.83
	Maximum				80	Median						1.55
	SD				10.96	CV						2.86
	k hat (MLE)				0.336	k star (bias corrected MLE)						0.332
	Theta hat (MLE)				11.39	Theta star (bias corrected MLE)						11.55
	nu hat (MLE)				49.76	nu star (bias corrected)						49.08
	Adjusted Level of Significance (β)				0.0468							
	Approximate Chi Square Value (49.08, α)				33.99	Adjusted Chi Square Value (49.08, β)						33.74
	95% Gamma Approximate UCL (use when n>=50)				5.529	95% Gamma Adjusted UCL (use when n<50)						5.57
	Estimates of Gamma Parameters using KM Estimates											
	Mean (KM)				4.124	SD (KM)						10.79
	Variance (KM)				116.4	SE of Mean (KM)						1.266
	k hat (KM)				0.146	k star (KM)						0.149
	nu hat (KM)				21.64	nu star (KM)						22.09
	theta hat (KM)				28.21	theta star (KM)						27.63
	80% gamma percentile (KM)				4.472	90% gamma percentile (KM)						12.22
	95% gamma percentile (KM)				22.72	99% gamma percentile (KM)						53.22
	Gamma Kaplan-Meier (KM) Statistics											
	Approximate Chi Square Value (22.09, α)				12.41	Adjusted Chi Square Value (22.09, β)						12.26
	95% Gamma Approximate KM-UCL (use when n>=50)				7.344	95% Gamma Adjusted KM-UCL (use when n<50)						7.43
	Lognormal GOF Test on Detected Observations Only											
	Shapiro Wilk Approximate Test Statistic				0.786	Shapiro Wilk GOF Test						
	5% Shapiro Wilk P Value				1.0507E-9	Detected Data Not Lognormal at 5% Significance Level						
	Lilliefors Test Statistic				0.222	Lilliefors GOF Test						
	5% Lilliefors Critical Value				0.122	Detected Data Not Lognormal at 5% Significance Level						
	Detected Data Not Lognormal at 5% Significance Level											
	Lognormal ROS Statistics Using Imputed Non-Detects											
	Mean in Original Scale				3.951	Mean in Log Scale						0.4
	SD in Original Scale				10.91	SD in Log Scale						1.219
	95% t UCL (assumes normality of ROS data)				6.065	95% Percentile Bootstrap UCL						6.208
	95% BCA Bootstrap UCL				7.6	95% Bootstrap t UCL						11.82
	95% H-UCL (Log ROS)				4.471							
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution											
	KM Mean (logged)				0.699	KM Geo Mean						2.011
	KM SD (logged)				0.865	95% Critical H Value (KM-Log)						2.131
	KM Standard Error of Mean (logged)				0.102	95% H-UCL (KM -Log)						3.628
	KM SD (logged)				0.865	95% Critical H Value (KM-Log)						2.131
	KM Standard Error of Mean (logged)				0.102							
	DL/2 Statistics											
	DL/2 Normal					DL/2 Log-Transformed						
	Mean in Original Scale				3.976	Mean in Log Scale						0.493
	SD in Original Scale				10.91	SD in Log Scale						1.073
	95% t UCL (Assumes normality)				6.088	95% H-Stat UCL						3.902
	DL/2 is not a recommended method, provided for comparisons and historical reasons											

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	9.643		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_Total			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	34
Number of Detects	69	Number of Non-Detects	5
Number of Distinct Detects	33	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	1
Maximum Detect	80	Maximum Non-Detect	1
Variance Detects	164	Percent Non-Detects	6.757%
Mean Detects	12.21	SD Detects	12.81
Median Detects	10	CV Detects	1.049
Skewness Detects	3.309	Kurtosis Detects	12.75
Mean of Logged Detects	2.196	SD of Logged Detects	0.745
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.592	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.409	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	11.45	KM Standard Error of Mean	1.475
KM SD	12.59	95% KM (BCA) UCL	13.88
95% KM (t) UCL	13.91	95% KM (Percentile Bootstrap) UCL	14.13
95% KM (z) UCL	13.87	95% KM Bootstrap t UCL	14.78
90% KM Chebyshev UCL	15.87	95% KM Chebyshev UCL	17.88
97.5% KM Chebyshev UCL	20.66	99% KM Chebyshev UCL	26.12
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.038	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.766	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.341	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.109	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.783	k star (bias corrected MLE)	1.715
Theta hat (MLE)	6.846	Theta star (bias corrected MLE)	7.117
nu hat (MLE)	246	nu star (bias corrected)	236.7
Mean (detects)	12.21		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	11.38
Maximum	80	Median	9.65
SD	12.74	CV	1.119
k hat (MLE)	0.847	k star (bias corrected MLE)	0.822
Theta hat (MLE)	13.44	Theta star (bias corrected MLE)	13.85

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

nu hat (MLE)	125.3	nu star (bias corrected)	121.6
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (121.60, α)	97.13	Adjusted Chi Square Value (121.60, β)	96.7
95% Gamma Approximate UCL (use when n>=50)	14.25	95% Gamma Adjusted UCL (use when n<50)	14.31
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	11.45	SD (KM)	12.59
Variance (KM)	158.6	SE of Mean (KM)	1.475
k hat (KM)	0.826	k star (KM)	0.802
nu hat (KM)	122.3	nu star (KM)	118.7
theta hat (KM)	13.86	theta star (KM)	14.28
80% gamma percentile (KM)	18.71	90% gamma percentile (KM)	27.82
95% gamma percentile (KM)	37.11	99% gamma percentile (KM)	59.03
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (118.66, α)	94.51	Adjusted Chi Square Value (118.66, β)	94.09
95% Gamma Approximate KM-UCL (use when n>=50)	14.37	95% Gamma Adjusted KM-UCL (use when n<50)	14.44
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	5.2895E-6	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	11.5	Mean in Log Scale	2.085
SD in Original Scale	12.64	SD in Log Scale	0.832
95% t UCL (assumes normality of ROS data)	13.95	95% Percentile Bootstrap UCL	14.07
95% BCA Bootstrap UCL	14.68	95% Bootstrap t UCL	15.01
95% H-UCL (Log ROS)	13.96		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.048	KM Geo Mean	7.749
KM SD (logged)	0.902	95% Critical H Value (KM-Log)	2.164
KM Standard Error of Mean (logged)	0.106	95% H-UCL (KM -Log)	14.64
KM SD (logged)	0.902	95% Critical H Value (KM-Log)	2.164
KM Standard Error of Mean (logged)	0.106		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	11.41	Mean in Log Scale	2.001
SD in Original Scale	12.71	SD in Log Scale	1.025
95% t UCL (Assumes normality)	13.88	95% H-Stat UCL	16.44
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	17.88		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury_FLT			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	6
Number of Detects	21	Number of Non-Detects	53
Number of Distinct Detects	5	Number of Distinct Non-Detects	1
Minimum Detect	0.01	Minimum Non-Detect	0.015
Maximum Detect	0.08	Maximum Non-Detect	0.015

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance Detects	6.6476E-4	Percent Non-Detects	71.62%
Mean Detects	0.0305	SD Detects	0.0258
Median Detects	0.02	CV Detects	0.846
Skewness Detects	1.161	Kurtosis Detects	-0.35
Mean of Logged Detects	-3.793	SD of Logged Detects	0.773
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.728	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0158	KM Standard Error of Mean	0.00194
KM SD	0.0163	95% KM (BCA) UCL	0.0193
95% KM (t) UCL	0.019	95% KM (Percentile Bootstrap) UCL	0.0191
95% KM (z) UCL	0.019	95% KM Bootstrap t UCL	0.0204
90% KM Chebyshev UCL	0.0216	95% KM Chebyshev UCL	0.0243
97.5% KM Chebyshev UCL	0.0279	99% KM Chebyshev UCL	0.0351
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.719	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.273	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.801	k star (bias corrected MLE)	1.575
Theta hat (MLE)	0.0169	Theta star (bias corrected MLE)	0.0193
nu hat (MLE)	75.63	nu star (bias corrected)	66.16
Mean (detects)	0.0305		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0175
Maximum	0.08	Median	0.01
SD	0.0162	CV	0.925
k hat (MLE)	2.527	k star (bias corrected MLE)	2.434
Theta hat (MLE)	0.00694	Theta star (bias corrected MLE)	0.0072
nu hat (MLE)	374	nu star (bias corrected)	360.2
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (360.21, α)	317.2	Adjusted Chi Square Value (360.21, β)	316.4
95% Gamma Approximate UCL (use when n>=50)	0.0199	95% Gamma Adjusted UCL (use when n<50)	0.02
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0158	SD (KM)	0.0163
Variance (KM)	2.6488E-4	SE of Mean (KM)	0.00194
k hat (KM)	0.944	k star (KM)	0.914
nu hat (KM)	139.7	nu star (KM)	135.3
theta hat (KM)	0.0168	theta star (KM)	0.0173
80% gamma percentile (KM)	0.0256	90% gamma percentile (KM)	0.0372
95% gamma percentile (KM)	0.0489	99% gamma percentile (KM)	0.0762
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (135.34, α)	109.5	Adjusted Chi Square Value (135.34, β)	109
95% Gamma Approximate KM-UCL (use when n>=50)	0.0195	95% Gamma Adjusted KM-UCL (use when n<50)	0.0196
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk GOF Test**	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

				5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level						
				Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**						
				5% Lilliefors Critical Value	0.188	Detected Data Not Lognormal at 5% Significance Level						
				Detected Data Not Lognormal at 5% Significance Level								
				Lognormal ROS Statistics Using Imputed Non-Detects								
				Mean in Original Scale	0.0167	Mean in Log Scale	-4.377					
				SD in Original Scale	0.0167	SD in Log Scale	0.702					
				95% t UCL (assumes normality of ROS data)	0.0199	95% Percentile Bootstrap UCL	0.0201					
				95% BCA Bootstrap UCL	0.0205	95% Bootstrap t UCL	0.0214					
				95% H-UCL (Log ROS)	0.0189							
				Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution								
				KM Mean (logged)	-4.375	KM Geo Mean	0.0126					
				KM SD (logged)	0.543	95% Critical H Value (KM-Log)	1.881					
				KM Standard Error of Mean (logged)	0.0647	95% H-UCL (KM -Log)	0.0164					
				KM SD (logged)	0.543	95% Critical H Value (KM-Log)	1.881					
				KM Standard Error of Mean (logged)	0.0647							
				DL/2 Statistics								
				DL/2 Normal		**DL/2 Log-Transformed**						
				Mean in Original Scale	0.014	Mean in Log Scale	-4.581					
				SD in Original Scale	0.0171	SD in Log Scale	0.642					
				95% t UCL (Assumes normality)	0.0173	95% H-Stat UCL	0.0146					
				DL/2 is not a recommended method, provided for comparisons and historical reasons								
				Nonparametric Distribution Free UCL Statistics								
				Data do not follow a Discernible Distribution at 5% Significance Level								
				Suggested UCL to Use								
				95% KM (Chebyshev) UCL	0.0243							
				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
				Recommendations are based upon data size, data distribution, and skewness.								
				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
				However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.								
				Mercury_Total								
				General Statistics								
				Total Number of Observations	74	Number of Distinct Observations	13					
				Number of Detects	40	Number of Non-Detects	34					
				Number of Distinct Detects	12	Number of Distinct Non-Detects	1					
				Minimum Detect	0.01	Minimum Non-Detect	0.015					
				Maximum Detect	0.25	Maximum Non-Detect	0.015					
				Variance Detects	0.00223	Percent Non-Detects	45.95%					
				Mean Detects	0.0433	SD Detects	0.0473					
				Median Detects	0.02	CV Detects	1.093					
				Skewness Detects	2.664	Kurtosis Detects	8.895					
				Mean of Logged Detects	-3.541	SD of Logged Detects	0.862					
				Normal GOF Test on Detects Only								
				Shapiro Wilk Test Statistic	0.694	**Shapiro Wilk GOF Test**						
				5% Shapiro Wilk Critical Value	0.94	Detected Data Not Normal at 5% Significance Level						
				Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**						
				5% Lilliefors Critical Value	0.139	Detected Data Not Normal at 5% Significance Level						
				Detected Data Not Normal at 5% Significance Level								
				Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs								
				KM Mean	0.028	KM Standard Error of Mean	0.00448					
				KM SD	0.0381	95% KM (BCA) UCL	0.0357					
				95% KM (t) UCL	0.0354	95% KM (Percentile Bootstrap) UCL	0.0361					
				95% KM (z) UCL	0.0354	95% KM Bootstrap t UCL	0.0383					
				90% KM Chebyshev UCL	0.0414	95% KM Chebyshev UCL	0.0475					
				97.5% KM Chebyshev UCL	0.056	99% KM Chebyshev UCL	0.0726					

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.728	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.219	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.393	k star (bias corrected MLE)	1.305	
Theta hat (MLE)	0.0311	Theta star (bias corrected MLE)	0.0331	
nu hat (MLE)	111.4	nu star (bias corrected)	104.4	
Mean (detects)	0.0433			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.0281	
Maximum	0.25	Median	0.01	
SD	0.0383	CV	1.362	
k hat (MLE)	1.26	k star (bias corrected MLE)	1.218	
Theta hat (MLE)	0.0223	Theta star (bias corrected MLE)	0.0231	
nu hat (MLE)	186.5	nu star (bias corrected)	180.2	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (180.23, α)	150.2	Adjusted Chi Square Value (180.23, β)	149.6	
95% Gamma Approximate UCL (use when n>=50)	0.0337	95% Gamma Adjusted UCL (use when n<50)	0.0339	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.028	SD (KM)	0.0381	
Variance (KM)	0.00145	SE of Mean (KM)	0.00448	
k hat (KM)	0.539	k star (KM)	0.526	
nu hat (KM)	79.8	nu star (KM)	77.89	
theta hat (KM)	0.0519	theta star (KM)	0.0531	
80% gamma percentile (KM)	0.046	90% gamma percentile (KM)	0.0749	
95% gamma percentile (KM)	0.106	99% gamma percentile (KM)	0.18	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (77.89, α)	58.56	Adjusted Chi Square Value (77.89, β)	58.23	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0372	95% Gamma Adjusted KM-UCL (use when n<50)	0.0374	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.139	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0281	Mean in Log Scale	-4.079	
SD in Original Scale	0.0384	SD in Log Scale	0.944	
95% t UCL (assumes normality of ROS data)	0.0356	95% Percentile Bootstrap UCL	0.0362	
95% BCA Bootstrap UCL	0.039	95% Bootstrap t UCL	0.0386	
95% H-UCL (Log ROS)	0.0337			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-4.03	KM Geo Mean	0.0178	
KM SD (logged)	0.82	95% Critical H Value (KM-Log)	2.092	
KM Standard Error of Mean (logged)	0.0966	95% H-UCL (KM -Log)	0.0304	
KM SD (logged)	0.82	95% Critical H Value (KM-Log)	2.092	
KM Standard Error of Mean (logged)	0.0966			
DL/2 Statistics				

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0268	Mean in Log Scale	-4.162
SD in Original Scale	0.0389	SD in Log Scale	0.926
95% t UCL (Assumes normality)	0.0344	95% H-Stat UCL	0.0303
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.0475		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Molybdenum_FLT			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	29
		Number of Missing Observations	0
Minimum	0.26	Mean	0.451
Maximum	1.2	Median	0.38
SD	0.197	Std. Error of Mean	0.0229
Coefficient of Variation	0.437	Skewness	2.101
Normal GOF Test			
Shapiro Wilk Test Statistic	0.668	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.32	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.49	95% Adjusted-CLT UCL (Chen-1995)	0.495
		95% Modified-t UCL (Johnson-1978)	0.49
Gamma GOF Test			
A-D Test Statistic	7.921	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.287	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.7	k star (bias corrected MLE)	7.397
Theta hat (MLE)	0.0586	Theta star (bias corrected MLE)	0.061
nu hat (MLE)	1140	nu star (bias corrected)	1095
MLE Mean (bias corrected)	0.451	MLE Sd (bias corrected)	0.166
		Approximate Chi Square Value (0.05)	1019
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	1018
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.485	95% Adjusted Gamma UCL (use when n<50)	0.486
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.778	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	1.665E-15	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.263	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics				
Minimum of Logged Data	-1.347	Mean of logged Data	-0.862	
Maximum of Logged Data	0.182	SD of logged Data	0.337	
Assuming Lognormal Distribution				
95% H-UCL	0.479	90% Chebyshev (MVUE) UCL	0.5	
95% Chebyshev (MVUE) UCL	0.525	97.5% Chebyshev (MVUE) UCL	0.559	
99% Chebyshev (MVUE) UCL	0.625			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.489	95% Jackknife UCL	0.49	
95% Standard Bootstrap UCL	0.488	95% Bootstrap-t UCL	0.499	
95% Hall's Bootstrap UCL	0.494	95% Percentile Bootstrap UCL	0.49	
95% BCA Bootstrap UCL	0.493			
90% Chebyshev(Mean, Sd) UCL	0.52	95% Chebyshev(Mean, Sd) UCL	0.551	
97.5% Chebyshev(Mean, Sd) UCL	0.595	99% Chebyshev(Mean, Sd) UCL	0.679	
Suggested UCL to Use				
95% Student's-t UCL	0.49	or 95% Modified-t UCL	0.49	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Molybdenum_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	32	
		Number of Missing Observations	0	
Minimum	0.25	Mean	0.433	
Maximum	0.94	Median	0.38	
SD	0.17	Std. Error of Mean	0.0198	
Coefficient of Variation	0.393	Skewness	1.82	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.727	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.466	95% Adjusted-CLT UCL (Chen-1995)	0.47	
		95% Modified-t UCL (Johnson-1978)	0.466	
Gamma GOF Test				
A-D Test Statistic	5.14	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.208	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	8.794	k star (bias corrected MLE)	8.447	
Theta hat (MLE)	0.0492	Theta star (bias corrected MLE)	0.0512	
nu hat (MLE)	1302	nu star (bias corrected)	1250	
MLE Mean (bias corrected)	0.433	MLE Sd (bias corrected)	0.149	
		Approximate Chi Square Value (0.05)	1169	
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	1167	

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.463	95% Adjusted Gamma UCL (use when n<50)	0.463	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	1.745E-10	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.386	Mean of logged Data	-0.895	
Maximum of Logged Data	-0.0619	SD of logged Data	0.321	
Assuming Lognormal Distribution				
95% H-UCL	0.46	90% Chebyshev (MVUE) UCL	0.479	
95% Chebyshev (MVUE) UCL	0.501	97.5% Chebyshev (MVUE) UCL	0.532	
99% Chebyshev (MVUE) UCL	0.593			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.465	95% Jackknife UCL	0.466	
95% Standard Bootstrap UCL	0.464	95% Bootstrap-t UCL	0.471	
95% Hall's Bootstrap UCL	0.473	95% Percentile Bootstrap UCL	0.467	
95% BCA Bootstrap UCL	0.471			
90% Chebyshev(Mean, Sd) UCL	0.492	95% Chebyshev(Mean, Sd) UCL	0.519	
97.5% Chebyshev(Mean, Sd) UCL	0.556	99% Chebyshev(Mean, Sd) UCL	0.63	
Suggested UCL to Use				
95% Student's-t UCL	0.466	or 95% Modified-t UCL	0.466	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nickel_FLT				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations	24	
		Number of Missing Observations	0	
Minimum	1.1	Mean	2.303	
Maximum	13	Median	2.1	
SD	1.368	Std. Error of Mean	0.159	
Coefficient of Variation	0.594	Skewness	6.749	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.436	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	2.568	95% Adjusted-CLT UCL (Chen-1995)	2.698	
		95% Modified-t UCL (Johnson-1978)	2.588	
Gamma GOF Test				
A-D Test Statistic	4.368	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level		

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

K-S Test Statistic	0.188	**Kolmogorov-Smirnov Gamma GOF Test**			
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level			
Data Not Gamma Distributed at 5% Significance Level					
Gamma Statistics					
k hat (MLE)	7.382	k star (bias corrected MLE)	7.092		
Theta hat (MLE)	0.312	Theta star (bias corrected MLE)	0.325		
nu hat (MLE)	1093	nu star (bias corrected)	1050		
MLE Mean (bias corrected)	2.303	MLE Sd (bias corrected)	0.865		
		Approximate Chi Square Value (0.05)	975.4		
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	974		
Assuming Gamma Distribution					
95% Approximate Gamma UCL (use when n>=50))	2.478	95% Adjusted Gamma UCL (use when n<50)	2.481		
Lognormal GOF Test					
Shapiro Wilk Test Statistic	0.84	**Shapiro Wilk Lognormal GOF Test**			
5% Shapiro Wilk P Value	6.390E-11	Data Not Lognormal at 5% Significance Level			
Lilliefors Test Statistic	0.138	**Lilliefors Lognormal GOF Test**			
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level			
Data Not Lognormal at 5% Significance Level					
Lognormal Statistics					
Minimum of Logged Data	0.0953	Mean of logged Data	0.765		
Maximum of Logged Data	2.565	SD of logged Data	0.317		
Assuming Lognormal Distribution					
95% H-UCL	2.411	90% Chebyshev (MVUE) UCL	2.512		
95% Chebyshev (MVUE) UCL	2.628	97.5% Chebyshev (MVUE) UCL	2.788		
99% Chebyshev (MVUE) UCL	3.103				
Nonparametric Distribution Free UCL Statistics					
Data do not follow a Discernible Distribution (0.05)					
Nonparametric Distribution Free UCLs					
95% CLT UCL	2.564	95% Jackknife UCL	2.568		
95% Standard Bootstrap UCL	2.56	95% Bootstrap-t UCL	2.922		
95% Hall's Bootstrap UCL	3.639	95% Percentile Bootstrap UCL	2.595		
95% BCA Bootstrap UCL	2.78				
90% Chebyshev(Mean, Sd) UCL	2.78	95% Chebyshev(Mean, Sd) UCL	2.996		
97.5% Chebyshev(Mean, Sd) UCL	3.296	99% Chebyshev(Mean, Sd) UCL	3.885		
Suggested UCL to Use					
95% Student's-t UCL	2.568	or 95% Modified-t UCL	2.588		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.					
Recommendations are based upon data size, data distribution, and skewness.					
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).					
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.					
Nickel_Total					
General Statistics					
Total Number of Observations	74	Number of Distinct Observations	23		
		Number of Missing Observations	0		
Minimum	1.2	Mean	2.384		
Maximum	7.9	Median	2.2		
SD	0.849	Std. Error of Mean	0.0986		
Coefficient of Variation	0.356	Skewness	4.048		
Normal GOF Test					
Shapiro Wilk Test Statistic	0.692	**Shapiro Wilk GOF Test**			
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level			
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.548	95% Adjusted-CLT UCL (Chen-1995)	2.596
		95% Modified-t UCL (Johnson-1978)	2.556
Gamma GOF Test			
A-D Test Statistic	2.362	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.154	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.104	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.37	k star (bias corrected MLE)	11.88
Theta hat (MLE)	0.193	Theta star (bias corrected MLE)	0.201
nu hat (MLE)	1831	nu star (bias corrected)	1758
MLE Mean (bias corrected)	2.384	MLE Sd (bias corrected)	0.692
		Approximate Chi Square Value (0.05)	1662
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	1660
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	2.522	95% Adjusted Gamma UCL (use when n<50)	2.525
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	7.9502E-5	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.103	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.182	Mean of logged Data	0.828
Maximum of Logged Data	2.067	SD of logged Data	0.267
Assuming Lognormal Distribution			
95% H-UCL	2.503	90% Chebyshev (MVUE) UCL	2.594
95% Chebyshev (MVUE) UCL	2.696	97.5% Chebyshev (MVUE) UCL	2.837
99% Chebyshev (MVUE) UCL	3.114		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.546	95% Jackknife UCL	2.548
95% Standard Bootstrap UCL	2.545	95% Bootstrap-t UCL	2.649
95% Hall's Bootstrap UCL	3.308	95% Percentile Bootstrap UCL	2.558
95% BCA Bootstrap UCL	2.614		
90% Chebyshev(Mean, Sd) UCL	2.68	95% Chebyshev(Mean, Sd) UCL	2.814
97.5% Chebyshev(Mean, Sd) UCL	3	99% Chebyshev(Mean, Sd) UCL	3.365
Suggested UCL to Use			
95% Student's-t UCL	2.548	or 95% Modified-t UCL	2.556
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium_FLT			
General Statistics			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Total Number of Observations	74	Number of Distinct Observations	7
Number of Detects	7	Number of Non-Detects	67
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.61	Minimum Non-Detect	0.5
Maximum Detect	0.77	Maximum Non-Detect	0.5
Variance Detects	0.00315	Percent Non-Detects	90.54%
Mean Detects	0.679	SD Detects	0.0561
Median Detects	0.67	CV Detects	0.0827
Skewness Detects	0.613	Kurtosis Detects	-0.528
Mean of Logged Detects	-0.391	SD of Logged Detects	0.0815

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.517	KM Standard Error of Mean	0.00686
KM SD	0.0546	95% KM (BCA) UCL	0.529
95% KM (t) UCL	0.528	95% KM (Percentile Bootstrap) UCL	0.529
95% KM (z) UCL	0.528	95% KM Bootstrap t UCL	0.527
90% KM Chebyshev UCL	0.537	95% KM Chebyshev UCL	0.547
97.5% KM Chebyshev UCL	0.56	99% KM Chebyshev UCL	0.585

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.249	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.199	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	174	k star (bias corrected MLE)	99.55
Theta hat (MLE)	0.0039	Theta star (bias corrected MLE)	0.00682
nu hat (MLE)	2437	nu star (bias corrected)	1394
Mean (detects)	0.679		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0333	Mean	0.384
Maximum	0.77	Median	0.379
SD	0.16	CV	0.417
k hat (MLE)	4.555	k star (bias corrected MLE)	4.379
Theta hat (MLE)	0.0842	Theta star (bias corrected MLE)	0.0876
nu hat (MLE)	674.1	nu star (bias corrected)	648.1
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (648.08, α)	590	Adjusted Chi Square Value (648.08, β)	588.9
95% Gamma Approximate UCL (use when n>=50)	0.421	95% Gamma Adjusted UCL (use when n<50)	0.422

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.517	SD (KM)	0.0546
Variance (KM)	0.00299	SE of Mean (KM)	0.00686
k hat (KM)	89.47	k star (KM)	85.85
nu hat (KM)	13241	nu star (KM)	12706
theta hat (KM)	0.00578	theta star (KM)	0.00602
80% gamma percentile (KM)	0.563	90% gamma percentile (KM)	0.59
95% gamma percentile (KM)	0.612	99% gamma percentile (KM)	0.655

Gamma Kaplan-Meier (KM) Statistics

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Approximate Chi Square Value (N/A, α)	12445	Adjusted Chi Square Value (N/A, β)		12440
95% Gamma Approximate KM-UCL (use when n>=50)	0.528	95% Gamma Adjusted KM-UCL (use when n<50)		0.528
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.444	Mean in Log Scale		-0.844
SD in Original Scale	0.114	SD in Log Scale		0.253
95% t UCL (assumes normality of ROS data)	0.466	95% Percentile Bootstrap UCL		0.466
95% BCA Bootstrap UCL	0.467	95% Bootstrap t UCL		0.467
95% H-UCL (Log ROS)	0.467			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.665	KM Geo Mean		0.515
KM SD (logged)	0.0915	95% Critical H Value (KM-Log)		N/A
KM Standard Error of Mean (logged)	0.0115	95% H-UCL (KM -Log)		N/A
KM SD (logged)	0.0915	95% Critical H Value (KM-Log)		N/A
KM Standard Error of Mean (logged)	0.0115			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.291	Mean in Log Scale		-1.292
SD in Original Scale	0.127	SD in Log Scale		0.294
95% t UCL (Assumes normality)	0.315	95% H-Stat UCL		0.305
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.528			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium_Total				
General Statistics				
Total Number of Observations	74	Number of Distinct Observations		7
Number of Detects	7	Number of Non-Detects		67
Number of Distinct Detects	6	Number of Distinct Non-Detects		1
Minimum Detect	0.6	Minimum Non-Detect		0.5
Maximum Detect	0.86	Maximum Non-Detect		0.5
Variance Detects	0.00799	Percent Non-Detects		90.54%
Mean Detects	0.727	SD Detects		0.0894
Median Detects	0.75	CV Detects		0.123
Skewness Detects	0.069	Kurtosis Detects		-0.776
Mean of Logged Detects	-0.325	SD of Logged Detects		0.124
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.521	KM Standard Error of Mean		0.00894

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD	0.0712	95% KM (BCA) UCL	0.536
95% KM (t) UCL	0.536	95% KM (Percentile Bootstrap) UCL	0.536
95% KM (z) UCL	0.536	95% KM Bootstrap t UCL	0.534
90% KM Chebyshev UCL	0.548	95% KM Chebyshev UCL	0.56
97.5% KM Chebyshev UCL	0.577	99% KM Chebyshev UCL	0.61
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.23	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.193	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	76.71	k star (bias corrected MLE)	43.93
Theta hat (MLE)	0.00948	Theta star (bias corrected MLE)	0.0166
nu hat (MLE)	1074	nu star (bias corrected)	615
Mean (detects)	0.727		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.294
Maximum	0.86	Median	0.272
SD	0.219	CV	0.745
k hat (MLE)	1.075	k star (bias corrected MLE)	1.04
Theta hat (MLE)	0.273	Theta star (bias corrected MLE)	0.282
nu hat (MLE)	159.1	nu star (bias corrected)	154
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (153.96, α)	126.3	Adjusted Chi Square Value (153.96, β)	125.8
95% Gamma Approximate UCL (use when n>=50)	0.358	95% Gamma Adjusted UCL (use when n<50)	0.36
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.521	SD (KM)	0.0712
Variance (KM)	0.00507	SE of Mean (KM)	0.00894
k hat (KM)	53.67	k star (KM)	51.51
nu hat (KM)	7944	nu star (KM)	7623
theta hat (KM)	0.00972	theta star (KM)	0.0101
80% gamma percentile (KM)	0.581	90% gamma percentile (KM)	0.617
95% gamma percentile (KM)	0.646	99% gamma percentile (KM)	0.705
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	7421	Adjusted Chi Square Value (N/A, β)	7417
95% Gamma Approximate KM-UCL (use when n>=50)	0.536	95% Gamma Adjusted KM-UCL (use when n<50)	0.536
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.398	Mean in Log Scale	-0.99
SD in Original Scale	0.151	SD in Log Scale	0.371
95% t UCL (assumes normality of ROS data)	0.427	95% Percentile Bootstrap UCL	0.428
95% BCA Bootstrap UCL	0.429	95% Bootstrap t UCL	0.431
95% H-UCL (Log ROS)	0.43		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.658	KM Geo Mean	0.518
KM SD (logged)	0.113	95% Critical H Value (KM-Log)	1.68

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Standard Error of Mean (logged)	0.0142	95% H-UCL (KM -Log)	0.533
KM SD (logged)	0.113	95% Critical H Value (KM-Log)	1.68
KM Standard Error of Mean (logged)	0.0142		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.295	Mean in Log Scale	-1.286
SD in Original Scale	0.143	SD in Log Scale	0.315
95% t UCL (Assumes normality)	0.323	95% H-Stat UCL	0.31

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.536		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Silver_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	74
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_FLT was not processed!

Silver_Total

General Statistics

Total Number of Observations	74	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	74
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_Total was not processed!

Thallium_FLT

General Statistics

Total Number of Observations	74	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	74
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium_FLT was not processed!

Thallium_Total

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	General Statistics			
	Total Number of Observations	74	Number of Distinct Observations	1
	Number of Detects	0	Number of Non-Detects	74
	Number of Distinct Detects	0	Number of Distinct Non-Detects	1
	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
	The data set for variable Thallium_Total was not processed!			
	Vanadium_FLT			
	General Statistics			
	Total Number of Observations	74	Number of Distinct Observations	1
	Number of Detects	0	Number of Non-Detects	74
	Number of Distinct Detects	0	Number of Distinct Non-Detects	1
	Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
	Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
	The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
	The data set for variable Vanadium_FLT was not processed!			
	Vanadium_Total			
	General Statistics			
	Total Number of Observations	74	Number of Distinct Observations	2
	Number of Detects	1	Number of Non-Detects	73
	Number of Distinct Detects	1	Number of Distinct Non-Detects	1
	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
	The data set for variable Vanadium_Total was not processed!			
	Zinc_FLT			
	General Statistics			
	Total Number of Observations	74	Number of Distinct Observations	53
	Number of Detects	45	Number of Non-Detects	29
	Number of Distinct Detects	35	Number of Distinct Non-Detects	21
	Minimum Detect	2.8	Minimum Non-Detect	1.3
	Maximum Detect	270	Maximum Non-Detect	7
	Variance Detects	1712	Percent Non-Detects	39.19%
	Mean Detects	20.35	SD Detects	41.37
	Median Detects	8.7	CV Detects	2.033
	Skewness Detects	5.308	Kurtosis Detects	31.5
	Mean of Logged Detects	2.314	SD of Logged Detects	1.042
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.415	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.336	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	12.98	KM Standard Error of Mean	3.903
	KM SD	33.2	95% KM (BCA) UCL	20.94
	95% KM (t) UCL	19.49	95% KM (Percentile Bootstrap) UCL	19.97

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% KM (z) UCL	19.4	95% KM Bootstrap t UCL	30.02
90% KM Chebyshev UCL	24.69	95% KM Chebyshev UCL	30
97.5% KM Chebyshev UCL	37.36	99% KM Chebyshev UCL	51.82
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.498	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.785	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.165	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.137	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.843	k star (bias corrected MLE)	0.802
Theta hat (MLE)	24.13	Theta star (bias corrected MLE)	25.37
nu hat (MLE)	75.91	nu star (bias corrected)	72.18
Mean (detects)	20.35		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	12.38
Maximum	270	Median	3.65
SD	33.64	CV	2.717
k hat (MLE)	0.245	k star (bias corrected MLE)	0.244
Theta hat (MLE)	50.6	Theta star (bias corrected MLE)	50.79
nu hat (MLE)	36.21	nu star (bias corrected)	36.07
Adjusted Level of Significance (β)	0.0468		
Approximate Chi Square Value (36.07, α)	23.33	Adjusted Chi Square Value (36.07, β)	23.12
95% Gamma Approximate UCL (use when n>=50)	19.14	95% Gamma Adjusted UCL (use when n<50)	19.31
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	12.98	SD (KM)	33.2
Variance (KM)	1102	SE of Mean (KM)	3.903
k hat (KM)	0.153	k star (KM)	0.156
nu hat (KM)	22.63	nu star (KM)	23.05
theta hat (KM)	84.9	theta star (KM)	83.36
80% gamma percentile (KM)	14.56	90% gamma percentile (KM)	38.68
95% gamma percentile (KM)	70.92	99% gamma percentile (KM)	163.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.05, α)	13.13	Adjusted Chi Square Value (23.05, β)	12.98
95% Gamma Approximate KM-UCL (use when n>=50)	22.79	95% Gamma Adjusted KM-UCL (use when n<50)	23.06
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.139	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	12.8	Mean in Log Scale	1.406
SD in Original Scale	33.49	SD in Log Scale	1.423
95% t UCL (assumes normality of ROS data)	19.29	95% Percentile Bootstrap UCL	19.66
95% BCA Bootstrap UCL	24.37	95% Bootstrap t UCL	29.19
95% H-UCL (Log ROS)	17.62		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.553	KM Geo Mean	4.723
KM SD (logged)	1.259	95% Critical H Value (KM-Log)	2.524
KM Standard Error of Mean (logged)	0.149	95% H-UCL (KM -Log)	15.13
KM SD (logged)	1.259	95% Critical H Value (KM-Log)	2.524

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Standard Error of Mean (logged)	0.149		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	12.94	Mean in Log Scale	1.507
SD in Original Scale	33.44	SD in Log Scale	1.327
95% t UCL (Assumes normality)	19.41	95% H-Stat UCL	16.29
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	30		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc_Total			
General Statistics			
Total Number of Observations	74	Number of Distinct Observations	53
Number of Detects	62	Number of Non-Detects	12
Number of Distinct Detects	44	Number of Distinct Non-Detects	10
Minimum Detect	2.7	Minimum Non-Detect	1.5
Maximum Detect	140	Maximum Non-Detect	6.5
Variance Detects	528	Percent Non-Detects	16.22%
Mean Detects	17.77	SD Detects	22.98
Median Detects	11	CV Detects	1.293
Skewness Detects	3.393	Kurtosis Detects	14.16
Mean of Logged Detects	2.401	SD of Logged Detects	0.919
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.623	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.112	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	15.17	KM Standard Error of Mean	2.542
KM SD	21.69	95% KM (BCA) UCL	19.69
95% KM (t) UCL	19.4	95% KM (Percentile Bootstrap) UCL	19.34
95% KM (z) UCL	19.35	95% KM Bootstrap t UCL	21.48
90% KM Chebyshev UCL	22.79	95% KM Chebyshev UCL	26.25
97.5% KM Chebyshev UCL	31.04	99% KM Chebyshev UCL	40.46
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.101	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.775	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.141	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.116	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.189	k star (bias corrected MLE)	1.142
Theta hat (MLE)	14.95	Theta star (bias corrected MLE)	15.57
nu hat (MLE)	147.4	nu star (bias corrected)	141.6
Mean (detects)	17.77		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			

Table E1-7
Lakeside Residents Drinking Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	14.89	
Maximum	140	Median	7.55	
SD	22.02	CV	1.478	
k hat (MLE)	0.45	k star (bias corrected MLE)	0.441	
Theta hat (MLE)	33.11	Theta star (bias corrected MLE)	33.8	
nu hat (MLE)	66.57	nu star (bias corrected)	65.21	
Adjusted Level of Significance (β)	0.0468			
Approximate Chi Square Value (65.21, α)	47.63	Adjusted Chi Square Value (65.21, β)	47.33	
95% Gamma Approximate UCL (use when n>=50)	20.39	95% Gamma Adjusted UCL (use when n<50)	20.52	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	15.17	SD (KM)	21.69	
Variance (KM)	470.4	SE of Mean (KM)	2.542	
k hat (KM)	0.489	k star (KM)	0.478	
nu hat (KM)	72.37	nu star (KM)	70.77	
theta hat (KM)	31.02	theta star (KM)	31.72	
80% gamma percentile (KM)	24.85	90% gamma percentile (KM)	41.41	
95% gamma percentile (KM)	59.2	99% gamma percentile (KM)	103.1	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (70.77, α)	52.4	Adjusted Chi Square Value (70.77, β)	52.09	
95% Gamma Approximate KM-UCL (use when n>=50)	20.48	95% Gamma Adjusted KM-UCL (use when n<50)	20.61	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.942	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.00952	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.112	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	15.15	Mean in Log Scale	2.084	
SD in Original Scale	21.84	SD in Log Scale	1.115	
95% t UCL (assumes normality of ROS data)	19.38	95% Percentile Bootstrap UCL	19.52	
95% BCA Bootstrap UCL	20.76	95% Bootstrap t UCL	21.63	
95% H-UCL (Log ROS)	20.4			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.091	KM Geo Mean	8.09	
KM SD (logged)	1.098	95% Critical H Value (KM-Log)	2.354	
KM Standard Error of Mean (logged)	0.129	95% H-UCL (KM -Log)	20.01	
KM SD (logged)	1.098	95% Critical H Value (KM-Log)	2.354	
KM Standard Error of Mean (logged)	0.129			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	15.1	Mean in Log Scale	2.041	
SD in Original Scale	21.88	SD in Log Scale	1.187	
95% t UCL (Assumes normality)	19.34	95% H-Stat UCL	21.89	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	20.01			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/27/2019 11:57:51 AM
From File	SWHist_ProUCLData_20191127.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	20
Number of Detects	26	Number of Non-Detects	16
Number of Distinct Detects	16	Number of Distinct Non-Detects	7
Minimum Detect	5.1	Minimum Non-Detect	5
Maximum Detect	320	Maximum Non-Detect	200
Variance Detects	5731	Percent Non-Detects	38.1%
Mean Detects	54.52	SD Detects	75.7
Median Detects	10	CV Detects	1.389
Skewness Detects	2.135	Kurtosis Detects	5.041
Mean of Logged Detects	3.181	SD of Logged Detects	1.28

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.688	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	37.63	KM Standard Error of Mean	10.03
KM SD	63.03	95% KM (BCA) UCL	56.18
95% KM (t) UCL	54.5	95% KM (Percentile Bootstrap) UCL	54.8
95% KM (z) UCL	54.12	95% KM Bootstrap t UCL	63.91
90% KM Chebyshev UCL	67.71	95% KM Chebyshev UCL	81.33
97.5% KM Chebyshev UCL	100.2	99% KM Chebyshev UCL	137.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.918	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.786	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.302	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.178	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.734	k star (bias corrected MLE)	0.675
Theta hat (MLE)	74.24	Theta star (bias corrected MLE)	80.74
nu hat (MLE)	38.19	nu star (bias corrected)	35.11
Mean (detects)	54.52		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	34.51
Maximum	320	Median	9.2
SD	64.57	CV	1.871
k hat (MLE)	0.26	k star (bias corrected MLE)	0.257
Theta hat (MLE)	132.8	Theta star (bias corrected MLE)	134.2
nu hat (MLE)	21.83	nu star (bias corrected)	21.6
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (21.60, α)	12.04	Adjusted Chi Square Value (21.60, β)	11.79

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	61.91	95% Gamma Adjusted UCL (use when n<50)	63.25
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	37.63	SD (KM)	63.03
Variance (KM)	3973	SE of Mean (KM)	10.03
k hat (KM)	0.356	k star (KM)	0.347
nu hat (KM)	29.93	nu star (KM)	29.13
theta hat (KM)	105.6	theta star (KM)	108.5
80% gamma percentile (KM)	59.48	90% gamma percentile (KM)	108.8
95% gamma percentile (KM)	164.1	99% gamma percentile (KM)	305.4
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (29.13, α)	17.81	Adjusted Chi Square Value (29.13, β)	17.49
95% Gamma Approximate KM-UCL (use when n>=50)	61.54	95% Gamma Adjusted KM-UCL (use when n<50)	62.65
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.17	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	36.35	Mean in Log Scale	2.602
SD in Original Scale	63.65	SD in Log Scale	1.345
95% t UCL (assumes normality of ROS data)	52.88	95% Percentile Bootstrap UCL	53.34
95% BCA Bootstrap UCL	57.78	95% Bootstrap t UCL	63.08
95% H-UCL (Log ROS)	59.51		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.744	KM Geo Mean	15.56
KM SD (logged)	1.184	95% Critical H Value (KM-Log)	2.567
KM Standard Error of Mean (logged)	0.194	95% H-UCL (KM -Log)	50.37
KM SD (logged)	1.184	95% Critical H Value (KM-Log)	2.567
KM Standard Error of Mean (logged)	0.194		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	42.33	Mean in Log Scale	2.891
SD in Original Scale	63.63	SD in Log Scale	1.282
95% t UCL (Assumes normality)	58.85	95% H-Stat UCL	70.14
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	81.33		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	23
Number of Detects	34	Number of Non-Detects	6
Number of Distinct Detects	22	Number of Distinct Non-Detects	3
Minimum Detect	10	Minimum Non-Detect	10
Maximum Detect	2160	Maximum Non-Detect	105
Variance Detects	167599	Percent Non-Detects	15%
Mean Detects	250.9	SD Detects	409.4
Median Detects	100	CV Detects	1.632

Table E1-8

Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)

Sitewide Human Health Risk Assessment

Sulphur Bank Mercury Mine, Clearlake, California

Skewness Detects	3.462	Kurtosis Detects	14.45
Mean of Logged Detects	4.548	SD of Logged Detects	1.494
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.598	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	215.4	KM Standard Error of Mean	61.21
KM SD	381.4	95% KM (BCA) UCL	336.2
95% KM (t) UCL	318.6	95% KM (Percentile Bootstrap) UCL	329.3
95% KM (z) UCL	316.1	95% KM Bootstrap t UCL	405.9
90% KM Chebyshev UCL	399.1	95% KM Chebyshev UCL	482.2
97.5% KM Chebyshev UCL	597.7	99% KM Chebyshev UCL	824.5
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.815	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.799	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.153	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.628	k star (bias corrected MLE)	0.593
Theta hat (MLE)	399.3	Theta star (bias corrected MLE)	423.4
nu hat (MLE)	42.73	nu star (bias corrected)	40.29
Mean (detects)	250.9		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	213.3
Maximum	2160	Median	50
SD	387.4	CV	1.816
k hat (MLE)	0.313	k star (bias corrected MLE)	0.306
Theta hat (MLE)	681.2	Theta star (bias corrected MLE)	696.4
nu hat (MLE)	25.05	nu star (bias corrected)	24.5
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (24.50, α)	14.23	Adjusted Chi Square Value (24.50, β)	13.94
95% Gamma Approximate UCL (use when n>=50)	367.2	95% Gamma Adjusted UCL (use when n<50)	375
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	215.4	SD (KM)	381.4
Variance (KM)	145429	SE of Mean (KM)	61.21
k hat (KM)	0.319	k star (KM)	0.312
nu hat (KM)	25.53	nu star (KM)	24.95
theta hat (KM)	675	theta star (KM)	690.8
80% gamma percentile (KM)	333.4	90% gamma percentile (KM)	632.3
95% gamma percentile (KM)	973.2	99% gamma percentile (KM)	1855
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (24.95, α)	14.57	Adjusted Chi Square Value (24.95, β)	14.28
95% Gamma Approximate KM-UCL (use when n>=50)	368.8	95% Gamma Adjusted KM-UCL (use when n<50)	376.5
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data appear Lognormal at 5% Significance Level	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	214.5	Mean in Log Scale	4.118	
SD in Original Scale	386.7	SD in Log Scale	1.76	
95% t UCL (assumes normality of ROS data)	317.5	95% Percentile Bootstrap UCL	322.6	
95% BCA Bootstrap UCL	373.5	95% Bootstrap t UCL	413.3	
95% H-UCL (Log ROS)	758			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.24	KM Geo Mean	69.43	
KM SD (logged)	1.553	95% Critical H Value (KM-Log)	3.124	
KM Standard Error of Mean (logged)	0.25	95% H-UCL (KM -Log)	504.4	
KM SD (logged)	1.553	95% Critical H Value (KM-Log)	3.124	
KM Standard Error of Mean (logged)	0.25			
DL/2 Statistics				
DL/2 Normal		DL/2 Log-Transformed		
Mean in Original Scale	215.6	Mean in Log Scale	4.201	
SD in Original Scale	386.2	SD in Log Scale	1.65	
95% t UCL (Assumes normality)	318.5	95% H-Stat UCL	615.7	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	376.5			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	7	
Number of Detects	2	Number of Non-Detects	40	
Number of Distinct Detects	2	Number of Distinct Non-Detects	5	
Minimum Detect	0.52	Minimum Non-Detect	0.215	
Maximum Detect	6.1	Maximum Non-Detect	30	
Variance Detects	15.57	Percent Non-Detects	95.24%	
Mean Detects	3.31	SD Detects	3.946	
Median Detects	3.31	CV Detects	1.192	
Skewness Detects	N/A	Kurtosis Detects	N/A	
Mean of Logged Detects	0.577	SD of Logged Detects	1.741	
Warning: Data set has only 2 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Not Enough Data to Perform GOF Test				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.372	KM Standard Error of Mean	0.206	
KM SD	0.919	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.718	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.71	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	0.988	95% KM Chebyshev UCL	1.268	
97.5% KM Chebyshev UCL	1.655	99% KM Chebyshev UCL	2.417	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.938	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	3.527	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	3.754	nu star (bias corrected)	N/A	
Mean (detects)	3.31			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.372	SD (KM)	0.919	
Variance (KM)	0.844	SE of Mean (KM)	0.206	
k hat (KM)	0.164	k star (KM)	0.168	
nu hat (KM)	13.75	nu star (KM)	14.1	
theta hat (KM)	2.271	theta star (KM)	2.214	
80% gamma percentile (KM)	0.441	90% gamma percentile (KM)	1.116	
95% gamma percentile (KM)	1.998	99% gamma percentile (KM)	4.503	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0443	
Approximate Chi Square Value (14.10, α)	6.64	Adjusted Chi Square Value (14.10, β)	6.457	
95% Gamma Approximate KM-UCL (use when n>=50)	0.789	95% Gamma Adjusted KM-UCL (use when n<50)	0.812	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.162	Mean in Log Scale	-9.192	
SD in Original Scale	0.942	SD in Log Scale	4.34	
95% t UCL (assumes normality of ROS data)	0.406	95% Percentile Bootstrap UCL	0.449	
95% BCA Bootstrap UCL	0.73	95% Bootstrap t UCL	12.38	
95% H-UCL (Log ROS)	166.2			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.426	KM Geo Mean	0.24	
KM SD (logged)	0.54	95% Critical H Value (KM-Log)	1.928	
KM Standard Error of Mean (logged)	0.122	95% H-UCL (KM -Log)	0.327	
KM SD (logged)	0.54	95% Critical H Value (KM-Log)	1.928	
KM Standard Error of Mean (logged)	0.122			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.139	Mean in Log Scale	-0.993	
SD in Original Scale	3.264	SD in Log Scale	1.012	
95% t UCL (Assumes normality)	1.987	95% H-Stat UCL	0.9	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.268			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony_Total				
General Statistics				
Total Number of Observations	40	Number of Distinct Observations	7	
Number of Detects	2	Number of Non-Detects	38	
Number of Distinct Detects	2	Number of Distinct Non-Detects	5	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	3.2	Minimum Non-Detect	0.5
Maximum Detect	5.5	Maximum Non-Detect	30
Variance Detects	2.645	Percent Non-Detects	95%
Mean Detects	4.35	SD Detects	1.626
Median Detects	4.35	CV Detects	0.374
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.434	SD of Logged Detects	0.383

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only
Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.701	KM Standard Error of Mean	0.204
KM SD	0.893	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.044	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.036	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.312	95% KM Chebyshev UCL	1.589
97.5% KM Chebyshev UCL	1.973	99% KM Chebyshev UCL	2.727

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	13.97	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.311	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	55.87	nu star (bias corrected)	N/A
Mean (detects)	4.35		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.701	SD (KM)	0.893
Variance (KM)	0.798	SE of Mean (KM)	0.204
k hat (KM)	0.616	k star (KM)	0.587
nu hat (KM)	49.31	nu star (KM)	46.95
theta hat (KM)	1.138	theta star (KM)	1.195
80% gamma percentile (KM)	1.156	90% gamma percentile (KM)	1.833
95% gamma percentile (KM)	2.544	99% gamma percentile (KM)	4.266

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.044
Approximate Chi Square Value (46.95, α)	32.23	Adjusted Chi Square Value (46.95, β)	31.77
95% Gamma Approximate KM-UCL (use when n>=50)	1.022	95% Gamma Adjusted KM-UCL (use when n<50)	1.036

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.731	Mean in Log Scale	-0.845
SD in Original Scale	0.989	SD in Log Scale	1.014
95% t UCL (assumes normality of ROS data)	0.995	95% Percentile Bootstrap UCL	1.007
95% BCA Bootstrap UCL	1.119	95% Bootstrap t UCL	1.251
95% H-UCL (Log ROS)	1.065		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.581	KM Geo Mean	0.559
KM SD (logged)	0.478	95% Critical H Value (KM-Log)	1.904
KM Standard Error of Mean (logged)	0.109	95% H-UCL (KM -Log)	0.725
KM SD (logged)	0.478	95% Critical H Value (KM-Log)	1.904
KM Standard Error of Mean (logged)	0.109		

DL/2 Statistics

DL/2 Normal	DL/2 Log-Transformed

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean in Original Scale	0.979	Mean in Log Scale	-0.915
SD in Original Scale	2.497	SD in Log Scale	0.988
95% t UCL (Assumes normality)	1.645	95% H-Stat UCL	0.953

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.044	KM H-UCL	0.725
95% KM (BCA) UCL	N/A		

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	28
Number of Detects	33	Number of Non-Detects	9
Number of Distinct Detects	27	Number of Distinct Non-Detects	1
Minimum Detect	0.56	Minimum Non-Detect	0.5
Maximum Detect	6.5	Maximum Non-Detect	0.5
Variance Detects	3.421	Percent Non-Detects	21.43%
Mean Detects	1.891	SD Detects	1.85
Median Detects	0.93	CV Detects	0.978
Skewness Detects	1.634	Kurtosis Detects	1.449
Mean of Logged Detects	0.284	SD of Logged Detects	0.798

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.704	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.281	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.152	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.593	KM Standard Error of Mean	0.268
KM SD	1.712	95% KM (BCA) UCL	2.039
95% KM (t) UCL	2.044	95% KM (Percentile Bootstrap) UCL	2.04
95% KM (z) UCL	2.034	95% KM Bootstrap t UCL	2.182
90% KM Chebyshev UCL	2.398	95% KM Chebyshev UCL	2.762
97.5% KM Chebyshev UCL	3.268	99% KM Chebyshev UCL	4.262

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.284	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.23	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.156	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.561	k star (bias corrected MLE)	1.439
Theta hat (MLE)	1.211	Theta star (bias corrected MLE)	1.314
nu hat (MLE)	103	nu star (bias corrected)	94.98
Mean (detects)	1.891		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.488
Maximum	6.5	Median	0.855
SD	1.811	CV	1.217
k hat (MLE)	0.54	k star (bias corrected MLE)	0.518
Theta hat (MLE)	2.752	Theta star (bias corrected MLE)	2.873
nu hat (MLE)	45.4	nu star (bias corrected)	43.49
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (43.49, α)	29.37	Adjusted Chi Square Value (43.49, β)	28.96
95% Gamma Approximate UCL (use when n>=50)	2.203	95% Gamma Adjusted UCL (use when n<50)	2.234
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.593	SD (KM)	1.712
Variance (KM)	2.932	SE of Mean (KM)	0.268
k hat (KM)	0.865	k star (KM)	0.819
nu hat (KM)	72.66	nu star (KM)	68.8
theta hat (KM)	1.841	theta star (KM)	1.944
80% gamma percentile (KM)	2.599	90% gamma percentile (KM)	3.851
95% gamma percentile (KM)	5.123	99% gamma percentile (KM)	8.122
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (68.80, α)	50.71	Adjusted Chi Square Value (68.80, β)	50.16
95% Gamma Approximate KM-UCL (use when n>=50)	2.161	95% Gamma Adjusted KM-UCL (use when n<50)	2.185
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.534	Mean in Log Scale	-0.11
SD in Original Scale	1.775	SD in Log Scale	1.055
95% t UCL (assumes normality of ROS data)	1.995	95% Percentile Bootstrap UCL	1.986
95% BCA Bootstrap UCL	2.049	95% Bootstrap t UCL	2.111
95% H-UCL (Log ROS)	2.328		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.0743	KM Geo Mean	1.077
KM SD (logged)	0.803	95% Critical H Value (KM-Log)	2.153
KM Standard Error of Mean (logged)	0.126	95% H-UCL (KM -Log)	1.948
KM SD (logged)	0.803	95% Critical H Value (KM-Log)	2.153
KM Standard Error of Mean (logged)	0.126		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.539	Mean in Log Scale	-0.0743
SD in Original Scale	1.77	SD in Log Scale	0.989
95% t UCL (Assumes normality)	1.999	95% H-Stat UCL	2.174
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	2.762		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_Total			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	40	Number of Distinct Observations	27	
Number of Detects	29	Number of Non-Detects	11	
Number of Distinct Detects	26	Number of Distinct Non-Detects	3	
Minimum Detect	0.5	Minimum Non-Detect	0.5	
Maximum Detect	12.1	Maximum Non-Detect	5	
Variance Detects	5.99	Percent Non-Detects	27.5%	
Mean Detects	1.9	SD Detects	2.447	
Median Detects	0.93	CV Detects	1.288	
Skewness Detects	3.096	Kurtosis Detects	10.79	
Mean of Logged Detects	0.224	SD of Logged Detects	0.809	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.577	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.299	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.551	KM Standard Error of Mean	0.345	
KM SD	2.137	95% KM (BCA) UCL	2.137	
95% KM (t) UCL	2.132	95% KM (Percentile Bootstrap) UCL	2.164	
95% KM (z) UCL	2.118	95% KM Bootstrap t UCL	2.662	
90% KM Chebyshev UCL	2.586	95% KM Chebyshev UCL	3.056	
97.5% KM Chebyshev UCL	3.707	99% KM Chebyshev UCL	4.986	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.633	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.766	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.299	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.166	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.339	k star (bias corrected MLE)	1.223	
Theta hat (MLE)	1.42	Theta star (bias corrected MLE)	1.554	
nu hat (MLE)	77.64	nu star (bias corrected)	70.94	
Mean (detects)	1.9			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.419	
Maximum	12.1	Median	0.82	
SD	2.228	CV	1.571	
k hat (MLE)	0.507	k star (bias corrected MLE)	0.485	
Theta hat (MLE)	2.8	Theta star (bias corrected MLE)	2.923	
nu hat (MLE)	40.53	nu star (bias corrected)	38.82	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (38.82, α)	25.55	Adjusted Chi Square Value (38.82, β)	25.15	
95% Gamma Approximate UCL (use when n>=50)	2.155	95% Gamma Adjusted UCL (use when n<50)	2.19	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.551	SD (KM)	2.137	
Variance (KM)	4.565	SE of Mean (KM)	0.345	
k hat (KM)	0.527	k star (KM)	0.504	
nu hat (KM)	42.13	nu star (KM)	40.3	
theta hat (KM)	2.944	theta star (KM)	3.078	
80% gamma percentile (KM)	2.547	90% gamma percentile (KM)	4.188	
95% gamma percentile (KM)	5.94	99% gamma percentile (KM)	10.25	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (40.30, α)	26.75	Adjusted Chi Square Value (40.30, β)	26.34	
95% Gamma Approximate KM-UCL (use when n>=50)	2.336	95% Gamma Adjusted KM-UCL (use when n<50)	2.372	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.48	Mean in Log Scale	-0.173	
SD in Original Scale	2.191	SD in Log Scale	1.01	
95% t UCL (assumes normality of ROS data)	2.064	95% Percentile Bootstrap UCL	2.083	
95% BCA Bootstrap UCL	2.333	95% Bootstrap t UCL	2.588	
95% H-UCL (Log ROS)	2.072			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.00958	KM Geo Mean	1.01	
KM SD (logged)	0.783	95% Critical H Value (KM-Log)	2.173	
KM Standard Error of Mean (logged)	0.128	95% H-UCL (KM -Log)	1.801	
KM SD (logged)	0.783	95% Critical H Value (KM-Log)	2.173	
KM Standard Error of Mean (logged)	0.128			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.58	Mean in Log Scale	-0.0666	
SD in Original Scale	2.188	SD in Log Scale	0.97	
95% t UCL (Assumes normality)	2.163	95% H-Stat UCL	2.164	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	3.056			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Barium_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	30	
Number of Detects	37	Number of Non-Detects	5	
Number of Distinct Detects	26	Number of Distinct Non-Detects	4	
Minimum Detect	13	Minimum Non-Detect	36.7	
Maximum Detect	89.7	Maximum Non-Detect	500	
Variance Detects	579.2	Percent Non-Detects	11.9%	
Mean Detects	37.61	SD Detects	24.07	
Median Detects	24	CV Detects	0.64	
Skewness Detects	0.793	Kurtosis Detects	-1.023	
Mean of Logged Detects	3.437	SD of Logged Detects	0.616	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean	36.8	KM Standard Error of Mean	3.809
KM SD	23.42	95% KM (BCA) UCL	43.17
95% KM (t) UCL	43.21	95% KM (Percentile Bootstrap) UCL	43.48
95% KM (z) UCL	43.07	95% KM Bootstrap t UCL	43.51
90% KM Chebyshev UCL	48.23	95% KM Chebyshev UCL	53.4
97.5% KM Chebyshev UCL	60.59	99% KM Chebyshev UCL	74.7
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.212	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.755	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.207	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.146	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.786	k star (bias corrected MLE)	2.579
Theta hat (MLE)	13.5	Theta star (bias corrected MLE)	14.59
nu hat (MLE)	206.2	nu star (bias corrected)	190.8
Mean (detects)	37.61		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	13	Mean	36.67
Maximum	89.7	Median	24.43
SD	22.85	CV	0.623
k hat (MLE)	3.037	k star (bias corrected MLE)	2.836
Theta hat (MLE)	12.08	Theta star (bias corrected MLE)	12.93
nu hat (MLE)	255.1	nu star (bias corrected)	238.2
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (238.19, α)	203.5	Adjusted Chi Square Value (238.19, β)	202.3
95% Gamma Approximate UCL (use when n>=50)	42.93	95% Gamma Adjusted UCL (use when n<50)	43.17
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	36.8	SD (KM)	23.42
Variance (KM)	548.5	SE of Mean (KM)	3.809
k hat (KM)	2.469	k star (KM)	2.309
nu hat (KM)	207.4	nu star (KM)	193.9
theta hat (KM)	14.91	theta star (KM)	15.94
80% gamma percentile (KM)	54.17	90% gamma percentile (KM)	69.23
95% gamma percentile (KM)	83.48	99% gamma percentile (KM)	114.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (193.92, α)	162.7	Adjusted Chi Square Value (193.92, β)	161.7
95% Gamma Approximate KM-UCL (use when n>=50)	43.86	95% Gamma Adjusted KM-UCL (use when n<50)	44.14
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.876	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	36.5	Mean in Log Scale	3.423
SD in Original Scale	22.87	SD in Log Scale	0.583
95% t UCL (assumes normality of ROS data)	42.44	95% Percentile Bootstrap UCL	42.37
95% BCA Bootstrap UCL	42.86	95% Bootstrap t UCL	43.12
95% H-UCL (Log ROS)	43.45		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.417	KM Geo Mean	30.49

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD (logged)	0.601	95% Critical H Value (KM-Log)	1.975
KM Standard Error of Mean (logged)	0.0981	95% H-UCL (KM -Log)	43.96
KM SD (logged)	0.601	95% Critical H Value (KM-Log)	1.975
KM Standard Error of Mean (logged)	0.0981		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	42.36	Mean in Log Scale	3.486
SD in Original Scale	40.13	SD in Log Scale	0.678
95% t UCL (Assumes normality)	52.78	95% H-Stat UCL	50.99

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	53.4		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Barium_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	25
Number of Detects	34	Number of Non-Detects	6
Number of Distinct Detects	22	Number of Distinct Non-Detects	3
Minimum Detect	14	Minimum Non-Detect	38.9
Maximum Detect	90.5	Maximum Non-Detect	100
Variance Detects	536.5	Percent Non-Detects	15%
Mean Detects	34.04	SD Detects	23.16
Median Detects	24.45	CV Detects	0.681
Skewness Detects	1.542	Kurtosis Detects	1.11
Mean of Logged Detects	3.355	SD of Logged Detects	0.559

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.283	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	33.43	KM Standard Error of Mean	3.792
KM SD	22.36	95% KM (BCA) UCL	39.76
95% KM (t) UCL	39.82	95% KM (Percentile Bootstrap) UCL	39.53
95% KM (z) UCL	39.67	95% KM Bootstrap t UCL	40.82
90% KM Chebyshev UCL	44.81	95% KM Chebyshev UCL	49.96
97.5% KM Chebyshev UCL	57.11	99% KM Chebyshev UCL	71.16

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.344	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.248	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.152	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.062	k star (bias corrected MLE)	2.811
Theta hat (MLE)	11.12	Theta star (bias corrected MLE)	12.11
nu hat (MLE)	208.2	nu star (bias corrected)	191.2
Mean (detects)	34.04		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	14	Mean	33.3	
Maximum	90.5	Median	24.65	
SD	21.85	CV	0.656	
k hat (MLE)	3.303	k star (bias corrected MLE)	3.072	
Theta hat (MLE)	10.08	Theta star (bias corrected MLE)	10.84	
nu hat (MLE)	264.2	nu star (bias corrected)	245.8	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (245.76, α)	210.5	Adjusted Chi Square Value (245.76, β)	209.2	
95% Gamma Approximate UCL (use when n>=50)	38.89	95% Gamma Adjusted UCL (use when n<50)	39.11	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	33.43	SD (KM)	22.36	
Variance (KM)	500.1	SE of Mean (KM)	3.792	
k hat (KM)	2.235	k star (KM)	2.084	
nu hat (KM)	178.8	nu star (KM)	166.7	
theta hat (KM)	14.96	theta star (KM)	16.04	
80% gamma percentile (KM)	49.81	90% gamma percentile (KM)	64.4	
95% gamma percentile (KM)	78.28	99% gamma percentile (KM)	109	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (166.73, α)	137.9	Adjusted Chi Square Value (166.73, β)	136.9	
95% Gamma Approximate KM-UCL (use when n>=50)	40.43	95% Gamma Adjusted KM-UCL (use when n<50)	40.72	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.15	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	33.16	Mean in Log Scale	3.346	
SD in Original Scale	21.68	SD in Log Scale	0.528	
95% t UCL (assumes normality of ROS data)	38.94	95% Percentile Bootstrap UCL	38.73	
95% BCA Bootstrap UCL	39.63	95% Bootstrap t UCL	40.17	
95% H-UCL (Log ROS)	38.46			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	3.342	KM Geo Mean	28.26	
KM SD (logged)	0.542	95% Critical H Value (KM-Log)	1.954	
KM Standard Error of Mean (logged)	0.0924	95% H-UCL (KM -Log)	38.8	
KM SD (logged)	0.542	95% Critical H Value (KM-Log)	1.954	
KM Standard Error of Mean (logged)	0.0924			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	34.91	Mean in Log Scale	3.392	
SD in Original Scale	22.14	SD in Log Scale	0.55	
95% t UCL (Assumes normality)	40.81	95% H-Stat UCL	41.1	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	49.96			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Beryllium_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	42
Number of Distinct Detects	0	Number of Distinct Non-Detects	5

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium_FLT was not processed!

Beryllium_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	8
Number of Detects	3	Number of Non-Detects	37
Number of Distinct Detects	3	Number of Distinct Non-Detects	5
Minimum Detect	0.17	Minimum Non-Detect	0.25
Maximum Detect	0.29	Maximum Non-Detect	2.5
Variance Detects	0.0039	Percent Non-Detects	92.5%
Mean Detects	0.24	SD Detects	0.0624
Median Detects	0.26	CV Detects	0.26
Skewness Detects	-1.293	Kurtosis Detects	N/A
Mean of Logged Detects	-1.452	SD of Logged Detects	0.282

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.181	KM Standard Error of Mean	0.00916
KM SD	0.0326	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.196	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.196	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.209	95% KM Chebyshev UCL	0.221
97.5% KM Chebyshev UCL	0.238	99% KM Chebyshev UCL	0.272

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	20.02	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.012	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	120.1	nu star (bias corrected)	N/A
Mean (detects)	0.24		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	0.0998	Mean	0.179
Maximum	0.29	Median	0.174
SD	0.0438	CV	0.244
k hat (MLE)	17.15	k star (bias corrected MLE)	15.88
Theta hat (MLE)	0.0104	Theta star (bias corrected MLE)	0.0113
nu hat (MLE)	1372	nu star (bias corrected)	1270
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (N/A, α)	1189	Adjusted Chi Square Value (N/A, β)	1186
95% Gamma Approximate UCL (use when n>=50)	0.191	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.181	SD (KM)	0.0326
Variance (KM)	0.00106	SE of Mean (KM)	0.00916
k hat (KM)	30.86	k star (KM)	28.57
nu hat (KM)	2469	nu star (KM)	2285
theta hat (KM)	0.00587	theta star (KM)	0.00634
80% gamma percentile (KM)	0.209	90% gamma percentile (KM)	0.226
95% gamma percentile (KM)	0.24	99% gamma percentile (KM)	0.269

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	2175	Adjusted Chi Square Value (N/A, β)	2171
95% Gamma Approximate KM-UCL (use when n>=50)	0.19	95% Gamma Adjusted KM-UCL (use when n<50)	0.191

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.18	Mean in Log Scale	-1.736
SD in Original Scale	0.0403	SD in Log Scale	0.219
95% t UCL (assumes normality of ROS data)	0.191	95% Percentile Bootstrap UCL	0.191
95% BCA Bootstrap UCL	0.191	95% Bootstrap t UCL	0.191
95% H-UCL (Log ROS)	0.192		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.721	KM Geo Mean	0.179
KM SD (logged)	0.148	95% Critical H Value (KM-Log)	1.717
KM Standard Error of Mean (logged)	0.0416	95% H-UCL (KM -Log)	0.188
KM SD (logged)	0.148	95% Critical H Value (KM-Log)	1.717
KM Standard Error of Mean (logged)	0.0416		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.309	Mean in Log Scale	-1.439
SD in Original Scale	0.275	SD in Log Scale	0.681
95% t UCL (Assumes normality)	0.382	95% H-Stat UCL	0.375

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.196

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Boron_FLT

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	40	Number of Distinct Observations	30	
		Number of Missing Observations	0	
Minimum	850	Mean	4544	
Maximum	11000	Median	5130	
SD	3366	Std. Error of Mean	532.3	
Coefficient of Variation	0.741	Skewness	0.353	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	5441	95% Adjusted-CLT UCL (Chen-1995)	5451	
		95% Modified-t UCL (Johnson-1978)	5446	
Gamma GOF Test				
A-D Test Statistic	2.255	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.191	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.142	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.513	k star (bias corrected MLE)	1.416	
Theta hat (MLE)	3004	Theta star (bias corrected MLE)	3210	
nu hat (MLE)	121	nu star (bias corrected)	113.3	
MLE Mean (bias corrected)	4544	MLE Sd (bias corrected)	3819	
		Approximate Chi Square Value (0.05)	89.7	
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	88.91	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	5738	95% Adjusted Gamma UCL (use when n<50)	5789	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.218	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.139	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	6.745	Mean of logged Data	8.056	
Maximum of Logged Data	9.306	SD of logged Data	0.934	
Assuming Lognormal Distribution				
95% H-UCL	6917	90% Chebyshev (MVUE) UCL	7250	
95% Chebyshev (MVUE) UCL	8358	97.5% Chebyshev (MVUE) UCL	9895	
99% Chebyshev (MVUE) UCL	12915			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	5420	95% Jackknife UCL	5441	
95% Standard Bootstrap UCL	5414	95% Bootstrap-t UCL	5420	
95% Hall's Bootstrap UCL	5413	95% Percentile Bootstrap UCL	5409	
95% BCA Bootstrap UCL	5443			
90% Chebyshev(Mean, Sd) UCL	6141	95% Chebyshev(Mean, Sd) UCL	6864	
97.5% Chebyshev(Mean, Sd) UCL	7868	99% Chebyshev(Mean, Sd) UCL	9840	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	6864			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Boron_Total				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	25	
		Number of Missing Observations	0	
Minimum	880	Mean	4681	
Maximum	10000	Median	5600	
SD	3336	Std. Error of Mean	541.3	
Coefficient of Variation	0.713	Skewness	0.212	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.849	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.142	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	5594	95% Adjusted-CLT UCL (Chen-1995)	5591	
		95% Modified-t UCL (Johnson-1978)	5597	
Gamma GOF Test				
A-D Test Statistic	2.481	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.766	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.217	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.146	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.539	k star (bias corrected MLE)	1.435	
Theta hat (MLE)	3042	Theta star (bias corrected MLE)	3262	
nu hat (MLE)	117	nu star (bias corrected)	109.1	
MLE Mean (bias corrected)	4681	MLE Sd (bias corrected)	3907	
		Approximate Chi Square Value (0.05)	85.96	
Adjusted Level of Significance	0.0434	Adjusted Chi Square Value	85.11	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	5939	95% Adjusted Gamma UCL (use when n<50)	5998	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.938	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.243	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.142	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	6.78	Mean of logged Data	8.092	
Maximum of Logged Data	9.21	SD of logged Data	0.94	
Assuming Lognormal Distribution				
95% H-UCL	7284	90% Chebyshev (MVUE) UCL	7626	
95% Chebyshev (MVUE) UCL	8815	97.5% Chebyshev (MVUE) UCL	10465	
99% Chebyshev (MVUE) UCL	13705			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	5571	95% Jackknife UCL	5594	
95% Standard Bootstrap UCL	5565	95% Bootstrap-t UCL	5635	
95% Hall's Bootstrap UCL	5576	95% Percentile Bootstrap UCL	5571	
95% BCA Bootstrap UCL	5618			
90% Chebyshev(Mean, Sd) UCL	6305	95% Chebyshev(Mean, Sd) UCL	7040	
97.5% Chebyshev(Mean, Sd) UCL	8061	99% Chebyshev(Mean, Sd) UCL	10066	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	7040			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	5	
Number of Detects	0	Number of Non-Detects	42	
Number of Distinct Detects	0	Number of Distinct Non-Detects	5	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Cadmium_FLT was not processed!				
Cadmium_Total				
General Statistics				
Total Number of Observations	40	Number of Distinct Observations	5	
Number of Detects	1	Number of Non-Detects	39	
Number of Distinct Detects	1	Number of Distinct Non-Detects	4	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Cadmium_Total was not processed!				
Chromium_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	7	
Number of Detects	2	Number of Non-Detects	40	
Number of Distinct Detects	2	Number of Distinct Non-Detects	5	
Minimum Detect	0.85	Minimum Non-Detect	0.45	
Maximum Detect	1.1	Maximum Non-Detect	25	
Variance Detects	0.0313	Percent Non-Detects	95.24%	
Mean Detects	0.975	SD Detects	0.177	
Median Detects	0.975	CV Detects	0.181	
Skewness Detects	N/A	Kurtosis Detects	N/A	
Mean of Logged Detects	-0.0336	SD of Logged Detects	0.182	
Warning: Data set has only 2 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Not Enough Data to Perform GOF Test				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.481	KM Standard Error of Mean	0.0311	
KM SD	0.128	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.534	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.532	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	0.575	95% KM Chebyshev UCL	0.617	
97.5% KM Chebyshev UCL	0.676	99% KM Chebyshev UCL	0.791	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	60.5	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.0161	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	242	nu star (bias corrected)	N/A	
Mean (detects)	0.975			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.481	SD (KM)	0.128	
Variance (KM)	0.0163	SE of Mean (KM)	0.0311	
k hat (KM)	14.21	k star (KM)	13.21	
nu hat (KM)	1193	nu star (KM)	1109	
theta hat (KM)	0.0339	theta star (KM)	0.0364	
80% gamma percentile (KM)	0.588	90% gamma percentile (KM)	0.657	
95% gamma percentile (KM)	0.718	99% gamma percentile (KM)	0.842	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0443	
Approximate Chi Square Value (N/A, α)	1033	Adjusted Chi Square Value (N/A, β)	1030	
95% Gamma Approximate KM-UCL (use when n>=50)	0.517	95% Gamma Adjusted KM-UCL (use when n<50)	0.518	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.382	Mean in Log Scale	-1.074	
SD in Original Scale	0.196	SD in Log Scale	0.475	
95% t UCL (assumes normality of ROS data)	0.433	95% Percentile Bootstrap UCL	0.434	
95% BCA Bootstrap UCL	0.438	95% Bootstrap t UCL	0.445	
95% H-UCL (Log ROS)	0.44			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.753	KM Geo Mean	0.471	
KM SD (logged)	0.184	95% Critical H Value (KM-Log)	1.711	
KM Standard Error of Mean (logged)	0.0448	95% H-UCL (KM -Log)	0.503	
KM SD (logged)	0.184	95% Critical H Value (KM-Log)	1.711	
KM Standard Error of Mean (logged)	0.0448			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.957	Mean in Log Scale	-0.831	
SD in Original Scale	2.01	SD in Log Scale	1.032	
95% t UCL (Assumes normality)	1.479	95% H-Stat UCL	1.091	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.534	KM H-UCL	0.503	
95% KM (BCA) UCL	N/A			
Warning: One or more Recommended UCL(s) not available!				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	35
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.46	Minimum Non-Detect	0.5
Maximum Detect	0.76	Maximum Non-Detect	5
Variance Detects	0.0123	Percent Non-Detects	87.5%
Mean Detects	0.576	SD Detects	0.111
Median Detects	0.55	CV Detects	0.193
Skewness Detects	1.401	Kurtosis Detects	2.931
Mean of Logged Detects	-0.565	SD of Logged Detects	0.182

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.322	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.479	KM Standard Error of Mean	0.0121
KM SD	0.0593	95% KM (BCA) UCL	0.53
95% KM (t) UCL	0.5	95% KM (Percentile Bootstrap) UCL	0.527
95% KM (z) UCL	0.499	95% KM Bootstrap t UCL	0.505
90% KM Chebyshev UCL	0.516	95% KM Chebyshev UCL	0.532
97.5% KM Chebyshev UCL	0.555	99% KM Chebyshev UCL	0.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.437	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.303	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	36.47	k star (bias corrected MLE)	14.72
Theta hat (MLE)	0.0158	Theta star (bias corrected MLE)	0.0391
nu hat (MLE)	364.7	nu star (bias corrected)	147.2
Mean (detects)	0.576		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.275	Mean	0.448
Maximum	0.76	Median	0.447
SD	0.0917	CV	0.205
k hat (MLE)	25.32	k star (bias corrected MLE)	23.44
Theta hat (MLE)	0.0177	Theta star (bias corrected MLE)	0.0191
nu hat (MLE)	2026	nu star (bias corrected)	1875
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (N/A, α)	1776	Adjusted Chi Square Value (N/A, β)	1772
95% Gamma Approximate UCL (use when n>=50)	0.473	95% Gamma Adjusted UCL (use when n<50)	0.474

Estimates of Gamma Parameters using KM Estimates

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (KM)	0.479	SD (KM)	0.0593
Variance (KM)	0.00351	SE of Mean (KM)	0.0121
k hat (KM)	65.4	k star (KM)	60.52
nu hat (KM)	5232	nu star (KM)	4841
theta hat (KM)	0.00733	theta star (KM)	0.00792
80% gamma percentile (KM)	0.53	90% gamma percentile (KM)	0.56
95% gamma percentile (KM)	0.585	99% gamma percentile (KM)	0.634
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	4681	Adjusted Chi Square Value (N/A, β)	4675
95% Gamma Approximate KM-UCL (use when n>=50)	0.496	95% Gamma Adjusted KM-UCL (use when n<50)	0.496
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.46	Mean in Log Scale	-0.791
SD in Original Scale	0.0808	SD in Log Scale	0.168
95% t UCL (assumes normality of ROS data)	0.481	95% Percentile Bootstrap UCL	0.481
95% BCA Bootstrap UCL	0.483	95% Bootstrap t UCL	0.485
95% H-UCL (Log ROS)	0.482		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.741	KM Geo Mean	0.476
KM SD (logged)	0.103	95% Critical H Value (KM-Log)	1.7
KM Standard Error of Mean (logged)	0.021	95% H-UCL (KM -Log)	0.493
KM SD (logged)	0.103	95% Critical H Value (KM-Log)	1.7
KM Standard Error of Mean (logged)	0.021		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.791	Mean in Log Scale	-0.743
SD in Original Scale	0.897	SD in Log Scale	0.941
95% t UCL (Assumes normality)	1.03	95% H-Stat UCL	1.054
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	28
Number of Detects	27	Number of Non-Detects	15
Number of Distinct Detects	24	Number of Distinct Non-Detects	5
Minimum Detect	0.29	Minimum Non-Detect	0.25
Maximum Detect	7.5	Maximum Non-Detect	125
Variance Detects	5.201	Percent Non-Detects	35.71%
Mean Detects	2.294	SD Detects	2.281
Median Detects	1.4	CV Detects	0.994
Skewness Detects	1.167	Kurtosis Detects	-0.0261
Mean of Logged Detects	0.347	SD of Logged Detects	1.013

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.79	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.167	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.835	KM Standard Error of Mean	0.369	
KM SD	2.14	95% KM (BCA) UCL	2.45	
95% KM (t) UCL	2.455	95% KM (Percentile Bootstrap) UCL	2.451	
95% KM (z) UCL	2.441	95% KM Bootstrap t UCL	2.589	
90% KM Chebyshev UCL	2.941	95% KM Chebyshev UCL	3.442	
97.5% KM Chebyshev UCL	4.137	99% KM Chebyshev UCL	5.503	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.012	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.77	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.16	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.174	k star (bias corrected MLE)	1.068	
Theta hat (MLE)	1.955	Theta star (bias corrected MLE)	2.148	
nu hat (MLE)	63.38	nu star (bias corrected)	57.67	
Mean (detects)	2.294			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.71	
Maximum	7.5	Median	0.785	
SD	2.107	CV	1.232	
k hat (MLE)	0.482	k star (bias corrected MLE)	0.464	
Theta hat (MLE)	3.543	Theta star (bias corrected MLE)	3.685	
nu hat (MLE)	40.53	nu star (bias corrected)	38.97	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (38.97, α)	25.67	Adjusted Chi Square Value (38.97, β)	25.28	
95% Gamma Approximate UCL (use when n>=50)	2.595	95% Gamma Adjusted UCL (use when n<50)	2.635	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.835	SD (KM)	2.14	
Variance (KM)	4.579	SE of Mean (KM)	0.369	
k hat (KM)	0.735	k star (KM)	0.698	
nu hat (KM)	61.75	nu star (KM)	58.67	
theta hat (KM)	2.496	theta star (KM)	2.627	
80% gamma percentile (KM)	3.016	90% gamma percentile (KM)	4.608	
95% gamma percentile (KM)	6.25	99% gamma percentile (KM)	10.17	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (58.67, α)	42.06	Adjusted Chi Square Value (58.67, β)	41.56	
95% Gamma Approximate KM-UCL (use when n>=50)	2.559	95% Gamma Adjusted KM-UCL (use when n<50)	2.59	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.167	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean in Original Scale	1.722	Mean in Log Scale	-0.146
SD in Original Scale	2.057	SD in Log Scale	1.243
95% t UCL (assumes normality of ROS data)	2.256	95% Percentile Bootstrap UCL	2.26
95% BCA Bootstrap UCL	2.282	95% Bootstrap t UCL	2.398
95% H-UCL (Log ROS)	3.124		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.0294	KM Geo Mean	0.971
KM SD (logged)	1.12	95% Critical H Value (KM-Log)	2.493
KM Standard Error of Mean (logged)	0.194	95% H-UCL (KM -Log)	2.814
KM SD (logged)	1.12	95% Critical H Value (KM-Log)	2.493
KM Standard Error of Mean (logged)	0.194		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.785	Mean in Log Scale	0.336
SD in Original Scale	10.07	SD in Log Scale	1.63
95% t UCL (Assumes normality)	7.4	95% H-Stat UCL	11.74
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	2.59	95% GROS Adjusted Gamma UCL	2.635
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	28
Number of Detects	28	Number of Non-Detects	12
Number of Distinct Detects	26	Number of Distinct Non-Detects	2
Minimum Detect	0.33	Minimum Non-Detect	0.25
Maximum Detect	7.3	Maximum Non-Detect	25
Variance Detects	2.733	Percent Non-Detects	30%
Mean Detects	1.656	SD Detects	1.653
Median Detects	0.91	CV Detects	0.998
Skewness Detects	1.991	Kurtosis Detects	4.263
Mean of Logged Detects	0.124	SD of Logged Detects	0.858
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.48	KM Standard Error of Mean	0.286
KM SD	1.588	95% KM (BCA) UCL	1.974
95% KM (t) UCL	1.962	95% KM (Percentile Bootstrap) UCL	1.968
95% KM (z) UCL	1.95	95% KM Bootstrap t UCL	2.157
90% KM Chebyshev UCL	2.338	95% KM Chebyshev UCL	2.726
97.5% KM Chebyshev UCL	3.265	99% KM Chebyshev UCL	4.325
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.951	**Anderson-Darling GOF Test**	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.181	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.169	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.461	k star (bias corrected MLE)	1.328	
Theta hat (MLE)	1.133	Theta star (bias corrected MLE)	1.247	
nu hat (MLE)	81.8	nu star (bias corrected)	74.37	
Mean (detects)	1.656			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.421	
Maximum	7.3	Median	0.785	
SD	1.568	CV	1.104	
k hat (MLE)	0.667	k star (bias corrected MLE)	0.633	
Theta hat (MLE)	2.131	Theta star (bias corrected MLE)	2.243	
nu hat (MLE)	53.34	nu star (bias corrected)	50.68	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (50.68, α)	35.33	Adjusted Chi Square Value (50.68, β)	34.85	
95% Gamma Approximate UCL (use when n>=50)	2.038	95% Gamma Adjusted UCL (use when n<50)	2.066	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.48	SD (KM)	1.588	
Variance (KM)	2.522	SE of Mean (KM)	0.286	
k hat (KM)	0.868	k star (KM)	0.82	
nu hat (KM)	69.48	nu star (KM)	65.6	
theta hat (KM)	1.704	theta star (KM)	1.805	
80% gamma percentile (KM)	2.415	90% gamma percentile (KM)	3.577	
95% gamma percentile (KM)	4.759	99% gamma percentile (KM)	7.543	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (65.60, α)	47.96	Adjusted Chi Square Value (65.60, β)	47.4	
95% Gamma Approximate KM-UCL (use when n>=50)	2.024	95% Gamma Adjusted KM-UCL (use when n<50)	2.048	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.924	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.164	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.423	Mean in Log Scale	-0.124	
SD in Original Scale	1.52	SD in Log Scale	1.011	
95% t UCL (assumes normality of ROS data)	1.828	95% Percentile Bootstrap UCL	1.827	
95% BCA Bootstrap UCL	1.941	95% Bootstrap t UCL	1.952	
95% H-UCL (Log ROS)	2.18			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.0644	KM Geo Mean	0.938	
KM SD (logged)	0.933	95% Critical H Value (KM-Log)	2.331	
KM Standard Error of Mean (logged)	0.168	95% H-UCL (KM -Log)	2.054	
KM SD (logged)	0.933	95% Critical H Value (KM-Log)	2.331	
KM Standard Error of Mean (logged)	0.168			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	3.672	Mean in Log Scale	0.384	
SD in Original Scale	4.7	SD in Log Scale	1.457	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (Assumes normality)	4.924	95% H-Stat UCL	8.521
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	2.054		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	12
Number of Detects	9	Number of Non-Detects	33
Number of Distinct Detects	7	Number of Distinct Non-Detects	6
Minimum Detect	0.78	Minimum Non-Detect	0.9
Maximum Detect	1.5	Maximum Non-Detect	4
Variance Detects	0.0462	Percent Non-Detects	78.57%
Mean Detects	1.061	SD Detects	0.215
Median Detects	1.1	CV Detects	0.203
Skewness Detects	0.802	Kurtosis Detects	1.358
Mean of Logged Detects	0.0417	SD of Logged Detects	0.198
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.889	KM Standard Error of Mean	0.0383
KM SD	0.148	95% KM (BCA) UCL	0.983
95% KM (t) UCL	0.953	95% KM (Percentile Bootstrap) UCL	0.977
95% KM (z) UCL	0.952	95% KM Bootstrap t UCL	0.995
90% KM Chebyshev UCL	1.004	95% KM Chebyshev UCL	1.056
97.5% KM Chebyshev UCL	1.128	99% KM Chebyshev UCL	1.27
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.295	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.177	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	28.59	k star (bias corrected MLE)	19.13
Theta hat (MLE)	0.0371	Theta star (bias corrected MLE)	0.0555
nu hat (MLE)	514.5	nu star (bias corrected)	344.4
Mean (detects)	1.061		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.52	Mean	0.863
Maximum	1.5	Median	0.849
SD	0.181	CV	0.21

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	24.42	k star (bias corrected MLE)	22.69
Theta hat (MLE)	0.0353	Theta star (bias corrected MLE)	0.038
nu hat (MLE)	2051	nu star (bias corrected)	1906
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (N/A, α)	1806	Adjusted Chi Square Value (N/A, β)	1802
95% Gamma Approximate UCL (use when n>=50)	0.911	95% Gamma Adjusted UCL (use when n<50)	0.912
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.889	SD (KM)	0.148
Variance (KM)	0.022	SE of Mean (KM)	0.0383
k hat (KM)	35.92	k star (KM)	33.37
nu hat (KM)	3017	nu star (KM)	2803
theta hat (KM)	0.0248	theta star (KM)	0.0266
80% gamma percentile (KM)	1.015	90% gamma percentile (KM)	1.091
95% gamma percentile (KM)	1.156	99% gamma percentile (KM)	1.286
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	2681	Adjusted Chi Square Value (N/A, β)	2677
95% Gamma Approximate KM-UCL (use when n>=50)	0.93	95% Gamma Adjusted KM-UCL (use when n<50)	0.931
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.877	Mean in Log Scale	-0.148
SD in Original Scale	0.167	SD in Log Scale	0.18
95% t UCL (assumes normality of ROS data)	0.92	95% Percentile Bootstrap UCL	0.921
95% BCA Bootstrap UCL	0.924	95% Bootstrap t UCL	0.925
95% H-UCL (Log ROS)	0.92		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.129	KM Geo Mean	0.879
KM SD (logged)	0.147	95% Critical H Value (KM-Log)	1.7
KM Standard Error of Mean (logged)	0.0416	95% H-UCL (KM -Log)	0.924
KM SD (logged)	0.147	95% Critical H Value (KM-Log)	1.7
KM Standard Error of Mean (logged)	0.0416		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.678	Mean in Log Scale	-0.47
SD in Original Scale	0.331	SD in Log Scale	0.377
95% t UCL (Assumes normality)	0.764	95% H-Stat UCL	0.746
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.953		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	8
Number of Detects	10	Number of Non-Detects	30
Number of Distinct Detects	6	Number of Distinct Non-Detects	3

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	0.65	Minimum Non-Detect	1
Maximum Detect	3.3	Maximum Non-Detect	5
Variance Detects	0.525	Percent Non-Detects	75%
Mean Detects	1.325	SD Detects	0.725
Median Detects	1.1	CV Detects	0.547
Skewness Detects	2.662	Kurtosis Detects	7.89
Mean of Logged Detects	0.191	SD of Logged Detects	0.412
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.641	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.359	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.831	KM Standard Error of Mean	0.0792
KM SD	0.462	95% KM (BCA) UCL	1.198
95% KM (t) UCL	0.964	95% KM (Percentile Bootstrap) UCL	1.166
95% KM (z) UCL	0.961	95% KM Bootstrap t UCL	1.068
90% KM Chebyshev UCL	1.068	95% KM Chebyshev UCL	1.176
97.5% KM Chebyshev UCL	1.325	99% KM Chebyshev UCL	1.619
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.079	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.729	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.293	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.267	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.693	k star (bias corrected MLE)	4.052
Theta hat (MLE)	0.233	Theta star (bias corrected MLE)	0.327
nu hat (MLE)	113.9	nu star (bias corrected)	81.04
Mean (detects)	1.325		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.523
Maximum	3.3	Median	0.343
SD	0.63	CV	1.205
k hat (MLE)	0.544	k star (bias corrected MLE)	0.52
Theta hat (MLE)	0.961	Theta star (bias corrected MLE)	1.006
nu hat (MLE)	43.52	nu star (bias corrected)	41.59
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (41.59, α)	27.81	Adjusted Chi Square Value (41.59, β)	27.38
95% Gamma Approximate UCL (use when n>=50)	0.782	95% Gamma Adjusted UCL (use when n<50)	0.794
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.831	SD (KM)	0.462
Variance (KM)	0.213	SE of Mean (KM)	0.0792
k hat (KM)	3.235	k star (KM)	3.009
nu hat (KM)	258.8	nu star (KM)	240.7
theta hat (KM)	0.257	theta star (KM)	0.276
80% gamma percentile (KM)	1.184	90% gamma percentile (KM)	1.473
95% gamma percentile (KM)	1.742	99% gamma percentile (KM)	2.325
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (240.69, α)	205.8	Adjusted Chi Square Value (240.69, β)	204.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.972	95% Gamma Adjusted KM-UCL (use when n<50)	0.977

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.748	Mean in Log Scale	-0.442	
SD in Original Scale	0.513	SD in Log Scale	0.535	
95% t UCL (assumes normality of ROS data)	0.885	95% Percentile Bootstrap UCL	0.888	
95% BCA Bootstrap UCL	0.946	95% Bootstrap t UCL	0.957	
95% H-UCL (Log ROS)	0.876			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.264	KM Geo Mean	0.768	
KM SD (logged)	0.341	95% Critical H Value (KM-Log)	1.814	
KM Standard Error of Mean (logged)	0.0586	95% H-UCL (KM -Log)	0.899	
KM SD (logged)	0.341	95% Critical H Value (KM-Log)	1.814	
KM Standard Error of Mean (logged)	0.0586			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.813	Mean in Log Scale	-0.381	
SD in Original Scale	0.634	SD in Log Scale	0.526	
95% t UCL (Assumes normality)	0.981	95% H-Stat UCL	0.924	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.964	KM H-UCL	0.899	
95% KM (BCA) UCL	1.198			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Fluoride_Total				
General Statistics				
Total Number of Observations	21	Number of Distinct Observations	14	
		Number of Missing Observations	0	
Minimum	100	Mean	312.4	
Maximum	620	Median	380	
SD	166.9	Std. Error of Mean	36.41	
Coefficient of Variation	0.534	Skewness	0.212	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.188	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	375.2	95% Adjusted-CLT UCL (Chen-1995)	374.1	
		95% Modified-t UCL (Johnson-1978)	375.5	
Gamma GOF Test				
A-D Test Statistic	1.339	**Anderson-Darling Gamma GOF Test**		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% A-D Critical Value	0.749	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.243	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.191	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.208	k star (bias corrected MLE)	2.781	
Theta hat (MLE)	97.39	Theta star (bias corrected MLE)	112.3	
nu hat (MLE)	134.7	nu star (bias corrected)	116.8	
MLE Mean (bias corrected)	312.4	MLE Sd (bias corrected)	187.3	
		Approximate Chi Square Value (0.05)	92.86	
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	91.22	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	393	95% Adjusted Gamma UCL (use when n<50)	400	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.262	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.188	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.605	Mean of logged Data	5.58	
Maximum of Logged Data	6.43	SD of logged Data	0.616	
Assuming Lognormal Distribution				
95% H-UCL	428.4	90% Chebyshev (MVUE) UCL	452.4	
95% Chebyshev (MVUE) UCL	513.6	97.5% Chebyshev (MVUE) UCL	598.5	
99% Chebyshev (MVUE) UCL	765.4			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	372.3	95% Jackknife UCL	375.2	
95% Standard Bootstrap UCL	370.9	95% Bootstrap-t UCL	381.2	
95% Hall's Bootstrap UCL	374.8	95% Percentile Bootstrap UCL	374.3	
95% BCA Bootstrap UCL	372.4			
90% Chebyshev(Mean, Sd) UCL	421.6	95% Chebyshev(Mean, Sd) UCL	471.1	
97.5% Chebyshev(Mean, Sd) UCL	539.8	99% Chebyshev(Mean, Sd) UCL	674.7	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	471.1			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	6	
Number of Detects	4	Number of Non-Detects	38	
Number of Distinct Detects	3	Number of Distinct Non-Detects	4	
Minimum Detect	20	Minimum Non-Detect	10	
Maximum Detect	70	Maximum Non-Detect	250	
Variance Detects	600	Percent Non-Detects	90.48%	
Mean Detects	40	SD Detects	24.49	
Median Detects	35	CV Detects	0.612	
Skewness Detects	0.544	Kurtosis Detects	-2.944	
Mean of Logged Detects	3.538	SD of Logged Detects	0.641	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	17.2	KM Standard Error of Mean	3.279	
KM SD	11.07	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	22.71	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	22.59	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	27.03	95% KM Chebyshev UCL	31.49	
97.5% KM Chebyshev UCL	37.67	99% KM Chebyshev UCL	49.82	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.478	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.334	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.472	k star (bias corrected MLE)	1.035	
Theta hat (MLE)	11.52	Theta star (bias corrected MLE)	38.66	
nu hat (MLE)	27.77	nu star (bias corrected)	8.277	
Mean (detects)	40			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	13.22	
Maximum	70	Median	8.004	
SD	16	CV	1.21	
k hat (MLE)	0.293	k star (bias corrected MLE)	0.288	
Theta hat (MLE)	45.15	Theta star (bias corrected MLE)	45.94	
nu hat (MLE)	24.59	nu star (bias corrected)	24.17	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (24.17, α)	13.97	Adjusted Chi Square Value (24.17, β)	13.7	
95% Gamma Approximate UCL (use when n>=50)	22.85	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	17.2	SD (KM)	11.07	
Variance (KM)	122.6	SE of Mean (KM)	3.279	
k hat (KM)	2.411	k star (KM)	2.255	
nu hat (KM)	202.5	nu star (KM)	189.4	
theta hat (KM)	7.131	theta star (KM)	7.626	
80% gamma percentile (KM)	25.38	90% gamma percentile (KM)	32.52	
95% gamma percentile (KM)	39.29	99% gamma percentile (KM)	54.19	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (189.41, α)	158.6	Adjusted Chi Square Value (189.41, β)	157.6	
95% Gamma Approximate KM-UCL (use when n>=50)	20.54	95% Gamma Adjusted KM-UCL (use when n<50)	20.67	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.301	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	16.92	Mean in Log Scale	2.599	
SD in Original Scale	13.02	SD in Log Scale	0.678	
95% t UCL (assumes normality of ROS data)	20.31	95% Percentile Bootstrap UCL	20.4	
95% BCA Bootstrap UCL	21.08	95% Bootstrap t UCL	21.76	
95% H-UCL (Log ROS)	21			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.719	KM Geo Mean	15.16	
KM SD (logged)	0.459	95% Critical H Value (KM-Log)	1.87	
KM Standard Error of Mean (logged)	0.198	95% H-UCL (KM -Log)	19.27	
KM SD (logged)	0.459	95% Critical H Value (KM-Log)	1.87	
KM Standard Error of Mean (logged)	0.198			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	27.92	Mean in Log Scale	3.221	
SD in Original Scale	17.84	SD in Log Scale	0.449	
95% t UCL (Assumes normality)	32.55	95% H-Stat UCL	31.57	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	22.71			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron_Total				
General Statistics				
Total Number of Observations	38	Number of Distinct Observations	20	
Number of Detects	26	Number of Non-Detects	12	
Number of Distinct Detects	20	Number of Distinct Non-Detects	1	
Minimum Detect	50	Minimum Non-Detect	50	
Maximum Detect	1490	Maximum Non-Detect	50	
Variance Detects	89191	Percent Non-Detects	31.58%	
Mean Detects	209.2	SD Detects	298.6	
Median Detects	125	CV Detects	1.428	
Skewness Detects	3.687	Kurtosis Detects	14.57	
Mean of Logged Detects	4.926	SD of Logged Detects	0.786	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.494	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.329	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	158.9	KM Standard Error of Mean	41.9	
KM SD	253.3	95% KM (BCA) UCL	232.6	
95% KM (t) UCL	229.6	95% KM (Percentile Bootstrap) UCL	234.7	
95% KM (z) UCL	227.8	95% KM Bootstrap t UCL	374.4	
90% KM Chebyshev UCL	284.6	95% KM Chebyshev UCL	341.6	
97.5% KM Chebyshev UCL	420.6	99% KM Chebyshev UCL	575.8	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.012	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.198	**Kolmogorov-Smirnov GOF**		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.175	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.341	k star (bias corrected MLE)	1.212	
Theta hat (MLE)	156	Theta star (bias corrected MLE)	172.6	
nu hat (MLE)	69.75	nu star (bias corrected)	63.03	
Mean (detects)	209.2			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	143.1	
Maximum	1490	Median	75	
SD	264.5	CV	1.848	
k hat (MLE)	0.235	k star (bias corrected MLE)	0.234	
Theta hat (MLE)	608.2	Theta star (bias corrected MLE)	610.9	
nu hat (MLE)	17.89	nu star (bias corrected)	17.81	
Adjusted Level of Significance (β)	0.0434			
Approximate Chi Square Value (17.81, α)	9.252	Adjusted Chi Square Value (17.81, β)	8.996	
95% Gamma Approximate UCL (use when n>=50)	275.5	95% Gamma Adjusted UCL (use when n<50)	283.3	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	158.9	SD (KM)	253.3	
Variance (KM)	64154	SE of Mean (KM)	41.9	
k hat (KM)	0.394	k star (KM)	0.38	
nu hat (KM)	29.92	nu star (KM)	28.89	
theta hat (KM)	403.7	theta star (KM)	418.1	
80% gamma percentile (KM)	254.8	90% gamma percentile (KM)	452.9	
95% gamma percentile (KM)	672	99% gamma percentile (KM)	1226	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (28.89, α)	17.62	Adjusted Chi Square Value (28.89, β)	17.26	
95% Gamma Approximate KM-UCL (use when n>=50)	260.5	95% Gamma Adjusted KM-UCL (use when n<50)	266	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	150.5	Mean in Log Scale	4.331	
SD in Original Scale	260.7	SD in Log Scale	1.134	
95% t UCL (assumes normality of ROS data)	221.9	95% Percentile Bootstrap UCL	229.3	
95% BCA Bootstrap UCL	260.1	95% Bootstrap t UCL	368.8	
95% H-UCL (Log ROS)	232.9			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.606	KM Geo Mean	100.1	
KM SD (logged)	0.793	95% Critical H Value (KM-Log)	2.174	
KM Standard Error of Mean (logged)	0.131	95% H-UCL (KM -Log)	181.9	
KM SD (logged)	0.793	95% Critical H Value (KM-Log)	2.174	
KM Standard Error of Mean (logged)	0.131			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	151	Mean in Log Scale	4.387	
SD in Original Scale	260.4	SD in Log Scale	1.032	
95% t UCL (Assumes normality)	222.3	95% H-Stat UCL	206.8	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	181.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lead_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	5
Number of Detects	1	Number of Non-Detects	41
Number of Distinct Detects	1	Number of Distinct Non-Detects	4
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Lead_FLT was not processed!			
Lead_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	40
Number of Distinct Detects	0	Number of Distinct Non-Detects	4
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Lead_Total was not processed!			
Lithium_FLT			
General Statistics			
Total Number of Observations	17	Number of Distinct Observations	15
Number of Detects	16	Number of Non-Detects	1
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	14	Minimum Non-Detect	8.5
Maximum Detect	150	Maximum Non-Detect	8.5
Variance Detects	2617	Percent Non-Detects	5.882%
Mean Detects	58.05	SD Detects	51.16
Median Detects	31.75	CV Detects	0.881
Skewness Detects	0.9	Kurtosis Detects	-1.119
Mean of Logged Detects	3.705	SD of Logged Detects	0.856
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.747	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.307	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	55.14	KM Standard Error of Mean	12.39
KM SD	49.45	95% KM (BCA) UCL	75.76
95% KM (t) UCL	76.76	95% KM (Percentile Bootstrap) UCL	75.94
95% KM (z) UCL	75.51	95% KM Bootstrap t UCL	81.99

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% KM Chebyshev UCL	92.3	95% KM Chebyshev UCL	109.1
97.5% KM Chebyshev UCL	132.5	99% KM Chebyshev UCL	178.4
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.404	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.256	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.219	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.548	k star (bias corrected MLE)	1.299
Theta hat (MLE)	37.51	Theta star (bias corrected MLE)	44.68
nu hat (MLE)	49.52	nu star (bias corrected)	41.57
Mean (detects)	58.05		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	54.64
Maximum	150	Median	31.5
SD	51.5	CV	0.943
k hat (MLE)	0.761	k star (bias corrected MLE)	0.666
Theta hat (MLE)	71.77	Theta star (bias corrected MLE)	82.02
nu hat (MLE)	25.88	nu star (bias corrected)	22.65
Adjusted Level of Significance (β)	0.0346		
Approximate Chi Square Value (22.65, α)	12.83	Adjusted Chi Square Value (22.65, β)	12.05
95% Gamma Approximate UCL (use when n>=50)	96.48	95% Gamma Adjusted UCL (use when n<50)	102.6
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	55.14	SD (KM)	49.45
Variance (KM)	2445	SE of Mean (KM)	12.39
k hat (KM)	1.243	k star (KM)	1.063
nu hat (KM)	42.27	nu star (KM)	36.14
theta hat (KM)	44.35	theta star (KM)	51.87
80% gamma percentile (KM)	88.28	90% gamma percentile (KM)	125.1
95% gamma percentile (KM)	161.7	99% gamma percentile (KM)	246.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (36.14, α)	23.38	Adjusted Chi Square Value (36.14, β)	22.31
95% Gamma Approximate KM-UCL (use when n>=50)	85.22	95% Gamma Adjusted KM-UCL (use when n<50)	89.32
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.21	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	54.95	Mean in Log Scale	3.586
SD in Original Scale	51.15	SD in Log Scale	0.962
95% t UCL (assumes normality of ROS data)	76.61	95% Percentile Bootstrap UCL	75.65
95% BCA Bootstrap UCL	77.42	95% Bootstrap t UCL	83.26
95% H-UCL (Log ROS)	107.6		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.613	KM Geo Mean	37.06
KM SD (logged)	0.884	95% Critical H Value (KM-Log)	2.492
KM Standard Error of Mean (logged)	0.221	95% H-UCL (KM -Log)	95.01
KM SD (logged)	0.884	95% Critical H Value (KM-Log)	2.492
KM Standard Error of Mean (logged)	0.221		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	54.89		Mean in Log Scale	3.572
SD in Original Scale	51.22		SD in Log Scale	0.993
95% t UCL (Assumes normality)	76.58		95% H-Stat UCL	112.7
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	95.01			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lithium_Total				
General Statistics				
Total Number of Observations	15		Number of Distinct Observations	12
			Number of Missing Observations	0
Minimum	14		Mean	59.21
Maximum	140		Median	33.7
SD	51.3		Std. Error of Mean	13.25
Coefficient of Variation	0.866		Skewness	0.757
Normal GOF Test				
Shapiro Wilk Test Statistic	0.749		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881		Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.286		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.22		Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	82.54		95% Adjusted-CLT UCL (Chen-1995)	83.76
			95% Modified-t UCL (Johnson-1978)	82.97
Gamma GOF Test				
A-D Test Statistic	1.283		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.754		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.228		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.225		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.508		k star (bias corrected MLE)	1.25
Theta hat (MLE)	39.27		Theta star (bias corrected MLE)	47.35
nu hat (MLE)	45.23		nu star (bias corrected)	37.51
MLE Mean (bias corrected)	59.21		MLE Sd (bias corrected)	52.95
			Approximate Chi Square Value (0.05)	24.49
Adjusted Level of Significance	0.0324		Adjusted Chi Square Value	23.2
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	90.69		95% Adjusted Gamma UCL (use when n<50)	95.74
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.842		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.881		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.221		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.22		Data Not Lognormal at 5% Significance Level	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.639	Mean of logged Data	3.714
Maximum of Logged Data	4.942	SD of logged Data	0.884
Assuming Lognormal Distribution			
95% H-UCL	111.2	90% Chebyshev (MVUE) UCL	101.9
95% Chebyshev (MVUE) UCL	121.5	97.5% Chebyshev (MVUE) UCL	148.7
99% Chebyshev (MVUE) UCL	202.1		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	80.99	95% Jackknife UCL	82.54
95% Standard Bootstrap UCL	80.27	95% Bootstrap-t UCL	87.61
95% Hall's Bootstrap UCL	77.73	95% Percentile Bootstrap UCL	81.18
95% BCA Bootstrap UCL	81.96		
90% Chebyshev(Mean, Sd) UCL	98.94	95% Chebyshev(Mean, Sd) UCL	116.9
97.5% Chebyshev(Mean, Sd) UCL	141.9	99% Chebyshev(Mean, Sd) UCL	191
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	116.9		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	29
Number of Detects	39	Number of Non-Detects	3
Number of Distinct Detects	26	Number of Distinct Non-Detects	3
Minimum Detect	4.8	Minimum Non-Detect	0.2
Maximum Detect	3900	Maximum Non-Detect	37.5
Variance Detects	647571	Percent Non-Detects	7.143%
Mean Detects	396.3	SD Detects	804.7
Median Detects	60	CV Detects	2.03
Skewness Detects	3.108	Kurtosis Detects	10.12
Mean of Logged Detects	4.586	SD of Logged Detects	1.683
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.531	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	368.4	KM Standard Error of Mean	120.7
KM SD	772	95% KM (BCA) UCL	610.3
95% KM (t) UCL	571.5	95% KM (Percentile Bootstrap) UCL	579.5
95% KM (z) UCL	566.9	95% KM Bootstrap t UCL	712.2
90% KM Chebyshev UCL	730.4	95% KM Chebyshev UCL	894.4
97.5% KM Chebyshev UCL	1122	99% KM Chebyshev UCL	1569
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.031	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.822	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.199	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.15	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	0.461	k star (bias corrected MLE)	0.442	
Theta hat (MLE)	860.1	Theta star (bias corrected MLE)	895.8	
nu hat (MLE)	35.94	nu star (bias corrected)	34.51	
Mean (detects)	396.3			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	368	
Maximum	3900	Median	60	
SD	781.6	CV	2.124	
k hat (MLE)	0.341	k star (bias corrected MLE)	0.333	
Theta hat (MLE)	1078	Theta star (bias corrected MLE)	1106	
nu hat (MLE)	28.67	nu star (bias corrected)	27.95	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (27.95, α)	16.89	Adjusted Chi Square Value (27.95, β)	16.58	
95% Gamma Approximate UCL (use when n>=50)	609	95% Gamma Adjusted UCL (use when n<50)	620.3	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	368.4	SD (KM)	772	
Variance (KM)	596056	SE of Mean (KM)	120.7	
k hat (KM)	0.228	k star (KM)	0.227	
nu hat (KM)	19.12	nu star (KM)	19.09	
theta hat (KM)	1618	theta star (KM)	1621	
80% gamma percentile (KM)	515.6	90% gamma percentile (KM)	1112	
95% gamma percentile (KM)	1833	99% gamma percentile (KM)	3781	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (19.09, α)	10.18	Adjusted Chi Square Value (19.09, β)	9.952	
95% Gamma Approximate KM-UCL (use when n>=50)	690.6	95% Gamma Adjusted KM-UCL (use when n<50)	706.7	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.939	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.14	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	368.4	Mean in Log Scale	4.344	
SD in Original Scale	781.4	SD in Log Scale	1.862	
95% t UCL (assumes normality of ROS data)	571.3	95% Percentile Bootstrap UCL	576.3	
95% BCA Bootstrap UCL	647.2	95% Bootstrap t UCL	720.3	
95% H-UCL (Log ROS)	1191			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.231	KM Geo Mean	68.78	
KM SD (logged)	2.117	95% Critical H Value (KM-Log)	3.819	
KM Standard Error of Mean (logged)	0.333	95% H-UCL (KM -Log)	2285	
KM SD (logged)	2.117	95% Critical H Value (KM-Log)	3.819	
KM Standard Error of Mean (logged)	0.333			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	368.5	Mean in Log Scale	4.254	
SD in Original Scale	781.4	SD in Log Scale	2.108	
95% t UCL (Assumes normality)	571.4	95% H-Stat UCL	2276	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	894.4			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Manganese_Total				
General Statistics				
Total Number of Observations	40	Number of Distinct Observations	32	
		Number of Missing Observations	0	
Minimum	10	Mean	546.9	
Maximum	4100	Median	158	
SD	868.4	Std. Error of Mean	137.3	
Coefficient of Variation	1.588	Skewness	2.494	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.661	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.139	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	778.2	95% Adjusted-CLT UCL (Chen-1995)	830.6	
		95% Modified-t UCL (Johnson-1978)	787.3	
Gamma GOF Test				
A-D Test Statistic	1.212	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.81	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.165	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.147	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.536	k star (bias corrected MLE)	0.513	
Theta hat (MLE)	1020	Theta star (bias corrected MLE)	1067	
nu hat (MLE)	42.89	nu star (bias corrected)	41.01	
MLE Mean (bias corrected)	546.9	MLE Sd (bias corrected)	763.9	
		Approximate Chi Square Value (0.05)	27.33	
Adjusted Level of Significance	0.044	Adjusted Chi Square Value	26.91	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	820.5	95% Adjusted Gamma UCL (use when n<50)	833.3	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.94	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0994	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.139	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.303	Mean of logged Data	5.132	
Maximum of Logged Data	8.319	SD of logged Data	1.648	
Assuming Lognormal Distribution				
95% H-UCL	1554	90% Chebyshev (MVUE) UCL	1251	
95% Chebyshev (MVUE) UCL	1540	97.5% Chebyshev (MVUE) UCL	1942	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	2732		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	772.7	95% Jackknife UCL	778.2
95% Standard Bootstrap UCL	771.9	95% Bootstrap-t UCL	892.8
95% Hall's Bootstrap UCL	872.3	95% Percentile Bootstrap UCL	790.2
95% BCA Bootstrap UCL	820.7		
90% Chebyshev(Mean, Sd) UCL	958.8	95% Chebyshev(Mean, Sd) UCL	1145
97.5% Chebyshev(Mean, Sd) UCL	1404	99% Chebyshev(Mean, Sd) UCL	1913
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	1145		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	12
Number of Detects	14	Number of Non-Detects	28
Number of Distinct Detects	8	Number of Distinct Non-Detects	5
Minimum Detect	0.01	Minimum Non-Detect	0.015
Maximum Detect	0.21	Maximum Non-Detect	0.1
Variance Detects	0.00339	Percent Non-Detects	66.67%
Mean Detects	0.0554	SD Detects	0.0582
Median Detects	0.03	CV Detects	1.05
Skewness Detects	1.78	Kurtosis Detects	2.783
Mean of Logged Detects	-3.298	SD of Logged Detects	0.884
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.716	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.364	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0257	KM Standard Error of Mean	0.00624
KM SD	0.0388	95% KM (BCA) UCL	0.0413
95% KM (t) UCL	0.0362	95% KM (Percentile Bootstrap) UCL	0.0371
95% KM (z) UCL	0.0359	95% KM Bootstrap t UCL	0.0435
90% KM Chebyshev UCL	0.0444	95% KM Chebyshev UCL	0.0529
97.5% KM Chebyshev UCL	0.0646	99% KM Chebyshev UCL	0.0877
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.224	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.753	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.318	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.233	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.378	k star (bias corrected MLE)	1.13
Theta hat (MLE)	0.0402	Theta star (bias corrected MLE)	0.049
nu hat (MLE)	38.58	nu star (bias corrected)	31.65
Mean (detects)	0.0554		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.0251	
Maximum	0.21	Median	0.01	
SD	0.0393	CV	1.562	
k hat (MLE)	1.167	k star (bias corrected MLE)	1.1	
Theta hat (MLE)	0.0215	Theta star (bias corrected MLE)	0.0229	
nu hat (MLE)	98.03	nu star (bias corrected)	92.36	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (92.36, α)	71.2	Adjusted Chi Square Value (92.36, β)	70.54	
95% Gamma Approximate UCL (use when n>=50)	0.0326	95% Gamma Adjusted UCL (use when n<50)	0.0329	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.0257	SD (KM)	0.0388	
Variance (KM)	0.0015	SE of Mean (KM)	0.00624	
k hat (KM)	0.438	k star (KM)	0.422	
nu hat (KM)	36.77	nu star (KM)	35.48	
theta hat (KM)	0.0586	theta star (KM)	0.0608	
80% gamma percentile (KM)	0.0417	90% gamma percentile (KM)	0.0718	
95% gamma percentile (KM)	0.105	99% gamma percentile (KM)	0.187	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (35.48, α)	22.85	Adjusted Chi Square Value (35.48, β)	22.49	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0399	95% Gamma Adjusted KM-UCL (use when n<50)	0.0405	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.877	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.226	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0232	Mean in Log Scale	-4.551	
SD in Original Scale	0.0402	SD in Log Scale	1.199	
95% t UCL (assumes normality of ROS data)	0.0337	95% Percentile Bootstrap UCL	0.0345	
95% BCA Bootstrap UCL	0.0372	95% Bootstrap t UCL	0.043	
95% H-UCL (Log ROS)	0.0351			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-4.14	KM Geo Mean	0.0159	
KM SD (logged)	0.79	95% Critical H Value (KM-Log)	2.141	
KM Standard Error of Mean (logged)	0.129	95% H-UCL (KM -Log)	0.0283	
KM SD (logged)	0.79	95% Critical H Value (KM-Log)	2.141	
KM Standard Error of Mean (logged)	0.129			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0263	Mean in Log Scale	-4.201	
SD in Original Scale	0.0399	SD in Log Scale	0.929	
95% t UCL (Assumes normality)	0.0367	95% H-Stat UCL	0.0321	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	0.0283			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mercury_Total

General Statistics			
Total Number of Observations	40	Number of Distinct Observations	17
Number of Detects	23	Number of Non-Detects	17
Number of Distinct Detects	15	Number of Distinct Non-Detects	3
Minimum Detect	0.01	Minimum Non-Detect	0.015
Maximum Detect	1.1	Maximum Non-Detect	0.1
Variance Detects	0.0558	Percent Non-Detects	42.5%
Mean Detects	0.142	SD Detects	0.236
Median Detects	0.04	CV Detects	1.663
Skewness Detects	3.341	Kurtosis Detects	12.87
Mean of Logged Detects	-2.798	SD of Logged Detects	1.287
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.572	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.087	KM Standard Error of Mean	0.0302
KM SD	0.187	95% KM (BCA) UCL	0.146
95% KM (t) UCL	0.138	95% KM (Percentile Bootstrap) UCL	0.137
95% KM (z) UCL	0.137	95% KM Bootstrap t UCL	0.196
90% KM Chebyshev UCL	0.178	95% KM Chebyshev UCL	0.219
97.5% KM Chebyshev UCL	0.275	99% KM Chebyshev UCL	0.387
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.072	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.786	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.2	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.189	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.712	k star (bias corrected MLE)	0.648
Theta hat (MLE)	0.199	Theta star (bias corrected MLE)	0.219
nu hat (MLE)	32.76	nu star (bias corrected)	29.82
Mean (detects)	0.142		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0862
Maximum	1.1	Median	0.02
SD	0.189	CV	2.194
k hat (MLE)	0.569	k star (bias corrected MLE)	0.543
Theta hat (MLE)	0.152	Theta star (bias corrected MLE)	0.159
nu hat (MLE)	45.5	nu star (bias corrected)	43.42
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (43.42, α)	29.31	Adjusted Chi Square Value (43.42, β)	28.88
95% Gamma Approximate UCL (use when n>=50)	0.128	95% Gamma Adjusted UCL (use when n<50)	0.13
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.087	SD (KM)	0.187
Variance (KM)	0.0348	SE of Mean (KM)	0.0302
k hat (KM)	0.218	k star (KM)	0.218
nu hat (KM)	17.4	nu star (KM)	17.43
theta hat (KM)	0.4	theta star (KM)	0.399

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

80% gamma percentile (KM)	0.12	90% gamma percentile (KM)	0.263
95% gamma percentile (KM)	0.438	99% gamma percentile (KM)	0.914
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.43, α)	8.982	Adjusted Chi Square Value (17.43, β)	8.754
95% Gamma Approximate KM-UCL (use when n>=50)	0.169	95% Gamma Adjusted KM-UCL (use when n<50)	0.173
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0863	Mean in Log Scale	-3.656
SD in Original Scale	0.189	SD in Log Scale	1.503
95% t UCL (assumes normality of ROS data)	0.137	95% Percentile Bootstrap UCL	0.139
95% BCA Bootstrap UCL	0.168	95% Bootstrap t UCL	0.201
95% H-UCL (Log ROS)	0.167		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.515	KM Geo Mean	0.0297
KM SD (logged)	1.292	95% Critical H Value (KM-Log)	2.769
KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	0.121
KM SD (logged)	1.292	95% Critical H Value (KM-Log)	2.769
KM Standard Error of Mean (logged)	0.212		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0886	Mean in Log Scale	-3.511
SD in Original Scale	0.189	SD in Log Scale	1.375
95% t UCL (Assumes normality)	0.139	95% H-Stat UCL	0.145
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.121		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Methyl Mercury_FLT			
General Statistics			
Total Number of Observations	5	Number of Distinct Observations	4
		Number of Missing Observations	0
Minimum	3.1000E-4	Mean	5.6000E-4
Maximum	8.0000E-4	Median	6.8000E-4
SD	2.2461E-4	Std. Error of Mean	1.0045E-4
Coefficient of Variation	0.401	Skewness	-0.387
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.833	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Data appear Normal at 5% Significance Level	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	7.7414E-4	95% Adjusted-CLT UCL (Chen-1995)	7.0667E-4	
		95% Modified-t UCL (Johnson-1978)	7.7125E-4	
Gamma GOF Test				
A-D Test Statistic	0.62	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.68	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.342	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	6.825	k star (bias corrected MLE)	2.863	
Theta hat (MLE)	8.2050E-5	Theta star (bias corrected MLE)	1.9557E-4	
nu hat (MLE)	68.25	nu star (bias corrected)	28.63	
MLE Mean (bias corrected)	5.6000E-4	MLE Sd (bias corrected)	3.3094E-4	
		Approximate Chi Square Value (0.05)	17.42	
Adjusted Level of Significance	0.0086	Adjusted Chi Square Value	13.74	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	9.2037E-4	95% Adjusted Gamma UCL (use when n<50)	0.00117	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.805	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.326	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.343	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-8.079	Mean of logged Data	-7.563	
Maximum of Logged Data	-7.131	SD of logged Data	0.448	
Assuming Lognormal Distribution				
95% H-UCL	0.00107	90% Chebyshev (MVUE) UCL	8.9824E-4	
95% Chebyshev (MVUE) UCL	0.00105	97.5% Chebyshev (MVUE) UCL	0.00126	
99% Chebyshev (MVUE) UCL	0.00168			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	7.2522E-4	95% Jackknife UCL	7.7414E-4	
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A	
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	8.6135E-4	95% Chebyshev(Mean, Sd) UCL	9.9785E-4	
97.5% Chebyshev(Mean, Sd) UCL	0.00119	99% Chebyshev(Mean, Sd) UCL	0.00156	
Suggested UCL to Use				
95% Student's-t UCL	7.7414E-4			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Methyl Mercury_Total

General Statistics

Total Number of Observations	5	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	4.5000E-4	Mean	0.00143
Maximum	0.00398	Median	7.8000E-4
SD	0.00146	Std. Error of Mean	6.5254E-4
Coefficient of Variation	1.022	Skewness	2.004

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.34	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.00282	95% Adjusted-CLT UCL (Chen-1995)	0.00313
		95% Modified-t UCL (Johnson-1978)	0.00292

Gamma GOF Test

A-D Test Statistic	0.481	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.686	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.271	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.361	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.68	k star (bias corrected MLE)	0.805
Theta hat (MLE)	8.4991E-4	Theta star (bias corrected MLE)	0.00177
nu hat (MLE)	16.8	nu star (bias corrected)	8.054
MLE Mean (bias corrected)	0.00143	MLE Sd (bias corrected)	0.00159
		Approximate Chi Square Value (0.05)	2.766
Adjusted Level of Significance	0.0086	Adjusted Chi Square Value	1.603

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.00416	95% Adjusted Gamma UCL (use when n<50)	0.00717

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.762	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.229	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.343	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-7.706	Mean of logged Data	-6.878
Maximum of Logged Data	-5.526	SD of logged Data	0.844

Assuming Lognormal Distribution

95% H-UCL	0.00882	90% Chebyshev (MVUE) UCL	0.00284
95% Chebyshev (MVUE) UCL	0.00352	97.5% Chebyshev (MVUE) UCL	0.00445
99% Chebyshev (MVUE) UCL	0.00629		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCLs				
95% CLT UCL	0.0025	95% Jackknife UCL	0.00282	
95% Standard Bootstrap UCL	0.0024	95% Bootstrap-t UCL	0.0089	
95% Hall's Bootstrap UCL	0.00869	95% Percentile Bootstrap UCL	0.00263	
95% BCA Bootstrap UCL	0.00277			
90% Chebyshev(Mean, Sd) UCL	0.00339	95% Chebyshev(Mean, Sd) UCL	0.00427	
97.5% Chebyshev(Mean, Sd) UCL	0.0055	99% Chebyshev(Mean, Sd) UCL	0.00792	
Suggested UCL to Use				
95% Student's-t UCL	0.00282			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Molybdenum_FLT				
General Statistics				
Total Number of Observations	41	Number of Distinct Observations	9	
Number of Detects	7	Number of Non-Detects	34	
Number of Distinct Detects	5	Number of Distinct Non-Detects	4	
Minimum Detect	0.31	Minimum Non-Detect	0.135	
Maximum Detect	0.56	Maximum Non-Detect	10	
Variance Detects	0.00746	Percent Non-Detects	82.93%	
Mean Detects	0.393	SD Detects	0.0864	
Median Detects	0.38	CV Detects	0.22	
Skewness Detects	1.312	Kurtosis Detects	1.985	
Mean of Logged Detects	-0.953	SD of Logged Detects	0.206	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.188	KM Standard Error of Mean	0.02	
KM SD	0.109	95% KM (BCA) UCL	0.297	
95% KM (t) UCL	0.222	95% KM (Percentile Bootstrap) UCL	0.292	
95% KM (z) UCL	0.221	95% KM Bootstrap t UCL	0.212	
90% KM Chebyshev UCL	0.248	95% KM Chebyshev UCL	0.275	
97.5% KM Chebyshev UCL	0.313	99% KM Chebyshev UCL	0.387	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.423	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.256	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	26.6	k star (bias corrected MLE)	15.29	
Theta hat (MLE)	0.0148	Theta star (bias corrected MLE)	0.0257	
nu hat (MLE)	372.4	nu star (bias corrected)	214.1	
Mean (detects)	0.393			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.175	
Maximum	0.56	Median	0.154	
SD	0.133	CV	0.761	
k hat (MLE)	1.219	k star (bias corrected MLE)	1.146	
Theta hat (MLE)	0.144	Theta star (bias corrected MLE)	0.153	
nu hat (MLE)	99.98	nu star (bias corrected)	94	
Adjusted Level of Significance (β)	0.0441			
Approximate Chi Square Value (94.00, α)	72.64	Adjusted Chi Square Value (94.00, β)	71.95	
95% Gamma Approximate UCL (use when n>=50)	0.227	95% Gamma Adjusted UCL (use when n<50)	0.229	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.188	SD (KM)	0.109	
Variance (KM)	0.0119	SE of Mean (KM)	0.02	
k hat (KM)	2.976	k star (KM)	2.775	
nu hat (KM)	244	nu star (KM)	227.5	
theta hat (KM)	0.0631	theta star (KM)	0.0677	
80% gamma percentile (KM)	0.271	90% gamma percentile (KM)	0.339	
95% gamma percentile (KM)	0.403	99% gamma percentile (KM)	0.543	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (227.51, α)	193.6	Adjusted Chi Square Value (227.51, β)	192.5	
95% Gamma Approximate KM-UCL (use when n>=50)	0.221	95% Gamma Adjusted KM-UCL (use when n<50)	0.222	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.242	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.228	Mean in Log Scale	-1.557	
SD in Original Scale	0.0973	SD in Log Scale	0.4	
95% t UCL (assumes normality of ROS data)	0.254	95% Percentile Bootstrap UCL	0.254	
95% BCA Bootstrap UCL	0.256	95% Bootstrap t UCL	0.257	
95% H-UCL (Log ROS)	0.256			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.786	KM Geo Mean	0.168	
KM SD (logged)	0.431	95% Critical H Value (KM-Log)	1.849	
KM Standard Error of Mean (logged)	0.0799	95% H-UCL (KM -Log)	0.209	
KM SD (logged)	0.431	95% Critical H Value (KM-Log)	1.849	
KM Standard Error of Mean (logged)	0.0799			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.425	Mean in Log Scale	-1.621	
SD in Original Scale	1.054	SD in Log Scale	0.88	
95% t UCL (Assumes normality)	0.703	95% H-Stat UCL	0.397	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.222			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Molybdenum_Total				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	40	Number of Distinct Observations	10	
Number of Detects	8	Number of Non-Detects	32	
Number of Distinct Detects	8	Number of Distinct Non-Detects	3	
Minimum Detect	0.25	Minimum Non-Detect	0.25	
Maximum Detect	2.7	Maximum Non-Detect	10	
Variance Detects	0.901	Percent Non-Detects	80%	
Mean Detects	0.846	SD Detects	0.949	
Median Detects	0.365	CV Detects	1.122	
Skewness Detects	1.583	Kurtosis Detects	1.016	
Mean of Logged Detects	-0.603	SD of Logged Detects	0.916	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.667	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.4	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.379	KM Standard Error of Mean	0.0823	
KM SD	0.474	95% KM (BCA) UCL	0.526	
95% KM (t) UCL	0.518	95% KM (Percentile Bootstrap) UCL	0.518	
95% KM (z) UCL	0.515	95% KM Bootstrap t UCL	1.3	
90% KM Chebyshev UCL	0.626	95% KM Chebyshev UCL	0.738	
97.5% KM Chebyshev UCL	0.893	99% KM Chebyshev UCL	1.198	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.172	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.731	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.36	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.3	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.287	k star (bias corrected MLE)	0.888	
Theta hat (MLE)	0.657	Theta star (bias corrected MLE)	0.953	
nu hat (MLE)	20.6	nu star (bias corrected)	14.21	
Mean (detects)	0.846			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.182	
Maximum	2.7	Median	0.01	
SD	0.525	CV	2.88	
k hat (MLE)	0.334	k star (bias corrected MLE)	0.326	
Theta hat (MLE)	0.545	Theta star (bias corrected MLE)	0.559	
nu hat (MLE)	26.75	nu star (bias corrected)	26.07	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (26.07, α)	15.44	Adjusted Chi Square Value (26.07, β)	15.13	
95% Gamma Approximate UCL (use when n>=50)	0.308	95% Gamma Adjusted UCL (use when n<50)	0.314	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.379	SD (KM)	0.474	
Variance (KM)	0.225	SE of Mean (KM)	0.0823	
k hat (KM)	0.64	k star (KM)	0.609	
nu hat (KM)	51.19	nu star (KM)	48.68	
theta hat (KM)	0.593	theta star (KM)	0.623	
80% gamma percentile (KM)	0.625	90% gamma percentile (KM)	0.983	
95% gamma percentile (KM)	1.357	99% gamma percentile (KM)	2.262	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (48.68, α)	33.67	Adjusted Chi Square Value (48.68, β)	33.2
95% Gamma Approximate KM-UCL (use when n>=50)	0.548	95% Gamma Adjusted KM-UCL (use when n<50)	0.556
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.307	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.211	Mean in Log Scale	-3.003
SD in Original Scale	0.518	SD in Log Scale	1.713
95% t UCL (assumes normality of ROS data)	0.349	95% Percentile Bootstrap UCL	0.356
95% BCA Bootstrap UCL	0.404	95% Bootstrap t UCL	0.73
95% H-UCL (Log ROS)	0.54		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.21	KM Geo Mean	0.298
KM SD (logged)	0.508	95% Critical H Value (KM-Log)	1.927
KM Standard Error of Mean (logged)	0.0889	95% H-UCL (KM -Log)	0.397
KM SD (logged)	0.508	95% Critical H Value (KM-Log)	1.927
KM Standard Error of Mean (logged)	0.0889		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.535	Mean in Log Scale	-1.478
SD in Original Scale	1.148	SD in Log Scale	1.006
95% t UCL (Assumes normality)	0.841	95% H-Stat UCL	0.558
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.738		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel_FLT			
General Statistics			
Total Number of Observations	42	Number of Distinct Observations	36
Number of Detects	37	Number of Non-Detects	5
Number of Distinct Detects	32	Number of Distinct Non-Detects	4
Minimum Detect	1.6	Minimum Non-Detect	0.48
Maximum Detect	28	Maximum Non-Detect	100
Variance Detects	41.76	Percent Non-Detects	11.9%
Mean Detects	8.589	SD Detects	6.462
Median Detects	8	CV Detects	0.752
Skewness Detects	1.617	Kurtosis Detects	2.514
Mean of Logged Detects	1.897	SD of Logged Detects	0.74
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	8.102	KM Standard Error of Mean	1.02
KM SD	6.376	95% KM (BCA) UCL	10.01
95% KM (t) UCL	9.819	95% KM (Percentile Bootstrap) UCL	9.864
95% KM (z) UCL	9.781	95% KM Bootstrap t UCL	10.14
90% KM Chebyshev UCL	11.16	95% KM Chebyshev UCL	12.55
97.5% KM Chebyshev UCL	14.47	99% KM Chebyshev UCL	18.26
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.854	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.179	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.147	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.121	k star (bias corrected MLE)	1.967
Theta hat (MLE)	4.049	Theta star (bias corrected MLE)	4.366
nu hat (MLE)	157	nu star (bias corrected)	145.6
Mean (detects)	8.589		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	8.03
Maximum	28	Median	7.6
SD	6.366	CV	0.793
k hat (MLE)	1.134	k star (bias corrected MLE)	1.069
Theta hat (MLE)	7.078	Theta star (bias corrected MLE)	7.509
nu hat (MLE)	95.3	nu star (bias corrected)	89.82
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (89.82, α)	68.97	Adjusted Chi Square Value (89.82, β)	68.32
95% Gamma Approximate UCL (use when n>=50)	10.46	95% Gamma Adjusted UCL (use when n<50)	10.56
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	8.102	SD (KM)	6.376
Variance (KM)	40.65	SE of Mean (KM)	1.02
k hat (KM)	1.615	k star (KM)	1.515
nu hat (KM)	135.7	nu star (KM)	127.3
theta hat (KM)	5.017	theta star (KM)	5.347
80% gamma percentile (KM)	12.52	90% gamma percentile (KM)	16.84
95% gamma percentile (KM)	21.03	99% gamma percentile (KM)	30.49
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (127.29, α)	102.2	Adjusted Chi Square Value (127.29, β)	101.4
95% Gamma Approximate KM-UCL (use when n>=50)	10.09	95% Gamma Adjusted KM-UCL (use when n<50)	10.17
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	8.049	Mean in Log Scale	1.805
SD in Original Scale	6.301	SD in Log Scale	0.788
95% t UCL (assumes normality of ROS data)	9.686	95% Percentile Bootstrap UCL	9.81
95% BCA Bootstrap UCL	9.966	95% Bootstrap t UCL	10.12
95% H-UCL (Log ROS)	10.78		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	1.756	KM Geo Mean	5.788
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.265
KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	12.15
KM SD (logged)	0.914	95% Critical H Value (KM-Log)	2.265
KM Standard Error of Mean (logged)	0.148		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	9.246	Mean in Log Scale	1.809
SD in Original Scale	9.03	SD in Log Scale	1.047
95% t UCL (Assumes normality)	11.59	95% H-Stat UCL	15.67

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	12.15		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	29
Number of Detects	36	Number of Non-Detects	4
Number of Distinct Detects	27	Number of Distinct Non-Detects	2
Minimum Detect	1.8	Minimum Non-Detect	0.8
Maximum Detect	28	Maximum Non-Detect	20
Variance Detects	44.67	Percent Non-Detects	10%
Mean Detects	10.05	SD Detects	6.684
Median Detects	9.25	CV Detects	0.665
Skewness Detects	1.046	Kurtosis Detects	0.779
Mean of Logged Detects	2.069	SD of Logged Detects	0.749

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.145	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	9.671	KM Standard Error of Mean	1.071
KM SD	6.551	95% KM (BCA) UCL	11.57
95% KM (t) UCL	11.48	95% KM (Percentile Bootstrap) UCL	11.52
95% KM (z) UCL	11.43	95% KM Bootstrap t UCL	11.6
90% KM Chebyshev UCL	12.88	95% KM Chebyshev UCL	14.34
97.5% KM Chebyshev UCL	16.36	99% KM Chebyshev UCL	20.33

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.473	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.136	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.149	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.245	k star (bias corrected MLE)	2.076
Theta hat (MLE)	4.479	Theta star (bias corrected MLE)	4.842
nu hat (MLE)	161.6	nu star (bias corrected)	149.5
Mean (detects)	10.05		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.421	Mean	9.641	
Maximum	28	Median	9.05	
SD	6.585	CV	0.683	
k hat (MLE)	1.95	k star (bias corrected MLE)	1.821	
Theta hat (MLE)	4.943	Theta star (bias corrected MLE)	5.295	
nu hat (MLE)	156	nu star (bias corrected)	145.7	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (145.66, α)	118.8	Adjusted Chi Square Value (145.66, β)	117.9	
95% Gamma Approximate UCL (use when n>=50)	11.82	95% Gamma Adjusted UCL (use when n<50)	11.92	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	9.671	SD (KM)	6.551	
Variance (KM)	42.92	SE of Mean (KM)	1.071	
k hat (KM)	2.179	k star (KM)	2.032	
nu hat (KM)	174.3	nu star (KM)	162.6	
theta hat (KM)	4.438	theta star (KM)	4.759	
80% gamma percentile (KM)	14.45	90% gamma percentile (KM)	18.74	
95% gamma percentile (KM)	22.82	99% gamma percentile (KM)	31.88	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (162.59, α)	134.1	Adjusted Chi Square Value (162.59, β)	133.1	
95% Gamma Approximate KM-UCL (use when n>=50)	11.73	95% Gamma Adjusted KM-UCL (use when n<50)	11.81	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.935	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.145	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	9.616	Mean in Log Scale	2.01	
SD in Original Scale	6.564	SD in Log Scale	0.775	
95% t UCL (assumes normality of ROS data)	11.37	95% Percentile Bootstrap UCL	11.36	
95% BCA Bootstrap UCL	11.54	95% Bootstrap t UCL	11.68	
95% H-UCL (Log ROS)	13.18			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.996	KM Geo Mean	7.361	
KM SD (logged)	0.814	95% Critical H Value (KM-Log)	2.205	
KM Standard Error of Mean (logged)	0.135	95% H-UCL (KM -Log)	13.67	
KM SD (logged)	0.814	95% Critical H Value (KM-Log)	2.205	
KM Standard Error of Mean (logged)	0.135			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	9.808	Mean in Log Scale	2.012	
SD in Original Scale	6.513	SD in Log Scale	0.856	
95% t UCL (Assumes normality)	11.54	95% H-Stat UCL	14.68	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Adjusted Gamma UCL	11.81	95% GROS Adjusted Gamma UCL	11.92	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nitrate+Nitrite as N_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	4
Minimum Detect	20	Minimum Non-Detect	15
Maximum Detect	400	Maximum Non-Detect	1500
Variance Detects	21680	Percent Non-Detects	50%
Mean Detects	146	SD Detects	147.2
Median Detects	110	CV Detects	1.009
Skewness Detects	1.832	Kurtosis Detects	3.796
Mean of Logged Detects	4.571	SD of Logged Detects	1.072

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.793	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.37	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	97.78	KM Standard Error of Mean	43.81
KM SD	115	95% KM (BCA) UCL	174.5
95% KM (t) UCL	178.1	95% KM (Percentile Bootstrap) UCL	166.7
95% KM (z) UCL	169.8	95% KM Bootstrap t UCL	222.2
90% KM Chebyshev UCL	229.2	95% KM Chebyshev UCL	288.7
97.5% KM Chebyshev UCL	371.4	99% KM Chebyshev UCL	533.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.327	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.688	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.271	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.362	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.356	k star (bias corrected MLE)	0.676
Theta hat (MLE)	107.7	Theta star (bias corrected MLE)	216.1
nu hat (MLE)	13.56	nu star (bias corrected)	6.756
Mean (detects)	146		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	82.71
Maximum	400	Median	35.37
SD	119.4	CV	1.443
k hat (MLE)	0.336	k star (bias corrected MLE)	0.302
Theta hat (MLE)	246.4	Theta star (bias corrected MLE)	274.2
nu hat (MLE)	6.714	nu star (bias corrected)	6.033
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (6.03, α)	1.657	Adjusted Chi Square Value (6.03, β)	1.291
95% Gamma Approximate UCL (use when n>=50)	301.2	95% Gamma Adjusted UCL (use when n<50)	386.5

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	97.78	SD (KM)	115

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance (KM)	13217	SE of Mean (KM)	43.81
k hat (KM)	0.723	k star (KM)	0.573
nu hat (KM)	14.47	nu star (KM)	11.46
theta hat (KM)	135.2	theta star (KM)	170.6
80% gamma percentile (KM)	161.1	90% gamma percentile (KM)	256.9
95% gamma percentile (KM)	357.7	99% gamma percentile (KM)	602.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (11.46, α)	4.874	Adjusted Chi Square Value (11.46, β)	4.153
95% Gamma Approximate KM-UCL (use when n>=50)	229.9	95% Gamma Adjusted KM-UCL (use when n<50)	269.8
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	87.19	Mean in Log Scale	3.852
SD in Original Scale	116.6	SD in Log Scale	1.172
95% t UCL (assumes normality of ROS data)	154.8	95% Percentile Bootstrap UCL	150.5
95% BCA Bootstrap UCL	179.8	95% Bootstrap t UCL	256.2
95% H-UCL (Log ROS)	362.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.967	KM Geo Mean	52.81
KM SD (logged)	1.127	95% Critical H Value (KM-Log)	3.369
KM Standard Error of Mean (logged)	0.46	95% H-UCL (KM -Log)	353.2
KM SD (logged)	1.127	95% Critical H Value (KM-Log)	3.369
KM Standard Error of Mean (logged)	0.46		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	172	Mean in Log Scale	4.284
SD in Original Scale	232.9	SD in Log Scale	1.538
95% t UCL (Assumes normality)	307	95% H-Stat UCL	2141
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	178.1		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nitrogen, Nitrate (as N)_Total			
General Statistics			
Total Number of Observations	30	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	26
Number of Distinct Detects	3	Number of Distinct Non-Detects	2
Minimum Detect	60	Minimum Non-Detect	50
Maximum Detect	360	Maximum Non-Detect	250
Variance Detects	21600	Percent Non-Detects	86.67%
Mean Detects	140	SD Detects	147
Median Detects	70	CV Detects	1.05
Skewness Detects	1.976	Kurtosis Detects	3.914

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean of Logged Detects	4.614	SD of Logged Detects	0.859
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.677	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.408	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	62.12	KM Standard Error of Mean	11.73
KM SD	55.64	95% KM (BCA) UCL	N/A
95% KM (t) UCL	82.06	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	81.43	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	97.33	95% KM Chebyshev UCL	113.3
97.5% KM Chebyshev UCL	135.4	99% KM Chebyshev UCL	178.9
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.744	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.662	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.403	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.399	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.674	k star (bias corrected MLE)	0.585
Theta hat (MLE)	83.62	Theta star (bias corrected MLE)	239.2
nu hat (MLE)	13.39	nu star (bias corrected)	4.682
Mean (detects)	140		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	18.68
Maximum	360	Median	0.01
SD	67.65	CV	3.623
k hat (MLE)	0.125	k star (bias corrected MLE)	0.135
Theta hat (MLE)	149.3	Theta star (bias corrected MLE)	138.5
nu hat (MLE)	7.506	nu star (bias corrected)	8.089
Adjusted Level of Significance (β)	0.041		
Approximate Chi Square Value (8.09, α)	2.787	Adjusted Chi Square Value (8.09, β)	2.61
95% Gamma Approximate UCL (use when n>=50)	54.21	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	62.12	SD (KM)	55.64
Variance (KM)	3096	SE of Mean (KM)	11.73
k hat (KM)	1.247	k star (KM)	1.144
nu hat (KM)	74.8	nu star (KM)	68.65
theta hat (KM)	49.83	theta star (KM)	54.29
80% gamma percentile (KM)	98.81	90% gamma percentile (KM)	138.4
95% gamma percentile (KM)	177.5	99% gamma percentile (KM)	267.5
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (68.65, α)	50.58	Adjusted Chi Square Value (68.65, β)	49.69
95% Gamma Approximate KM-UCL (use when n>=50)	84.32	95% Gamma Adjusted KM-UCL (use when n<50)	85.84
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.74	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	23.67	Mean in Log Scale	1.404	
SD in Original Scale	66.57	SD in Log Scale	1.918	
95% t UCL (assumes normality of ROS data)	44.32	95% Percentile Bootstrap UCL	45.6	
95% BCA Bootstrap UCL	61.9	95% Bootstrap t UCL	95.51	
95% H-UCL (Log ROS)	99.41			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.008	KM Geo Mean	55.02	
KM SD (logged)	0.362	95% Critical H Value (KM-Log)	1.848	
KM Standard Error of Mean (logged)	0.0765	95% H-UCL (KM -Log)	66.51	
KM SD (logged)	0.362	95% Critical H Value (KM-Log)	1.848	
KM Standard Error of Mean (logged)	0.0765			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	47	Mean in Log Scale	3.512	
SD in Original Scale	65.17	SD in Log Scale	0.659	
95% t UCL (Assumes normality)	67.22	95% H-Stat UCL	53.83	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	66.51			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nitrogen, Nitrite (as N)_Total				
General Statistics				
Total Number of Observations	29	Number of Distinct Observations	2	
Number of Detects	0	Number of Non-Detects	29	
Number of Distinct Detects	0	Number of Distinct Non-Detects	2	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Nitrogen, Nitrite (as N)_Total was not processed!				
Selenium_FLT				
General Statistics				
Total Number of Observations	42	Number of Distinct Observations	11	
Number of Detects	5	Number of Non-Detects	37	
Number of Distinct Detects	5	Number of Distinct Non-Detects	6	
Minimum Detect	0.52	Minimum Non-Detect	0.3	
Maximum Detect	0.66	Maximum Non-Detect	17.5	
Variance Detects	0.00325	Percent Non-Detects	88.1%	
Mean Detects	0.57	SD Detects	0.057	
Median Detects	0.55	CV Detects	0.1	
Skewness Detects	1.214	Kurtosis Detects	0.845	
Mean of Logged Detects	-0.566	SD of Logged Detects	0.097	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.889	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.336	KM Standard Error of Mean	0.0173	
KM SD	0.0942	95% KM (BCA) UCL	0.517	
95% KM (t) UCL	0.366	95% KM (Percentile Bootstrap) UCL	0.516	
95% KM (z) UCL	0.365	95% KM Bootstrap t UCL	0.347	
90% KM Chebyshev UCL	0.388	95% KM Chebyshev UCL	0.412	
97.5% KM Chebyshev UCL	0.445	99% KM Chebyshev UCL	0.509	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.36	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.247	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	130.4	k star (bias corrected MLE)	52.3	
Theta hat (MLE)	0.00437	Theta star (bias corrected MLE)	0.0109	
nu hat (MLE)	1304	nu star (bias corrected)	523	
Mean (detects)	0.57			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.307	
Maximum	0.66	Median	0.302	
SD	0.146	CV	0.474	
k hat (MLE)	3.018	k star (bias corrected MLE)	2.818	
Theta hat (MLE)	0.102	Theta star (bias corrected MLE)	0.109	
nu hat (MLE)	253.5	nu star (bias corrected)	236.7	
Adjusted Level of Significance (β)	0.0443			
Approximate Chi Square Value (236.73, α)	202.1	Adjusted Chi Square Value (236.73, β)	201	
95% Gamma Approximate UCL (use when n>=50)	0.36	95% Gamma Adjusted UCL (use when n<50)	0.362	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.336	SD (KM)	0.0942	
Variance (KM)	0.00887	SE of Mean (KM)	0.0173	
k hat (KM)	12.76	k star (KM)	11.87	
nu hat (KM)	1072	nu star (KM)	996.8	
theta hat (KM)	0.0264	theta star (KM)	0.0284	
80% gamma percentile (KM)	0.415	90% gamma percentile (KM)	0.466	
95% gamma percentile (KM)	0.512	99% gamma percentile (KM)	0.604	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (996.82, α)	924.5	Adjusted Chi Square Value (996.82, β)	922.1	
95% Gamma Approximate KM-UCL (use when n>=50)	0.363	95% Gamma Adjusted KM-UCL (use when n<50)	0.364	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.366	Mean in Log Scale	-1.042	
SD in Original Scale	0.102	SD in Log Scale	0.272	
95% t UCL (assumes normality of ROS data)	0.392	95% Percentile Bootstrap UCL	0.391	
95% BCA Bootstrap UCL	0.394	95% Bootstrap t UCL	0.395	

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL (Log ROS)	0.394		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.118	KM Geo Mean	0.327
KM SD (logged)	0.22	95% Critical H Value (KM-Log)	1.727
KM Standard Error of Mean (logged)	0.0405	95% H-UCL (KM -Log)	0.356
KM SD (logged)	0.22	95% Critical H Value (KM-Log)	1.727
KM Standard Error of Mean (logged)	0.0405		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.726	Mean in Log Scale	-1.061
SD in Original Scale	1.826	SD in Log Scale	0.826
95% t UCL (Assumes normality)	1.2	95% H-Stat UCL	0.644
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.366		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	12
Number of Detects	8	Number of Non-Detects	32
Number of Distinct Detects	8	Number of Distinct Non-Detects	4
Minimum Detect	0.1	Minimum Non-Detect	0.5
Maximum Detect	0.73	Maximum Non-Detect	17.5
Variance Detects	0.0442	Percent Non-Detects	80%
Mean Detects	0.509	SD Detects	0.21
Median Detects	0.565	CV Detects	0.413
Skewness Detects	-1.265	Kurtosis Detects	0.994
Mean of Logged Detects	-0.814	SD of Logged Detects	0.663
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.309	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.265	KM Standard Error of Mean	0.0662
KM SD	0.181	95% KM (BCA) UCL	0.528
95% KM (t) UCL	0.376	95% KM (Percentile Bootstrap) UCL	0.522
95% KM (z) UCL	0.374	95% KM Bootstrap t UCL	0.477
90% KM Chebyshev UCL	0.463	95% KM Chebyshev UCL	0.553
97.5% KM Chebyshev UCL	0.678	99% KM Chebyshev UCL	0.923
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.907	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.719	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.364	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.296	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	3.782	k star (bias corrected MLE)	2.447

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Theta hat (MLE)	0.135	Theta star (bias corrected MLE)	0.208
nu hat (MLE)	60.51	nu star (bias corrected)	39.15
Mean (detects)	0.509		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.276
Maximum	0.73	Median	0.247
SD	0.181	CV	0.657
k hat (MLE)	1.879	k star (bias corrected MLE)	1.755
Theta hat (MLE)	0.147	Theta star (bias corrected MLE)	0.157
nu hat (MLE)	150.3	nu star (bias corrected)	140.4
Adjusted Level of Significance (β)	0.044		
Approximate Chi Square Value (140.39, α)	114	Adjusted Chi Square Value (140.39, β)	113.1
95% Gamma Approximate UCL (use when n>=50)	0.34	95% Gamma Adjusted UCL (use when n<50)	0.342
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.265	SD (KM)	0.181
Variance (KM)	0.0326	SE of Mean (KM)	0.0662
k hat (KM)	2.148	k star (KM)	2.004
nu hat (KM)	171.8	nu star (KM)	160.3
theta hat (KM)	0.123	theta star (KM)	0.132
80% gamma percentile (KM)	0.396	90% gamma percentile (KM)	0.515
95% gamma percentile (KM)	0.628	99% gamma percentile (KM)	0.878
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (160.28, α)	132	Adjusted Chi Square Value (160.28, β)	131.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.321	95% Gamma Adjusted KM-UCL (use when n<50)	0.324
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.725	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.367	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.255	Mean in Log Scale	-1.582
SD in Original Scale	0.176	SD in Log Scale	0.672
95% t UCL (assumes normality of ROS data)	0.302	95% Percentile Bootstrap UCL	0.3
95% BCA Bootstrap UCL	0.302	95% Bootstrap t UCL	0.31
95% H-UCL (Log ROS)	0.322		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.558	KM Geo Mean	0.211
KM SD (logged)	0.681	95% Critical H Value (KM-Log)	2.074
KM Standard Error of Mean (logged)	0.346	95% H-UCL (KM -Log)	0.333
KM SD (logged)	0.681	95% Critical H Value (KM-Log)	2.074
KM Standard Error of Mean (logged)	0.346		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.894	Mean in Log Scale	-0.961
SD in Original Scale	1.969	SD in Log Scale	0.987
95% t UCL (Assumes normality)	1.419	95% H-Stat UCL	0.908
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% KM (t) UCL	0.376			

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Silver_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	5
Number of Detects	1	Number of Non-Detects	41
Number of Distinct Detects	1	Number of Distinct Non-Detects	4

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_FLT was not processed!

Silver_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	40
Number of Distinct Detects	0	Number of Distinct Non-Detects	4

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_Total was not processed!

Thallium_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	42
Number of Distinct Detects	0	Number of Distinct Non-Detects	4

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium_FLT was not processed!

Thallium_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	40
Number of Distinct Detects	0	Number of Distinct Non-Detects	4

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium_Total was not processed!

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Vanadium_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	7
Number of Detects	2	Number of Non-Detects	40
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	0.73	Minimum Non-Detect	0.85
Maximum Detect	1.6	Maximum Non-Detect	125
Variance Detects	0.378	Percent Non-Detects	95.24%
Mean Detects	1.165	SD Detects	0.615
Median Detects	1.165	CV Detects	0.528
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.0776	SD of Logged Detects	0.555

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.02	KM Standard Error of Mean	0.335
KM SD	0.41	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.584	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.571	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	2.025	95% KM Chebyshev UCL	2.48
97.5% KM Chebyshev UCL	3.111	99% KM Chebyshev UCL	4.352

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	6.822	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.171	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	27.29	nu star (bias corrected)	N/A
Mean (detects)	1.165		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.02	SD (KM)	0.41
Variance (KM)	0.168	SE of Mean (KM)	0.335
k hat (KM)	6.185	k star (KM)	5.76
nu hat (KM)	519.6	nu star (KM)	483.8
theta hat (KM)	0.165	theta star (KM)	0.177
80% gamma percentile (KM)	1.35	90% gamma percentile (KM)	1.588
95% gamma percentile (KM)	1.804	99% gamma percentile (KM)	2.258

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0443
Approximate Chi Square Value (483.80, α)	433.8	Adjusted Chi Square Value (483.80, β)	432.1
95% Gamma Approximate KM-UCL (use when n>=50)	1.138	95% Gamma Adjusted KM-UCL (use when n<50)	1.142

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.03	Mean in Log Scale	-0.0715
SD in Original Scale	0.476	SD in Log Scale	0.457
95% t UCL (assumes normality of ROS data)	1.154	95% Percentile Bootstrap UCL	1.152
95% BCA Bootstrap UCL	1.159	95% Bootstrap t UCL	1.165
95% H-UCL (Log ROS)	1.181		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.0531	KM Geo Mean	0.948

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD (logged)	0.37	95% Critical H Value (KM-Log)	1.814
KM Standard Error of Mean (logged)	0.302	95% H-UCL (KM -Log)	1.128
KM SD (logged)	0.37	95% Critical H Value (KM-Log)	1.814
KM Standard Error of Mean (logged)	0.302		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.518	Mean in Log Scale	0.963
SD in Original Scale	9.931	SD in Log Scale	1.158
95% t UCL (Assumes normality)	8.097	95% H-Stat UCL	8.099

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	2.48		

Warning: Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium_Total

General Statistics

Total Number of Observations	40	Number of Distinct Observations	8
Number of Detects	4	Number of Non-Detects	36
Number of Distinct Detects	4	Number of Distinct Non-Detects	4
Minimum Detect	0.63	Minimum Non-Detect	2
Maximum Detect	2.9	Maximum Non-Detect	25
Variance Detects	1.532	Percent Non-Detects	90%
Mean Detects	1.78	SD Detects	1.238
Median Detects	1.795	CV Detects	0.695
Skewness Detects	-0.0088	Kurtosis Detects	-5.884
Mean of Logged Detects	0.349	SD of Logged Detects	0.811

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.295	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.896	KM Standard Error of Mean	0.157
KM SD	0.608	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.161	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.154	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.367	95% KM Chebyshev UCL	1.58
97.5% KM Chebyshev UCL	1.877	99% KM Chebyshev UCL	2.458

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.583	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.332	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.397	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.351	k star (bias corrected MLE)	0.754
Theta hat (MLE)	0.757	Theta star (bias corrected MLE)	2.359
nu hat (MLE)	18.81	nu star (bias corrected)	6.036
Mean (detects)	1.78		

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.956	
Maximum	2.9	Median	0.808	
SD	0.703	CV	0.735	
k hat (MLE)	1.476	k star (bias corrected MLE)	1.382	
Theta hat (MLE)	0.648	Theta star (bias corrected MLE)	0.692	
nu hat (MLE)	118.1	nu star (bias corrected)	110.6	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (110.56, α)	87.29	Adjusted Chi Square Value (110.56, β)	86.52	
95% Gamma Approximate UCL (use when n>=50)	1.211	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.896	SD (KM)	0.608	
Variance (KM)	0.37	SE of Mean (KM)	0.157	
k hat (KM)	2.172	k star (KM)	2.026	
nu hat (KM)	173.8	nu star (KM)	162.1	
theta hat (KM)	0.413	theta star (KM)	0.442	
80% gamma percentile (KM)	1.34	90% gamma percentile (KM)	1.737	
95% gamma percentile (KM)	2.117	99% gamma percentile (KM)	2.958	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (162.08, α)	133.6	Adjusted Chi Square Value (162.08, β)	132.7	
95% Gamma Approximate KM-UCL (use when n>=50)	1.087	95% Gamma Adjusted KM-UCL (use when n<50)	1.095	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.299	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.956	Mean in Log Scale	-0.216	
SD in Original Scale	0.613	SD in Log Scale	0.586	
95% t UCL (assumes normality of ROS data)	1.119	95% Percentile Bootstrap UCL	1.125	
95% BCA Bootstrap UCL	1.145	95% Bootstrap t UCL	1.166	
95% H-UCL (Log ROS)	1.153			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.227	KM Geo Mean	0.797	
KM SD (logged)	0.408	95% Critical H Value (KM-Log)	1.855	
KM Standard Error of Mean (logged)	0.127	95% H-UCL (KM -Log)	0.977	
KM SD (logged)	0.408	95% Critical H Value (KM-Log)	1.855	
KM Standard Error of Mean (logged)	0.127			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	3.591	Mean in Log Scale	0.799	
SD in Original Scale	3.804	SD in Log Scale	0.966	
95% t UCL (Assumes normality)	4.604	95% H-Stat UCL	5.115	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	1.161			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc_FLT

General Statistics

Total Number of Observations	42	Number of Distinct Observations	20
Number of Detects	22	Number of Non-Detects	20
Number of Distinct Detects	15	Number of Distinct Non-Detects	7
Minimum Detect	2	Minimum Non-Detect	2.3
Maximum Detect	20.9	Maximum Non-Detect	27.7
Variance Detects	14.75	Percent Non-Detects	47.62%
Mean Detects	4.759	SD Detects	3.841
Median Detects	3.8	CV Detects	0.807
Skewness Detects	3.828	Kurtosis Detects	16.35
Mean of Logged Detects	1.408	SD of Logged Detects	0.491

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.536	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.753	KM Standard Error of Mean	0.509
KM SD	3.079	95% KM (BCA) UCL	4.889
95% KM (t) UCL	4.609	95% KM (Percentile Bootstrap) UCL	4.709
95% KM (z) UCL	4.59	95% KM Bootstrap t UCL	5.367
90% KM Chebyshev UCL	5.279	95% KM Chebyshev UCL	5.971
97.5% KM Chebyshev UCL	6.93	99% KM Chebyshev UCL	8.815

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.352	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.748	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.183	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.438	k star (bias corrected MLE)	3
Theta hat (MLE)	1.384	Theta star (bias corrected MLE)	1.587
nu hat (MLE)	151.3	nu star (bias corrected)	132
Mean (detects)	4.759		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.104
Maximum	20.9	Median	2.65
SD	3.445	CV	1.11
k hat (MLE)	0.57	k star (bias corrected MLE)	0.545
Theta hat (MLE)	5.446	Theta star (bias corrected MLE)	5.694
nu hat (MLE)	47.88	nu star (bias corrected)	45.79
Adjusted Level of Significance (β)	0.0443		
Approximate Chi Square Value (45.79, α)	31.27	Adjusted Chi Square Value (45.79, β)	30.84
95% Gamma Approximate UCL (use when n>=50)	4.546	95% Gamma Adjusted UCL (use when n<50)	4.61

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3.753	SD (KM)	3.079
Variance (KM)	9.48	SE of Mean (KM)	0.509

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (KM)	1.486	k star (KM)	1.395
nu hat (KM)	124.8	nu star (KM)	117.2
theta hat (KM)	2.526	theta star (KM)	2.69
80% gamma percentile (KM)	5.852	90% gamma percentile (KM)	7.96
95% gamma percentile (KM)	10.02	99% gamma percentile (KM)	14.68
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (117.21, α)	93.21	Adjusted Chi Square Value (117.21, β)	92.45
95% Gamma Approximate KM-UCL (use when n>=50)	4.719	95% Gamma Adjusted KM-UCL (use when n<50)	4.758
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3.571	Mean in Log Scale	1.086
SD in Original Scale	3.101	SD in Log Scale	0.567
95% t UCL (assumes normality of ROS data)	4.376	95% Percentile Bootstrap UCL	4.41
95% BCA Bootstrap UCL	4.948	95% Bootstrap t UCL	5.149
95% H-UCL (Log ROS)	4.133		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.164	KM Geo Mean	3.201
KM SD (logged)	0.495	95% Critical H Value (KM-Log)	1.895
KM Standard Error of Mean (logged)	0.0855	95% H-UCL (KM -Log)	4.188
KM SD (logged)	0.495	95% Critical H Value (KM-Log)	1.895
KM Standard Error of Mean (logged)	0.0855		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	4.304	Mean in Log Scale	1.192
SD in Original Scale	3.819	SD in Log Scale	0.718
95% t UCL (Assumes normality)	5.296	95% H-Stat UCL	5.379
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	4.758	95% GROS Adjusted Gamma UCL	4.61
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc_Total			
General Statistics			
Total Number of Observations	40	Number of Distinct Observations	25
Number of Detects	26	Number of Non-Detects	14
Number of Distinct Detects	22	Number of Distinct Non-Detects	4
Minimum Detect	2.5	Minimum Non-Detect	2.5
Maximum Detect	17	Maximum Non-Detect	28.3
Variance Detects	11.89	Percent Non-Detects	35%
Mean Detects	5.95	SD Detects	3.448
Median Detects	5.05	CV Detects	0.579
Skewness Detects	1.777	Kurtosis Detects	3.341
Mean of Logged Detects	1.657	SD of Logged Detects	0.491

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.188	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.17	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	5	KM Standard Error of Mean	0.538	
KM SD	3.202	95% KM (BCA) UCL	5.904	
95% KM (t) UCL	5.906	95% KM (Percentile Bootstrap) UCL	5.884	
95% KM (z) UCL	5.885	95% KM Bootstrap t UCL	6.24	
90% KM Chebyshev UCL	6.614	95% KM Chebyshev UCL	7.345	
97.5% KM Chebyshev UCL	8.36	99% KM Chebyshev UCL	10.35	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.754	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.748	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.158	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	4.1	k star (bias corrected MLE)	3.653	
Theta hat (MLE)	1.451	Theta star (bias corrected MLE)	1.629	
nu hat (MLE)	213.2	nu star (bias corrected)	189.9	
Mean (detects)	5.95			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	4.428	
Maximum	17	Median	3.802	
SD	3.632	CV	0.82	
k hat (MLE)	0.78	k star (bias corrected MLE)	0.738	
Theta hat (MLE)	5.678	Theta star (bias corrected MLE)	6	
nu hat (MLE)	62.39	nu star (bias corrected)	59.04	
Adjusted Level of Significance (β)	0.044			
Approximate Chi Square Value (59.04, α)	42.38	Adjusted Chi Square Value (59.04, β)	41.85	
95% Gamma Approximate UCL (use when n>=50)	6.17	95% Gamma Adjusted UCL (use when n<50)	6.248	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	5	SD (KM)	3.202	
Variance (KM)	10.25	SE of Mean (KM)	0.538	
k hat (KM)	2.438	k star (KM)	2.272	
nu hat (KM)	195	nu star (KM)	181.7	
theta hat (KM)	2.051	theta star (KM)	2.201	
80% gamma percentile (KM)	7.373	90% gamma percentile (KM)	9.44	
95% gamma percentile (KM)	11.4	99% gamma percentile (KM)	15.71	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (181.75, α)	151.6	Adjusted Chi Square Value (181.75, β)	150.5	
95% Gamma Approximate KM-UCL (use when n>=50)	5.996	95% Gamma Adjusted KM-UCL (use when n<50)	6.037	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.17	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				

Table E1-8
Tribal Drinking Water (Clear Lake Surface Water - Removed Samples around Waste Rock Dam), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	4.737	Mean in Log Scale	1.357	
SD in Original Scale	3.309	SD in Log Scale	0.633	
95% t UCL (assumes normality of ROS data)	5.619	95% Percentile Bootstrap UCL	5.616	
95% BCA Bootstrap UCL	5.788	95% Bootstrap t UCL	5.913	
95% H-UCL (Log ROS)	5.834			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.458	KM Geo Mean	4.297	
KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.936	
KM Standard Error of Mean (logged)	0.0881	95% H-UCL (KM -Log)	5.773	
KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.936	
KM Standard Error of Mean (logged)	0.0881			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	5.165	Mean in Log Scale	1.375	
SD in Original Scale	3.83	SD in Log Scale	0.767	
95% t UCL (Assumes normality)	6.185	95% H-Stat UCL	6.918	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Adjusted Gamma UCL	6.037	95% GROS Adjusted Gamma UCL	6.248	
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/14/2019 2:08:21 PM
From File	Plant_Acorns_UCLData_20191114.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	3	Number of Non-Detects	17
Number of Distinct Detects	3	Number of Distinct Non-Detects	17
Minimum Detect	1.557	Minimum Non-Detect	0.784
Maximum Detect	2.509	Maximum Non-Detect	0.96
Variance Detects	0.227	Percent Non-Detects	85%
Mean Detects	2.046	SD Detects	0.477
Median Detects	2.071	CV Detects	0.233
Skewness Detects	-0.239	Kurtosis Detects	N/A
Mean of Logged Detects	0.697	SD of Logged Detects	0.24

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.998	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.188	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.973	KM Standard Error of Mean	0.13
KM SD	0.475	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.198	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.187	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.363	95% KM Chebyshev UCL	1.54
97.5% KM Chebyshev UCL	1.786	99% KM Chebyshev UCL	2.268

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	26.72	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0766	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	160.3	nu star (bias corrected)	N/A
Mean (detects)	2.046		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.315
Maximum	2.509	Median	0.01
SD	0.762	CV	2.415
k hat (MLE)	0.265	k star (bias corrected MLE)	0.259
Theta hat (MLE)	1.19	Theta star (bias corrected MLE)	1.22
nu hat (MLE)	10.6	nu star (bias corrected)	10.34
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (10.34, α)	4.156	Adjusted Chi Square Value (10.34, β)	3.851

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	0.785	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.973	SD (KM)	0.475	
Variance (KM)	0.226	SE of Mean (KM)	0.13	
k hat (KM)	4.191	k star (KM)	3.596	
nu hat (KM)	167.6	nu star (KM)	143.8	
theta hat (KM)	0.232	theta star (KM)	0.271	
80% gamma percentile (KM)	1.358	90% gamma percentile (KM)	1.661	
95% gamma percentile (KM)	1.941	99% gamma percentile (KM)	2.542	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (143.82, α)	117.1	Adjusted Chi Square Value (143.82, β)	115.2	
95% Gamma Approximate KM-UCL (use when n>=50)	1.195	95% Gamma Adjusted KM-UCL (use when n<50)	1.214	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.987	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.218	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.743	Mean in Log Scale	-0.464	
SD in Original Scale	0.583	SD in Log Scale	0.506	
95% t UCL (assumes normality of ROS data)	0.968	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A	
95% H-UCL (Log ROS)	0.905			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.103	KM Geo Mean	0.902	
KM SD (logged)	0.344	95% Critical H Value (KM-Log)	1.884	
KM Standard Error of Mean (logged)	0.0943	95% H-UCL (KM -Log)	1.111	
KM SD (logged)	0.344	95% Critical H Value (KM-Log)	1.884	
KM Standard Error of Mean (logged)	0.0943			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.682	Mean in Log Scale	-0.592	
SD in Original Scale	0.608	SD in Log Scale	0.563	
95% t UCL (Assumes normality)	0.917	95% H-Stat UCL	0.849	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	1.198			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
Number of Detects	1	Number of Non-Detects	19	
Number of Distinct Detects	1	Number of Distinct Non-Detects	19	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	12	Number of Non-Detects	8
Number of Distinct Detects	12	Number of Distinct Non-Detects	8
Minimum Detect	0.0426	Minimum Non-Detect	0.0784
Maximum Detect	0.0769	Maximum Non-Detect	0.0919
Variance Detects	1.0298E-4	Percent Non-Detects	40%
Mean Detects	0.0555	SD Detects	0.0101
Median Detects	0.0554	CV Detects	0.183
Skewness Detects	0.65	Kurtosis Detects	0.299
Mean of Logged Detects	-2.906	SD of Logged Detects	0.179

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0555	KM Standard Error of Mean	0.00293
KM SD	0.00972	95% KM (BCA) UCL	0.0604
95% KM (t) UCL	0.0606	95% KM (Percentile Bootstrap) UCL	0.0602
95% KM (z) UCL	0.0603	95% KM Bootstrap t UCL	0.0615
90% KM Chebyshev UCL	0.0643	95% KM Chebyshev UCL	0.0683
97.5% KM Chebyshev UCL	0.0738	99% KM Chebyshev UCL	0.0847

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.242	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	33.82	k star (bias corrected MLE)	25.42
Theta hat (MLE)	0.00164	Theta star (bias corrected MLE)	0.00218
nu hat (MLE)	811.6	nu star (bias corrected)	610
Mean (detects)	0.0555		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0426	Mean	0.0553
Maximum	0.0769	Median	0.0551
SD	0.00772	CV	0.14
k hat (MLE)	56.2	k star (bias corrected MLE)	47.81
Theta hat (MLE)	9.8464E-4	Theta star (bias corrected MLE)	0.00116
nu hat (MLE)	2248	nu star (bias corrected)	1912
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (N/A, α)	1812	Adjusted Chi Square Value (N/A, β)	1804
95% Gamma Approximate UCL (use when n>=50)	0.0584	95% Gamma Adjusted UCL (use when n<50)	0.0587

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0555	SD (KM)	0.00972
Variance (KM)	9.4398E-5	SE of Mean (KM)	0.00293
k hat (KM)	32.65	k star (KM)	27.79

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

nu hat (KM)	1306	nu star (KM)	1111
theta hat (KM)	0.0017	theta star (KM)	0.002
80% gamma percentile (KM)	0.0641	90% gamma percentile (KM)	0.0694
95% gamma percentile (KM)	0.0739	99% gamma percentile (KM)	0.0829
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (N/A, α)	1035	Adjusted Chi Square Value (N/A, β)	1029
95% Gamma Approximate KM-UCL (use when n>=50)	0.0596	95% Gamma Adjusted KM-UCL (use when n<50)	0.06
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0552	Mean in Log Scale	-2.906
SD in Original Scale	0.00773	SD in Log Scale	0.136
95% t UCL (assumes normality of ROS data)	0.0582	95% Percentile Bootstrap UCL	0.058
95% BCA Bootstrap UCL	0.0584	95% Bootstrap t UCL	0.0589
95% H-UCL (Log ROS)	0.0583		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.906	KM Geo Mean	0.0547
KM SD (logged)	0.171	95% Critical H Value (KM-Log)	1.77
KM Standard Error of Mean (logged)	0.0517	95% H-UCL (KM -Log)	0.0595
KM SD (logged)	0.171	95% Critical H Value (KM-Log)	1.77
KM Standard Error of Mean (logged)	0.0517		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0506	Mean in Log Scale	-3.001
SD in Original Scale	0.00998	SD in Log Scale	0.184
95% t UCL (Assumes normality)	0.0545	95% H-Stat UCL	0.0545
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0606		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.579	Mean	3.711
Maximum	11.57	Median	2.023
SD	3.292	Std. Error of Mean	0.736
Coefficient of Variation	0.887	Skewness	0.978
Normal GOF Test			
Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.984		95% Adjusted-CLT UCL (Chen-1995)	5.094
			95% Modified-t UCL (Johnson-1978)	5.011
Gamma GOF Test				
A-D Test Statistic	0.988		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.76		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.203		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.198		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.409		k star (bias corrected MLE)	1.231
Theta hat (MLE)	2.634		Theta star (bias corrected MLE)	3.015
nu hat (MLE)	56.37		nu star (bias corrected)	49.24
MLE Mean (bias corrected)	3.711		MLE Sd (bias corrected)	3.345
			Approximate Chi Square Value (0.05)	34.13
Adjusted Level of Significance	0.038		Adjusted Chi Square Value	33.14
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	5.354		95% Adjusted Gamma UCL (use when n<50)	5.515
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.92		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.547		Mean of logged Data	0.916
Maximum of Logged Data	2.448		SD of logged Data	0.928
Assuming Lognormal Distribution				
95% H-UCL	6.585		90% Chebyshev (MVUE) UCL	6.303
95% Chebyshev (MVUE) UCL	7.467		97.5% Chebyshev (MVUE) UCL	9.083
99% Chebyshev (MVUE) UCL	12.26			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	4.922		95% Jackknife UCL	4.984
95% Standard Bootstrap UCL	4.878		95% Bootstrap-t UCL	5.242
95% Hall's Bootstrap UCL	5.066		95% Percentile Bootstrap UCL	4.861
95% BCA Bootstrap UCL	5.068			
90% Chebyshev(Mean, Sd) UCL	5.919		95% Chebyshev(Mean, Sd) UCL	6.92
97.5% Chebyshev(Mean, Sd) UCL	8.308		99% Chebyshev(Mean, Sd) UCL	11.04
Suggested UCL to Use				
95% H-UCL	6.585			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.				
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.				
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.				
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Beryllium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	0	Number of Non-Detects	20
Number of Distinct Detects	0	Number of Distinct Non-Detects	20

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Boron

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	6.353	Mean	10.58
Maximum	19.15	Median	10.01
SD	3.246	Std. Error of Mean	0.726
Coefficient of Variation	0.307	Skewness	1.237

Normal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.84	95% Adjusted-CLT UCL (Chen-1995)	11.99
		95% Modified-t UCL (Johnson-1978)	11.87

Gamma GOF Test

A-D Test Statistic	0.342	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.128	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.194	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.6	k star (bias corrected MLE)	10.75
Theta hat (MLE)	0.84	Theta star (bias corrected MLE)	0.985
nu hat (MLE)	504.2	nu star (bias corrected)	429.9
MLE Mean (bias corrected)	10.58	MLE Sd (bias corrected)	3.228
		Approximate Chi Square Value (0.05)	382.8
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	379.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.88	95% Adjusted Gamma UCL (use when n<50)	11.99

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.849	Mean of logged Data	2.319
Maximum of Logged Data	2.952	SD of logged Data	0.285

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	11.95	90% Chebyshev (MVUE) UCL	12.61	
95% Chebyshev (MVUE) UCL	13.54	97.5% Chebyshev (MVUE) UCL	14.83	
99% Chebyshev (MVUE) UCL	17.36			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	11.78	95% Jackknife UCL	11.84	
95% Standard Bootstrap UCL	11.75	95% Bootstrap-t UCL	12.29	
95% Hall's Bootstrap UCL	12.64	95% Percentile Bootstrap UCL	11.79	
95% BCA Bootstrap UCL	11.91			
90% Chebyshev(Mean, Sd) UCL	12.76	95% Chebyshev(Mean, Sd) UCL	13.75	
97.5% Chebyshev(Mean, Sd) UCL	15.12	99% Chebyshev(Mean, Sd) UCL	17.81	
Suggested UCL to Use				
95% Student's-t UCL	11.84			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	19	
Number of Detects	17	Number of Non-Detects	3	
Number of Distinct Detects	16	Number of Distinct Non-Detects	3	
Minimum Detect	0.00122	Minimum Non-Detect	0.00432	
Maximum Detect	0.0053	Maximum Non-Detect	0.00473	
Variance Detects	1.5227E-6	Percent Non-Detects	15%	
Mean Detects	0.00286	SD Detects	0.00123	
Median Detects	0.00306	CV Detects	0.431	
Skewness Detects	0.328	Kurtosis Detects	-0.694	
Mean of Logged Detects	-5.954	SD of Logged Detects	0.47	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.136	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.207	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00281	KM Standard Error of Mean	2.8446E-4	
KM SD	0.00117	95% KM (BCA) UCL	0.00323	
95% KM (t) UCL	0.0033	95% KM (Percentile Bootstrap) UCL	0.00326	
95% KM (z) UCL	0.00328	95% KM Bootstrap t UCL	0.00331	
90% KM Chebyshev UCL	0.00366	95% KM Chebyshev UCL	0.00405	
97.5% KM Chebyshev UCL	0.00459	99% KM Chebyshev UCL	0.00564	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.364	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.148	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.21	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	5.312	k star (bias corrected MLE)	4.414	
Theta hat (MLE)	5.3850E-4	Theta star (bias corrected MLE)	6.4809E-4	
nu hat (MLE)	180.6	nu star (bias corrected)	150.1	
Mean (detects)	0.00286			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00122	Mean	0.00393	
Maximum	0.01	Median	0.00319	
SD	0.00285	CV	0.725	
k hat (MLE)	2.504	k star (bias corrected MLE)	2.162	
Theta hat (MLE)	0.00157	Theta star (bias corrected MLE)	0.00182	
nu hat (MLE)	100.2	nu star (bias corrected)	86.46	
Adjusted Level of Significance (β)	0.038			
Approximate Chi Square Value (86.46, α)	66.03	Adjusted Chi Square Value (86.46, β)	64.62	
95% Gamma Approximate UCL (use when n>=50)	0.00515	95% Gamma Adjusted UCL (use when n<50)	0.00526	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00281	SD (KM)	0.00117	
Variance (KM)	1.3663E-6	SE of Mean (KM)	2.8446E-4	
k hat (KM)	5.783	k star (KM)	4.949	
nu hat (KM)	231.3	nu star (KM)	198	
theta hat (KM)	4.8606E-4	theta star (KM)	5.6798E-4	
80% gamma percentile (KM)	0.00378	90% gamma percentile (KM)	0.0045	
95% gamma percentile (KM)	0.00516	99% gamma percentile (KM)	0.00655	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (197.95, α)	166.4	Adjusted Chi Square Value (197.95, β)	164.1	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00334	95% Gamma Adjusted KM-UCL (use when n<50)	0.00339	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.207	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00278	Mean in Log Scale	-5.969	
SD in Original Scale	0.00115	SD in Log Scale	0.433	
95% t UCL (assumes normality of ROS data)	0.00323	95% Percentile Bootstrap UCL	0.00319	
95% BCA Bootstrap UCL	0.00322	95% Bootstrap t UCL	0.00328	
95% H-UCL (Log ROS)	0.00341			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-5.969	KM Geo Mean	0.00256	
KM SD (logged)	0.451	95% Critical H Value (KM-Log)	1.973	
KM Standard Error of Mean (logged)	0.111	95% H-UCL (KM -Log)	0.00347	
KM SD (logged)	0.451	95% Critical H Value (KM-Log)	1.973	
KM Standard Error of Mean (logged)	0.111			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00277	Mean in Log Scale	-5.976	
SD in Original Scale	0.00116	SD in Log Scale	0.435	
95% t UCL (Assumes normality)	0.00321	95% H-Stat UCL	0.00339	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% KM (t) UCL	0.0033			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Chromium				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	19	
Number of Detects	6	Number of Non-Detects	14	
Number of Distinct Detects	6	Number of Distinct Non-Detects	13	
Minimum Detect	0.0266	Minimum Non-Detect	0.0588	
Maximum Detect	0.289	Maximum Non-Detect	0.0712	
Variance Detects	0.00727	Percent Non-Detects	70%	
Mean Detects	0.173	SD Detects	0.0853	
Median Detects	0.174	CV Detects	0.492	
Skewness Detects	-0.752	Kurtosis Detects	2.235	
Mean of Logged Detects	-1.954	SD of Logged Detects	0.845	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0706	KM Standard Error of Mean	0.0195	
KM SD	0.0796	95% KM (BCA) UCL	0.124	
95% KM (t) UCL	0.104	95% KM (Percentile Bootstrap) UCL	0.115	
95% KM (z) UCL	0.103	95% KM Bootstrap t UCL	0.102	
90% KM Chebyshev UCL	0.129	95% KM Chebyshev UCL	0.156	
97.5% KM Chebyshev UCL	0.192	99% KM Chebyshev UCL	0.264	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.75	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.702	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.383	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.335	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.643	k star (bias corrected MLE)	1.433	
Theta hat (MLE)	0.0655	Theta star (bias corrected MLE)	0.121	
nu hat (MLE)	31.72	nu star (bias corrected)	17.19	
Mean (detects)	0.173			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.074	
Maximum	0.289	Median	0.031	
SD	0.0801	CV	1.082	
k hat (MLE)	1.282	k star (bias corrected MLE)	1.123	
Theta hat (MLE)	0.0577	Theta star (bias corrected MLE)	0.0659	
nu hat (MLE)	51.27	nu star (bias corrected)	44.91	
Adjusted Level of Significance (β)	0.038			
Approximate Chi Square Value (44.91, α)	30.54	Adjusted Chi Square Value (44.91, β)	29.61	

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	0.109	95% Gamma Adjusted UCL (use when n<50)	0.112
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0706	SD (KM)	0.0796
Variance (KM)	0.00633	SE of Mean (KM)	0.0195
k hat (KM)	0.787	k star (KM)	0.702
nu hat (KM)	31.47	nu star (KM)	28.09
theta hat (KM)	0.0897	theta star (KM)	0.101
80% gamma percentile (KM)	0.116	90% gamma percentile (KM)	0.177
95% gamma percentile (KM)	0.24	99% gamma percentile (KM)	0.39
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (28.09, α)	16.99	Adjusted Chi Square Value (28.09, β)	16.31
95% Gamma Approximate KM-UCL (use when n>=50)	0.117	95% Gamma Adjusted KM-UCL (use when n<50)	0.121
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.723	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.403	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0746	Mean in Log Scale	-2.996
SD in Original Scale	0.0795	SD in Log Scale	0.833
95% t UCL (assumes normality of ROS data)	0.105	95% Percentile Bootstrap UCL	0.105
95% BCA Bootstrap UCL	0.11	95% Bootstrap t UCL	0.118
95% H-UCL (Log ROS)	0.112		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.125	KM Geo Mean	0.0439
KM SD (logged)	0.875	95% Critical H Value (KM-Log)	2.458
KM Standard Error of Mean (logged)	0.214	95% H-UCL (KM -Log)	0.106
KM SD (logged)	0.875	95% Critical H Value (KM-Log)	2.458
KM Standard Error of Mean (logged)	0.214		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0751	Mean in Log Scale	-2.973
SD in Original Scale	0.0791	SD in Log Scale	0.811
95% t UCL (Assumes normality)	0.106	95% H-Stat UCL	0.111
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.104		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.02	Mean	0.195
Maximum	0.3	Median	0.225
SD	0.0792	Std. Error of Mean	0.0177
Coefficient of Variation	0.405	Skewness	-0.943

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test				
Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.175	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.226	95% Adjusted-CLT UCL (Chen-1995)	0.221	
		95% Modified-t UCL (Johnson-1978)	0.225	
Gamma GOF Test				
A-D Test Statistic	1.781	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.195	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.126	k star (bias corrected MLE)	2.69	
Theta hat (MLE)	0.0625	Theta star (bias corrected MLE)	0.0726	
nu hat (MLE)	125	nu star (bias corrected)	107.6	
MLE Mean (bias corrected)	0.195	MLE Sd (bias corrected)	0.119	
		Approximate Chi Square Value (0.05)	84.68	
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	83.07	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.248	95% Adjusted Gamma UCL (use when n<50)	0.253	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.668	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.255	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-3.915	Mean of logged Data	-1.801	
Maximum of Logged Data	-1.204	SD of logged Data	0.751	
Assuming Lognormal Distribution				
95% H-UCL	0.325	90% Chebyshev (MVUE) UCL	0.332	
95% Chebyshev (MVUE) UCL	0.385	97.5% Chebyshev (MVUE) UCL	0.458	
99% Chebyshev (MVUE) UCL	0.602			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.225	95% Jackknife UCL	0.226	
95% Standard Bootstrap UCL	0.225	95% Bootstrap-t UCL	0.224	
95% Hall's Bootstrap UCL	0.22	95% Percentile Bootstrap UCL	0.222	
95% BCA Bootstrap UCL	0.22			
90% Chebyshev(Mean, Sd) UCL	0.249	95% Chebyshev(Mean, Sd) UCL	0.273	
97.5% Chebyshev(Mean, Sd) UCL	0.306	99% Chebyshev(Mean, Sd) UCL	0.372	
Suggested UCL to Use				
95% Student's-t UCL	0.226			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Copper

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	3.395	Mean	4.64
Maximum	6.103	Median	4.594
SD	0.723	Std. Error of Mean	0.162
Coefficient of Variation	0.156	Skewness	0.278

Normal GOF Test

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.112	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.919	95% Adjusted-CLT UCL (Chen-1995)	4.917
		95% Modified-t UCL (Johnson-1978)	4.921

Gamma GOF Test

A-D Test Statistic	0.27	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.112	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.193	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	43.53	k star (bias corrected MLE)	37.04
Theta hat (MLE)	0.107	Theta star (bias corrected MLE)	0.125
nu hat (MLE)	1741	nu star (bias corrected)	1481
MLE Mean (bias corrected)	4.64	MLE Sd (bias corrected)	0.762
		Approximate Chi Square Value (0.05)	1393
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	1386

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	4.934	95% Adjusted Gamma UCL (use when n<50)	4.958

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.106	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.222	Mean of logged Data	1.523
Maximum of Logged Data	1.809	SD of logged Data	0.156

Assuming Lognormal Distribution

95% H-UCL	4.944	90% Chebyshev (MVUE) UCL	5.127
95% Chebyshev (MVUE) UCL	5.348	97.5% Chebyshev (MVUE) UCL	5.654
99% Chebyshev (MVUE) UCL	6.255		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	4.906	95% Jackknife UCL	4.919

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Standard Bootstrap UCL	4.898	95% Bootstrap-t UCL	4.931
95% Hall's Bootstrap UCL	4.924	95% Percentile Bootstrap UCL	4.919
95% BCA Bootstrap UCL	4.916		
90% Chebyshev(Mean, Sd) UCL	5.125	95% Chebyshev(Mean, Sd) UCL	5.345
97.5% Chebyshev(Mean, Sd) UCL	5.65	99% Chebyshev(Mean, Sd) UCL	6.249

Suggested UCL to Use

95% Student's-t UCL	4.919		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Iron

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	8.619	Mean	11.26
Maximum	14.08	Median	11.01
SD	1.554	Std. Error of Mean	0.347
Coefficient of Variation	0.138	Skewness	0.0777

Normal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0967	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.86	95% Adjusted-CLT UCL (Chen-1995)	11.84
		95% Modified-t UCL (Johnson-1978)	11.86

Gamma GOF Test

A-D Test Statistic	0.28	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.108	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.193	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	54.74	k star (bias corrected MLE)	46.56
Theta hat (MLE)	0.206	Theta star (bias corrected MLE)	0.242
nu hat (MLE)	2190	nu star (bias corrected)	1862
MLE Mean (bias corrected)	11.26	MLE Sd (bias corrected)	1.65
		Approximate Chi Square Value (0.05)	1763
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	1756

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.89	95% Adjusted Gamma UCL (use when n<50)	11.94

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.105	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.154	Mean of logged Data	2.412
Maximum of Logged Data	2.645	SD of logged Data	0.139

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	11.91	90% Chebyshev (MVUE) UCL	12.32	
95% Chebyshev (MVUE) UCL	12.79	97.5% Chebyshev (MVUE) UCL	13.46	
99% Chebyshev (MVUE) UCL	14.76			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	11.83	95% Jackknife UCL	11.86	
95% Standard Bootstrap UCL	11.81	95% Bootstrap-t UCL	11.85	
95% Hall's Bootstrap UCL	11.86	95% Percentile Bootstrap UCL	11.83	
95% BCA Bootstrap UCL	11.78			
90% Chebyshev(Mean, Sd) UCL	12.3	95% Chebyshev(Mean, Sd) UCL	12.77	
97.5% Chebyshev(Mean, Sd) UCL	13.43	99% Chebyshev(Mean, Sd) UCL	14.72	
Suggested UCL to Use				
95% Student's-t UCL	11.86			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
Number of Detects	3	Number of Non-Detects	17	
Number of Distinct Detects	3	Number of Distinct Non-Detects	17	
Minimum Detect	0.002	Minimum Non-Detect	0.00784	
Maximum Detect	0.0188	Maximum Non-Detect	0.00979	
Variance Detects	9.1324E-5	Percent Non-Detects	85%	
Mean Detects	0.00776	SD Detects	0.00956	
Median Detects	0.00249	CV Detects	1.232	
Skewness Detects	1.727	Kurtosis Detects	N/A	
Mean of Logged Detects	-5.395	SD of Logged Detects	1.236	
Warning: Data set has only 3 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.772	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00307	KM Standard Error of Mean	0.00101	
KM SD	0.00361	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.00481	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.00473	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	0.0061	95% KM Chebyshev UCL	0.00747	
97.5% KM Chebyshev UCL	0.00937	99% KM Chebyshev UCL	0.0131	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.068	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.00727	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	6.407	nu star (bias corrected)	N/A	

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (detects)	0.00776		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.002	Mean	0.00966
Maximum	0.0188	Median	0.01
SD	0.00321	CV	0.332
k hat (MLE)	6.09	k star (bias corrected MLE)	5.21
Theta hat (MLE)	0.00159	Theta star (bias corrected MLE)	0.00185
nu hat (MLE)	243.6	nu star (bias corrected)	208.4
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (208.39, α)	176	Adjusted Chi Square Value (208.39, β)	173.6
95% Gamma Approximate UCL (use when n>=50)	0.0114	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00307	SD (KM)	0.00361
Variance (KM)	1.3064E-5	SE of Mean (KM)	0.00101
k hat (KM)	0.722	k star (KM)	0.647
nu hat (KM)	28.87	nu star (KM)	25.88
theta hat (KM)	0.00425	theta star (KM)	0.00475
80% gamma percentile (KM)	0.00506	90% gamma percentile (KM)	0.00785
95% gamma percentile (KM)	0.0108	99% gamma percentile (KM)	0.0177
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (25.88, α)	15.28	Adjusted Chi Square Value (25.88, β)	14.64
95% Gamma Approximate KM-UCL (use when n>=50)	0.0052	95% Gamma Adjusted KM-UCL (use when n<50)	0.00543
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.824	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.353	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00318	Mean in Log Scale	-5.946
SD in Original Scale	0.00367	SD in Log Scale	0.466
95% t UCL (assumes normality of ROS data)	0.0046	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	0.00361		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-5.999	KM Geo Mean	0.00248
KM SD (logged)	0.477	95% Critical H Value (KM-Log)	1.997
KM Standard Error of Mean (logged)	0.157	95% H-UCL (KM -Log)	0.00346
KM SD (logged)	0.477	95% Critical H Value (KM-Log)	1.997
KM Standard Error of Mean (logged)	0.157		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00498	Mean in Log Scale	-5.405
SD in Original Scale	0.00333	SD in Log Scale	0.404
95% t UCL (Assumes normality)	0.00627	95% H-Stat UCL	0.00583
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00481		

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Lithium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	0	Number of Non-Detects	20
Number of Distinct Detects	0	Number of Distinct Non-Detects	20

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lithium was not processed!

Manganese

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	5.293	Mean	40.56
Maximum	66.05	Median	45.89
SD	18.47	Std. Error of Mean	4.131
Coefficient of Variation	0.455	Skewness	-0.521

Normal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.159	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	47.7	95% Adjusted-CLT UCL (Chen-1995)	46.84
		95% Modified-t UCL (Johnson-1978)	47.62

Gamma GOF Test

A-D Test Statistic	1.021	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.211	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.195	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.18	k star (bias corrected MLE)	2.736
Theta hat (MLE)	12.75	Theta star (bias corrected MLE)	14.82
nu hat (MLE)	127.2	nu star (bias corrected)	109.5
MLE Mean (bias corrected)	40.56	MLE Sd (bias corrected)	24.52
		Approximate Chi Square Value (0.05)	86.31
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	84.68

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	51.43	95% Adjusted Gamma UCL (use when n<50)	52.42

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.666	Mean of logged Data	3.537	
Maximum of Logged Data	4.19	SD of logged Data	0.69	
Assuming Lognormal Distribution				
95% H-UCL	62	90% Chebyshev (MVUE) UCL	64.18	
95% Chebyshev (MVUE) UCL	73.77	97.5% Chebyshev (MVUE) UCL	87.1	
99% Chebyshev (MVUE) UCL	113.3			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	47.35	95% Jackknife UCL	47.7	
95% Standard Bootstrap UCL	47.11	95% Bootstrap-t UCL	47.33	
95% Hall's Bootstrap UCL	46.82	95% Percentile Bootstrap UCL	46.75	
95% BCA Bootstrap UCL	46.62			
90% Chebyshev(Mean, Sd) UCL	52.95	95% Chebyshev(Mean, Sd) UCL	58.56	
97.5% Chebyshev(Mean, Sd) UCL	66.35	99% Chebyshev(Mean, Sd) UCL	81.65	
Suggested UCL to Use				
95% Student's-t UCL	47.7			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be				
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Mercury				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
		Number of Missing Observations	0	
Minimum	0.00112	Mean	0.0106	
Maximum	0.0211	Median	0.0115	
SD	0.00627	Std. Error of Mean	0.0014	
Coefficient of Variation	0.59	Skewness	0.0666	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.0131	95% Adjusted-CLT UCL (Chen-1995)	0.013	
		95% Modified-t UCL (Johnson-1978)	0.0131	
Gamma GOF Test				
A-D Test Statistic	0.686	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.218	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.196	Data Not Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	2.057	k star (bias corrected MLE)	1.782	

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Theta hat (MLE)	0.00517	Theta star (bias corrected MLE)	0.00597
	nu hat (MLE)	82.27	nu star (bias corrected)	71.27
	MLE Mean (bias corrected)	0.0106	MLE Sd (bias corrected)	0.00797
			Approximate Chi Square Value (0.05)	52.83
	Adjusted Level of Significance	0.038	Adjusted Chi Square Value	51.58
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	0.0144	95% Adjusted Gamma UCL (use when n<50)	0.0147
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.239	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level	
	Data Not Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	-6.792	Mean of logged Data	-4.805
	Maximum of Logged Data	-3.858	SD of logged Data	0.866
	Assuming Lognormal Distribution			
	95% H-UCL	0.0194	90% Chebyshev (MVUE) UCL	0.019
	95% Chebyshev (MVUE) UCL	0.0224	97.5% Chebyshev (MVUE) UCL	0.027
	99% Chebyshev (MVUE) UCL	0.0362		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	0.0129	95% Jackknife UCL	0.0131
	95% Standard Bootstrap UCL	0.0129	95% Bootstrap-t UCL	0.0133
	95% Hall's Bootstrap UCL	0.0129	95% Percentile Bootstrap UCL	0.0129
	95% BCA Bootstrap UCL	0.0129		
	90% Chebyshev(Mean, Sd) UCL	0.0149	95% Chebyshev(Mean, Sd) UCL	0.0168
	97.5% Chebyshev(Mean, Sd) UCL	0.0194	99% Chebyshev(Mean, Sd) UCL	0.0246
	Suggested UCL to Use			
	95% Student's-t UCL	0.0131		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Methyl Mercury			
	General Statistics			
	Total Number of Observations	20	Number of Distinct Observations	19
	Number of Detects	4	Number of Non-Detects	16
	Number of Distinct Detects	4	Number of Distinct Non-Detects	15
	Minimum Detect	5.7690E-4	Minimum Non-Detect	1.1605E-5
	Maximum Detect	0.00111	Maximum Non-Detect	0.00101
	Variance Detects	5.3914E-8	Percent Non-Detects	80%
	Mean Detects	7.9973E-4	SD Detects	2.3219E-4
	Median Detects	7.5400E-4	CV Detects	0.29
	Skewness Detects	0.987	Kurtosis Detects	0.704
	Mean of Logged Detects	-7.161	SD of Logged Detects	0.281
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
	Detected Data appear Normal at 5% Significance Level			

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	5.5362E-4	KM Standard Error of Mean	1.7234E-4
KM SD	3.2687E-4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	8.5163E-4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	8.3710E-4	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00107	95% KM Chebyshev UCL	0.0013
97.5% KM Chebyshev UCL	0.00163	99% KM Chebyshev UCL	0.00227
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.237	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.394	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	16.7	k star (bias corrected MLE)	4.341
Theta hat (MLE)	4.7896E-5	Theta star (bias corrected MLE)	1.8423E-4
nu hat (MLE)	133.6	nu star (bias corrected)	34.73
Mean (detects)	7.9973E-4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	5.7690E-4	Mean	0.00816
Maximum	0.01	Median	0.01
SD	0.00378	CV	0.463
k hat (MLE)	1.772	k star (bias corrected MLE)	1.54
Theta hat (MLE)	0.0046	Theta star (bias corrected MLE)	0.0053
nu hat (MLE)	70.89	nu star (bias corrected)	61.59
Adjusted Level of Significance (β)	0.038		
Approximate Chi Square Value (61.59, α)	44.54	Adjusted Chi Square Value (61.59, β)	43.39
95% Gamma Approximate UCL (use when n>=50)	0.0113	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	5.5362E-4	SD (KM)	3.2687E-4
Variance (KM)	1.0685E-7	SE of Mean (KM)	1.7234E-4
k hat (KM)	2.869	k star (KM)	2.472
nu hat (KM)	114.7	nu star (KM)	98.86
theta hat (KM)	1.9299E-4	theta star (KM)	2.2399E-4
80% gamma percentile (KM)	8.0820E-4	90% gamma percentile (KM)	0.00103
95% gamma percentile (KM)	0.00123	99% gamma percentile (KM)	0.00168
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (98.86, α)	76.93	Adjusted Chi Square Value (98.86, β)	75.4
95% Gamma Approximate KM-UCL (use when n>=50)	7.1150E-4	95% Gamma Adjusted KM-UCL (use when n<50)	7.2592E-4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.4864E-4	Mean in Log Scale	-7.356
SD in Original Scale	1.2909E-4	SD in Log Scale	0.172
95% t UCL (assumes normality of ROS data)	6.9855E-4	95% Percentile Bootstrap UCL	6.9820E-4
95% BCA Bootstrap UCL	7.1930E-4	95% Bootstrap t UCL	7.4917E-4
95% H-UCL (Log ROS)	6.9506E-4		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	KM Mean (logged)				-8.227	KM Geo Mean						2.6723E-4
	KM SD (logged)				1.758	95% Critical H Value (KM-Log)						3.872
	KM Standard Error of Mean (logged)				0.976	95% H-UCL (KM -Log)						0.00597
	KM SD (logged)				1.758	95% Critical H Value (KM-Log)						3.872
	KM Standard Error of Mean (logged)				0.976							
	DL/2 Statistics											
	DL/2 Normal					**DL/2 Log-Transformed**						
	Mean in Original Scale				5.2097E-4	Mean in Log Scale						-7.765
	SD in Original Scale				2.0053E-4	SD in Log Scale						1.035
	95% t UCL (Assumes normality)				5.9851E-4	95% H-Stat UCL						0.00137
	DL/2 is not a recommended method, provided for comparisons and historical reasons											
	Nonparametric Distribution Free UCL Statistics											
	Detected Data appear Normal Distributed at 5% Significance Level											
	Suggested UCL to Use											
	95% KM (t) UCL				8.5163E-4							
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
	Recommendations are based upon data size, data distribution, and skewness.											
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
	Molybdenum											
	General Statistics											
	Total Number of Observations				20	Number of Distinct Observations						19
	Number of Detects				1	Number of Non-Detects						19
	Number of Distinct Detects				1	Number of Distinct Non-Detects						18
	Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!											
	It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).											
	The data set for variable Molybdenum was not processed!											
	Nickel											
	General Statistics											
	Total Number of Observations				20	Number of Distinct Observations						20
						Number of Missing Observations						0
	Minimum				0.595	Mean						2.724
	Maximum				4.495	Median						2.986
	SD				1.185	Std. Error of Mean						0.265
	Coefficient of Variation				0.435	Skewness						-0.293
	Normal GOF Test											
	Shapiro Wilk Test Statistic				0.928	**Shapiro Wilk GOF Test**						
	5% Shapiro Wilk Critical Value				0.905	Data appear Normal at 5% Significance Level						
	Lilliefors Test Statistic				0.168	**Lilliefors GOF Test**						
	5% Lilliefors Critical Value				0.192	Data appear Normal at 5% Significance Level						
	Data appear Normal at 5% Significance Level											
	Assuming Normal Distribution											
	95% Normal UCL					**95% UCLs (Adjusted for Skewness)**						
	95% Student's-t UCL				3.182	95% Adjusted-CLT UCL (Chen-1995)						3.141
						95% Modified-t UCL (Johnson-1978)						3.179
	Gamma GOF Test											
	A-D Test Statistic				0.87	**Anderson-Darling Gamma GOF Test**						
	5% A-D Critical Value				0.745	Data Not Gamma Distributed at 5% Significance Level						
	K-S Test Statistic				0.181	**Kolmogorov-Smirnov Gamma GOF Test**						
	5% K-S Critical Value				0.195	Detected data appear Gamma Distributed at 5% Significance Level						
	Detected data follow Appr. Gamma Distribution at 5% Significance Level											

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics				
k hat (MLE)	4.134	k star (bias corrected MLE)	3.547	
Theta hat (MLE)	0.659	Theta star (bias corrected MLE)	0.768	
nu hat (MLE)	165.4	nu star (bias corrected)	141.9	
MLE Mean (bias corrected)	2.724	MLE Sd (bias corrected)	1.446	
		Approximate Chi Square Value (0.05)	115.4	
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	113.5	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	3.35	95% Adjusted Gamma UCL (use when n<50)	3.406	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.199	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.192	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.519	Mean of logged Data	0.876	
Maximum of Logged Data	1.503	SD of logged Data	0.57	
Assuming Lognormal Distribution				
95% H-UCL	3.711	90% Chebyshev (MVUE) UCL	3.918	
95% Chebyshev (MVUE) UCL	4.425	97.5% Chebyshev (MVUE) UCL	5.128	
99% Chebyshev (MVUE) UCL	6.51			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	3.16	95% Jackknife UCL	3.182	
95% Standard Bootstrap UCL	3.15	95% Bootstrap-t UCL	3.15	
95% Hall's Bootstrap UCL	3.123	95% Percentile Bootstrap UCL	3.14	
95% BCA Bootstrap UCL	3.127			
90% Chebyshev(Mean, Sd) UCL	3.519	95% Chebyshev(Mean, Sd) UCL	3.879	
97.5% Chebyshev(Mean, Sd) UCL	4.378	99% Chebyshev(Mean, Sd) UCL	5.36	
Suggested UCL to Use				
95% Student's-t UCL	3.182			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Selenium				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
Number of Detects	13	Number of Non-Detects	7	
Number of Distinct Detects	13	Number of Distinct Non-Detects	7	
Minimum Detect	0.0532	Minimum Non-Detect	0.118	
Maximum Detect	0.106	Maximum Non-Detect	0.144	
Variance Detects	3.0896E-4	Percent Non-Detects	35%	
Mean Detects	0.0781	SD Detects	0.0176	
Median Detects	0.0797	CV Detects	0.225	
Skewness Detects	-0.0235	Kurtosis Detects	-1.399	
Mean of Logged Detects	-2.574	SD of Logged Detects	0.233	
Normal GOF Test on Detects Only				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.234	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0781	KM Standard Error of Mean	0.00488	
KM SD	0.0169	95% KM (BCA) UCL	0.0856	
95% KM (t) UCL	0.0865	95% KM (Percentile Bootstrap) UCL	0.0858	
95% KM (z) UCL	0.0861	95% KM Bootstrap t UCL	0.0866	
90% KM Chebyshev UCL	0.0927	95% KM Chebyshev UCL	0.0993	
97.5% KM Chebyshev UCL	0.109	99% KM Chebyshev UCL	0.127	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.391	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.173	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.236	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	20.65	k star (bias corrected MLE)	15.94	
Theta hat (MLE)	0.00378	Theta star (bias corrected MLE)	0.0049	
nu hat (MLE)	536.9	nu star (bias corrected)	414.3	
Mean (detects)	0.0781			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.0532	Mean	0.0777	
Maximum	0.106	Median	0.0771	
SD	0.014	CV	0.18	
k hat (MLE)	31.64	k star (bias corrected MLE)	26.93	
Theta hat (MLE)	0.00246	Theta star (bias corrected MLE)	0.00289	
nu hat (MLE)	1266	nu star (bias corrected)	1077	
Adjusted Level of Significance (β)	0.038			
Approximate Chi Square Value (N/A, α)	1002	Adjusted Chi Square Value (N/A, β)	996.3	
95% Gamma Approximate UCL (use when n>=50)	0.0836	95% Gamma Adjusted UCL (use when n<50)	0.084	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.0781	SD (KM)	0.0169	
Variance (KM)	2.8519E-4	SE of Mean (KM)	0.00488	
k hat (KM)	21.38	k star (KM)	18.2	
nu hat (KM)	855.1	nu star (KM)	728.2	
theta hat (KM)	0.00365	theta star (KM)	0.00429	
80% gamma percentile (KM)	0.0929	90% gamma percentile (KM)	0.102	
95% gamma percentile (KM)	0.11	99% gamma percentile (KM)	0.127	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (728.17, α)	666.6	Adjusted Chi Square Value (728.17, β)	661.9	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0853	95% Gamma Adjusted KM-UCL (use when n<50)	0.0859	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.234	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0774	Mean in Log Scale	-2.574	

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	0.014	SD in Log Scale	0.185
95% t UCL (assumes normality of ROS data)	0.0828	95% Percentile Bootstrap UCL	0.0826
95% BCA Bootstrap UCL	0.0825	95% Bootstrap t UCL	0.0828
95% H-UCL (Log ROS)	0.0836		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.574	KM Geo Mean	0.0762
KM SD (logged)	0.223	95% Critical H Value (KM-Log)	1.8
KM Standard Error of Mean (logged)	0.0645	95% H-UCL (KM -Log)	0.0857
KM SD (logged)	0.223	95% Critical H Value (KM-Log)	1.8
KM Standard Error of Mean (logged)	0.0645		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0748	Mean in Log Scale	-2.612
SD in Original Scale	0.0149	SD in Log Scale	0.196
95% t UCL (Assumes normality)	0.0805	95% H-Stat UCL	0.0811
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0865		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Silver			
General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
Number of Detects	2	Number of Non-Detects	18
Number of Distinct Detects	2	Number of Distinct Non-Detects	18
Minimum Detect	0.00167	Minimum Non-Detect	0.00392
Maximum Detect	0.00929	Maximum Non-Detect	0.0049
Variance Detects	2.9009E-5	Percent Non-Detects	90%
Mean Detects	0.00548	SD Detects	0.00539
Median Detects	0.00548	CV Detects	0.983
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-5.538	SD of Logged Detects	1.214
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00205	KM Standard Error of Mean	5.2497E-4
KM SD	0.00166	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.00296	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00291	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00362	95% KM Chebyshev UCL	0.00434
97.5% KM Chebyshev UCL	0.00533	99% KM Chebyshev UCL	0.00727
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.66	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0033	Theta star (bias corrected MLE)	N/A

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	6.641	nu star (bias corrected)	N/A
	Mean (detects)	0.00548		
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.00205	SD (KM)	0.00166
	Variance (KM)	2.7559E-6	SE of Mean (KM)	5.2497E-4
	k hat (KM)	1.523	k star (KM)	1.328
	nu hat (KM)	60.93	nu star (KM)	53.12
	theta hat (KM)	0.00135	theta star (KM)	0.00154
	80% gamma percentile (KM)	0.00321	90% gamma percentile (KM)	0.0044
	95% gamma percentile (KM)	0.00556	99% gamma percentile (KM)	0.00821
	Gamma Kaplan-Meier (KM) Statistics			
			Adjusted Level of Significance (β)	0.038
	Approximate Chi Square Value (53.12, α)	37.38	Adjusted Chi Square Value (53.12, β)	36.34
	95% Gamma Approximate KM-UCL (use when n>=50)	0.00291	95% Gamma Adjusted KM-UCL (use when n<50)	0.003
	Lognormal GOF Test on Detected Observations Only			
	Not Enough Data to Perform GOF Test			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.00205	Mean in Log Scale	-6.31
	SD in Original Scale	0.0017	SD in Log Scale	0.384
	95% t UCL (assumes normality of ROS data)	0.00271	95% Percentile Bootstrap UCL	N/A
	95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
	95% H-UCL (Log ROS)	0.00232		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-6.31	KM Geo Mean	0.00182
	KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.908
	KM Standard Error of Mean (logged)	0.118	95% H-UCL (KM -Log)	0.0023
	KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.908
	KM Standard Error of Mean (logged)	0.118		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.00256	Mean in Log Scale	-6.05
	SD in Original Scale	0.00159	SD in Log Scale	0.333
	95% t UCL (Assumes normality)	0.00317	95% H-Stat UCL	0.00288
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	0.00434		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Thallium			
	General Statistics			
	Total Number of Observations	20	Number of Distinct Observations	20
	Number of Detects	15	Number of Non-Detects	5
	Number of Distinct Detects	15	Number of Distinct Non-Detects	5
	Minimum Detect	0.00522	Minimum Non-Detect	9.9150E-4
	Maximum Detect	0.446	Maximum Non-Detect	0.00131
	Variance Detects	0.0191	Percent Non-Detects	25%
	Mean Detects	0.173	SD Detects	0.138
	Median Detects	0.117	CV Detects	0.798
	Skewness Detects	0.647	Kurtosis Detects	-0.83
	Mean of Logged Detects	-2.235	SD of Logged Detects	1.245

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.22	Detected Data Not Normal at 5% Significance Level		
Detected Data appear Approximate Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.13	KM Standard Error of Mean	0.0319	
KM SD	0.138	95% KM (BCA) UCL	0.185	
95% KM (t) UCL	0.185	95% KM (Percentile Bootstrap) UCL	0.184	
95% KM (z) UCL	0.183	95% KM Bootstrap t UCL	0.194	
90% KM Chebyshev UCL	0.226	95% KM Chebyshev UCL	0.269	
97.5% KM Chebyshev UCL	0.329	99% KM Chebyshev UCL	0.447	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.479	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.76	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.184	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.227	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.174	k star (bias corrected MLE)	0.984	
Theta hat (MLE)	0.148	Theta star (bias corrected MLE)	0.176	
nu hat (MLE)	35.23	nu star (bias corrected)	29.52	
Mean (detects)	0.173			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00522	Mean	0.132	
Maximum	0.446	Median	0.0996	
SD	0.139	CV	1.05	
k hat (MLE)	0.743	k star (bias corrected MLE)	0.665	
Theta hat (MLE)	0.178	Theta star (bias corrected MLE)	0.199	
nu hat (MLE)	29.73	nu star (bias corrected)	26.6	
Adjusted Level of Significance (β)	0.038			
Approximate Chi Square Value (26.60, α)	15.84	Adjusted Chi Square Value (26.60, β)	15.19	
95% Gamma Approximate UCL (use when n>=50)	0.222	95% Gamma Adjusted UCL (use when n<50)	0.232	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.13	SD (KM)	0.138	
Variance (KM)	0.0189	SE of Mean (KM)	0.0319	
k hat (KM)	0.895	k star (KM)	0.794	
nu hat (KM)	35.79	nu star (KM)	31.76	
theta hat (KM)	0.146	theta star (KM)	0.164	
80% gamma percentile (KM)	0.213	90% gamma percentile (KM)	0.317	
95% gamma percentile (KM)	0.424	99% gamma percentile (KM)	0.675	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (31.76, α)	19.88	Adjusted Chi Square Value (31.76, β)	19.14	
95% Gamma Approximate KM-UCL (use when n>=50)	0.208	95% Gamma Adjusted KM-UCL (use when n<50)	0.216	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.253	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.22	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.132	Mean in Log Scale	-2.886	
SD in Original Scale	0.14	SD in Log Scale	1.574	
95% t UCL (assumes normality of ROS data)	0.186	95% Percentile Bootstrap UCL	0.184	
95% BCA Bootstrap UCL	0.188	95% Bootstrap t UCL	0.199	
95% H-UCL (Log ROS)	0.695			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-3.406	KM Geo Mean	0.0332	
KM SD (logged)	2.279	95% Critical H Value (KM-Log)	4.814	
KM Standard Error of Mean (logged)	0.527	95% H-UCL (KM -Log)	5.515	
KM SD (logged)	2.279	95% Critical H Value (KM-Log)	4.814	
KM Standard Error of Mean (logged)	0.527			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.13	Mean in Log Scale	-3.564	
SD in Original Scale	0.141	SD in Log Scale	2.592	
95% t UCL (Assumes normality)	0.185	95% H-Stat UCL	20.17	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.185			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
Number of Detects	0	Number of Non-Detects	20	
Number of Distinct Detects	0	Number of Distinct Non-Detects	20	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Vanadium was not processed!				
Zinc				
General Statistics				
Total Number of Observations	20	Number of Distinct Observations	20	
		Number of Missing Observations	0	
Minimum	6.394	Mean	7.981	
Maximum	9.696	Median	8.025	
SD	0.959	Std. Error of Mean	0.214	
Coefficient of Variation	0.12	Skewness	-0.187	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0987	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.192	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				

Table E1-9
Acorns, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8.352		95% Adjusted-CLT UCL (Chen-1995)	8.324
			95% Modified-t UCL (Johnson-1978)	8.35
Gamma GOF Test				
A-D Test Statistic	0.354		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.74		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.109		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.193		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	71.01		k star (bias corrected MLE)	60.39
Theta hat (MLE)	0.112		Theta star (bias corrected MLE)	0.132
nu hat (MLE)	2840		nu star (bias corrected)	2416
MLE Mean (bias corrected)	7.981		MLE Sd (bias corrected)	1.027
			Approximate Chi Square Value (0.05)	2302
Adjusted Level of Significance	0.038		Adjusted Chi Square Value	2294
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	8.373		95% Adjusted Gamma UCL (use when n<50)	8.405
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.946		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.905		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.192		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.855		Mean of logged Data	2.07
Maximum of Logged Data	2.272		SD of logged Data	0.123
Assuming Lognormal Distribution				
95% H-UCL	8.387		90% Chebyshev (MVUE) UCL	8.641
95% Chebyshev (MVUE) UCL	8.94		97.5% Chebyshev (MVUE) UCL	9.355
99% Chebyshev (MVUE) UCL	10.17			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	8.333		95% Jackknife UCL	8.352
95% Standard Bootstrap UCL	8.323		95% Bootstrap-t UCL	8.328
95% Hall's Bootstrap UCL	8.319		95% Percentile Bootstrap UCL	8.324
95% BCA Bootstrap UCL	8.304			
90% Chebyshev(Mean, Sd) UCL	8.624		95% Chebyshev(Mean, Sd) UCL	8.915
97.5% Chebyshev(Mean, Sd) UCL	9.32		99% Chebyshev(Mean, Sd) UCL	10.11
Suggested UCL to Use				
95% Student's-t UCL	8.352			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/14/2019 3:00:53 PM
From File	Plant_CattailsStalk_UCLData_20191114.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.664	Minimum Non-Detect	0.694
Maximum Detect	5.634	Maximum Non-Detect	0.694
Variance Detects	2.495	Percent Non-Detects	10%
Mean Detects	1.954	SD Detects	1.579
Median Detects	1.575	CV Detects	0.808
Skewness Detects	1.849	Kurtosis Detects	3.698
Mean of Logged Detects	0.432	SD of Logged Detects	0.71

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.796	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.826	KM Standard Error of Mean	0.491
KM SD	1.464	95% KM (BCA) UCL	2.711
95% KM (t) UCL	2.726	95% KM (Percentile Bootstrap) UCL	2.645
95% KM (z) UCL	2.634	95% KM Bootstrap t UCL	3.781
90% KM Chebyshev UCL	3.299	95% KM Chebyshev UCL	3.966
97.5% KM Chebyshev UCL	4.892	99% KM Chebyshev UCL	6.711

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.343	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.154	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.254	k star (bias corrected MLE)	1.576
Theta hat (MLE)	0.867	Theta star (bias corrected MLE)	1.239
nu hat (MLE)	40.56	nu star (bias corrected)	28.38
Mean (detects)	1.954		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.181	Mean	1.777
Maximum	5.634	Median	1.448
SD	1.591	CV	0.896
k hat (MLE)	1.546	k star (bias corrected MLE)	1.149
Theta hat (MLE)	1.149	Theta star (bias corrected MLE)	1.547
nu hat (MLE)	30.92	nu star (bias corrected)	22.97
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (22.97, α)	13.07	Adjusted Chi Square Value (22.97, β)	11.79

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	3.123	95% Gamma Adjusted UCL (use when n<50)	3.461
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.826	SD (KM)	1.464
Variance (KM)	2.142	SE of Mean (KM)	0.491
k hat (KM)	1.557	k star (KM)	1.157
nu hat (KM)	31.14	nu star (KM)	23.13
theta hat (KM)	1.173	theta star (KM)	1.579
80% gamma percentile (KM)	2.902	90% gamma percentile (KM)	4.057
95% gamma percentile (KM)	5.199	99% gamma percentile (KM)	7.824
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.13, α)	13.19	Adjusted Chi Square Value (23.13, β)	11.91
95% Gamma Approximate KM-UCL (use when n>=50)	3.203	95% Gamma Adjusted KM-UCL (use when n<50)	3.549
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.145	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.819	Mean in Log Scale	0.338
SD in Original Scale	1.549	SD in Log Scale	0.732
95% t UCL (assumes normality of ROS data)	2.717	95% Percentile Bootstrap UCL	2.701
95% BCA Bootstrap UCL	2.92	95% Bootstrap t UCL	3.627
95% H-UCL (Log ROS)	3.445		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.35	KM Geo Mean	1.419
KM SD (logged)	0.681	95% Critical H Value (KM-Log)	2.499
KM Standard Error of Mean (logged)	0.228	95% H-UCL (KM -Log)	3.155
KM SD (logged)	0.681	95% Critical H Value (KM-Log)	2.499
KM Standard Error of Mean (logged)	0.228		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.793	Mean in Log Scale	0.283
SD in Original Scale	1.573	SD in Log Scale	0.818
95% t UCL (Assumes normality)	2.705	95% H-Stat UCL	3.921
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	2.726		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.00526	Minimum Non-Detect	0.00874
Maximum Detect	0.0475	Maximum Non-Detect	0.012

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance Detects	8.9169E-4	Percent Non-Detects	80%
Mean Detects	0.0264	SD Detects	0.0299
Median Detects	0.0264	CV Detects	1.132
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-4.147	SD of Logged Detects	1.556

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00948	KM Standard Error of Mean	0.00567
KM SD	0.0127	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0199	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0188	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0265	95% KM Chebyshev UCL	0.0342
97.5% KM Chebyshev UCL	0.0449	99% KM Chebyshev UCL	0.0659

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	1.113	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0237	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	4.454	nu star (bias corrected)	N/A
Mean (detects)	0.0264		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00948	SD (KM)	0.0127
Variance (KM)	1.6050E-4	SE of Mean (KM)	0.00567
k hat (KM)	0.56	k star (KM)	0.459
nu hat (KM)	11.21	nu star (KM)	9.177
theta hat (KM)	0.0169	theta star (KM)	0.0207
80% gamma percentile (KM)	0.0155	90% gamma percentile (KM)	0.0261
95% gamma percentile (KM)	0.0376	99% gamma percentile (KM)	0.0659

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (9.18, α)	3.434	Adjusted Chi Square Value (9.18, β)	2.852
95% Gamma Approximate KM-UCL (use when n>=50)	0.0253	95% Gamma Adjusted KM-UCL (use when n<50)	0.0305

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.00948	Mean in Log Scale	-5.028
SD in Original Scale	0.0134	SD in Log Scale	0.696
95% t UCL (assumes normality of ROS data)	0.0172	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	0.015		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.028	KM Geo Mean	0.00655
KM SD (logged)	0.66	95% Critical H Value (KM-Log)	2.465
KM Standard Error of Mean (logged)	0.295	95% H-UCL (KM -Log)	0.014
KM SD (logged)	0.66	95% Critical H Value (KM-Log)	2.465
KM Standard Error of Mean (logged)	0.295		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00944	Mean in Log Scale	-5.04
SD in Original Scale	0.0134	SD in Log Scale	0.708

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (Assumes normality)	0.0172	95% H-Stat UCL	0.0152
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
975% KM (Chebyshev) UCL	0.0449		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.036	Minimum Non-Detect	0.0697
Maximum Detect	0.045	Maximum Non-Detect	0.095
Variance Detects	4.0320E-5	Percent Non-Detects	80%
Mean Detects	0.0405	SD Detects	0.00635
Median Detects	0.0405	CV Detects	0.157
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-3.213	SD of Logged Detects	0.158
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0405	KM Standard Error of Mean	0.00449
KM SD	0.00449	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0487	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0479	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0539	95% KM Chebyshev UCL	0.06
97.5% KM Chebyshev UCL	0.0685	99% KM Chebyshev UCL	0.0851
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	80.91	k star (bias corrected MLE)	N/A
Theta hat (MLE)	5.0021E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	323.6	nu star (bias corrected)	N/A
Mean (detects)	0.0405		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0405	SD (KM)	0.00449
Variance (KM)	2.0160E-5	SE of Mean (KM)	0.00449
k hat (KM)	81.24	k star (KM)	56.94
nu hat (KM)	1625	nu star (KM)	1139
theta hat (KM)	4.9815E-4	theta star (KM)	7.1081E-4
80% gamma percentile (KM)	0.0449	90% gamma percentile (KM)	0.0475
95% gamma percentile (KM)	0.0497	99% gamma percentile (KM)	0.054
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (N/A, α)	1061	Adjusted Chi Square Value (N/A, β)	1048

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate KM-UCL (use when n>=50)	0.0434	95% Gamma Adjusted KM-UCL (use when n<50)	0.044
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0403	Mean in Log Scale	-3.213
SD in Original Scale	0.00212	SD in Log Scale	0.0525
95% t UCL (assumes normality of ROS data)	0.0415	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	N/A		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.213	KM Geo Mean	0.0402
KM SD (logged)	0.111	95% Critical H Value (KM-Log)	1.81
KM Standard Error of Mean (logged)	0.111	95% H-UCL (KM -Log)	0.0433
KM SD (logged)	0.111	95% Critical H Value (KM-Log)	1.81
KM Standard Error of Mean (logged)	0.111		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0413	Mean in Log Scale	-3.192
SD in Original Scale	0.00479	SD in Log Scale	0.117
95% t UCL (Assumes normality)	0.0441	95% H-Stat UCL	0.0444
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0487	KM H-UCL	0.0433
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	3.761	Mean	4.982
Maximum	7.752	Median	4.796
SD	1.28	Std. Error of Mean	0.405
Coefficient of Variation	0.257	Skewness	1.208
Normal GOF Test			
Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.724	95% Adjusted-CLT UCL (Chen-1995)	5.813
		95% Modified-t UCL (Johnson-1978)	5.749
Gamma GOF Test			
A-D Test Statistic	0.387	**Anderson-Darling Gamma GOF Test**	

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.163	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	18.76	k star (bias corrected MLE)	13.2	
Theta hat (MLE)	0.266	Theta star (bias corrected MLE)	0.377	
nu hat (MLE)	375.3	nu star (bias corrected)	264	
MLE Mean (bias corrected)	4.982	MLE Sd (bias corrected)	1.371	
		Approximate Chi Square Value (0.05)	227.4	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	221.5	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	5.784	95% Adjusted Gamma UCL (use when n<50)	5.938	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.325	Mean of logged Data	1.579	
Maximum of Logged Data	2.048	SD of logged Data	0.239	
Assuming Lognormal Distribution				
95% H-UCL	5.813	90% Chebyshev (MVUE) UCL	6.108	
95% Chebyshev (MVUE) UCL	6.621	97.5% Chebyshev (MVUE) UCL	7.333	
99% Chebyshev (MVUE) UCL	8.732			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	5.647	95% Jackknife UCL	5.724	
95% Standard Bootstrap UCL	5.609	95% Bootstrap-t UCL	6.081	
95% Hall's Bootstrap UCL	6.478	95% Percentile Bootstrap UCL	5.648	
95% BCA Bootstrap UCL	5.771			
90% Chebyshev(Mean, Sd) UCL	6.196	95% Chebyshev(Mean, Sd) UCL	6.746	
97.5% Chebyshev(Mean, Sd) UCL	7.509	99% Chebyshev(Mean, Sd) UCL	9.009	
Suggested UCL to Use				
95% Student's-t UCL	5.724			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	10	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Beryllium was not processed!				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Boron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	8	Number of Non-Detects	2	
Number of Distinct Detects	8	Number of Distinct Non-Detects	2	
Minimum Detect	1.56	Minimum Non-Detect	1.078	
Maximum Detect	8.284	Maximum Non-Detect	1.136	
Variance Detects	5.844	Percent Non-Detects	20%	
Mean Detects	3.862	SD Detects	2.418	
Median Detects	2.888	CV Detects	0.626	
Skewness Detects	1.349	Kurtosis Detects	0.342	
Mean of Logged Detects	1.206	SD of Logged Detects	0.555	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.765	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.374	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	3.305	KM Standard Error of Mean	0.781	
KM SD	2.309	95% KM (BCA) UCL	4.59	
95% KM (t) UCL	4.736	95% KM (Percentile Bootstrap) UCL	4.63	
95% KM (z) UCL	4.589	95% KM Bootstrap t UCL	6.659	
90% KM Chebyshev UCL	5.646	95% KM Chebyshev UCL	6.707	
97.5% KM Chebyshev UCL	8.179	99% KM Chebyshev UCL	11.07	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.794	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.72	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.338	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.296	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.594	k star (bias corrected MLE)	2.33	
Theta hat (MLE)	1.074	Theta star (bias corrected MLE)	1.658	
nu hat (MLE)	57.5	nu star (bias corrected)	37.27	
Mean (detects)	3.862			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	3.091	
Maximum	8.284	Median	2.754	
SD	2.68	CV	0.867	
k hat (MLE)	0.573	k star (bias corrected MLE)	0.468	
Theta hat (MLE)	5.392	Theta star (bias corrected MLE)	6.606	
nu hat (MLE)	11.47	nu star (bias corrected)	9.359	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (9.36, α)	3.545	Adjusted Chi Square Value (9.36, β)	2.951	
95% Gamma Approximate UCL (use when n>=50)	8.16	95% Gamma Adjusted UCL (use when n<50)	9.803	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	3.305	SD (KM)	2.309	
Variance (KM)	5.331	SE of Mean (KM)	0.781	
k hat (KM)	2.049	k star (KM)	1.501	
nu hat (KM)	40.97	nu star (KM)	30.01	
theta hat (KM)	1.613	theta star (KM)	2.202	
80% gamma percentile (KM)	5.113	90% gamma percentile (KM)	6.886	

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% gamma percentile (KM)	8.607	99% gamma percentile (KM)	12.49	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (30.01, α)	18.5	Adjusted Chi Square Value (30.01, β)	16.95	
95% Gamma Approximate KM-UCL (use when n>=50)	5.36	95% Gamma Adjusted KM-UCL (use when n<50)	5.852	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.868	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	3.274	Mean in Log Scale	0.948	
SD in Original Scale	2.466	SD in Log Scale	0.73	
95% t UCL (assumes normality of ROS data)	4.703	95% Percentile Bootstrap UCL	4.529	
95% BCA Bootstrap UCL	4.908	95% Bootstrap t UCL	6.414	
95% H-UCL (Log ROS)	6.322			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.979	KM Geo Mean	2.663	
KM SD (logged)	0.648	95% Critical H Value (KM-Log)	2.445	
KM Standard Error of Mean (logged)	0.219	95% H-UCL (KM -Log)	5.571	
KM SD (logged)	0.648	95% Critical H Value (KM-Log)	2.445	
KM Standard Error of Mean (logged)	0.219			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	3.2	Mean in Log Scale	0.846	
SD in Original Scale	2.548	SD in Log Scale	0.902	
95% t UCL (Assumes normality)	4.677	95% H-Stat UCL	8.39	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	5.571			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	4	Number of Non-Detects	6	
Number of Distinct Detects	4	Number of Distinct Non-Detects	6	
Minimum Detect	0.00126	Minimum Non-Detect	0.00347	
Maximum Detect	0.00562	Maximum Non-Detect	0.00475	
Variance Detects	4.8224E-6	Percent Non-Detects	60%	
Mean Detects	0.00331	SD Detects	0.0022	
Median Detects	0.00317	CV Detects	0.664	
Skewness Detects	0.119	Kurtosis Detects	-5.093	
Mean of Logged Detects	-5.911	SD of Logged Detects	0.753	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.281	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00222	KM Standard Error of Mean	5.8622E-4
KM SD	0.00154	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0033	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00319	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00398	95% KM Chebyshev UCL	0.00478
97.5% KM Chebyshev UCL	0.00588	99% KM Chebyshev UCL	0.00806
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.468	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.397	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.67	k star (bias corrected MLE)	0.834
Theta hat (MLE)	0.00124	Theta star (bias corrected MLE)	0.00396
nu hat (MLE)	21.36	nu star (bias corrected)	6.674
Mean (detects)	0.00331		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.00126	Mean	0.00732
Maximum	0.01	Median	0.01
SD	0.00368	CV	0.503
k hat (MLE)	2.528	k star (bias corrected MLE)	1.836
Theta hat (MLE)	0.0029	Theta star (bias corrected MLE)	0.00399
nu hat (MLE)	50.55	nu star (bias corrected)	36.72
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (36.72, α)	23.85	Adjusted Chi Square Value (36.72, β)	22.06
95% Gamma Approximate UCL (use when n>=50)	0.0113	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00222	SD (KM)	0.00154
Variance (KM)	2.3773E-6	SE of Mean (KM)	5.8622E-4
k hat (KM)	2.079	k star (KM)	1.522
nu hat (KM)	41.58	nu star (KM)	30.44
theta hat (KM)	0.00107	theta star (KM)	0.00146
80% gamma percentile (KM)	0.00343	90% gamma percentile (KM)	0.00462
95% gamma percentile (KM)	0.00576	99% gamma percentile (KM)	0.00835
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (30.44, α)	18.84	Adjusted Chi Square Value (30.44, β)	17.27
95% Gamma Approximate KM-UCL (use when n>=50)	0.00359	95% Gamma Adjusted KM-UCL (use when n<50)	0.00392
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.00225	Mean in Log Scale	-6.245
SD in Original Scale	0.00156	SD in Log Scale	0.522
95% t UCL (assumes normality of ROS data)	0.00316	95% Percentile Bootstrap UCL	0.00307
95% BCA Bootstrap UCL	0.00331	95% Bootstrap t UCL	0.0129
95% H-UCL (Log ROS)	0.00329		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-6.282	KM Geo Mean	0.00187	
KM SD (logged)	0.537	95% Critical H Value (KM-Log)	2.272	
KM Standard Error of Mean (logged)	0.212	95% H-UCL (KM -Log)	0.00324	
KM SD (logged)	0.537	95% Critical H Value (KM-Log)	2.272	
KM Standard Error of Mean (logged)	0.212			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00254	Mean in Log Scale	-6.086	
SD in Original Scale	0.00144	SD in Log Scale	0.468	
95% t UCL (Assumes normality)	0.00338	95% H-Stat UCL	0.00357	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.0033			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Chromium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	7	Number of Non-Detects	3	
Number of Distinct Detects	7	Number of Distinct Non-Detects	3	
Minimum Detect	0.0427	Minimum Non-Detect	0.0527	
Maximum Detect	0.242	Maximum Non-Detect	0.0711	
Variance Detects	0.00527	Percent Non-Detects	30%	
Mean Detects	0.128	SD Detects	0.0726	
Median Detects	0.119	CV Detects	0.568	
Skewness Detects	0.687	Kurtosis Detects	-0.722	
Mean of Logged Detects	-2.206	SD of Logged Detects	0.606	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.103	KM Standard Error of Mean	0.0233	
KM SD	0.068	95% KM (BCA) UCL	0.145	
95% KM (t) UCL	0.146	95% KM (Percentile Bootstrap) UCL	0.14	
95% KM (z) UCL	0.141	95% KM Bootstrap t UCL	0.163	
90% KM Chebyshev UCL	0.173	95% KM Chebyshev UCL	0.204	
97.5% KM Chebyshev UCL	0.248	99% KM Chebyshev UCL	0.334	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.226	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.711	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.18	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.523	k star (bias corrected MLE)	2.108	
Theta hat (MLE)	0.0363	Theta star (bias corrected MLE)	0.0606	

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

nu hat (MLE)	49.32	nu star (bias corrected)	29.51
Mean (detects)	0.128		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.023	Mean	0.0976
Maximum	0.242	Median	0.0806
SD	0.0767	CV	0.785
k hat (MLE)	1.788	k star (bias corrected MLE)	1.318
Theta hat (MLE)	0.0546	Theta star (bias corrected MLE)	0.0741
nu hat (MLE)	35.76	nu star (bias corrected)	26.37
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (26.37, α)	15.66	Adjusted Chi Square Value (26.37, β)	14.25
95% Gamma Approximate UCL (use when n>=50)	0.164	95% Gamma Adjusted UCL (use when n<50)	0.181
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.103	SD (KM)	0.068
Variance (KM)	0.00462	SE of Mean (KM)	0.0233
k hat (KM)	2.289	k star (KM)	1.669
nu hat (KM)	45.78	nu star (KM)	33.38
theta hat (KM)	0.0449	theta star (KM)	0.0616
80% gamma percentile (KM)	0.157	90% gamma percentile (KM)	0.209
95% gamma percentile (KM)	0.259	99% gamma percentile (KM)	0.37
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (33.38, α)	21.17	Adjusted Chi Square Value (33.38, β)	19.49
95% Gamma Approximate KM-UCL (use when n>=50)	0.162	95% Gamma Adjusted KM-UCL (use when n<50)	0.176
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.102	Mean in Log Scale	-2.492
SD in Original Scale	0.0722	SD in Log Scale	0.677
95% t UCL (assumes normality of ROS data)	0.144	95% Percentile Bootstrap UCL	0.141
95% BCA Bootstrap UCL	0.145	95% Bootstrap t UCL	0.172
95% H-UCL (Log ROS)	0.183		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.479	KM Geo Mean	0.0838
KM SD (logged)	0.632	95% Critical H Value (KM-Log)	2.418
KM Standard Error of Mean (logged)	0.217	95% H-UCL (KM -Log)	0.17
KM SD (logged)	0.632	95% Critical H Value (KM-Log)	2.418
KM Standard Error of Mean (logged)	0.217		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0984	Mean in Log Scale	-2.6
SD in Original Scale	0.0759	SD in Log Scale	0.808
95% t UCL (Assumes normality)	0.142	95% H-Stat UCL	0.214
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.146		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.00514	Minimum Non-Detect	0.0237
Maximum Detect	0.0112	Maximum Non-Detect	0.0237
Variance Detects	4.3442E-6	Percent Non-Detects	10%
Mean Detects	0.00721	SD Detects	0.00208
Median Detects	0.00687	CV Detects	0.289
Skewness Detects	0.923	Kurtosis Detects	0.146
Mean of Logged Detects	-4.967	SD of Logged Detects	0.275

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.00721	KM Standard Error of Mean	6.9476E-4
KM SD	0.00197	95% KM (BCA) UCL	0.0084
95% KM (t) UCL	0.00849	95% KM (Percentile Bootstrap) UCL	0.00832
95% KM (z) UCL	0.00835	95% KM Bootstrap t UCL	0.009
90% KM Chebyshev UCL	0.0093	95% KM Chebyshev UCL	0.0102
97.5% KM Chebyshev UCL	0.0116	99% KM Chebyshev UCL	0.0141

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.327	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.169	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	14.59	k star (bias corrected MLE)	9.802
Theta hat (MLE)	4.9426E-4	Theta star (bias corrected MLE)	7.3578E-4
nu hat (MLE)	262.7	nu star (bias corrected)	176.4
Mean (detects)	0.00721		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.00514	Mean	0.00749
Maximum	0.0112	Median	0.00724
SD	0.00215	CV	0.288
k hat (MLE)	13.89	k star (bias corrected MLE)	9.788
Theta hat (MLE)	5.3940E-4	Theta star (bias corrected MLE)	7.6532E-4
nu hat (MLE)	277.8	nu star (bias corrected)	195.8
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (195.76, α)	164.4	Adjusted Chi Square Value (195.76, β)	159.4
95% Gamma Approximate UCL (use when n>=50)	0.00892	95% Gamma Adjusted UCL (use when n<50)	0.0092

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00721	SD (KM)	0.00197	
Variance (KM)	3.8615E-6	SE of Mean (KM)	6.9476E-4	
k hat (KM)	13.47	k star (KM)	9.496	
nu hat (KM)	269.4	nu star (KM)	189.9	
theta hat (KM)	5.3541E-4	theta star (KM)	7.5950E-4	
80% gamma percentile (KM)	0.00907	90% gamma percentile (KM)	0.0103	
95% gamma percentile (KM)	0.0114	99% gamma percentile (KM)	0.0137	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (189.92, α)	159	Adjusted Chi Square Value (189.92, β)	154.1	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00861	95% Gamma Adjusted KM-UCL (use when n<50)	0.00889	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00719	Mean in Log Scale	-4.967	
SD in Original Scale	0.00197	SD in Log Scale	0.259	
95% t UCL (assumes normality of ROS data)	0.00833	95% Percentile Bootstrap UCL	0.00825	
95% BCA Bootstrap UCL	0.00833	95% Bootstrap t UCL	0.00887	
95% H-UCL (Log ROS)	0.00852			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-4.967	KM Geo Mean	0.00697	
KM SD (logged)	0.259	95% Critical H Value (KM-Log)	1.936	
KM Standard Error of Mean (logged)	0.0916	95% H-UCL (KM -Log)	0.00852	
KM SD (logged)	0.259	95% Critical H Value (KM-Log)	1.936	
KM Standard Error of Mean (logged)	0.0916			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00768	Mean in Log Scale	-4.914	
SD in Original Scale	0.00245	SD in Log Scale	0.309	
95% t UCL (Assumes normality)	0.0091	95% H-Stat UCL	0.00945	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.00849			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.179	Mean	9.36	
Maximum	90.2	Median	0.307	
SD	28.41	Std. Error of Mean	8.983	
Coefficient of Variation	3.035	Skewness	3.162	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.372	**Shapiro Wilk GOF Test**		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.518	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	25.83	95% Adjusted-CLT UCL (Chen-1995)	33.73	
		95% Modified-t UCL (Johnson-1978)	27.32	
Gamma GOF Test				
A-D Test Statistic	2.585	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.833	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.479	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.291	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.254	k star (bias corrected MLE)	0.244	
Theta hat (MLE)	36.86	Theta star (bias corrected MLE)	38.3	
nu hat (MLE)	5.078	nu star (bias corrected)	4.888	
MLE Mean (bias corrected)	9.36	MLE Sd (bias corrected)	18.93	
		Approximate Chi Square Value (0.05)	1.101	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	0.824	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	41.56	95% Adjusted Gamma UCL (use when n<50)	55.5	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.619	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.318	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.723	Mean of logged Data	-0.554	
Maximum of Logged Data	4.502	SD of logged Data	1.849	
Assuming Lognormal Distribution				
95% H-UCL	70.58	90% Chebyshev (MVUE) UCL	6.401	
95% Chebyshev (MVUE) UCL	8.274	97.5% Chebyshev (MVUE) UCL	10.87	
99% Chebyshev (MVUE) UCL	15.98			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	24.13	95% Jackknife UCL	25.83	
95% Standard Bootstrap UCL	23.5	95% Bootstrap-t UCL	1780	
95% Hall's Bootstrap UCL	1149	95% Percentile Bootstrap UCL	27.3	
95% BCA Bootstrap UCL	36.3			
90% Chebyshev(Mean, Sd) UCL	36.31	95% Chebyshev(Mean, Sd) UCL	48.51	
97.5% Chebyshev(Mean, Sd) UCL	65.46	99% Chebyshev(Mean, Sd) UCL	98.73	
Suggested UCL to Use				
99% Chebyshev (Mean, Sd) UCL	98.73			
Recommended UCL exceeds the maximum observation				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Iron

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	1.505	Mean	4.984
Maximum	14.2	Median	3.274
SD	4.449	Std. Error of Mean	1.407
Coefficient of Variation	0.893	Skewness	1.613
Normal GOF Test			
Shapiro Wilk Test Statistic	0.723	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.563	95% Adjusted-CLT UCL (Chen-1995)	8.065
		95% Modified-t UCL (Johnson-1978)	7.683
Gamma GOF Test			
A-D Test Statistic	0.829	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.297	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.27	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.936	k star (bias corrected MLE)	1.422
Theta hat (MLE)	2.574	Theta star (bias corrected MLE)	3.505
nu hat (MLE)	38.72	nu star (bias corrected)	28.44
MLE Mean (bias corrected)	4.984	MLE Sd (bias corrected)	4.18
		Approximate Chi Square Value (0.05)	17.27
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	15.77
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	8.208	95% Adjusted Gamma UCL (use when n<50)	8.986
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.886	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.252	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.409	Mean of logged Data	1.326
Maximum of Logged Data	2.653	SD of logged Data	0.74
Assuming Lognormal Distribution			
95% H-UCL	9.413	90% Chebyshev (MVUE) UCL	8.275
95% Chebyshev (MVUE) UCL	9.851	97.5% Chebyshev (MVUE) UCL	12.04
99% Chebyshev (MVUE) UCL	16.34		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.299	95% Jackknife UCL	7.563
95% Standard Bootstrap UCL	7.209	95% Bootstrap-t UCL	13.71
95% Hall's Bootstrap UCL	19.93	95% Percentile Bootstrap UCL	7.34
95% BCA Bootstrap UCL	7.975		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% Chebyshev(Mean, Sd) UCL	9.205	95% Chebyshev(Mean, Sd) UCL	11.12
97.5% Chebyshev(Mean, Sd) UCL	13.77	99% Chebyshev(Mean, Sd) UCL	18.98

Suggested UCL to Use

95% H-UCL	9.413		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Lead

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	0.00157	Minimum Non-Detect	0.00738
Maximum Detect	4.215	Maximum Non-Detect	0.00948
Variance Detects	3.547	Percent Non-Detects	50%
Mean Detects	0.846	SD Detects	1.883
Median Detects	0.00228	CV Detects	2.227
Skewness Detects	2.236	Kurtosis Detects	5
Mean of Logged Detects	-4.414	SD of Logged Detects	3.336

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.553	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.472	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.424	KM Standard Error of Mean	0.447
KM SD	1.264	95% KM (BCA) UCL	1.267
95% KM (t) UCL	1.243	95% KM (Percentile Bootstrap) UCL	1.266
95% KM (z) UCL	1.159	95% KM Bootstrap t UCL	1119
90% KM Chebyshev UCL	1.764	95% KM Chebyshev UCL	2.371
97.5% KM Chebyshev UCL	3.214	99% KM Chebyshev UCL	4.869

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.044	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.797	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.447	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.392	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.177	k star (bias corrected MLE)	0.204
Theta hat (MLE)	4.788	Theta star (bias corrected MLE)	4.147
nu hat (MLE)	1.766	nu star (bias corrected)	2.04
Mean (detects)	0.846		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	0.00157	Mean	0.428
Maximum	4.215	Median	0.01
SD	1.331	CV	3.109
k hat (MLE)	0.201	k star (bias corrected MLE)	0.207
Theta hat (MLE)	2.13	Theta star (bias corrected MLE)	2.064
nu hat (MLE)	4.018	nu star (bias corrected)	4.146
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (4.15, α)	0.78	Adjusted Chi Square Value (4.15, β)	0.565
95% Gamma Approximate UCL (use when n>=50)	2.274	95% Gamma Adjusted UCL (use when n<50)	3.142

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.424	SD (KM)	1.264
Variance (KM)	1.597	SE of Mean (KM)	0.447
k hat (KM)	0.113	k star (KM)	0.146
nu hat (KM)	2.253	nu star (KM)	2.91
theta hat (KM)	3.765	theta star (KM)	2.914
80% gamma percentile (KM)	0.45	90% gamma percentile (KM)	1.252
95% gamma percentile (KM)	2.348	99% gamma percentile (KM)	5.548

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (2.91, α)	0.346	Adjusted Chi Square Value (2.91, β)	0.237
95% Gamma Approximate KM-UCL (use when n>=50)	3.564	95% Gamma Adjusted KM-UCL (use when n<50)	5.209

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.702	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.343	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.343	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.424	Mean in Log Scale	-5.199
SD in Original Scale	1.332	SD in Log Scale	2.379
95% t UCL (assumes normality of ROS data)	1.196	95% Percentile Bootstrap UCL	1.267
95% BCA Bootstrap UCL	1.688	95% Bootstrap t UCL	960.7
95% H-UCL (Log ROS)	14.04		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-5.287	KM Geo Mean	0.00506
KM SD (logged)	2.298	95% Critical H Value (KM-Log)	6.123
KM Standard Error of Mean (logged)	0.82	95% H-UCL (KM -Log)	7.729
KM SD (logged)	2.298	95% Critical H Value (KM-Log)	6.123
KM Standard Error of Mean (logged)	0.82		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.425	Mean in Log Scale	-4.951
SD in Original Scale	1.332	SD in Log Scale	2.296
95% t UCL (Assumes normality)	1.197	95% H-Stat UCL	10.65

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

KM Bootstrap t UCL	1.266		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Lithium

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.544	Mean	0.802	
Maximum	1.759	Median	0.696	
SD	0.353	Std. Error of Mean	0.112	
Coefficient of Variation	0.44	Skewness	2.642	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.648	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.341	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	1.007	95% Adjusted-CLT UCL (Chen-1995)	1.086	
		95% Modified-t UCL (Johnson-1978)	1.022	
Gamma GOF Test				
A-D Test Statistic	1.063	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.726	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.307	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.267	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	8.495	k star (bias corrected MLE)	6.013	
Theta hat (MLE)	0.0944	Theta star (bias corrected MLE)	0.133	
nu hat (MLE)	169.9	nu star (bias corrected)	120.3	
MLE Mean (bias corrected)	0.802	MLE Sd (bias corrected)	0.327	
		Approximate Chi Square Value (0.05)	95.94	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	92.17	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	1.005	95% Adjusted Gamma UCL (use when n<50)	1.047	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.787	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.283	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.608	Mean of logged Data	-0.281	
Maximum of Logged Data	0.565	SD of logged Data	0.334	
Assuming Lognormal Distribution				
95% H-UCL	0.999	90% Chebyshev (MVUE) UCL	1.048	
95% Chebyshev (MVUE) UCL	1.162	97.5% Chebyshev (MVUE) UCL	1.322	
99% Chebyshev (MVUE) UCL	1.635			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.986	95% Jackknife UCL	1.007	
95% Standard Bootstrap UCL	0.976	95% Bootstrap-t UCL	1.43	
95% Hall's Bootstrap UCL	1.847	95% Percentile Bootstrap UCL	0.993	
95% BCA Bootstrap UCL	1.119			
90% Chebyshev(Mean, Sd) UCL	1.137	95% Chebyshev(Mean, Sd) UCL	1.289	
97.5% Chebyshev(Mean, Sd) UCL	1.5	99% Chebyshev(Mean, Sd) UCL	1.914	

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Student's-t UCL	1.007	or 95% Modified-t UCL	1.022	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Manganese				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.267	Mean	2.608	
Maximum	8.576	Median	1.152	
SD	2.83	Std. Error of Mean	0.895	
Coefficient of Variation	1.085	Skewness	1.309	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	4.249	95% Adjusted-CLT UCL (Chen-1995)	4.476	
		95% Modified-t UCL (Johnson-1978)	4.311	
Gamma GOF Test				
A-D Test Statistic	0.38	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.217	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.274	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.991	k star (bias corrected MLE)	0.76	
Theta hat (MLE)	2.633	Theta star (bias corrected MLE)	3.431	
nu hat (MLE)	19.82	nu star (bias corrected)	15.2	
MLE Mean (bias corrected)	2.608	MLE Sd (bias corrected)	2.992	
		Approximate Chi Square Value (0.05)	7.404	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	6.48	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	5.357	95% Adjusted Gamma UCL (use when n<50)	6.12	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.321	Mean of logged Data	0.376	
Maximum of Logged Data	2.149	SD of logged Data	1.183	
Assuming Lognormal Distribution				
95% H-UCL	11.6	90% Chebyshev (MVUE) UCL	5.779	
95% Chebyshev (MVUE) UCL	7.198	97.5% Chebyshev (MVUE) UCL	9.167	
99% Chebyshev (MVUE) UCL	13.04			

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	4.081	95% Jackknife UCL	4.249	
95% Standard Bootstrap UCL	3.994	95% Bootstrap-t UCL	5.338	
95% Hall's Bootstrap UCL	4.705	95% Percentile Bootstrap UCL	4.062	
95% BCA Bootstrap UCL	4.436			
90% Chebyshev(Mean, Sd) UCL	5.294	95% Chebyshev(Mean, Sd) UCL	6.51	
97.5% Chebyshev(Mean, Sd) UCL	8.198	99% Chebyshev(Mean, Sd) UCL	11.51	
Suggested UCL to Use				
95% Adjusted Gamma UCL	6.12			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	6	Number of Non-Detects	4	
Number of Distinct Detects	6	Number of Distinct Non-Detects	4	
Minimum Detect	1.5190E-4	Minimum Non-Detect	3.7175E-4	
Maximum Detect	0.0155	Maximum Non-Detect	3.8780E-4	
Variance Detects	3.6578E-5	Percent Non-Detects	40%	
Mean Detects	0.00322	SD Detects	0.00605	
Median Detects	7.4785E-4	CV Detects	1.878	
Skewness Detects	2.409	Kurtosis Detects	5.841	
Mean of Logged Detects	-6.907	SD of Logged Detects	1.561	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.574	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.432	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00199	KM Standard Error of Mean	0.00157	
KM SD	0.00453	95% KM (BCA) UCL	0.00514	
95% KM (t) UCL	0.00487	95% KM (Percentile Bootstrap) UCL	0.00498	
95% KM (z) UCL	0.00458	95% KM Bootstrap t UCL	0.0326	
90% KM Chebyshev UCL	0.0067	95% KM Chebyshev UCL	0.00884	
97.5% KM Chebyshev UCL	0.0118	99% KM Chebyshev UCL	0.0176	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.685	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.313	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.348	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.538	k star (bias corrected MLE)	0.38	
Theta hat (MLE)	0.00599	Theta star (bias corrected MLE)	0.00848	
nu hat (MLE)	6.451	nu star (bias corrected)	4.559	
Mean (detects)	0.00322			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	1.5190E-4	Mean	0.00593	
Maximum	0.0155	Median	0.00585	
SD	0.00571	CV	0.962	
k hat (MLE)	0.703	k star (bias corrected MLE)	0.559	
Theta hat (MLE)	0.00844	Theta star (bias corrected MLE)	0.0106	
nu hat (MLE)	14.07	nu star (bias corrected)	11.18	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (11.18, α)	4.692	Adjusted Chi Square Value (11.18, β)	3.987	
95% Gamma Approximate UCL (use when n>=50)	0.0141	95% Gamma Adjusted UCL (use when n<50)	0.0166	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00199	SD (KM)	0.00453	
Variance (KM)	2.0550E-5	SE of Mean (KM)	0.00157	
k hat (KM)	0.193	k star (KM)	0.202	
nu hat (KM)	3.867	nu star (KM)	4.04	
theta hat (KM)	0.0103	theta star (KM)	0.00987	
80% gamma percentile (KM)	0.00264	90% gamma percentile (KM)	0.00603	
95% gamma percentile (KM)	0.0102	99% gamma percentile (KM)	0.0218	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (4.04, α)	0.738	Adjusted Chi Square Value (4.04, β)	0.531	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0109	95% Gamma Adjusted KM-UCL (use when n<50)	0.0152	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00197	Mean in Log Scale	-7.867	
SD in Original Scale	0.00479	SD in Log Scale	1.7	
95% t UCL (assumes normality of ROS data)	0.00474	95% Percentile Bootstrap UCL	0.00494	
95% BCA Bootstrap UCL	0.00635	95% Bootstrap t UCL	0.0306	
95% H-UCL (Log ROS)	0.023			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-7.661	KM Geo Mean	4.7090E-4	
KM SD (logged)	1.439	95% Critical H Value (KM-Log)	4.066	
KM Standard Error of Mean (logged)	0.499	95% H-UCL (KM -Log)	0.00933	
KM SD (logged)	1.439	95% Critical H Value (KM-Log)	4.066	
KM Standard Error of Mean (logged)	0.499			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00201	Mean in Log Scale	-7.569	
SD in Original Scale	0.00477	SD in Log Scale	1.444	
95% t UCL (Assumes normality)	0.00478	95% H-Stat UCL	0.0104	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Bootstrap t UCL	0.0326	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0152	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Methyl Mercury				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	9	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	9	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Methyl Mercury was not processed!				
Molybdenum				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.00538	Mean	0.0299	
Maximum	0.0689	Median	0.0249	
SD	0.0229	Std. Error of Mean	0.00723	
Coefficient of Variation	0.765	Skewness	0.77	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.0431	95% Adjusted-CLT UCL (Chen-1995)	0.0437	
		95% Modified-t UCL (Johnson-1978)	0.0434	
Gamma GOF Test				
A-D Test Statistic	0.228	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.142	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.744	k star (bias corrected MLE)	1.288	
Theta hat (MLE)	0.0171	Theta star (bias corrected MLE)	0.0232	
nu hat (MLE)	34.89	nu star (bias corrected)	25.75	
MLE Mean (bias corrected)	0.0299	MLE Sd (bias corrected)	0.0263	
		Approximate Chi Square Value (0.05)	15.19	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	13.8	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.0507	95% Adjusted Gamma UCL (use when n<50)	0.0558	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.127	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-5.225	Mean of logged Data	-3.824	
Maximum of Logged Data	-2.676	SD of logged Data	0.885	
Assuming Lognormal Distribution				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL	0.0754	90% Chebyshev (MVUE) UCL	0.0577
95% Chebyshev (MVUE) UCL	0.0699	97.5% Chebyshev (MVUE) UCL	0.0868
99% Chebyshev (MVUE) UCL	0.12		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.0418	95% Jackknife UCL	0.0431
95% Standard Bootstrap UCL	0.041	95% Bootstrap-t UCL	0.0462
95% Hall's Bootstrap UCL	0.0465	95% Percentile Bootstrap UCL	0.0417
95% BCA Bootstrap UCL	0.0426		
90% Chebyshev(Mean, Sd) UCL	0.0516	95% Chebyshev(Mean, Sd) UCL	0.0614
97.5% Chebyshev(Mean, Sd) UCL	0.075	99% Chebyshev(Mean, Sd) UCL	0.102
Suggested UCL to Use			
95% Student's-t UCL	0.0431		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.0465	Minimum Non-Detect	0.0237
Maximum Detect	0.719	Maximum Non-Detect	0.0237
Variance Detects	0.0436	Percent Non-Detects	10%
Mean Detects	0.183	SD Detects	0.209
Median Detects	0.13	CV Detects	1.139
Skewness Detects	2.592	Kurtosis Detects	7.174
Mean of Logged Detects	-2.069	SD of Logged Detects	0.845
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.64	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.325	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.167	KM Standard Error of Mean	0.0647
KM SD	0.193	95% KM (BCA) UCL	0.288
95% KM (t) UCL	0.286	95% KM (Percentile Bootstrap) UCL	0.287
95% KM (z) UCL	0.274	95% KM Bootstrap t UCL	0.476
90% KM Chebyshev UCL	0.361	95% KM Chebyshev UCL	0.449
97.5% KM Chebyshev UCL	0.571	99% KM Chebyshev UCL	0.811
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.616	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.236	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.489	k star (bias corrected MLE)	1.067
Theta hat (MLE)	0.123	Theta star (bias corrected MLE)	0.172
nu hat (MLE)	26.8	nu star (bias corrected)	19.2
Mean (detects)	0.183		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.166	
Maximum	0.719	Median	0.125	
SD	0.204	CV	1.232	
k hat (MLE)	1.086	k star (bias corrected MLE)	0.827	
Theta hat (MLE)	0.153	Theta star (bias corrected MLE)	0.201	
nu hat (MLE)	21.73	nu star (bias corrected)	16.54	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (16.54, α)	8.345	Adjusted Chi Square Value (16.54, β)	7.355	
95% Gamma Approximate UCL (use when n>=50)	0.329	95% Gamma Adjusted UCL (use when n<50)	0.373	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.167	SD (KM)	0.193	
Variance (KM)	0.0372	SE of Mean (KM)	0.0647	
k hat (KM)	0.753	k star (KM)	0.594	
nu hat (KM)	15.06	nu star (KM)	11.87	
theta hat (KM)	0.222	theta star (KM)	0.282	
80% gamma percentile (KM)	0.276	90% gamma percentile (KM)	0.436	
95% gamma percentile (KM)	0.604	99% gamma percentile (KM)	1.012	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (11.87, α)	5.144	Adjusted Chi Square Value (11.87, β)	4.4	
95% Gamma Approximate KM-UCL (use when n>=50)	0.386	95% Gamma Adjusted KM-UCL (use when n<50)	0.452	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.173	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.167	Mean in Log Scale	-2.272	
SD in Original Scale	0.204	SD in Log Scale	1.024	
95% t UCL (assumes normality of ROS data)	0.285	95% Percentile Bootstrap UCL	0.276	
95% BCA Bootstrap UCL	0.346	95% Bootstrap t UCL	0.484	
95% H-UCL (Log ROS)	0.511			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.236	KM Geo Mean	0.107	
KM SD (logged)	0.908	95% Critical H Value (KM-Log)	2.917	
KM Standard Error of Mean (logged)	0.304	95% H-UCL (KM -Log)	0.39	
KM SD (logged)	0.908	95% Critical H Value (KM-Log)	2.917	
KM Standard Error of Mean (logged)	0.304			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.166	Mean in Log Scale	-2.305	
SD in Original Scale	0.204	SD in Log Scale	1.093	
95% t UCL (Assumes normality)	0.285	95% H-Stat UCL	0.603	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Adjusted Gamma UCL	0.452	95% GROS Adjusted Gamma UCL	0.373	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Selenium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.0565	Minimum Non-Detect	0.111
Maximum Detect	0.0579	Maximum Non-Detect	0.143
Variance Detects	8.7120E-7	Percent Non-Detects	80%
Mean Detects	0.0572	SD Detects	9.3338E-4
Median Detects	0.0572	CV Detects	0.0163
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.861	SD of Logged Detects	0.0163

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0572	KM Standard Error of Mean	6.6000E-4
KM SD	6.6000E-4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0584	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0583	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0592	95% KM Chebyshev UCL	0.0601
97.5% KM Chebyshev UCL	0.0613	99% KM Chebyshev UCL	0.0638

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	7511	k star (bias corrected MLE)	N/A
Theta hat (MLE)	7.6157E-6	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	30043	nu star (bias corrected)	N/A
Mean (detects)	0.0572		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0572	SD (KM)	6.6000E-4
Variance (KM)	4.3560E-7	SE of Mean (KM)	6.6000E-4
k hat (KM)	7511	k star (KM)	5258
nu hat (KM)	150222	nu star (KM)	105157
theta hat (KM)	7.6154E-6	theta star (KM)	1.0879E-5
80% gamma percentile (KM)	0.0579	90% gamma percentile (KM)	0.0582
95% gamma percentile (KM)	0.0585	99% gamma percentile (KM)	0.0591

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (N/A, α)	104404	Adjusted Chi Square Value (N/A, β)	104273
95% Gamma Approximate KM-UCL (use when n>=50)	0.0576	95% Gamma Adjusted KM-UCL (use when n<50)	0.0577

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0572	Mean in Log Scale	-2.861
SD in Original Scale	3.1113E-4	SD in Log Scale	0.00544
95% t UCL (assumes normality of ROS data)	0.0574	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% H-UCL (Log ROS)	N/A		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.861	KM Geo Mean	0.0572
KM SD (logged)	0.0115	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0115	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0115	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0115		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0622	Mean in Log Scale	-2.782
SD in Original Scale	0.00592	SD in Log Scale	0.0936
95% t UCL (Assumes normality)	0.0656	95% H-Stat UCL	N/A
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0584	KM H-UCL	N/A
95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!			
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Silver			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	9
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Silver was not processed!			
Thallium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	9
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Thallium was not processed!			
Vanadium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	3	Number of Non-Detects	7
Number of Distinct Detects	3	Number of Distinct Non-Detects	7
Minimum Detect	0.126	Minimum Non-Detect	0.0521
Maximum Detect	0.181	Maximum Non-Detect	0.0713

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance Detects	7.8780E-4	Percent Non-Detects	70%
Mean Detects	0.151	SD Detects	0.0281
Median Detects	0.147	CV Detects	0.186
Skewness Detects	0.698	Kurtosis Detects	N/A
Mean of Logged Detects	-1.901	SD of Logged Detects	0.184
Warning: Data set has only 3 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.981	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0818	KM Standard Error of Mean	0.0182
KM SD	0.0471	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.115	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.112	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.136	95% KM Chebyshev UCL	0.161
97.5% KM Chebyshev UCL	0.196	99% KM Chebyshev UCL	0.263
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	44.15	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00342	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	264.9	nu star (bias corrected)	N/A
Mean (detects)	0.151		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0398	Mean	0.0732
Maximum	0.181	Median	0.0398
SD	0.0553	CV	0.756
k hat (MLE)	2.513	k star (bias corrected MLE)	1.826
Theta hat (MLE)	0.0291	Theta star (bias corrected MLE)	0.0401
nu hat (MLE)	50.27	nu star (bias corrected)	36.52
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (36.52, α)	23.69	Adjusted Chi Square Value (36.52, β)	21.91
95% Gamma Approximate UCL (use when n>=50)	0.113	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0818	SD (KM)	0.0471
Variance (KM)	0.00222	SE of Mean (KM)	0.0182
k hat (KM)	3.016	k star (KM)	2.178
nu hat (KM)	60.31	nu star (KM)	43.55
theta hat (KM)	0.0271	theta star (KM)	0.0375
80% gamma percentile (KM)	0.121	90% gamma percentile (KM)	0.156
95% gamma percentile (KM)	0.189	99% gamma percentile (KM)	0.262
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (43.55, α)	29.42	Adjusted Chi Square Value (43.55, β)	27.41
95% Gamma Approximate KM-UCL (use when n>=50)	0.121	95% Gamma Adjusted KM-UCL (use when n<50)	0.13
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk GOF Test**	

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.207	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0931	Mean in Log Scale	-2.449	
SD in Original Scale	0.0421	SD in Log Scale	0.388	
95% t UCL (assumes normality of ROS data)	0.118	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A	
95% H-UCL (Log ROS)	0.122			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.639	KM Geo Mean	0.0714	
KM SD (logged)	0.49	95% Critical H Value (KM-Log)	2.206	
KM Standard Error of Mean (logged)	0.19	95% H-UCL (KM -Log)	0.115	
KM SD (logged)	0.49	95% Critical H Value (KM-Log)	2.206	
KM Standard Error of Mean (logged)	0.19			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0662	Mean in Log Scale	-3.033	
SD in Original Scale	0.0601	SD in Log Scale	0.791	
95% t UCL (Assumes normality)	0.101	95% H-Stat UCL	0.134	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.115			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.251	Mean	7.62	
Maximum	64.07	Median	1.144	
SD	19.86	Std. Error of Mean	6.28	
Coefficient of Variation	2.606	Skewness	3.148	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.41	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.488	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	19.13	95% Adjusted-CLT UCL (Chen-1995)	24.63	
		95% Modified-t UCL (Johnson-1978)	20.17	
Gamma GOF Test				
A-D Test Statistic	1.545	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.795	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.376	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.284	Data Not Gamma Distributed at 5% Significance Level		

Table E1-10
Cattail Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.404	k star (bias corrected MLE)	0.35	
Theta hat (MLE)	18.85	Theta star (bias corrected MLE)	21.8	
nu hat (MLE)	8.083	nu star (bias corrected)	6.991	
MLE Mean (bias corrected)	7.62	MLE Sd (bias corrected)	12.89	
		Approximate Chi Square Value (0.05)	2.166	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	1.73	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	24.6	95% Adjusted Gamma UCL (use when n<50)	30.79	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.382	Mean of logged Data	0.405	
Maximum of Logged Data	4.16	SD of logged Data	1.557	
Assuming Lognormal Distribution				
95% H-UCL	47.96	90% Chebyshev (MVUE) UCL	10.45	
95% Chebyshev (MVUE) UCL	13.33	97.5% Chebyshev (MVUE) UCL	17.33	
99% Chebyshev (MVUE) UCL	25.19			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	17.95	95% Jackknife UCL	19.13	
95% Standard Bootstrap UCL	17.28	95% Bootstrap-t UCL	172.2	
95% Hall's Bootstrap UCL	99.39	95% Percentile Bootstrap UCL	20.06	
95% BCA Bootstrap UCL	26.41			
90% Chebyshev(Mean, Sd) UCL	26.46	95% Chebyshev(Mean, Sd) UCL	34.99	
97.5% Chebyshev(Mean, Sd) UCL	46.84	99% Chebyshev(Mean, Sd) UCL	70.11	
Suggested UCL to Use				
99% Chebyshev (Mean, Sd) UCL	70.11			
Recommended UCL exceeds the maximum observation				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/14/2019 3:15:00 PM
From File	Plant_CattailsRhizome_UCLData_20191114.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	17.23	Mean	29.11
Maximum	43.51	Median	27.89
SD	8.764	Std. Error of Mean	2.771
Coefficient of Variation	0.301	Skewness	0.252

Normal GOF Test

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	34.19	95% Adjusted-CLT UCL (Chen-1995)	33.91
		95% Modified-t UCL (Johnson-1978)	34.23

Gamma GOF Test

A-D Test Statistic	0.287	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.19	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.07	k star (bias corrected MLE)	8.514
Theta hat (MLE)	2.412	Theta star (bias corrected MLE)	3.419
nu hat (MLE)	241.4	nu star (bias corrected)	170.3
MLE Mean (bias corrected)	29.11	MLE Sd (bias corrected)	9.978
		Approximate Chi Square Value (0.05)	141.1
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	136.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	35.13	95% Adjusted Gamma UCL (use when n<50)	36.32

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.847	Mean of logged Data	3.329
Maximum of Logged Data	3.773	SD of logged Data	0.308

Assuming Lognormal Distribution

95% H-UCL	35.9	90% Chebyshev (MVUE) UCL	37.71
95% Chebyshev (MVUE) UCL	41.6	97.5% Chebyshev (MVUE) UCL	47
99% Chebyshev (MVUE) UCL	57.59		

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	33.67	95% Jackknife UCL	34.19	
95% Standard Bootstrap UCL	33.44	95% Bootstrap-t UCL	34.72	
95% Hall's Bootstrap UCL	33.66	95% Percentile Bootstrap UCL	33.57	
95% BCA Bootstrap UCL	33.64			
90% Chebyshev(Mean, Sd) UCL	37.43	95% Chebyshev(Mean, Sd) UCL	41.19	
97.5% Chebyshev(Mean, Sd) UCL	46.42	99% Chebyshev(Mean, Sd) UCL	56.69	
Suggested UCL to Use				
95% Student's-t UCL	34.19			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	9	Number of Non-Detects	1	
Number of Distinct Detects	9	Number of Distinct Non-Detects	1	
Minimum Detect	0.00432	Minimum Non-Detect	0.00924	
Maximum Detect	0.0121	Maximum Non-Detect	0.00924	
Variance Detects	6.9709E-6	Percent Non-Detects	10%	
Mean Detects	0.00677	SD Detects	0.00264	
Median Detects	0.00603	CV Detects	0.39	
Skewness Detects	1.149	Kurtosis Detects	0.765	
Mean of Logged Detects	-5.056	SD of Logged Detects	0.362	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.877	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00666	KM Standard Error of Mean	8.2172E-4	
KM SD	0.00242	95% KM (BCA) UCL	0.00799	
95% KM (t) UCL	0.00816	95% KM (Percentile Bootstrap) UCL	0.00797	
95% KM (z) UCL	0.00801	95% KM Bootstrap t UCL	0.00877	
90% KM Chebyshev UCL	0.00912	95% KM Chebyshev UCL	0.0102	
97.5% KM Chebyshev UCL	0.0118	99% KM Chebyshev UCL	0.0148	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.356	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.17	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	8.376	k star (bias corrected MLE)	5.658	
Theta hat (MLE)	8.0863E-4	Theta star (bias corrected MLE)	0.0012	
nu hat (MLE)	150.8	nu star (bias corrected)	101.8	
Mean (detects)	0.00677			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00432	Mean	0.0071	
Maximum	0.0121	Median	0.00651	
SD	0.00269	CV	0.379	
k hat (MLE)	8.18	k star (bias corrected MLE)	5.792	
Theta hat (MLE)	8.6751E-4	Theta star (bias corrected MLE)	0.00123	
nu hat (MLE)	163.6	nu star (bias corrected)	115.8	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (115.85, α)	92	Adjusted Chi Square Value (115.85, β)	88.31	
95% Gamma Approximate UCL (use when n>=50)	0.00894	95% Gamma Adjusted UCL (use when n<50)	0.00931	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00666	SD (KM)	0.00242	
Variance (KM)	5.8403E-6	SE of Mean (KM)	8.2172E-4	
k hat (KM)	7.587	k star (KM)	5.378	
nu hat (KM)	151.7	nu star (KM)	107.6	
theta hat (KM)	8.7737E-4	theta star (KM)	0.00124	
80% gamma percentile (KM)	0.00888	90% gamma percentile (KM)	0.0105	
95% gamma percentile (KM)	0.012	99% gamma percentile (KM)	0.0151	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (107.55, α)	84.62	Adjusted Chi Square Value (107.55, β)	81.09	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00846	95% Gamma Adjusted KM-UCL (use when n<50)	0.00883	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.163	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00666	Mean in Log Scale	-5.068	
SD in Original Scale	0.00251	SD in Log Scale	0.343	
95% t UCL (assumes normality of ROS data)	0.00812	95% Percentile Bootstrap UCL	0.00795	
95% BCA Bootstrap UCL	0.00816	95% Bootstrap t UCL	0.00917	
95% H-UCL (Log ROS)	0.00842			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-5.071	KM Geo Mean	0.00628	
KM SD (logged)	0.333	95% Critical H Value (KM-Log)	2.013	
KM Standard Error of Mean (logged)	0.114	95% H-UCL (KM -Log)	0.0083	
KM SD (logged)	0.333	95% Critical H Value (KM-Log)	2.013	
KM Standard Error of Mean (logged)	0.114			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00656	Mean in Log Scale	-5.088	
SD in Original Scale	0.00258	SD in Log Scale	0.356	
95% t UCL (Assumes normality)	0.00805	95% H-Stat UCL	0.00837	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.00816			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Arsenic

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	7	Number of Non-Detects	3
Number of Distinct Detects	7	Number of Distinct Non-Detects	3
Minimum Detect	0.0432	Minimum Non-Detect	0.0684
Maximum Detect	0.083	Maximum Non-Detect	0.0905
Variance Detects	2.1439E-4	Percent Non-Detects	30%
Mean Detects	0.0627	SD Detects	0.0146
Median Detects	0.0626	CV Detects	0.234
Skewness Detects	0.0836	Kurtosis Detects	-1.128
Mean of Logged Detects	-2.794	SD of Logged Detects	0.24

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0611	KM Standard Error of Mean	0.005
KM SD	0.013	95% KM (BCA) UCL	0.0689
95% KM (t) UCL	0.0703	95% KM (Percentile Bootstrap) UCL	0.069
95% KM (z) UCL	0.0693	95% KM Bootstrap t UCL	0.0703
90% KM Chebyshev UCL	0.0761	95% KM Chebyshev UCL	0.0829
97.5% KM Chebyshev UCL	0.0923	99% KM Chebyshev UCL	0.111

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.212	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.154	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	20.85	k star (bias corrected MLE)	12.01
Theta hat (MLE)	0.00301	Theta star (bias corrected MLE)	0.00522
nu hat (MLE)	291.9	nu star (bias corrected)	168.1
Mean (detects)	0.0627		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0432	Mean	0.061
Maximum	0.083	Median	0.059
SD	0.0123	CV	0.202
k hat (MLE)	27.93	k star (bias corrected MLE)	19.62
Theta hat (MLE)	0.00218	Theta star (bias corrected MLE)	0.00311
nu hat (MLE)	558.7	nu star (bias corrected)	392.4
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (392.42, α)	347.5	Adjusted Chi Square Value (392.42, β)	340.2
95% Gamma Approximate UCL (use when n>=50)	0.0689	95% Gamma Adjusted UCL (use when n<50)	0.0704

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0611	SD (KM)	0.013
Variance (KM)	1.6885E-4	SE of Mean (KM)	0.005
k hat (KM)	22.12	k star (KM)	15.55
nu hat (KM)	442.3	nu star (KM)	311
theta hat (KM)	0.00276	theta star (KM)	0.00393

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

80% gamma percentile (KM)	0.0736	90% gamma percentile (KM)	0.0816
95% gamma percentile (KM)	0.0886	99% gamma percentile (KM)	0.103
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (310.96, α)	271.1	Adjusted Chi Square Value (310.96, β)	264.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.0701	95% Gamma Adjusted KM-UCL (use when n<50)	0.0718
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0608	Mean in Log Scale	-2.818
SD in Original Scale	0.0124	SD in Log Scale	0.201
95% t UCL (assumes normality of ROS data)	0.068	95% Percentile Bootstrap UCL	0.0671
95% BCA Bootstrap UCL	0.0675	95% Bootstrap t UCL	0.0703
95% H-UCL (Log ROS)	0.0691		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.818	KM Geo Mean	0.0597
KM SD (logged)	0.215	95% Critical H Value (KM-Log)	1.895
KM Standard Error of Mean (logged)	0.0841	95% H-UCL (KM -Log)	0.07
KM SD (logged)	0.215	95% Critical H Value (KM-Log)	1.895
KM Standard Error of Mean (logged)	0.0841		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0555	Mean in Log Scale	-2.933
SD in Original Scale	0.0169	SD in Log Scale	0.306
95% t UCL (Assumes normality)	0.0653	95% H-Stat UCL	0.0683
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0703		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Barium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	2.703	Mean	4.939
Maximum	11.01	Median	4.452
SD	2.351	Std. Error of Mean	0.744
Coefficient of Variation	0.476	Skewness	2.194
Normal GOF Test			
Shapiro Wilk Test Statistic	0.757	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.302	95% Adjusted-CLT UCL (Chen-1995)	6.713
		95% Modified-t UCL (Johnson-1978)	6.388
Gamma GOF Test			
A-D Test Statistic	0.598	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.265	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.657	k star (bias corrected MLE)	4.727
Theta hat (MLE)	0.742	Theta star (bias corrected MLE)	1.045
nu hat (MLE)	133.1	nu star (bias corrected)	94.53
MLE Mean (bias corrected)	4.939	MLE Sd (bias corrected)	2.272
		Approximate Chi Square Value (0.05)	73.11
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	69.84
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6.386	95% Adjusted Gamma UCL (use when n<50)	6.685
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.238	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.994	Mean of logged Data	1.52
Maximum of Logged Data	2.399	SD of logged Data	0.39
Assuming Lognormal Distribution			
95% H-UCL	6.464	90% Chebyshev (MVUE) UCL	6.727
95% Chebyshev (MVUE) UCL	7.557	97.5% Chebyshev (MVUE) UCL	8.709
99% Chebyshev (MVUE) UCL	10.97		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.162	95% Jackknife UCL	6.302
95% Standard Bootstrap UCL	6.12	95% Bootstrap-t UCL	7.901
95% Hall's Bootstrap UCL	12.56	95% Percentile Bootstrap UCL	6.243
95% BCA Bootstrap UCL	6.884		
90% Chebyshev(Mean, Sd) UCL	7.169	95% Chebyshev(Mean, Sd) UCL	8.18
97.5% Chebyshev(Mean, Sd) UCL	9.582	99% Chebyshev(Mean, Sd) UCL	12.34
Suggested UCL to Use			
95% Adjusted Gamma UCL	6.685		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Beryllium was not processed!				
Boron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	2.786	Mean	4.776	
Maximum	10.43	Median	3.385	
SD	2.789	Std. Error of Mean	0.882	
Coefficient of Variation	0.584	Skewness	1.608	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.703	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.293	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	6.393	95% Adjusted-CLT UCL (Chen-1995)	6.706	
		95% Modified-t UCL (Johnson-1978)	6.468	
Gamma GOF Test				
A-D Test Statistic	1.149	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.729	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.274	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.268	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	4.405	k star (bias corrected MLE)	3.15	
Theta hat (MLE)	1.084	Theta star (bias corrected MLE)	1.516	
nu hat (MLE)	88.1	nu star (bias corrected)	63	
MLE Mean (bias corrected)	4.776	MLE Sd (bias corrected)	2.691	
		Approximate Chi Square Value (0.05)	45.74	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	43.2	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	6.579	95% Adjusted Gamma UCL (use when n<50)	6.966	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.255	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.025	Mean of logged Data	1.446	
Maximum of Logged Data	2.345	SD of logged Data	0.477	
Assuming Lognormal Distribution				
95% H-UCL	6.734	90% Chebyshev (MVUE) UCL	6.859	
95% Chebyshev (MVUE) UCL	7.837	97.5% Chebyshev (MVUE) UCL	9.195	
99% Chebyshev (MVUE) UCL	11.86			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCLs				
95% CLT UCL	6.227	95% Jackknife UCL	6.393	
95% Standard Bootstrap UCL	6.134	95% Bootstrap-t UCL	11.02	
95% Hall's Bootstrap UCL	14.04	95% Percentile Bootstrap UCL	6.235	
95% BCA Bootstrap UCL	6.549			
90% Chebyshev(Mean, Sd) UCL	7.422	95% Chebyshev(Mean, Sd) UCL	8.62	
97.5% Chebyshev(Mean, Sd) UCL	10.28	99% Chebyshev(Mean, Sd) UCL	13.55	
Suggested UCL to Use				
95% Student's-t UCL	6.393	or 95% Modified-t UCL	6.468	
or 95% H-UCL	6.734			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Cadmium

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	7	Number of Non-Detects	3
Number of Distinct Detects	7	Number of Distinct Non-Detects	3
Minimum Detect	0.00109	Minimum Non-Detect	0.00378
Maximum Detect	0.0168	Maximum Non-Detect	0.00452
Variance Detects	3.2789E-5	Percent Non-Detects	30%
Mean Detects	0.00401	SD Detects	0.00573
Median Detects	0.00166	CV Detects	1.428
Skewness Detects	2.489	Kurtosis Detects	6.321
Mean of Logged Detects	-6.064	SD of Logged Detects	0.986
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.591	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.367	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00332	KM Standard Error of Mean	0.00158
KM SD	0.00458	95% KM (BCA) UCL	0.00624
95% KM (t) UCL	0.00621	95% KM (Percentile Bootstrap) UCL	0.00624
95% KM (z) UCL	0.00591	95% KM Bootstrap t UCL	0.0182
90% KM Chebyshev UCL	0.00805	95% KM Chebyshev UCL	0.0102
97.5% KM Chebyshev UCL	0.0132	99% KM Chebyshev UCL	0.019
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.902	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.727	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.283	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.319	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.053	k star (bias corrected MLE)	0.697
Theta hat (MLE)	0.00381	Theta star (bias corrected MLE)	0.00575
nu hat (MLE)	14.75	nu star (bias corrected)	9.76
Mean (detects)	0.00401		

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00109	Mean	0.00581	
Maximum	0.0168	Median	0.0031	
SD	0.0055	CV	0.947	
k hat (MLE)	1.186	k star (bias corrected MLE)	0.897	
Theta hat (MLE)	0.0049	Theta star (bias corrected MLE)	0.00647	
nu hat (MLE)	23.72	nu star (bias corrected)	17.94	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (17.94, α)	9.348	Adjusted Chi Square Value (17.94, β)	8.291	
95% Gamma Approximate UCL (use when n>=50)	0.0111	95% Gamma Adjusted UCL (use when n<50)	0.0126	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00332	SD (KM)	0.00458	
Variance (KM)	2.0995E-5	SE of Mean (KM)	0.00158	
k hat (KM)	0.525	k star (KM)	0.434	
nu hat (KM)	10.5	nu star (KM)	8.68	
theta hat (KM)	0.00633	theta star (KM)	0.00765	
80% gamma percentile (KM)	0.0054	90% gamma percentile (KM)	0.00924	
95% gamma percentile (KM)	0.0134	99% gamma percentile (KM)	0.0238	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (8.68, α)	3.135	Adjusted Chi Square Value (8.68, β)	2.584	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00919	95% Gamma Adjusted KM-UCL (use when n<50)	0.0111	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.81	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00332	Mean in Log Scale	-6.155	
SD in Original Scale	0.00481	SD in Log Scale	0.819	
95% t UCL (assumes normality of ROS data)	0.00611	95% Percentile Bootstrap UCL	0.00618	
95% BCA Bootstrap UCL	0.00806	95% Bootstrap t UCL	0.0257	
95% H-UCL (Log ROS)	0.00629			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-6.184	KM Geo Mean	0.00206	
KM SD (logged)	0.816	95% Critical H Value (KM-Log)	2.74	
KM Standard Error of Mean (logged)	0.293	95% H-UCL (KM -Log)	0.00606	
KM SD (logged)	0.816	95% Critical H Value (KM-Log)	2.74	
KM Standard Error of Mean (logged)	0.293			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00342	Mean in Log Scale	-6.104	
SD in Original Scale	0.00477	SD in Log Scale	0.809	
95% t UCL (Assumes normality)	0.00619	95% H-Stat UCL	0.00646	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Gamma Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM Bootstrap t UCL	0.0182	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0111	
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.0697	Mean	0.224
Maximum	0.613	Median	0.166
SD	0.168	Std. Error of Mean	0.0532
Coefficient of Variation	0.752	Skewness	1.621

Normal GOF Test

Shapiro Wilk Test Statistic	0.824	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.322	95% Adjusted-CLT UCL (Chen-1995)	0.341
		95% Modified-t UCL (Johnson-1978)	0.326

Gamma GOF Test

A-D Test Statistic	0.355	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.207	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.435	k star (bias corrected MLE)	1.771
Theta hat (MLE)	0.092	Theta star (bias corrected MLE)	0.126
nu hat (MLE)	48.7	nu star (bias corrected)	35.42
MLE Mean (bias corrected)	0.224	MLE Sd (bias corrected)	0.168
		Approximate Chi Square Value (0.05)	22.8
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	21.06

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.348	95% Adjusted Gamma UCL (use when n<50)	0.377

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.663	Mean of logged Data	-1.716
Maximum of Logged Data	-0.489	SD of logged Data	0.686

Assuming Lognormal Distribution

95% H-UCL	0.404	90% Chebyshev (MVUE) UCL	0.37
95% Chebyshev (MVUE) UCL	0.437	97.5% Chebyshev (MVUE) UCL	0.53
99% Chebyshev (MVUE) UCL	0.714		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCLs				
95% CLT UCL	0.312	95% Jackknife UCL	0.322	
95% Standard Bootstrap UCL	0.309	95% Bootstrap-t UCL	0.428	
95% Hall's Bootstrap UCL	0.756	95% Percentile Bootstrap UCL	0.316	
95% BCA Bootstrap UCL	0.335			
90% Chebyshev(Mean, Sd) UCL	0.384	95% Chebyshev(Mean, Sd) UCL	0.456	
97.5% Chebyshev(Mean, Sd) UCL	0.556	99% Chebyshev(Mean, Sd) UCL	0.754	
Suggested UCL to Use				
95% Adjusted Gamma UCL	0.377			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.0113	Mean	0.0287
Maximum	0.06	Median	0.0253
SD	0.0152	Std. Error of Mean	0.00479
Coefficient of Variation	0.529	Skewness	1.162
Normal GOF Test			
Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.0374	95% Adjusted-CLT UCL (Chen-1995)	0.0384
		95% Modified-t UCL (Johnson-1978)	0.0377
Gamma GOF Test			
A-D Test Statistic	0.261	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.191	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.411	k star (bias corrected MLE)	3.155
Theta hat (MLE)	0.0065	Theta star (bias corrected MLE)	0.00908
nu hat (MLE)	88.22	nu star (bias corrected)	63.09
MLE Mean (bias corrected)	0.0287	MLE Sd (bias corrected)	0.0161
		Approximate Chi Square Value (0.05)	45.82
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	43.27
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.0395	95% Adjusted Gamma UCL (use when n<50)	0.0418
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics				
Minimum of Logged Data	-4.485	Mean of logged Data	-3.67	
Maximum of Logged Data	-2.813	SD of logged Data	0.509	
Assuming Lognormal Distribution				
95% H-UCL	0.0424	90% Chebyshev (MVUE) UCL	0.0427	
95% Chebyshev (MVUE) UCL	0.049	97.5% Chebyshev (MVUE) UCL	0.0579	
99% Chebyshev (MVUE) UCL	0.0752			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.0365	95% Jackknife UCL	0.0374	
95% Standard Bootstrap UCL	0.0362	95% Bootstrap-t UCL	0.0441	
95% Hall's Bootstrap UCL	0.0868	95% Percentile Bootstrap UCL	0.0371	
95% BCA Bootstrap UCL	0.038			
90% Chebyshev(Mean, Sd) UCL	0.043	95% Chebyshev(Mean, Sd) UCL	0.0496	
97.5% Chebyshev(Mean, Sd) UCL	0.0586	99% Chebyshev(Mean, Sd) UCL	0.0764	
Suggested UCL to Use				
95% Student's-t UCL	0.0374			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.885	Mean	2.727	
Maximum	11.34	Median	1.4	
SD	3.284	Std. Error of Mean	1.039	
Coefficient of Variation	1.205	Skewness	2.464	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.61	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.394	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	4.63	95% Adjusted-CLT UCL (Chen-1995)	5.3	
		95% Modified-t UCL (Johnson-1978)	4.765	
Gamma GOF Test				
A-D Test Statistic	1.181	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.741	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.336	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.272	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.412	k star (bias corrected MLE)	1.055	
Theta hat (MLE)	1.931	Theta star (bias corrected MLE)	2.585	
nu hat (MLE)	28.24	nu star (bias corrected)	21.1	
MLE Mean (bias corrected)	2.727	MLE Sd (bias corrected)	2.655	
		Approximate Chi Square Value (0.05)	11.66	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	10.47	

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	4.932	95% Adjusted Gamma UCL (use when n<50)	5.497	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.273	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.123	Mean of logged Data	0.609	
Maximum of Logged Data	2.428	SD of logged Data	0.82	
Assuming Lognormal Distribution				
95% H-UCL	5.455	90% Chebyshev (MVUE) UCL	4.464	
95% Chebyshev (MVUE) UCL	5.368	97.5% Chebyshev (MVUE) UCL	6.622	
99% Chebyshev (MVUE) UCL	9.086			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	4.435	95% Jackknife UCL	4.63	
95% Standard Bootstrap UCL	4.317	95% Bootstrap-t UCL	13.83	
95% Hall's Bootstrap UCL	13.04	95% Percentile Bootstrap UCL	4.495	
95% BCA Bootstrap UCL	5.576			
90% Chebyshev(Mean, Sd) UCL	5.842	95% Chebyshev(Mean, Sd) UCL	7.253	
97.5% Chebyshev(Mean, Sd) UCL	9.212	99% Chebyshev(Mean, Sd) UCL	13.06	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	7.253			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	20.68	Mean	38.9	
Maximum	49.17	Median	40.23	
SD	9.438	Std. Error of Mean	2.984	
Coefficient of Variation	0.243	Skewness	-0.795	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	44.37	95% Adjusted-CLT UCL (Chen-1995)	43.01	
		95% Modified-t UCL (Johnson-1978)	44.25	
Gamma GOF Test				
A-D Test Statistic	0.488	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level		

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

K-S Test Statistic	0.205	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	15.98	k star (bias corrected MLE)	11.25	
Theta hat (MLE)	2.435	Theta star (bias corrected MLE)	3.458	
nu hat (MLE)	319.5	nu star (bias corrected)	225	
MLE Mean (bias corrected)	38.9	MLE Sd (bias corrected)	11.6	
		Approximate Chi Square Value (0.05)	191.3	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	185.9	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	45.76	95% Adjusted Gamma UCL (use when n<50)	47.09	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.197	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.029	Mean of logged Data	3.629	
Maximum of Logged Data	3.895	SD of logged Data	0.278	
Assuming Lognormal Distribution				
95% H-UCL	46.96	90% Chebyshev (MVUE) UCL	49.38	
95% Chebyshev (MVUE) UCL	54.07	97.5% Chebyshev (MVUE) UCL	60.58	
99% Chebyshev (MVUE) UCL	73.37			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	43.81	95% Jackknife UCL	44.37	
95% Standard Bootstrap UCL	43.62	95% Bootstrap-t UCL	43.65	
95% Hall's Bootstrap UCL	43	95% Percentile Bootstrap UCL	43.48	
95% BCA Bootstrap UCL	43.02			
90% Chebyshev(Mean, Sd) UCL	47.86	95% Chebyshev(Mean, Sd) UCL	51.91	
97.5% Chebyshev(Mean, Sd) UCL	57.54	99% Chebyshev(Mean, Sd) UCL	68.6	
Suggested UCL to Use				
95% Student's-t UCL	44.37			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be				
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Lead				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.0109	Mean	0.0681	
Maximum	0.516	Median	0.0197	
SD	0.158	Std. Error of Mean	0.0498	
Coefficient of Variation	2.315	Skewness	3.155	
Normal GOF Test				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Shapiro Wilk Test Statistic	0.398	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.498	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.159	95% Adjusted-CLT UCL (Chen-1995)	0.203	
		95% Modified-t UCL (Johnson-1978)	0.168	
Gamma GOF Test				
A-D Test Statistic	2.379	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.769	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.45	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.279	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.604	k star (bias corrected MLE)	0.49	
Theta hat (MLE)	0.113	Theta star (bias corrected MLE)	0.139	
nu hat (MLE)	12.09	nu star (bias corrected)	9.795	
MLE Mean (bias corrected)	0.0681	MLE Sd (bias corrected)	0.0972	
		Approximate Chi Square Value (0.05)	3.814	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	3.193	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.175	95% Adjusted Gamma UCL (use when n<50)	0.209	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.625	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.338	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-4.52	Mean of logged Data	-3.709	
Maximum of Logged Data	-0.661	SD of logged Data	1.111	
Assuming Lognormal Distribution				
95% H-UCL	0.156	90% Chebyshev (MVUE) UCL	0.0879	
95% Chebyshev (MVUE) UCL	0.109	97.5% Chebyshev (MVUE) UCL	0.138	
99% Chebyshev (MVUE) UCL	0.195			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.15	95% Jackknife UCL	0.159	
95% Standard Bootstrap UCL	0.143	95% Bootstrap-t UCL	2.012	
95% Hall's Bootstrap UCL	0.938	95% Percentile Bootstrap UCL	0.167	
95% BCA Bootstrap UCL	0.218			
90% Chebyshev(Mean, Sd) UCL	0.218	95% Chebyshev(Mean, Sd) UCL	0.285	
97.5% Chebyshev(Mean, Sd) UCL	0.379	99% Chebyshev(Mean, Sd) UCL	0.564	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	0.285			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lithium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.244	Mean	0.402
Maximum	0.882	Median	0.343
SD	0.189	Std. Error of Mean	0.0598
Coefficient of Variation	0.47	Skewness	2.065

Normal GOF Test

Shapiro Wilk Test Statistic	0.772	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.512	95% Adjusted-CLT UCL (Chen-1995)	0.542
		95% Modified-t UCL (Johnson-1978)	0.518

Gamma GOF Test

A-D Test Statistic	0.521	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.175	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.718	k star (bias corrected MLE)	4.769
Theta hat (MLE)	0.0599	Theta star (bias corrected MLE)	0.0844
nu hat (MLE)	134.4	nu star (bias corrected)	95.38
MLE Mean (bias corrected)	0.402	MLE Sd (bias corrected)	0.184
		Approximate Chi Square Value (0.05)	73.86
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	70.57

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.52	95% Adjusted Gamma UCL (use when n<50)	0.544

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.151	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.409	Mean of logged Data	-0.987
Maximum of Logged Data	-0.125	SD of logged Data	0.389

Assuming Lognormal Distribution

95% H-UCL	0.526	90% Chebyshev (MVUE) UCL	0.548
95% Chebyshev (MVUE) UCL	0.615	97.5% Chebyshev (MVUE) UCL	0.709
99% Chebyshev (MVUE) UCL	0.892		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.501	95% Jackknife UCL	0.512
95% Standard Bootstrap UCL	0.497	95% Bootstrap-t UCL	0.604
95% Hall's Bootstrap UCL	0.905	95% Percentile Bootstrap UCL	0.511
95% BCA Bootstrap UCL	0.546		
90% Chebyshev(Mean, Sd) UCL	0.582	95% Chebyshev(Mean, Sd) UCL	0.663

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

97.5% Chebyshev(Mean, Sd) UCL	0.776	99% Chebyshev(Mean, Sd) UCL	0.997
Suggested UCL to Use			
95% Student's-t UCL	0.512		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	1.613	Mean	7.146
Maximum	34.17	Median	4.582
SD	9.826	Std. Error of Mean	3.107
Coefficient of Variation	1.375	Skewness	2.803
Normal GOF Test			
Shapiro Wilk Test Statistic	0.578	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.376	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.84	95% Adjusted-CLT UCL (Chen-1995)	15.2
		95% Modified-t UCL (Johnson-1978)	13.3
Gamma GOF Test			
A-D Test Statistic	0.894	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.745	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.297	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.273	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.166	k star (bias corrected MLE)	0.883
Theta hat (MLE)	6.13	Theta star (bias corrected MLE)	8.096
nu hat (MLE)	23.31	nu star (bias corrected)	17.65
MLE Mean (bias corrected)	7.146	MLE Sd (bias corrected)	7.606
		Approximate Chi Square Value (0.05)	9.141
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	8.097
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	13.8	95% Adjusted Gamma UCL (use when n<50)	15.58
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.221	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.478	Mean of logged Data	1.48
Maximum of Logged Data	3.531	SD of logged Data	0.924

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	16.68	90% Chebyshev (MVUE) UCL	12.2	
95% Chebyshev (MVUE) UCL	14.84	97.5% Chebyshev (MVUE) UCL	18.5	
99% Chebyshev (MVUE) UCL	25.7			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	12.26	95% Jackknife UCL	12.84	
95% Standard Bootstrap UCL	11.9	95% Bootstrap-t UCL	32.2	
95% Hall's Bootstrap UCL	37.05	95% Percentile Bootstrap UCL	12.74	
95% BCA Bootstrap UCL	16.31			
90% Chebyshev(Mean, Sd) UCL	16.47	95% Chebyshev(Mean, Sd) UCL	20.69	
97.5% Chebyshev(Mean, Sd) UCL	26.55	99% Chebyshev(Mean, Sd) UCL	38.06	
Suggested UCL to Use				
95% H-UCL	16.68			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.				
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.				
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.				
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.				
Mercury				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.00442	Mean	0.0806	
Maximum	0.706	Median	0.00909	
SD	0.22	Std. Error of Mean	0.0695	
Coefficient of Variation	2.728	Skewness	3.158	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.389	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.506	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.208	95% Adjusted-CLT UCL (Chen-1995)	0.269	
		95% Modified-t UCL (Johnson-1978)	0.22	
Gamma GOF Test				
A-D Test Statistic	2.242	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.797	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.448	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.285	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.393	k star (bias corrected MLE)	0.341	
Theta hat (MLE)	0.205	Theta star (bias corrected MLE)	0.236	
nu hat (MLE)	7.851	nu star (bias corrected)	6.829	
MLE Mean (bias corrected)	0.0806	MLE Sd (bias corrected)	0.138	
		Approximate Chi Square Value (0.05)	2.077	

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance	0.0267	Adjusted Chi Square Value		1.653
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.265	95% Adjusted Gamma UCL (use when n<50)		0.333
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.696	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.3	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-5.423	Mean of logged Data		-4.199
Maximum of Logged Data	-0.348	SD of logged Data		1.443
Assuming Lognormal Distribution				
95% H-UCL	0.302	90% Chebyshev (MVUE) UCL		0.0876
95% Chebyshev (MVUE) UCL	0.111	97.5% Chebyshev (MVUE) UCL		0.144
99% Chebyshev (MVUE) UCL	0.208			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.195	95% Jackknife UCL		0.208
95% Standard Bootstrap UCL	0.187	95% Bootstrap-t UCL		3.499
95% Hall's Bootstrap UCL	2.103	95% Percentile Bootstrap UCL		0.219
95% BCA Bootstrap UCL	0.289			
90% Chebyshev(Mean, Sd) UCL	0.289	95% Chebyshev(Mean, Sd) UCL		0.384
97.5% Chebyshev(Mean, Sd) UCL	0.515	99% Chebyshev(Mean, Sd) UCL		0.773
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	0.384			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Methyl Mercury				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations		10
Number of Detects	1	Number of Non-Detects		9
Number of Distinct Detects	1	Number of Distinct Non-Detects		9
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Methyl Mercury was not processed!				
Molybdenum				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations		10
		Number of Missing Observations		0
Minimum	0.012	Mean		0.0971
Maximum	0.222	Median		0.0702
SD	0.0727	Std. Error of Mean		0.023
Coefficient of Variation	0.749	Skewness		0.734
Normal GOF Test				
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**		

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.139	95% Adjusted-CLT UCL (Chen-1995)	0.141	
		95% Modified-t UCL (Johnson-1978)	0.14	
Gamma GOF Test				
A-D Test Statistic	0.285	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.194	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.763	k star (bias corrected MLE)	1.301	
Theta hat (MLE)	0.0551	Theta star (bias corrected MLE)	0.0747	
nu hat (MLE)	35.26	nu star (bias corrected)	26.01	
MLE Mean (bias corrected)	0.0971	MLE Sd (bias corrected)	0.0852	
		Approximate Chi Square Value (0.05)	15.39	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	13.99	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.164	95% Adjusted Gamma UCL (use when n<50)	0.181	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.145	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-4.423	Mean of logged Data	-2.642	
Maximum of Logged Data	-1.503	SD of logged Data	0.901	
Assuming Lognormal Distribution				
95% H-UCL	0.256	90% Chebyshev (MVUE) UCL	0.192	
95% Chebyshev (MVUE) UCL	0.233	97.5% Chebyshev (MVUE) UCL	0.29	
99% Chebyshev (MVUE) UCL	0.402			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.135	95% Jackknife UCL	0.139	
95% Standard Bootstrap UCL	0.134	95% Bootstrap-t UCL	0.148	
95% Hall's Bootstrap UCL	0.141	95% Percentile Bootstrap UCL	0.135	
95% BCA Bootstrap UCL	0.139			
90% Chebyshev(Mean, Sd) UCL	0.166	95% Chebyshev(Mean, Sd) UCL	0.197	
97.5% Chebyshev(Mean, Sd) UCL	0.241	99% Chebyshev(Mean, Sd) UCL	0.326	
Suggested UCL to Use				
95% Student's-t UCL	0.139			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nickel				

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.17	Mean	0.328	
Maximum	0.518	Median	0.346	
SD	0.111	Std. Error of Mean	0.0352	
Coefficient of Variation	0.34	Skewness	0.217	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.393	95% Adjusted-CLT UCL (Chen-1995)	0.389	
		95% Modified-t UCL (Johnson-1978)	0.393	
Gamma GOF Test				
A-D Test Statistic	0.29	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.186	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	9.213	k star (bias corrected MLE)	6.516	
Theta hat (MLE)	0.0356	Theta star (bias corrected MLE)	0.0504	
nu hat (MLE)	184.3	nu star (bias corrected)	130.3	
MLE Mean (bias corrected)	0.328	MLE Sd (bias corrected)	0.129	
		Approximate Chi Square Value (0.05)	104.9	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	101	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.407	95% Adjusted Gamma UCL (use when n<50)	0.423	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.772	Mean of logged Data	-1.17	
Maximum of Logged Data	-0.657	SD of logged Data	0.357	
Assuming Lognormal Distribution				
95% H-UCL	0.422	90% Chebyshev (MVUE) UCL	0.441	
95% Chebyshev (MVUE) UCL	0.492	97.5% Chebyshev (MVUE) UCL	0.563	
99% Chebyshev (MVUE) UCL	0.702			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.386	95% Jackknife UCL	0.393	
95% Standard Bootstrap UCL	0.384	95% Bootstrap-t UCL	0.4	
95% Hall's Bootstrap UCL	0.388	95% Percentile Bootstrap UCL	0.383	
95% BCA Bootstrap UCL	0.388			
90% Chebyshev(Mean, Sd) UCL	0.434	95% Chebyshev(Mean, Sd) UCL	0.482	
97.5% Chebyshev(Mean, Sd) UCL	0.548	99% Chebyshev(Mean, Sd) UCL	0.679	

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Student's-t UCL	0.393			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	5	Number of Non-Detects	5	
Number of Distinct Detects	5	Number of Distinct Non-Detects	5	
Minimum Detect	0.0653	Minimum Non-Detect	0.101	
Maximum Detect	0.0972	Maximum Non-Detect	0.131	
Variance Detects	1.6443E-4	Percent Non-Detects	50%	
Mean Detects	0.0798	SD Detects	0.0128	
Median Detects	0.0752	CV Detects	0.161	
Skewness Detects	0.479	Kurtosis Detects	-1.382	
Mean of Logged Detects	-2.538	SD of Logged Detects	0.159	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0798	KM Standard Error of Mean	0.00573	
KM SD	0.0115	95% KM (BCA) UCL	0.0892	
95% KM (t) UCL	0.0903	95% KM (Percentile Bootstrap) UCL	0.0893	
95% KM (z) UCL	0.0892	95% KM Bootstrap t UCL	0.103	
90% KM Chebyshev UCL	0.097	95% KM Chebyshev UCL	0.105	
97.5% KM Chebyshev UCL	0.116	99% KM Chebyshev UCL	0.137	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.27	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.242	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	49.29	k star (bias corrected MLE)	19.85	
Theta hat (MLE)	0.00162	Theta star (bias corrected MLE)	0.00402	
nu hat (MLE)	492.9	nu star (bias corrected)	198.5	
Mean (detects)	0.0798			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.0653	Mean	0.0796	
Maximum	0.0972	Median	0.0794	
SD	0.00855	CV	0.107	
k hat (MLE)	98.36	k star (bias corrected MLE)	68.92	
Theta hat (MLE)	8.0951E-4	Theta star (bias corrected MLE)	0.00116	
nu hat (MLE)	1967	nu star (bias corrected)	1378	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (N/A, α)	1293	Adjusted Chi Square Value (N/A, β)	1279	

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	0.0849	95% Gamma Adjusted UCL (use when n<50)	0.0858
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0798	SD (KM)	0.0115
Variance (KM)	1.3154E-4	SE of Mean (KM)	0.00573
k hat (KM)	48.41	k star (KM)	33.95
nu hat (KM)	968.2	nu star (KM)	679.1
theta hat (KM)	0.00165	theta star (KM)	0.00235
80% gamma percentile (KM)	0.091	90% gamma percentile (KM)	0.0978
95% gamma percentile (KM)	0.104	99% gamma percentile (KM)	0.115
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (679.08, α)	619.6	Adjusted Chi Square Value (679.08, β)	609.7
95% Gamma Approximate KM-UCL (use when n>=50)	0.0875	95% Gamma Adjusted KM-UCL (use when n<50)	0.0889
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0794	Mean in Log Scale	-2.538
SD in Original Scale	0.00856	SD in Log Scale	0.106
95% t UCL (assumes normality of ROS data)	0.0844	95% Percentile Bootstrap UCL	0.084
95% BCA Bootstrap UCL	0.0839	95% Bootstrap t UCL	0.0857
95% H-UCL (Log ROS)	0.0847		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.538	KM Geo Mean	0.079
KM SD (logged)	0.142	95% Critical H Value (KM-Log)	1.833
KM Standard Error of Mean (logged)	0.0711	95% H-UCL (KM -Log)	0.087
KM SD (logged)	0.142	95% Critical H Value (KM-Log)	1.833
KM Standard Error of Mean (logged)	0.0711		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0693	Mean in Log Scale	-2.688
SD in Original Scale	0.0145	SD in Log Scale	0.202
95% t UCL (Assumes normality)	0.0777	95% H-Stat UCL	0.0788
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0903		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Silver			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Silver was not processed!

Thallium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	7	Number of Non-Detects	3
Number of Distinct Detects	7	Number of Distinct Non-Detects	3
Minimum Detect	2.9800E-4	Minimum Non-Detect	8.7300E-4
Maximum Detect	0.0117	Maximum Non-Detect	9.7200E-4
Variance Detects	1.6836E-5	Percent Non-Detects	30%
Mean Detects	0.00249	SD Detects	0.0041
Median Detects	0.00101	CV Detects	1.645
Skewness Detects	2.533	Kurtosis Detects	6.518
Mean of Logged Detects	-6.747	SD of Logged Detects	1.182

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.577	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.388	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0019	KM Standard Error of Mean	0.00113
KM SD	0.00331	95% KM (BCA) UCL	0.00404
95% KM (t) UCL	0.00397	95% KM (Percentile Bootstrap) UCL	0.00401
95% KM (z) UCL	0.00376	95% KM Bootstrap t UCL	0.0183
90% KM Chebyshev UCL	0.00529	95% KM Chebyshev UCL	0.00683
97.5% KM Chebyshev UCL	0.00896	99% KM Chebyshev UCL	0.0131

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.802	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.735	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.33	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.322	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.789	k star (bias corrected MLE)	0.546
Theta hat (MLE)	0.00316	Theta star (bias corrected MLE)	0.00457
nu hat (MLE)	11.05	nu star (bias corrected)	7.647
Mean (detects)	0.00249		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	2.9800E-4	Mean	0.00475
Maximum	0.0117	Median	0.0016
SD	0.00494	CV	1.04
k hat (MLE)	0.789	k star (bias corrected MLE)	0.619
Theta hat (MLE)	0.00602	Theta star (bias corrected MLE)	0.00767
nu hat (MLE)	15.77	nu star (bias corrected)	12.37
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (12.37, α)	5.474	Adjusted Chi Square Value (12.37, β)	4.701
95% Gamma Approximate UCL (use when n>=50)	0.0107	95% Gamma Adjusted UCL (use when n<50)	0.0125

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0019	SD (KM)	0.00331
Variance (KM)	1.0928E-5	SE of Mean (KM)	0.00113

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	k hat (KM)	0.331	k star (KM)	0.298
	nu hat (KM)	6.62	nu star (KM)	5.967
	theta hat (KM)	0.00575	theta star (KM)	0.00637
	80% gamma percentile (KM)	0.00291	90% gamma percentile (KM)	0.00561
	95% gamma percentile (KM)	0.00872	99% gamma percentile (KM)	0.0168
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (5.97, α)	1.623	Adjusted Chi Square Value (5.97, β)	1.263
	95% Gamma Approximate KM-UCL (use when n>=50)	0.00699	95% Gamma Adjusted KM-UCL (use when n<50)	0.00899
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.00188	Mean in Log Scale	-7.037
	SD in Original Scale	0.00349	SD in Log Scale	1.072
	95% t UCL (assumes normality of ROS data)	0.00391	95% Percentile Bootstrap UCL	0.00403
	95% BCA Bootstrap UCL	0.00518	95% Bootstrap t UCL	0.0187
	95% H-UCL (Log ROS)	0.00499		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-7.009	KM Geo Mean	9.0371E-4
	KM SD (logged)	1.018	95% Critical H Value (KM-Log)	3.139
	KM Standard Error of Mean (logged)	0.36	95% H-UCL (KM -Log)	0.0044
	KM SD (logged)	1.018	95% Critical H Value (KM-Log)	3.139
	KM Standard Error of Mean (logged)	0.36		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.00189	Mean in Log Scale	-7.026
	SD in Original Scale	0.00349	SD in Log Scale	1.064
	95% t UCL (Assumes normality)	0.00391	95% H-Stat UCL	0.00494
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	0.00683		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Vanadium			
	General Statistics			
	Total Number of Observations	10	Number of Distinct Observations	10
			Number of Missing Observations	0
	Minimum	0.118	Mean	0.237
	Maximum	0.352	Median	0.226
	SD	0.0731	Std. Error of Mean	0.0231
	Coefficient of Variation	0.309	Skewness	0.176
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.279		95% Adjusted-CLT UCL (Chen-1995)	0.276
			95% Modified-t UCL (Johnson-1978)	0.28
Gamma GOF Test				
A-D Test Statistic	0.22		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.725		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.134		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.267		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	11.02		k star (bias corrected MLE)	7.778
Theta hat (MLE)	0.0215		Theta star (bias corrected MLE)	0.0305
nu hat (MLE)	220.3		nu star (bias corrected)	155.6
MLE Mean (bias corrected)	0.237		MLE Sd (bias corrected)	0.085
			Approximate Chi Square Value (0.05)	127.7
Adjusted Level of Significance	0.0267		Adjusted Chi Square Value	123.3
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.289		95% Adjusted Gamma UCL (use when n<50)	0.299
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.955		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.842		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.157		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.262		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-2.136		Mean of logged Data	-1.486
Maximum of Logged Data	-1.044		SD of logged Data	0.328
Assuming Lognormal Distribution				
95% H-UCL	0.297		90% Chebyshev (MVUE) UCL	0.312
95% Chebyshev (MVUE) UCL	0.346		97.5% Chebyshev (MVUE) UCL	0.393
99% Chebyshev (MVUE) UCL	0.485			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.275		95% Jackknife UCL	0.279
95% Standard Bootstrap UCL	0.273		95% Bootstrap-t UCL	0.283
95% Hall's Bootstrap UCL	0.278		95% Percentile Bootstrap UCL	0.275
95% BCA Bootstrap UCL	0.275			
90% Chebyshev(Mean, Sd) UCL	0.306		95% Chebyshev(Mean, Sd) UCL	0.338
97.5% Chebyshev(Mean, Sd) UCL	0.381		99% Chebyshev(Mean, Sd) UCL	0.467
Suggested UCL to Use				
95% Student's-t UCL	0.279			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	10		Number of Distinct Observations	10

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

			Number of Missing Observations	0
	Minimum	1.508	Mean	5.238
	Maximum	19.1	Median	2.802
	SD	5.726	Std. Error of Mean	1.811
	Coefficient of Variation	1.093	Skewness	2.051
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.671	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.364	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	8.557	95% Adjusted-CLT UCL (Chen-1995)	9.471
			95% Modified-t UCL (Johnson-1978)	8.753
	Gamma GOF Test			
	A-D Test Statistic	0.964	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.739	Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.28	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.271	Data Not Gamma Distributed at 5% Significance Level	
	Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	1.493	k star (bias corrected MLE)	1.112
	Theta hat (MLE)	3.508	Theta star (bias corrected MLE)	4.71
	nu hat (MLE)	29.87	nu star (bias corrected)	22.24
	MLE Mean (bias corrected)	5.238	MLE Sd (bias corrected)	4.967
			Approximate Chi Square Value (0.05)	12.52
	Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	11.27
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	9.306	95% Adjusted Gamma UCL (use when n<50)	10.34
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	0.411	Mean of logged Data	1.285
	Maximum of Logged Data	2.95	SD of logged Data	0.823
	Assuming Lognormal Distribution			
	95% H-UCL	10.79	90% Chebyshev (MVUE) UCL	8.81
	95% Chebyshev (MVUE) UCL	10.6	97.5% Chebyshev (MVUE) UCL	13.08
	99% Chebyshev (MVUE) UCL	17.95		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	8.216	95% Jackknife UCL	8.557
	95% Standard Bootstrap UCL	8.002	95% Bootstrap-t UCL	20.79
	95% Hall's Bootstrap UCL	24.59	95% Percentile Bootstrap UCL	8.42
	95% BCA Bootstrap UCL	9.469		
	90% Chebyshev(Mean, Sd) UCL	10.67	95% Chebyshev(Mean, Sd) UCL	13.13
	97.5% Chebyshev(Mean, Sd) UCL	16.55	99% Chebyshev(Mean, Sd) UCL	23.25
	Suggested UCL to Use			
	95% H-UCL	10.79		

Table E1-11
Cattail Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
	Recommendations are based upon data size, data distribution, and skewness.
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.
	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/14/2019 2:43:39 PM
From File	Plant_TulesStalk_UCLData_20191114.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	8	Number of Non-Detects	2
Number of Distinct Detects	8	Number of Distinct Non-Detects	2
Minimum Detect	2.04	Minimum Non-Detect	0.907
Maximum Detect	32.51	Maximum Non-Detect	0.983
Variance Detects	94.52	Percent Non-Detects	20%
Mean Detects	11.35	SD Detects	9.722
Median Detects	9.251	CV Detects	0.856
Skewness Detects	1.714	Kurtosis Detects	3.256
Mean of Logged Detects	2.129	SD of Logged Detects	0.848

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.833	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	9.263	KM Standard Error of Mean	3.091
KM SD	9.144	95% KM (BCA) UCL	14.14
95% KM (t) UCL	14.93	95% KM (Percentile Bootstrap) UCL	14.49
95% KM (z) UCL	14.35	95% KM Bootstrap t UCL	19.24
90% KM Chebyshev UCL	18.54	95% KM Chebyshev UCL	22.74
97.5% KM Chebyshev UCL	28.57	99% KM Chebyshev UCL	40.02

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.217	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.726	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.169	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.298	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.813	k star (bias corrected MLE)	1.217
Theta hat (MLE)	6.261	Theta star (bias corrected MLE)	9.331
nu hat (MLE)	29.01	nu star (bias corrected)	19.47
Mean (detects)	11.35		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	9.084
Maximum	32.51	Median	6.473
SD	9.818	CV	1.081
k hat (MLE)	0.453	k star (bias corrected MLE)	0.384
Theta hat (MLE)	20.06	Theta star (bias corrected MLE)	23.67
nu hat (MLE)	9.058	nu star (bias corrected)	7.674
Adjusted Level of Significance (β)	0.0267		

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Approximate Chi Square Value (7.67, α)	2.548	Adjusted Chi Square Value (7.67, β)	2.065
95% Gamma Approximate UCL (use when n>=50)	27.36	95% Gamma Adjusted UCL (use when n<50)	33.77
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	9.263	SD (KM)	9.144
Variance (KM)	83.62	SE of Mean (KM)	3.091
k hat (KM)	1.026	k star (KM)	0.785
nu hat (KM)	20.52	nu star (KM)	15.7
theta hat (KM)	9.027	theta star (KM)	11.8
80% gamma percentile (KM)	15.15	90% gamma percentile (KM)	22.63
95% gamma percentile (KM)	30.25	99% gamma percentile (KM)	48.29
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.70, α)	7.751	Adjusted Chi Square Value (15.70, β)	6.803
95% Gamma Approximate KM-UCL (use when n>=50)	18.76	95% Gamma Adjusted KM-UCL (use when n<50)	21.38
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	9.297	Mean in Log Scale	1.718
SD in Original Scale	9.606	SD in Log Scale	1.144
95% t UCL (assumes normality of ROS data)	14.87	95% Percentile Bootstrap UCL	14.68
95% BCA Bootstrap UCL	15.79	95% Bootstrap t UCL	19.61
95% H-UCL (Log ROS)	39.35		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.684	KM Geo Mean	5.385
KM SD (logged)	1.139	95% Critical H Value (KM-Log)	3.395
KM Standard Error of Mean (logged)	0.385	95% H-UCL (KM -Log)	37.36
KM SD (logged)	1.139	95% Critical H Value (KM-Log)	3.395
KM Standard Error of Mean (logged)	0.385		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	9.176	Mean in Log Scale	1.553
SD in Original Scale	9.724	SD in Log Scale	1.426
95% t UCL (Assumes normality)	14.81	95% H-Stat UCL	89.01
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	14.93		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Antimonywas not processed!				
Arsenic				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	1	Number of Non-Detects	9	
Number of Distinct Detects	1	Number of Distinct Non-Detects	9	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Arsenicwas not processed!				
Barium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.529	Mean	4.581	
Maximum	8.077	Median	5.13	
SD	2.736	Std. Error of Mean	0.865	
Coefficient of Variation	0.597	Skewness	-0.326	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	6.167	95% Adjusted-CLT UCL (Chen-1995)	5.909	
		95% Modified-t UCL (Johnson-1978)	6.152	
Gamma GOF Test				
A-D Test Statistic	0.56	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.24	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.905	k star (bias corrected MLE)	1.4	
Theta hat (MLE)	2.404	Theta star (bias corrected MLE)	3.271	
nu hat (MLE)	38.11	nu star (bias corrected)	28.01	
MLE Mean (bias corrected)	4.581	MLE Sd (bias corrected)	3.871	
		Approximate Chi Square Value (0.05)	16.93	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	15.46	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	7.576	95% Adjusted Gamma UCL (use when n<50)	8.301	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.253	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.636	Mean of logged Data	1.237	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum of Logged Data	2.089	SD of logged Data	0.934
Assuming Lognormal Distribution			
95% H-UCL	13.44	90% Chebyshev (MVUE) UCL	9.703
95% Chebyshev (MVUE) UCL	11.82	97.5% Chebyshev (MVUE) UCL	14.75
99% Chebyshev (MVUE) UCL	20.51		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6.004	95% Jackknife UCL	6.167
95% Standard Bootstrap UCL	5.941	95% Bootstrap-t UCL	6.144
95% Hall's Bootstrap UCL	5.79	95% Percentile Bootstrap UCL	5.916
95% BCA Bootstrap UCL	5.935		
90% Chebyshev(Mean, Sd) UCL	7.177	95% Chebyshev(Mean, Sd) UCL	8.352
97.5% Chebyshev(Mean, Sd) UCL	9.984	99% Chebyshev(Mean, Sd) UCL	13.19
Suggested UCL to Use			
95% Student's-t UCL	6.167		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be			
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.			
Beryllium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Berylliumwas not processed!			
Boron			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	6	Number of Non-Detects	4
Number of Distinct Detects	6	Number of Distinct Non-Detects	4
Minimum Detect	2.975	Minimum Non-Detect	0.931
Maximum Detect	8.881	Maximum Non-Detect	1.073
Variance Detects	4.622	Percent Non-Detects	40%
Mean Detects	5.629	SD Detects	2.15
Median Detects	5.317	CV Detects	0.382
Skewness Detects	0.427	Kurtosis Detects	-0.669
Mean of Logged Detects	1.665	SD of Logged Detects	0.395
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean	3.75	KM Standard Error of Mean	0.956
KM SD	2.759	95% KM (BCA) UCL	5.103
95% KM (t) UCL	5.501	95% KM (Percentile Bootstrap) UCL	5.174
95% KM (z) UCL	5.321	95% KM Bootstrap t UCL	5.276
90% KM Chebyshev UCL	6.616	95% KM Chebyshev UCL	7.915
97.5% KM Chebyshev UCL	9.717	99% KM Chebyshev UCL	13.26
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.232	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.212	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	8.06	k star (bias corrected MLE)	4.141
Theta hat (MLE)	0.698	Theta star (bias corrected MLE)	1.359
nu hat (MLE)	96.72	nu star (bias corrected)	49.69
Mean (detects)	5.629		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.637	Mean	3.632
Maximum	8.881	Median	3.642
SD	3.035	CV	0.836
k hat (MLE)	1.2	k star (bias corrected MLE)	0.907
Theta hat (MLE)	3.027	Theta star (bias corrected MLE)	4.006
nu hat (MLE)	24	nu star (bias corrected)	18.13
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (18.13, α)	9.486	Adjusted Chi Square Value (18.13, β)	8.42
95% Gamma Approximate UCL (use when n>=50)	6.943	95% Gamma Adjusted UCL (use when n<50)	7.821
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3.75	SD (KM)	2.759
Variance (KM)	7.609	SE of Mean (KM)	0.956
k hat (KM)	1.848	k star (KM)	1.36
nu hat (KM)	36.95	nu star (KM)	27.2
theta hat (KM)	2.029	theta star (KM)	2.757
80% gamma percentile (KM)	5.863	90% gamma percentile (KM)	8.003
95% gamma percentile (KM)	10.1	99% gamma percentile (KM)	14.85
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (27.20, α)	16.31	Adjusted Chi Square Value (27.20, β)	14.86
95% Gamma Approximate KM-UCL (use when n>=50)	6.254	95% Gamma Adjusted KM-UCL (use when n<50)	6.864
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.181	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	4.107	Mean in Log Scale	1.239
SD in Original Scale	2.536	SD in Log Scale	0.623
95% t UCL (assumes normality of ROS data)	5.577	95% Percentile Bootstrap UCL	5.404
95% BCA Bootstrap UCL	5.584	95% Bootstrap t UCL	5.95
95% H-UCL (Log ROS)	6.911		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.97	KM Geo Mean	2.638

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.893
KM Standard Error of Mean (logged)	0.31	95% H-UCL (KM -Log)	9.342
KM SD (logged)	0.896	95% Critical H Value (KM-Log)	2.893
KM Standard Error of Mean (logged)	0.31		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.575	Mean in Log Scale	0.716
SD in Original Scale	3.099	SD in Log Scale	1.261
95% t UCL (Assumes normality)	5.371	95% H-Stat UCL	21.09

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	5.501		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmiumwas not processed!

Chromium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.518	Mean	0.876
Maximum	1.221	Median	0.791
SD	0.263	Std. Error of Mean	0.0832
Coefficient of Variation	0.3	Skewness	0.136

Normal GOF Test

Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.028	95% Adjusted-CLT UCL (Chen-1995)	1.016
		95% Modified-t UCL (Johnson-1978)	1.029

Gamma GOF Test

A-D Test Statistic	0.473	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.232	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	11.95	k star (bias corrected MLE)	8.433	
Theta hat (MLE)	0.0733	Theta star (bias corrected MLE)	0.104	
nu hat (MLE)	239	nu star (bias corrected)	168.7	
MLE Mean (bias corrected)	0.876	MLE Sd (bias corrected)	0.302	
		Approximate Chi Square Value (0.05)	139.6	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	135	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	1.058	95% Adjusted Gamma UCL (use when n<50)	1.094	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.219	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.657	Mean of logged Data	-0.175	
Maximum of Logged Data	0.2	SD of logged Data	0.311	
Assuming Lognormal Distribution				
95% H-UCL	1.082	90% Chebyshev (MVUE) UCL	1.137	
95% Chebyshev (MVUE) UCL	1.254	97.5% Chebyshev (MVUE) UCL	1.418	
99% Chebyshev (MVUE) UCL	1.739			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	1.013	95% Jackknife UCL	1.028	
95% Standard Bootstrap UCL	1.006	95% Bootstrap-t UCL	1.026	
95% Hall's Bootstrap UCL	0.993	95% Percentile Bootstrap UCL	1.011	
95% BCA Bootstrap UCL	1.002			
90% Chebyshev(Mean, Sd) UCL	1.125	95% Chebyshev(Mean, Sd) UCL	1.238	
97.5% Chebyshev(Mean, Sd) UCL	1.395	99% Chebyshev(Mean, Sd) UCL	1.704	
Suggested UCL to Use				
95% Student's-t UCL	1.028			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	6	Number of Non-Detects	4	
Number of Distinct Detects	6	Number of Distinct Non-Detects	4	
Minimum Detect	0.00756	Minimum Non-Detect	0.0191	
Maximum Detect	0.0692	Maximum Non-Detect	0.0223	
Variance Detects	8.0833E-4	Percent Non-Detects	40%	
Mean Detects	0.0307	SD Detects	0.0284	
Median Detects	0.015	CV Detects	0.927	
Skewness Detects	0.924	Kurtosis Detects	-1.82	
Mean of Logged Detects	-3.853	SD of Logged Detects	0.932	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.746	**Shapiro Wilk GOF Test**		

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.325	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0234	KM Standard Error of Mean	0.00774	
KM SD	0.0221	95% KM (BCA) UCL	0.037	
95% KM (t) UCL	0.0376	95% KM (Percentile Bootstrap) UCL	0.0353	
95% KM (z) UCL	0.0361	95% KM Bootstrap t UCL	0.0822	
90% KM Chebyshev UCL	0.0466	95% KM Chebyshev UCL	0.0571	
97.5% KM Chebyshev UCL	0.0717	99% KM Chebyshev UCL	0.1	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.664	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.337	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.5	k star (bias corrected MLE)	0.861	
Theta hat (MLE)	0.0204	Theta star (bias corrected MLE)	0.0356	
nu hat (MLE)	18	nu star (bias corrected)	10.33	
Mean (detects)	0.0307			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00756	Mean	0.0237	
Maximum	0.0692	Median	0.0134	
SD	0.023	CV	0.969	
k hat (MLE)	1.828	k star (bias corrected MLE)	1.346	
Theta hat (MLE)	0.013	Theta star (bias corrected MLE)	0.0176	
nu hat (MLE)	36.55	nu star (bias corrected)	26.92	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (26.92, α)	16.09	Adjusted Chi Square Value (26.92, β)	14.65	
95% Gamma Approximate UCL (use when n>=50)	0.0397	95% Gamma Adjusted UCL (use when n<50)	0.0436	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.0234	SD (KM)	0.0221	
Variance (KM)	4.8882E-4	SE of Mean (KM)	0.00774	
k hat (KM)	1.118	k star (KM)	0.85	
nu hat (KM)	22.37	nu star (KM)	16.99	
theta hat (KM)	0.0209	theta star (KM)	0.0275	
80% gamma percentile (KM)	0.0381	90% gamma percentile (KM)	0.056	
95% gamma percentile (KM)	0.0742	99% gamma percentile (KM)	0.117	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (16.99, α)	8.665	Adjusted Chi Square Value (16.99, β)	7.654	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0458	95% Gamma Adjusted KM-UCL (use when n<50)	0.0519	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.852	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0237	Mean in Log Scale	-4.043	
SD in Original Scale	0.023	SD in Log Scale	0.736	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (assumes normality of ROS data)	0.037	95% Percentile Bootstrap UCL	0.0354
95% BCA Bootstrap UCL	0.0403	95% Bootstrap t UCL	0.129
95% H-UCL (Log ROS)	0.0435		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-4.084	KM Geo Mean	0.0168
KM SD (logged)	0.741	95% Critical H Value (KM-Log)	2.604
KM Standard Error of Mean (logged)	0.273	95% H-UCL (KM -Log)	0.0422
KM SD (logged)	0.741	95% Critical H Value (KM-Log)	2.604
KM Standard Error of Mean (logged)	0.273		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0225	Mean in Log Scale	-4.147
SD in Original Scale	0.0237	SD in Log Scale	0.792
95% t UCL (Assumes normality)	0.0362	95% H-Stat UCL	0.0441
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Bootstrap t UCL	0.0822	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0519
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.132	Mean	0.589
Maximum	1.303	Median	0.436
SD	0.394	Std. Error of Mean	0.124
Coefficient of Variation	0.668	Skewness	1.204
Normal GOF Test			
Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.817	95% Adjusted-CLT UCL (Chen-1995)	0.844
		95% Modified-t UCL (Johnson-1978)	0.825
Gamma GOF Test			
A-D Test Statistic	0.505	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.211	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.735	k star (bias corrected MLE)	1.981
Theta hat (MLE)	0.215	Theta star (bias corrected MLE)	0.297
nu hat (MLE)	54.71	nu star (bias corrected)	39.63
MLE Mean (bias corrected)	0.589	MLE Sd (bias corrected)	0.418
		Approximate Chi Square Value (0.05)	26.21

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance	0.0267	Adjusted Chi Square Value		24.32
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	0.89	95% Adjusted Gamma UCL (use when n<50)		0.959
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.199	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-2.022	Mean of logged Data		-0.723
Maximum of Logged Data	0.265	SD of logged Data		0.669
Assuming Lognormal Distribution				
95% H-UCL	1.055	90% Chebyshev (MVUE) UCL		0.978
95% Chebyshev (MVUE) UCL	1.153	97.5% Chebyshev (MVUE) UCL		1.396
99% Chebyshev (MVUE) UCL	1.873			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.794	95% Jackknife UCL		0.817
95% Standard Bootstrap UCL	0.786	95% Bootstrap-t UCL		1.077
95% Hall's Bootstrap UCL	2.188	95% Percentile Bootstrap UCL		0.786
95% BCA Bootstrap UCL	0.82			
90% Chebyshev(Mean, Sd) UCL	0.962	95% Chebyshev(Mean, Sd) UCL		1.131
97.5% Chebyshev(Mean, Sd) UCL	1.366	99% Chebyshev(Mean, Sd) UCL		1.827
Suggested UCL to Use				
95% Adjusted Gamma UCL	0.959			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations		10
		Number of Missing Observations		0
Minimum	7.938	Mean		18.72
Maximum	48.27	Median		14.29
SD	12.72	Std. Error of Mean		4.022
Coefficient of Variation	0.68	Skewness		1.591
Normal GOF Test				
Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.199	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	26.09	95% Adjusted-CLT UCL (Chen-1995)		27.5
		95% Modified-t UCL (Johnson-1978)		26.43
Gamma GOF Test				
A-D Test Statistic	0.406	**Anderson-Darling Gamma GOF Test**		

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.195	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	3.024	k star (bias corrected MLE)	2.183	
Theta hat (MLE)	6.19	Theta star (bias corrected MLE)	8.572	
nu hat (MLE)	60.48	nu star (bias corrected)	43.67	
MLE Mean (bias corrected)	18.72	MLE Sd (bias corrected)	12.67	
		Approximate Chi Square Value (0.05)	29.51	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	27.51	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	27.69	95% Adjusted Gamma UCL (use when n<50)	29.72	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.072	Mean of logged Data	2.755	
Maximum of Logged Data	3.877	SD of logged Data	0.601	
Assuming Lognormal Distribution				
95% H-UCL	30.29	90% Chebyshev (MVUE) UCL	29.24	
95% Chebyshev (MVUE) UCL	34.13	97.5% Chebyshev (MVUE) UCL	40.91	
99% Chebyshev (MVUE) UCL	54.22			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	25.33	95% Jackknife UCL	26.09	
95% Standard Bootstrap UCL	25.14	95% Bootstrap-t UCL	31.47	
95% Hall's Bootstrap UCL	55.44	95% Percentile Bootstrap UCL	25.3	
95% BCA Bootstrap UCL	26.8			
90% Chebyshev(Mean, Sd) UCL	30.78	95% Chebyshev(Mean, Sd) UCL	36.25	
97.5% Chebyshev(Mean, Sd) UCL	43.84	99% Chebyshev(Mean, Sd) UCL	58.74	
Suggested UCL to Use				
95% Student's-t UCL	26.09			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	10	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Leadwas not processed!

Lithium

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	9	Number of Non-Detects	1
Number of Distinct Detects	9	Number of Distinct Non-Detects	1
Minimum Detect	0.0955	Minimum Non-Detect	0.342
Maximum Detect	0.699	Maximum Non-Detect	0.342
Variance Detects	0.0374	Percent Non-Detects	10%
Mean Detects	0.279	SD Detects	0.193
Median Detects	0.249	CV Detects	0.693
Skewness Detects	1.287	Kurtosis Detects	1.942
Mean of Logged Detects	-1.484	SD of Logged Detects	0.692

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.266	KM Standard Error of Mean	0.0602
KM SD	0.178	95% KM (BCA) UCL	0.366
95% KM (t) UCL	0.376	95% KM (Percentile Bootstrap) UCL	0.359
95% KM (z) UCL	0.365	95% KM Bootstrap t UCL	0.428
90% KM Chebyshev UCL	0.447	95% KM Chebyshev UCL	0.528
97.5% KM Chebyshev UCL	0.642	99% KM Chebyshev UCL	0.865

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.377	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.185	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only			
k hat (MLE)	2.551	k star (bias corrected MLE)	1.775
Theta hat (MLE)	0.109	Theta star (bias corrected MLE)	0.157
nu hat (MLE)	45.93	nu star (bias corrected)	31.95
Mean (detects)	0.279		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0955	Mean	0.265
Maximum	0.699	Median	0.213
SD	0.187	CV	0.706
k hat (MLE)	2.595	k star (bias corrected MLE)	1.883
Theta hat (MLE)	0.102	Theta star (bias corrected MLE)	0.141
nu hat (MLE)	51.9	nu star (bias corrected)	37.66
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (37.66, α)	24.61	Adjusted Chi Square Value (37.66, β)	22.79
95% Gamma Approximate UCL (use when n>=50)	0.406	95% Gamma Adjusted UCL (use when n<50)	0.439

Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.266	SD (KM)	0.178
Variance (KM)	0.0318	SE of Mean (KM)	0.0602

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (KM)	2.223	k star (KM)	1.623
nu hat (KM)	44.46	nu star (KM)	32.46
theta hat (KM)	0.12	theta star (KM)	0.164
80% gamma percentile (KM)	0.408	90% gamma percentile (KM)	0.544
95% gamma percentile (KM)	0.675	99% gamma percentile (KM)	0.97
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (32.46, α)	20.43	Adjusted Chi Square Value (32.46, β)	18.79
95% Gamma Approximate KM-UCL (use when n>=50)	0.422	95% Gamma Adjusted KM-UCL (use when n<50)	0.459
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.266	Mean in Log Scale	-1.53
SD in Original Scale	0.187	SD in Log Scale	0.668
95% t UCL (assumes normality of ROS data)	0.374	95% Percentile Bootstrap UCL	0.362
95% BCA Bootstrap UCL	0.375	95% Bootstrap t UCL	0.431
95% H-UCL (Log ROS)	0.47		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.535	KM Geo Mean	0.216
KM SD (logged)	0.647	95% Critical H Value (KM-Log)	2.443
KM Standard Error of Mean (logged)	0.221	95% H-UCL (KM -Log)	0.45
KM SD (logged)	0.647	95% Critical H Value (KM-Log)	2.443
KM Standard Error of Mean (logged)	0.221		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.268	Mean in Log Scale	-1.513
SD in Original Scale	0.186	SD in Log Scale	0.658
95% t UCL (Assumes normality)	0.376	95% H-Stat UCL	0.47
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.376		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	22.66	Mean	75.54
Maximum	226.8	Median	62.31
SD	62.79	Std. Error of Mean	19.85
Coefficient of Variation	0.831	Skewness	1.733
Normal GOF Test			
Shapiro Wilk Test Statistic	0.816	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	111.9		95% Adjusted-CLT UCL (Chen-1995)	119.8
			95% Modified-t UCL (Johnson-1978)	113.7
Gamma GOF Test				
A-D Test Statistic	0.341		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.736		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.175		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.27		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.98		k star (bias corrected MLE)	1.453
Theta hat (MLE)	38.15		Theta star (bias corrected MLE)	52
nu hat (MLE)	39.6		nu star (bias corrected)	29.05
MLE Mean (bias corrected)	75.54		MLE Sd (bias corrected)	62.67
			Approximate Chi Square Value (0.05)	17.75
Adjusted Level of Significance	0.0267		Adjusted Chi Square Value	16.23
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	123.6		95% Adjusted Gamma UCL (use when n<50)	135.2
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.937		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.842		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.262		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.121		Mean of logged Data	4.051
Maximum of Logged Data	5.424		SD of logged Data	0.771
Assuming Lognormal Distribution				
95% H-UCL	153.3		90% Chebyshev (MVUE) UCL	131.2
95% Chebyshev (MVUE) UCL	156.9		97.5% Chebyshev (MVUE) UCL	192.5
99% Chebyshev (MVUE) UCL	262.3			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	108.2		95% Jackknife UCL	111.9
95% Standard Bootstrap UCL	106.4		95% Bootstrap-t UCL	138.4
95% Hall's Bootstrap UCL	254.1		95% Percentile Bootstrap UCL	108.9
95% BCA Bootstrap UCL	118.1			
90% Chebyshev(Mean, Sd) UCL	135.1		95% Chebyshev(Mean, Sd) UCL	162.1
97.5% Chebyshev(Mean, Sd) UCL	199.5		99% Chebyshev(Mean, Sd) UCL	273.1
Suggested UCL to Use				
95% Student's-t UCL	111.9			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury				

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.00155	Mean	0.00229	
Maximum	0.00414	Median	0.00204	
SD	7.7302E-4	Std. Error of Mean	2.4445E-4	
Coefficient of Variation	0.338	Skewness	1.67	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.837	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.00273	95% Adjusted-CLT UCL (Chen-1995)	0.00283	
		95% Modified-t UCL (Johnson-1978)	0.00276	
Gamma GOF Test				
A-D Test Statistic	0.426	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.198	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	11.72	k star (bias corrected MLE)	8.27	
Theta hat (MLE)	1.9512E-4	Theta star (bias corrected MLE)	2.7650E-4	
nu hat (MLE)	234.4	nu star (bias corrected)	165.4	
MLE Mean (bias corrected)	0.00229	MLE Sd (bias corrected)	7.9513E-4	
		Approximate Chi Square Value (0.05)	136.7	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	132.1	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.00277	95% Adjusted Gamma UCL (use when n<50)	0.00286	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-6.468	Mean of logged Data	-6.124	
Maximum of Logged Data	-5.488	SD of logged Data	0.298	
Assuming Lognormal Distribution				
95% H-UCL	0.00279	90% Chebyshev (MVUE) UCL	0.00293	
95% Chebyshev (MVUE) UCL	0.00322	97.5% Chebyshev (MVUE) UCL	0.00363	
99% Chebyshev (MVUE) UCL	0.00443			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.00269	95% Jackknife UCL	0.00273	
95% Standard Bootstrap UCL	0.00266	95% Bootstrap-t UCL	0.00303	
95% Hall's Bootstrap UCL	0.00426	95% Percentile Bootstrap UCL	0.00269	
95% BCA Bootstrap UCL	0.00282			
90% Chebyshev(Mean, Sd) UCL	0.00302	95% Chebyshev(Mean, Sd) UCL	0.00335	
97.5% Chebyshev(Mean, Sd) UCL	0.00381	99% Chebyshev(Mean, Sd) UCL	0.00472	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% Student's-t UCL	0.00273			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Methyl Mercury				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	1	Number of Non-Detects	9	
Number of Distinct Detects	1	Number of Distinct Non-Detects	9	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Methyl Mercurywas not processed!				
Molybdenum				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	4	Number of Non-Detects	6	
Number of Distinct Detects	4	Number of Distinct Non-Detects	6	
Minimum Detect	0.0227	Minimum Non-Detect	0.0112	
Maximum Detect	0.11	Maximum Non-Detect	0.0136	
Variance Detects	0.00172	Percent Non-Detects	60%	
Mean Detects	0.0487	SD Detects	0.0415	
Median Detects	0.031	CV Detects	0.852	
Skewness Detects	1.859	Kurtosis Detects	3.467	
Mean of Logged Detects	-3.246	SD of Logged Detects	0.728	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.358	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0262	KM Standard Error of Mean	0.0107	
KM SD	0.0292	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.0458	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.0438	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	0.0582	95% KM Chebyshev UCL	0.0727	
97.5% KM Chebyshev UCL	0.0929	99% KM Chebyshev UCL	0.132	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.536	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.318	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.397	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.383	k star (bias corrected MLE)	0.762	
Theta hat (MLE)	0.0204	Theta star (bias corrected MLE)	0.0639	
nu hat (MLE)	19.06	nu star (bias corrected)	6.099	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (detects)	0.0487		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.0255
Maximum	0.11	Median	0.01
SD	0.0312	CV	1.225
k hat (MLE)	1.42	k star (bias corrected MLE)	1.061
Theta hat (MLE)	0.0179	Theta star (bias corrected MLE)	0.024
nu hat (MLE)	28.4	nu star (bias corrected)	21.21
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (21.21, α)	11.75	Adjusted Chi Square Value (21.21, β)	10.54
95% Gamma Approximate UCL (use when n>=50)	0.046	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.0262	SD (KM)	0.0292
Variance (KM)	8.5373E-4	SE of Mean (KM)	0.0107
k hat (KM)	0.806	k star (KM)	0.631
nu hat (KM)	16.11	nu star (KM)	12.61
theta hat (KM)	0.0326	theta star (KM)	0.0416
80% gamma percentile (KM)	0.0432	90% gamma percentile (KM)	0.0674
95% gamma percentile (KM)	0.0927	99% gamma percentile (KM)	0.153
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (12.61, α)	5.634	Adjusted Chi Square Value (12.61, β)	4.847
95% Gamma Approximate KM-UCL (use when n>=50)	0.0587	95% Gamma Adjusted KM-UCL (use when n<50)	0.0682
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.842	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0215	Mean in Log Scale	-4.717
SD in Original Scale	0.0335	SD in Log Scale	1.334
95% t UCL (assumes normality of ROS data)	0.0409	95% Percentile Bootstrap UCL	0.0404
95% BCA Bootstrap UCL	0.0501	95% Bootstrap t UCL	0.0674
95% H-UCL (Log ROS)	0.119		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.991	KM Geo Mean	0.0185
KM SD (logged)	0.727	95% Critical H Value (KM-Log)	2.579
KM Standard Error of Mean (logged)	0.266	95% H-UCL (KM -Log)	0.045
KM SD (logged)	0.727	95% Critical H Value (KM-Log)	2.579
KM Standard Error of Mean (logged)	0.266		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0231	Mean in Log Scale	-4.369
SD in Original Scale	0.0326	SD in Log Scale	1.055
95% t UCL (Assumes normality)	0.042	95% H-Stat UCL	0.0684
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0458		

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.244	Mean	0.494
Maximum	0.72	Median	0.526
SD	0.196	Std. Error of Mean	0.062
Coefficient of Variation	0.397	Skewness	-0.222

Normal GOF Test

Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.607	95% Adjusted-CLT UCL (Chen-1995)	0.591
		95% Modified-t UCL (Johnson-1978)	0.606

Gamma GOF Test

A-D Test Statistic	0.667	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.207	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.144	k star (bias corrected MLE)	4.367
Theta hat (MLE)	0.0803	Theta star (bias corrected MLE)	0.113
nu hat (MLE)	122.9	nu star (bias corrected)	87.35
MLE Mean (bias corrected)	0.494	MLE Sd (bias corrected)	0.236
		Approximate Chi Square Value (0.05)	66.8
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	63.69

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.645	95% Adjusted Gamma UCL (use when n<50)	0.677

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.842	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.203	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.411	Mean of logged Data	-0.79
Maximum of Logged Data	-0.329	SD of logged Data	0.448

Assuming Lognormal Distribution

95% H-UCL	0.692	90% Chebyshev (MVUE) UCL	0.711
95% Chebyshev (MVUE) UCL	0.808	97.5% Chebyshev (MVUE) UCL	0.942
99% Chebyshev (MVUE) UCL	1.207		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCLs				
95% CLT UCL	0.596	95% Jackknife UCL	0.607	
95% Standard Bootstrap UCL	0.587	95% Bootstrap-t UCL	0.596	
95% Hall's Bootstrap UCL	0.579	95% Percentile Bootstrap UCL	0.586	
95% BCA Bootstrap UCL	0.586			
90% Chebyshev(Mean, Sd) UCL	0.68	95% Chebyshev(Mean, Sd) UCL	0.764	
97.5% Chebyshev(Mean, Sd) UCL	0.881	99% Chebyshev(Mean, Sd) UCL	1.111	
Suggested UCL to Use				
95% Student's-t UCL	0.607			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Selenium

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Seleniumwas not processed!

Silver

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silverwas not processed!

Thallium

General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	3.9400E-4	Minimum Non-Detect	9.5150E-4
Maximum Detect	0.00408	Maximum Non-Detect	0.00112
Variance Detects	2.1183E-6	Percent Non-Detects	50%
Mean Detects	0.00235	SD Detects	0.00146
Median Detects	0.00246	CV Detects	0.619
Skewness Detects	-0.277	Kurtosis Detects	-1.038
Mean of Logged Detects	-6.31	SD of Logged Detects	0.933
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.983	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00137	KM Standard Error of Mean	4.7518E-4	
KM SD	0.00134	95% KM (BCA) UCL	0.00251	
95% KM (t) UCL	0.00224	95% KM (Percentile Bootstrap) UCL	0.00227	
95% KM (z) UCL	0.00215	95% KM Bootstrap t UCL	0.00208	
90% KM Chebyshev UCL	0.0028	95% KM Chebyshev UCL	0.00344	
97.5% KM Chebyshev UCL	0.00434	99% KM Chebyshev UCL	0.0061	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.309	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.684	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.216	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.36	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.088	k star (bias corrected MLE)	0.969	
Theta hat (MLE)	0.00113	Theta star (bias corrected MLE)	0.00243	
nu hat (MLE)	20.88	nu star (bias corrected)	9.687	
Mean (detects)	0.00235			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	3.9400E-4	Mean	0.00618	
Maximum	0.01	Median	0.00704	
SD	0.00415	CV	0.671	
k hat (MLE)	1.494	k star (bias corrected MLE)	1.112	
Theta hat (MLE)	0.00414	Theta star (bias corrected MLE)	0.00555	
nu hat (MLE)	29.87	nu star (bias corrected)	22.24	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (22.24, α)	12.52	Adjusted Chi Square Value (22.24, β)	11.27	
95% Gamma Approximate UCL (use when n>=50)	0.011	95% Gamma Adjusted UCL (use when n<50)	0.0122	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00137	SD (KM)	0.00134	
Variance (KM)	1.8064E-6	SE of Mean (KM)	4.7518E-4	
k hat (KM)	1.044	k star (KM)	0.798	
nu hat (KM)	20.88	nu star (KM)	15.95	
theta hat (KM)	0.00132	theta star (KM)	0.00172	
80% gamma percentile (KM)	0.00224	90% gamma percentile (KM)	0.00334	
95% gamma percentile (KM)	0.00446	99% gamma percentile (KM)	0.0071	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (15.95, α)	7.927	Adjusted Chi Square Value (15.95, β)	6.966	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00276	95% Gamma Adjusted KM-UCL (use when n<50)	0.00314	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00139	Mean in Log Scale	-7.031	
SD in Original Scale	0.0014	SD in Log Scale	0.982	
95% t UCL (assumes normality of ROS data)	0.0022	95% Percentile Bootstrap UCL	0.00213	

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% BCA Bootstrap UCL	0.00221	95% Bootstrap t UCL	0.00245
95% H-UCL (Log ROS)	0.0039		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-7.075	KM Geo Mean	8.4620E-4
KM SD (logged)	0.966	95% Critical H Value (KM-Log)	3.033
KM Standard Error of Mean (logged)	0.341	95% H-UCL (KM -Log)	0.00358
KM SD (logged)	0.966	95% Critical H Value (KM-Log)	3.033
KM Standard Error of Mean (logged)	0.341		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.00143	Mean in Log Scale	-6.959
SD in Original Scale	0.00138	SD in Log Scale	0.925
95% t UCL (Assumes normality)	0.00222	95% H-Stat UCL	0.00362
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.00224		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	0.122	Minimum Non-Detect	0.0582
Maximum Detect	0.209	Maximum Non-Detect	0.0745
Variance Detects	0.00127	Percent Non-Detects	50%
Mean Detects	0.147	SD Detects	0.0356
Median Detects	0.134	CV Detects	0.243
Skewness Detects	1.963	Kurtosis Detects	4.002
Mean of Logged Detects	-1.94	SD of Logged Detects	0.217
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.755	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.346	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.102	KM Standard Error of Mean	0.0176
KM SD	0.0497	95% KM (BCA) UCL	0.133
95% KM (t) UCL	0.135	95% KM (Percentile Bootstrap) UCL	0.133
95% KM (z) UCL	0.131	95% KM Bootstrap t UCL	0.119
90% KM Chebyshev UCL	0.155	95% KM Chebyshev UCL	0.179
97.5% KM Chebyshev UCL	0.212	99% KM Chebyshev UCL	0.277
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.637	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.329	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	24.69	k star (bias corrected MLE)	10.01	
Theta hat (MLE)	0.00594	Theta star (bias corrected MLE)	0.0147	
nu hat (MLE)	246.9	nu star (bias corrected)	100.1	
Mean (detects)	0.147			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.0555	Mean	0.101	
Maximum	0.209	Median	0.0885	
SD	0.0536	CV	0.53	
k hat (MLE)	4.202	k star (bias corrected MLE)	3.008	
Theta hat (MLE)	0.0241	Theta star (bias corrected MLE)	0.0336	
nu hat (MLE)	84.04	nu star (bias corrected)	60.16	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (60.16, α)	43.32	Adjusted Chi Square Value (60.16, β)	40.85	
95% Gamma Approximate UCL (use when n>=50)	0.14	95% Gamma Adjusted UCL (use when n<50)	0.149	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.102	SD (KM)	0.0497	
Variance (KM)	0.00247	SE of Mean (KM)	0.0176	
k hat (KM)	4.257	k star (KM)	3.046	
nu hat (KM)	85.14	nu star (KM)	60.93	
theta hat (KM)	0.0241	theta star (KM)	0.0336	
80% gamma percentile (KM)	0.146	90% gamma percentile (KM)	0.181	
95% gamma percentile (KM)	0.214	99% gamma percentile (KM)	0.285	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (60.93, α)	43.98	Adjusted Chi Square Value (60.93, β)	41.48	
95% Gamma Approximate KM-UCL (use when n>=50)	0.142	95% Gamma Adjusted KM-UCL (use when n<50)	0.15	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.801	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.112	Mean in Log Scale	-2.249	
SD in Original Scale	0.0436	SD in Log Scale	0.357	
95% t UCL (assumes normality of ROS data)	0.137	95% Percentile Bootstrap UCL	0.135	
95% BCA Bootstrap UCL	0.139	95% Bootstrap t UCL	0.147	
95% H-UCL (Log ROS)	0.143			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.392	KM Geo Mean	0.0915	
KM SD (logged)	0.472	95% Critical H Value (KM-Log)	2.182	
KM Standard Error of Mean (logged)	0.167	95% H-UCL (KM -Log)	0.144	
KM SD (logged)	0.472	95% Critical H Value (KM-Log)	2.182	
KM Standard Error of Mean (logged)	0.167			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0906	Mean in Log Scale	-2.656	
SD in Original Scale	0.0638	SD in Log Scale	0.771	
95% t UCL (Assumes normality)	0.128	95% H-Stat UCL	0.187	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Gamma Distributed at 5% Significance Level				

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% KM Adjusted Gamma UCL	0.15	95% GROS Adjusted Gamma UCL	0.149	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Zinc				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	0.406	Mean	1.591	
Maximum	3.184	Median	1.217	
SD	1.136	Std. Error of Mean	0.359	
Coefficient of Variation	0.714	Skewness	0.559	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.832	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	2.25	95% Adjusted-CLT UCL (Chen-1995)	2.25	
		95% Modified-t UCL (Johnson-1978)	2.26	
Gamma GOF Test				
A-D Test Statistic	0.534	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	2.086	k star (bias corrected MLE)	1.527	
Theta hat (MLE)	0.763	Theta star (bias corrected MLE)	1.042	
nu hat (MLE)	41.73	nu star (bias corrected)	30.54	
MLE Mean (bias corrected)	1.591	MLE Sd (bias corrected)	1.288	
		Approximate Chi Square Value (0.05)	18.92	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	17.35	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	2.569	95% Adjusted Gamma UCL (use when n<50)	2.802	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-0.902	Mean of logged Data	0.206	
Maximum of Logged Data	1.158	SD of logged Data	0.78	
Assuming Lognormal Distribution				
95% H-UCL	3.335	90% Chebyshev (MVUE) UCL	2.835	
95% Chebyshev (MVUE) UCL	3.393	97.5% Chebyshev (MVUE) UCL	4.166	
99% Chebyshev (MVUE) UCL	5.685			

Table E1-12
Tule Stalks, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	2.182	95% Jackknife UCL	2.25
	95% Standard Bootstrap UCL	2.151	95% Bootstrap-t UCL	2.322
	95% Hall's Bootstrap UCL	2.066	95% Percentile Bootstrap UCL	2.168
	95% BCA Bootstrap UCL	2.218		
	90% Chebyshev(Mean, Sd) UCL	2.669	95% Chebyshev(Mean, Sd) UCL	3.157
	97.5% Chebyshev(Mean, Sd) UCL	3.834	99% Chebyshev(Mean, Sd) UCL	5.164
	Suggested UCL to Use			
	95% Student's-t UCL	2.25		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/14/2019 2:19:23 PM
From File	Plant_TulesRoot_UCLData_20191114.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	13.21	Mean	32
Maximum	64.07	Median	27.51
SD	16.81	Std. Error of Mean	5.317
Coefficient of Variation	0.525	Skewness	0.833

Normal GOF Test

Shapiro Wilk Test Statistic	0.905	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	41.75	95% Adjusted-CLT UCL (Chen-1995)	42.24
		95% Modified-t UCL (Johnson-1978)	41.98

Gamma GOF Test

A-D Test Statistic	0.289	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.165	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.21	k star (bias corrected MLE)	3.014
Theta hat (MLE)	7.601	Theta star (bias corrected MLE)	10.62
nu hat (MLE)	84.2	nu star (bias corrected)	60.27
MLE Mean (bias corrected)	32	MLE Sd (bias corrected)	18.43
		Approximate Chi Square Value (0.05)	43.42
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	40.94

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	44.42	95% Adjusted Gamma UCL (use when n<50)	47.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.581	Mean of logged Data	3.342
Maximum of Logged Data	4.16	SD of logged Data	0.527

Assuming Lognormal Distribution

95% H-UCL	48.33	90% Chebyshev (MVUE) UCL	48.32
95% Chebyshev (MVUE) UCL	55.72	97.5% Chebyshev (MVUE) UCL	65.98
99% Chebyshev (MVUE) UCL	86.13		

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	40.74	95% Jackknife UCL	41.75	
95% Standard Bootstrap UCL	40.45	95% Bootstrap-t UCL	43.25	
95% Hall's Bootstrap UCL	42.15	95% Percentile Bootstrap UCL	40.25	
95% BCA Bootstrap UCL	42.42			
90% Chebyshev(Mean, Sd) UCL	47.95	95% Chebyshev(Mean, Sd) UCL	55.17	
97.5% Chebyshev(Mean, Sd) UCL	65.2	99% Chebyshev(Mean, Sd) UCL	84.9	
Suggested UCL to Use				
95% Student's-t UCL	41.75			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	3	Number of Non-Detects	7	
Number of Distinct Detects	3	Number of Distinct Non-Detects	7	
Minimum Detect	0.00772	Minimum Non-Detect	0.00945	
Maximum Detect	0.017	Maximum Non-Detect	0.0118	
Variance Detects	2.2970E-5	Percent Non-Detects	70%	
Mean Detects	0.0117	SD Detects	0.00479	
Median Detects	0.0103	CV Detects	0.41	
Skewness Detects	1.176	Kurtosis Detects	N/A	
Mean of Logged Detects	-4.504	SD of Logged Detects	0.4	
Warning: Data set has only 3 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.939	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.00912	KM Standard Error of Mean	0.00114	
KM SD	0.00281	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.0112	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.011	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	0.0125	95% KM Chebyshev UCL	0.0141	
97.5% KM Chebyshev UCL	0.0162	99% KM Chebyshev UCL	0.0205	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	9.378	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.00125	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	56.27	nu star (bias corrected)	N/A	
Mean (detects)	0.0117			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00772	Mean	0.0105	
Maximum	0.017	Median	0.01	
SD	0.0024	CV	0.229	
k hat (MLE)	26.66	k star (bias corrected MLE)	18.73	
Theta hat (MLE)	3.9403E-4	Theta star (bias corrected MLE)	5.6090E-4	
nu hat (MLE)	533.2	nu star (bias corrected)	374.6	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (374.58, α)	330.7	Adjusted Chi Square Value (374.58, β)	323.6	
95% Gamma Approximate UCL (use when n>=50)	0.0119	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00912	SD (KM)	0.00281	
Variance (KM)	7.8956E-6	SE of Mean (KM)	0.00114	
k hat (KM)	10.53	k star (KM)	7.436	
nu hat (KM)	210.5	nu star (KM)	148.7	
theta hat (KM)	8.6603E-4	theta star (KM)	0.00123	
80% gamma percentile (KM)	0.0117	90% gamma percentile (KM)	0.0136	
95% gamma percentile (KM)	0.0152	99% gamma percentile (KM)	0.0186	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (148.72, α)	121.5	Adjusted Chi Square Value (148.72, β)	117.3	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0112	95% Gamma Adjusted KM-UCL (use when n<50)	0.0116	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00892	Mean in Log Scale	-4.755	
SD in Original Scale	0.00297	SD in Log Scale	0.259	
95% t UCL (assumes normality of ROS data)	0.0106	95% Percentile Bootstrap UCL	0.0107	
95% BCA Bootstrap UCL	0.0117	95% Bootstrap t UCL	0.02	
95% H-UCL (Log ROS)	0.0105			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-4.733	KM Geo Mean	0.0088	
KM SD (logged)	0.246	95% Critical H Value (KM-Log)	1.923	
KM Standard Error of Mean (logged)	0.103	95% H-UCL (KM -Log)	0.0106	
KM SD (logged)	0.246	95% Critical H Value (KM-Log)	1.923	
KM Standard Error of Mean (logged)	0.103			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00719	Mean in Log Scale	-5.026	
SD in Original Scale	0.00385	SD in Log Scale	0.413	
95% t UCL (Assumes normality)	0.00943	95% H-Stat UCL	0.00955	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.0112			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Arsenic

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	8
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.0471	Minimum Non-Detect	0.0756
Maximum Detect	0.0559	Maximum Non-Detect	0.0951
Variance Detects	3.9073E-5	Percent Non-Detects	80%
Mean Detects	0.0515	SD Detects	0.00625
Median Detects	0.0515	CV Detects	0.121
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-2.97	SD of Logged Detects	0.122

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.0515	KM Standard Error of Mean	0.00442
KM SD	0.00442	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.0596	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.0588	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.0647	95% KM Chebyshev UCL	0.0707
97.5% KM Chebyshev UCL	0.0791	99% KM Chebyshev UCL	0.0955

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	135.3	k star (bias corrected MLE)	N/A
Theta hat (MLE)	3.8043E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	541.3	nu star (bias corrected)	N/A
Mean (detects)	0.0515		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0515	SD (KM)	0.00442
Variance (KM)	1.9536E-5	SE of Mean (KM)	0.00442
k hat (KM)	135.7	k star (KM)	95.02
nu hat (KM)	2713	nu star (KM)	1900
theta hat (KM)	3.7949E-4	theta star (KM)	5.4176E-4
80% gamma percentile (KM)	0.0559	90% gamma percentile (KM)	0.0584
95% gamma percentile (KM)	0.0605	99% gamma percentile (KM)	0.0646

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0267
Approximate Chi Square Value (N/A, α)	1800	Adjusted Chi Square Value (N/A, β)	1783
95% Gamma Approximate KM-UCL (use when n>=50)	0.0543	95% Gamma Adjusted KM-UCL (use when n<50)	0.0549

Lognormal GOF Test on Detected Observations Only

Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0513	Mean in Log Scale	-2.97
SD in Original Scale	0.00209	SD in Log Scale	0.0406
95% t UCL (assumes normality of ROS data)	0.0525	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	N/A		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	-2.97	KM Geo Mean	0.0513
KM SD (logged)	0.0861	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0861	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0861	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0861		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0439	Mean in Log Scale	-3.133
SD in Original Scale	0.00542	SD in Log Scale	0.118
95% t UCL (Assumes normality)	0.047	95% H-Stat UCL	0.0472

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0596	KM H-UCL	N/A
95% KM (BCA) UCL	N/A		

Warning: One or more Recommended UCL(s) not available!
Warning: Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Barium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.326	Mean	1.384
Maximum	3.572	Median	1.201
SD	0.95	Std. Error of Mean	0.3
Coefficient of Variation	0.686	Skewness	1.359

Normal GOF Test

Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.935	95% Adjusted-CLT UCL (Chen-1995)	2.016
		95% Modified-t UCL (Johnson-1978)	1.956

Gamma GOF Test

A-D Test Statistic	0.222	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.139	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.463	k star (bias corrected MLE)	1.79
Theta hat (MLE)	0.562	Theta star (bias corrected MLE)	0.773
nu hat (MLE)	49.25	nu star (bias corrected)	35.81
MLE Mean (bias corrected)	1.384	MLE Sd (bias corrected)	1.034
		Approximate Chi Square Value (0.05)	23.12
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	21.36

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	2.144	95% Adjusted Gamma UCL (use when n<50)	2.321	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.183	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.121	Mean of logged Data	0.109	
Maximum of Logged Data	1.273	SD of logged Data	0.72	
Assuming Lognormal Distribution				
95% H-UCL	2.676	90% Chebyshev (MVUE) UCL	2.39	
95% Chebyshev (MVUE) UCL	2.838	97.5% Chebyshev (MVUE) UCL	3.459	
99% Chebyshev (MVUE) UCL	4.68			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	1.878	95% Jackknife UCL	1.935	
95% Standard Bootstrap UCL	1.863	95% Bootstrap-t UCL	2.194	
95% Hall's Bootstrap UCL	4.264	95% Percentile Bootstrap UCL	1.883	
95% BCA Bootstrap UCL	2.015			
90% Chebyshev(Mean, Sd) UCL	2.285	95% Chebyshev(Mean, Sd) UCL	2.694	
97.5% Chebyshev(Mean, Sd) UCL	3.26	99% Chebyshev(Mean, Sd) UCL	4.373	
Suggested UCL to Use				
95% Student's-t UCL	1.935			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Beryllium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	10	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Beryllium was not processed!				
Boron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	7	Number of Non-Detects	3	
Number of Distinct Detects	7	Number of Distinct Non-Detects	3	
Minimum Detect	1.009	Minimum Non-Detect	0.909	
Maximum Detect	64.8	Maximum Non-Detect	1.077	
Variance Detects	496	Percent Non-Detects	30%	
Mean Detects	18.53	SD Detects	22.27	
Median Detects	9.706	CV Detects	1.202	
Skewness Detects	1.838	Kurtosis Detects	3.687	
Mean of Logged Detects	2.119	SD of Logged Detects	1.58	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.794	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Approximate Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	13.25	KM Standard Error of Mean	6.504	
KM SD	19.04	95% KM (BCA) UCL	24.36	
95% KM (t) UCL	25.17	95% KM (Percentile Bootstrap) UCL	24.21	
95% KM (z) UCL	23.95	95% KM Bootstrap t UCL	39.6	
90% KM Chebyshev UCL	32.76	95% KM Chebyshev UCL	41.6	
97.5% KM Chebyshev UCL	53.87	99% KM Chebyshev UCL	77.97	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.278	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.186	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.323	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.748	k star (bias corrected MLE)	0.523	
Theta hat (MLE)	24.77	Theta star (bias corrected MLE)	35.45	
nu hat (MLE)	10.47	nu star (bias corrected)	7.317	
Mean (detects)	18.53			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	12.97	
Maximum	64.8	Median	4.86	
SD	20.26	CV	1.562	
k hat (MLE)	0.283	k star (bias corrected MLE)	0.265	
Theta hat (MLE)	45.86	Theta star (bias corrected MLE)	49.01	
nu hat (MLE)	5.657	nu star (bias corrected)	5.293	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (5.29, α)	1.29	Adjusted Chi Square Value (5.29, β)	0.981	
95% Gamma Approximate UCL (use when n>=50)	53.23	95% Gamma Adjusted UCL (use when n<50)	69.97	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	13.25	SD (KM)	19.04	
Variance (KM)	362.6	SE of Mean (KM)	6.504	
k hat (KM)	0.484	k star (KM)	0.405	
nu hat (KM)	9.679	nu star (KM)	8.109	
theta hat (KM)	27.37	theta star (KM)	32.67	
80% gamma percentile (KM)	21.41	90% gamma percentile (KM)	37.33	
95% gamma percentile (KM)	54.79	99% gamma percentile (KM)	98.62	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (8.11, α)	2.798	Adjusted Chi Square Value (8.11, β)	2.285	
95% Gamma Approximate KM-UCL (use when n>=50)	38.39	95% Gamma Adjusted KM-UCL (use when n<50)	47	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	13.06	Mean in Log Scale	1.092
SD in Original Scale	20.2	SD in Log Scale	2.119
95% t UCL (assumes normality of ROS data)	24.77	95% Percentile Bootstrap UCL	24.05
95% BCA Bootstrap UCL	28.3	95% Bootstrap t UCL	38.73
95% H-UCL (Log ROS)	1563		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.46	KM Geo Mean	4.307
KM SD (logged)	1.584	95% Critical H Value (KM-Log)	4.403
KM Standard Error of Mean (logged)	0.541	95% H-UCL (KM -Log)	154.4
KM SD (logged)	1.584	95% Critical H Value (KM-Log)	4.403
KM Standard Error of Mean (logged)	0.541		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	13.12	Mean in Log Scale	1.266
SD in Original Scale	20.16	SD in Log Scale	1.884
95% t UCL (Assumes normality)	24.8	95% H-Stat UCL	519.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	25.17		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cadmium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	4	Number of Non-Detects	6
Number of Distinct Detects	4	Number of Distinct Non-Detects	6
Minimum Detect	0.00309	Minimum Non-Detect	0.00378
Maximum Detect	0.00903	Maximum Non-Detect	0.0047
Variance Detects	7.7497E-6	Percent Non-Detects	60%
Mean Detects	0.00699	SD Detects	0.00278
Median Detects	0.00792	CV Detects	0.398
Skewness Detects	-1.334	Kurtosis Detects	1.121
Mean of Logged Detects	-5.046	SD of Logged Detects	0.506
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00465	KM Standard Error of Mean	8.9245E-4
KM SD	0.00244	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.00628	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00612	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00732	95% KM Chebyshev UCL	0.00854
97.5% KM Chebyshev UCL	0.0102	99% KM Chebyshev UCL	0.0135
Gamma GOF Tests on Detected Observations Only			

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

A-D Test Statistic	0.526	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.288	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	6.261	k star (bias corrected MLE)	1.732	
Theta hat (MLE)	0.00112	Theta star (bias corrected MLE)	0.00403	
nu hat (MLE)	50.09	nu star (bias corrected)	13.86	
Mean (detects)	0.00699			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00309	Mean	0.00879	
Maximum	0.01	Median	0.01	
SD	0.00224	CV	0.254	
k hat (MLE)	10.63	k star (bias corrected MLE)	7.506	
Theta hat (MLE)	8.2749E-4	Theta star (bias corrected MLE)	0.00117	
nu hat (MLE)	212.6	nu star (bias corrected)	150.1	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (150.13, α)	122.8	Adjusted Chi Square Value (150.13, β)	118.5	
95% Gamma Approximate UCL (use when n>=50)	0.0108	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00465	SD (KM)	0.00244	
Variance (KM)	5.9734E-6	SE of Mean (KM)	8.9245E-4	
k hat (KM)	3.616	k star (KM)	2.598	
nu hat (KM)	72.32	nu star (KM)	51.96	
theta hat (KM)	0.00129	theta star (KM)	0.00179	
80% gamma percentile (KM)	0.00674	90% gamma percentile (KM)	0.00851	
95% gamma percentile (KM)	0.0102	99% gamma percentile (KM)	0.0138	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (51.96, α)	36.4	Adjusted Chi Square Value (51.96, β)	34.15	
95% Gamma Approximate KM-UCL (use when n>=50)	0.00663	95% Gamma Adjusted KM-UCL (use when n<50)	0.00707	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.796	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.302	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00473	Mean in Log Scale	-5.461	
SD in Original Scale	0.00252	SD in Log Scale	0.462	
95% t UCL (assumes normality of ROS data)	0.00619	95% Percentile Bootstrap UCL	0.00604	
95% BCA Bootstrap UCL	0.00625	95% Bootstrap t UCL	0.00723	
95% H-UCL (Log ROS)	0.0066			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-5.486	KM Geo Mean	0.00414	
KM SD (logged)	0.454	95% Critical H Value (KM-Log)	2.158	
KM Standard Error of Mean (logged)	0.166	95% H-UCL (KM -Log)	0.00637	
KM SD (logged)	0.454	95% Critical H Value (KM-Log)	2.158	
KM Standard Error of Mean (logged)	0.166			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00408	Mean in Log Scale	-5.709	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	0.00298	SD in Log Scale	0.644
95% t UCL (Assumes normality)	0.0058	95% H-Stat UCL	0.00689

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.00628		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.132	Mean	0.714
Maximum	4.67	Median	0.188
SD	1.417	Std. Error of Mean	0.448
Coefficient of Variation	1.984	Skewness	2.966

Normal GOF Test

Shapiro Wilk Test Statistic	0.474	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.431	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.535	95% Adjusted-CLT UCL (Chen-1995)	1.9
		95% Modified-t UCL (Johnson-1978)	1.605

Gamma GOF Test

A-D Test Statistic	1.919	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.763	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.427	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.277	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.676	k star (bias corrected MLE)	0.54
Theta hat (MLE)	1.056	Theta star (bias corrected MLE)	1.322
nu hat (MLE)	13.53	nu star (bias corrected)	10.8
MLE Mean (bias corrected)	0.714	MLE Sd (bias corrected)	0.972
		Approximate Chi Square Value (0.05)	4.449
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	3.767

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.734	95% Adjusted Gamma UCL (use when n<50)	2.048

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.687	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.364	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.027	Mean of logged Data	-1.235

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum of Logged Data	1.541	SD of logged Data	1.14
Assuming Lognormal Distribution			
95% H-UCL	2.023	90% Chebyshev (MVUE) UCL	1.086
95% Chebyshev (MVUE) UCL	1.348	97.5% Chebyshev (MVUE) UCL	1.712
99% Chebyshev (MVUE) UCL	2.426		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.451	95% Jackknife UCL	1.535
95% Standard Bootstrap UCL	1.407	95% Bootstrap-t UCL	23.24
95% Hall's Bootstrap UCL	8.131	95% Percentile Bootstrap UCL	1.536
95% BCA Bootstrap UCL	2.068		
90% Chebyshev(Mean, Sd) UCL	2.058	95% Chebyshev(Mean, Sd) UCL	2.667
97.5% Chebyshev(Mean, Sd) UCL	3.511	99% Chebyshev(Mean, Sd) UCL	5.171
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	2.667		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Cobalt			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	5	Number of Non-Detects	5
Number of Distinct Detects	5	Number of Distinct Non-Detects	5
Minimum Detect	0.0298	Minimum Non-Detect	0.0194
Maximum Detect	0.275	Maximum Non-Detect	0.024
Variance Detects	0.00905	Percent Non-Detects	50%
Mean Detects	0.11	SD Detects	0.0951
Median Detects	0.0811	CV Detects	0.867
Skewness Detects	1.909	Kurtosis Detects	4.074
Mean of Logged Detects	-2.468	SD of Logged Detects	0.788
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.751	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.402	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.0646	KM Standard Error of Mean	0.0266
KM SD	0.0752	95% KM (BCA) UCL	0.114
95% KM (t) UCL	0.113	95% KM (Percentile Bootstrap) UCL	0.11
95% KM (z) UCL	0.108	95% KM Bootstrap t UCL	0.137
90% KM Chebyshev UCL	0.144	95% KM Chebyshev UCL	0.18
97.5% KM Chebyshev UCL	0.231	99% KM Chebyshev UCL	0.329
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.522	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.684	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.346	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.36	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.093	k star (bias corrected MLE)	0.97
Theta hat (MLE)	0.0524	Theta star (bias corrected MLE)	0.113

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	20.93	nu star (bias corrected)	9.704
	Mean (detects)	0.11		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.0598
	Maximum	0.275	Median	0.0199
	SD	0.0824	CV	1.376
	k hat (MLE)	0.821	k star (bias corrected MLE)	0.641
	Theta hat (MLE)	0.0729	Theta star (bias corrected MLE)	0.0933
	nu hat (MLE)	16.42	nu star (bias corrected)	12.83
	Adjusted Level of Significance (β)	0.0267		
	Approximate Chi Square Value (12.83, α)	5.777	Adjusted Chi Square Value (12.83, β)	4.979
	95% Gamma Approximate UCL (use when n>=50)	0.133	95% Gamma Adjusted UCL (use when n<50)	0.154
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.0646	SD (KM)	0.0752
	Variance (KM)	0.00566	SE of Mean (KM)	0.0266
	k hat (KM)	0.737	k star (KM)	0.582
	nu hat (KM)	14.73	nu star (KM)	11.65
	theta hat (KM)	0.0876	theta star (KM)	0.111
	80% gamma percentile (KM)	0.106	90% gamma percentile (KM)	0.169
	95% gamma percentile (KM)	0.235	99% gamma percentile (KM)	0.394
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (11.65, α)	4.995	Adjusted Chi Square Value (11.65, β)	4.263
	95% Gamma Approximate KM-UCL (use when n>=50)	0.151	95% Gamma Adjusted KM-UCL (use when n<50)	0.176
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.298	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.0594	Mean in Log Scale	-3.585
	SD in Original Scale	0.0827	SD in Log Scale	1.29
	95% t UCL (assumes normality of ROS data)	0.107	95% Percentile Bootstrap UCL	0.104
	95% BCA Bootstrap UCL	0.123	95% Bootstrap t UCL	0.156
	95% H-UCL (Log ROS)	0.316		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-3.204	KM Geo Mean	0.0406
	KM SD (logged)	0.89	95% Critical H Value (KM-Log)	2.881
	KM Standard Error of Mean (logged)	0.315	95% H-UCL (KM -Log)	0.142
	KM SD (logged)	0.89	95% Critical H Value (KM-Log)	2.881
	KM Standard Error of Mean (logged)	0.315		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.0603	Mean in Log Scale	-3.49
	SD in Original Scale	0.082	SD in Log Scale	1.2
	95% t UCL (Assumes normality)	0.108	95% H-Stat UCL	0.257
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Gamma Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM Bootstrap t UCL	0.137	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.176

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.468	Mean	1.316
Maximum	2.58	Median	1.27
SD	0.738	Std. Error of Mean	0.233
Coefficient of Variation	0.561	Skewness	0.718

Normal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.744	95% Adjusted-CLT UCL (Chen-1995)	1.757
		95% Modified-t UCL (Johnson-1978)	1.753

Gamma GOF Test

A-D Test Statistic	0.271	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.485	k star (bias corrected MLE)	2.506
Theta hat (MLE)	0.378	Theta star (bias corrected MLE)	0.525
nu hat (MLE)	69.7	nu star (bias corrected)	50.12
MLE Mean (bias corrected)	1.316	MLE Sd (bias corrected)	0.832
		Approximate Chi Square Value (0.05)	34.86
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	32.67

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.892	95% Adjusted Gamma UCL (use when n<50)	2.02

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.759	Mean of logged Data	0.125
Maximum of Logged Data	0.948	SD of logged Data	0.593

Assuming Lognormal Distribution

95% H-UCL	2.153	90% Chebyshev (MVUE) UCL	2.087
95% Chebyshev (MVUE) UCL	2.433	97.5% Chebyshev (MVUE) UCL	2.913
99% Chebyshev (MVUE) UCL	3.856		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCLs				
95% CLT UCL	1.7	95% Jackknife UCL	1.744	
95% Standard Bootstrap UCL	1.68	95% Bootstrap-t UCL	1.85	
95% Hall's Bootstrap UCL	2.009	95% Percentile Bootstrap UCL	1.677	
95% BCA Bootstrap UCL	1.698			
90% Chebyshev(Mean, Sd) UCL	2.017	95% Chebyshev(Mean, Sd) UCL	2.334	
97.5% Chebyshev(Mean, Sd) UCL	2.774	99% Chebyshev(Mean, Sd) UCL	3.639	
Suggested UCL to Use				
95% Student's-t UCL	1.744			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Iron				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
		Number of Missing Observations	0	
Minimum	13.8	Mean	34.1	
Maximum	72.76	Median	27.88	
SD	18.3	Std. Error of Mean	5.787	
Coefficient of Variation	0.537	Skewness	1.241	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	44.71	95% Adjusted-CLT UCL (Chen-1995)	46.05	
		95% Modified-t UCL (Johnson-1978)	45.09	
Gamma GOF Test				
A-D Test Statistic	0.268	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.196	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	4.424	k star (bias corrected MLE)	3.163	
Theta hat (MLE)	7.709	Theta star (bias corrected MLE)	10.78	
nu hat (MLE)	88.47	nu star (bias corrected)	63.26	
MLE Mean (bias corrected)	34.1	MLE Sd (bias corrected)	19.17	
		Approximate Chi Square Value (0.05)	45.97	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	43.41	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	46.93	95% Adjusted Gamma UCL (use when n<50)	49.69	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.164	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics				
Minimum of Logged Data	2.625	Mean of logged Data	3.412	
Maximum of Logged Data	4.287	SD of logged Data	0.503	
Assuming Lognormal Distribution				
95% H-UCL	49.98	90% Chebyshev (MVUE) UCL	50.45	
95% Chebyshev (MVUE) UCL	57.92	97.5% Chebyshev (MVUE) UCL	68.29	
99% Chebyshev (MVUE) UCL	88.67			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	43.62	95% Jackknife UCL	44.71	
95% Standard Bootstrap UCL	43.13	95% Bootstrap-t UCL	52.37	
95% Hall's Bootstrap UCL	95.01	95% Percentile Bootstrap UCL	43.17	
95% BCA Bootstrap UCL	45.51			
90% Chebyshev(Mean, Sd) UCL	51.46	95% Chebyshev(Mean, Sd) UCL	59.32	
97.5% Chebyshev(Mean, Sd) UCL	70.24	99% Chebyshev(Mean, Sd) UCL	91.68	
Suggested UCL to Use				
95% Student's-t UCL	44.71			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	1	Number of Non-Detects	9	
Number of Distinct Detects	1	Number of Distinct Non-Detects	9	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Lead was not processed!				
Lithium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	9	Number of Non-Detects	1	
Number of Distinct Detects	9	Number of Distinct Non-Detects	1	
Minimum Detect	0.0547	Minimum Non-Detect	0.292	
Maximum Detect	0.916	Maximum Non-Detect	0.292	
Variance Detects	0.0694	Percent Non-Detects	10%	
Mean Detects	0.234	SD Detects	0.263	
Median Detects	0.155	CV Detects	1.126	
Skewness Detects	2.685	Kurtosis Detects	7.566	
Mean of Logged Detects	-1.79	SD of Logged Detects	0.785	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.615	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.339	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.225	KM Standard Error of Mean	0.0801	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD	0.238	95% KM (BCA) UCL	0.382
95% KM (t) UCL	0.372	95% KM (Percentile Bootstrap) UCL	0.375
95% KM (z) UCL	0.357	95% KM Bootstrap t UCL	0.764
90% KM Chebyshev UCL	0.466	95% KM Chebyshev UCL	0.574
97.5% KM Chebyshev UCL	0.725	99% KM Chebyshev UCL	1.022
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.745	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.733	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.265	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.629	k star (bias corrected MLE)	1.16
Theta hat (MLE)	0.144	Theta star (bias corrected MLE)	0.202
nu hat (MLE)	29.33	nu star (bias corrected)	20.89
Mean (detects)	0.234		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0547	Mean	0.225
Maximum	0.916	Median	0.151
SD	0.25	CV	1.109
k hat (MLE)	1.75	k star (bias corrected MLE)	1.292
Theta hat (MLE)	0.129	Theta star (bias corrected MLE)	0.174
nu hat (MLE)	35	nu star (bias corrected)	25.84
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (25.84, α)	15.25	Adjusted Chi Square Value (25.84, β)	13.86
95% Gamma Approximate UCL (use when n>=50)	0.382	95% Gamma Adjusted UCL (use when n<50)	0.42
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.225	SD (KM)	0.238
Variance (KM)	0.0565	SE of Mean (KM)	0.0801
k hat (KM)	0.898	k star (KM)	0.696
nu hat (KM)	17.97	nu star (KM)	13.91
theta hat (KM)	0.251	theta star (KM)	0.324
80% gamma percentile (KM)	0.371	90% gamma percentile (KM)	0.567
95% gamma percentile (KM)	0.769	99% gamma percentile (KM)	1.252
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (13.91, α)	6.511	Adjusted Chi Square Value (13.91, β)	5.655
95% Gamma Approximate KM-UCL (use when n>=50)	0.482	95% Gamma Adjusted KM-UCL (use when n<50)	0.555
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.225	Mean in Log Scale	-1.804
SD in Original Scale	0.25	SD in Log Scale	0.741
95% t UCL (assumes normality of ROS data)	0.37	95% Percentile Bootstrap UCL	0.37
95% BCA Bootstrap UCL	0.458	95% Bootstrap t UCL	0.815
95% H-UCL (Log ROS)	0.412		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.811	KM Geo Mean	0.163
KM SD (logged)	0.72	95% Critical H Value (KM-Log)	2.566

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Standard Error of Mean (logged)	0.247	95% H-UCL (KM -Log)	0.392
KM SD (logged)	0.72	95% Critical H Value (KM-Log)	2.566
KM Standard Error of Mean (logged)	0.247		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.225	Mean in Log Scale	-1.803
SD in Original Scale	0.25	SD in Log Scale	0.741
95% t UCL (Assumes normality)	0.37	95% H-Stat UCL	0.413
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.555	95% GROS Adjusted Gamma UCL	0.42
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	5.353	Mean	23.09
Maximum	65.63	Median	16.79
SD	19.07	Std. Error of Mean	6.032
Coefficient of Variation	0.826	Skewness	1.508
Normal GOF Test			
Shapiro Wilk Test Statistic	0.836	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	34.14	95% Adjusted-CLT UCL (Chen-1995)	36.08
		95% Modified-t UCL (Johnson-1978)	34.62
Gamma GOF Test			
A-D Test Statistic	0.263	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.143	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.919	k star (bias corrected MLE)	1.41
Theta hat (MLE)	12.03	Theta star (bias corrected MLE)	16.37
nu hat (MLE)	38.39	nu star (bias corrected)	28.2
MLE Mean (bias corrected)	23.09	MLE Sd (bias corrected)	19.44
		Approximate Chi Square Value (0.05)	17.09
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	15.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	38.11	95% Adjusted Gamma UCL (use when n<50)	41.74

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	1.678	Mean of logged Data	2.857
	Maximum of Logged Data	4.184	SD of logged Data	0.795
	Assuming Lognormal Distribution			
	95% H-UCL	48.83	90% Chebyshev (MVUE) UCL	40.93
	95% Chebyshev (MVUE) UCL	49.07	97.5% Chebyshev (MVUE) UCL	60.36
	99% Chebyshev (MVUE) UCL	82.55		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	33.01	95% Jackknife UCL	34.14
	95% Standard Bootstrap UCL	32.71	95% Bootstrap-t UCL	45.22
	95% Hall's Bootstrap UCL	88.95	95% Percentile Bootstrap UCL	33.33
	95% BCA Bootstrap UCL	35.84		
	90% Chebyshev(Mean, Sd) UCL	41.18	95% Chebyshev(Mean, Sd) UCL	49.38
	97.5% Chebyshev(Mean, Sd) UCL	60.75	99% Chebyshev(Mean, Sd) UCL	83.1
	Suggested UCL to Use			
	95% Student's-t UCL	34.14		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Mercury			
	General Statistics			
	Total Number of Observations	10	Number of Distinct Observations	10
			Number of Missing Observations	0
	Minimum	0.00151	Mean	0.00345
	Maximum	0.00667	Median	0.00337
	SD	0.00136	Std. Error of Mean	4.3135E-4
	Coefficient of Variation	0.395	Skewness	1.298
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.879	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
	Data appear Approximate Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	0.00424	95% Adjusted-CLT UCL (Chen-1995)	0.00435
			95% Modified-t UCL (Johnson-1978)	0.00427
	Gamma GOF Test			
	A-D Test Statistic	0.391	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.727	Detected data appear Gamma Distributed at 5% Significance Level	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	K-S Test Statistic	0.228	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	7.606	k star (bias corrected MLE)	5.391
	Theta hat (MLE)	4.5394E-4	Theta star (bias corrected MLE)	6.4046E-4
	nu hat (MLE)	152.1	nu star (bias corrected)	107.8
	MLE Mean (bias corrected)	0.00345	MLE Sd (bias corrected)	0.00149
			Approximate Chi Square Value (0.05)	84.85
	Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	81.32
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	0.00439	95% Adjusted Gamma UCL (use when n<50)	0.00458
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.22	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	-6.499	Mean of logged Data	-5.736
	Maximum of Logged Data	-5.011	SD of logged Data	0.39
	Assuming Lognormal Distribution			
	95% H-UCL	0.00456	90% Chebyshev (MVUE) UCL	0.00475
	95% Chebyshev (MVUE) UCL	0.00534	97.5% Chebyshev (MVUE) UCL	0.00615
	99% Chebyshev (MVUE) UCL	0.00775		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	0.00416	95% Jackknife UCL	0.00424
	95% Standard Bootstrap UCL	0.00412	95% Bootstrap-t UCL	0.00451
	95% Hall's Bootstrap UCL	0.00801	95% Percentile Bootstrap UCL	0.00419
	95% BCA Bootstrap UCL	0.00431		
	90% Chebyshev(Mean, Sd) UCL	0.00475	95% Chebyshev(Mean, Sd) UCL	0.00533
	97.5% Chebyshev(Mean, Sd) UCL	0.00615	99% Chebyshev(Mean, Sd) UCL	0.00774
	Suggested UCL to Use			
	95% Student's-t UCL	0.00424		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Methyl Mercury			
	General Statistics			
	Total Number of Observations	10	Number of Distinct Observations	10
	Number of Detects	6	Number of Non-Detects	4
	Number of Distinct Detects	6	Number of Distinct Non-Detects	4
	Minimum Detect	5.4720E-4	Minimum Non-Detect	9.0300E-4
	Maximum Detect	0.00164	Maximum Non-Detect	9.8850E-4
	Variance Detects	1.6502E-7	Percent Non-Detects	40%
	Mean Detects	9.3283E-4	SD Detects	4.0623E-4
	Median Detects	8.0975E-4	CV Detects	0.435

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Skewness Detects	1.257	Kurtosis Detects	1.174
Mean of Logged Detects	-7.048	SD of Logged Detects	0.404
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	8.4000E-4	KM Standard Error of Mean	1.1617E-4
KM SD	3.1798E-4	95% KM (BCA) UCL	0.00102
95% KM (t) UCL	0.00105	95% KM (Percentile Bootstrap) UCL	0.00103
95% KM (z) UCL	0.00103	95% KM Bootstrap t UCL	0.00116
90% KM Chebyshev UCL	0.00119	95% KM Chebyshev UCL	0.00135
97.5% KM Chebyshev UCL	0.00157	99% KM Chebyshev UCL	0.002
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.268	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	7.188	k star (bias corrected MLE)	3.705
Theta hat (MLE)	1.2978E-4	Theta star (bias corrected MLE)	2.5178E-4
nu hat (MLE)	86.25	nu star (bias corrected)	44.46
Mean (detects)	9.3283E-4		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	5.4720E-4	Mean	0.00456
Maximum	0.01	Median	0.0014
SD	0.00469	CV	1.029
k hat (MLE)	0.863	k star (bias corrected MLE)	0.671
Theta hat (MLE)	0.00528	Theta star (bias corrected MLE)	0.00679
nu hat (MLE)	17.27	nu star (bias corrected)	13.42
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (13.42, α)	6.177	Adjusted Chi Square Value (13.42, β)	5.347
95% Gamma Approximate UCL (use when n>=50)	0.00991	95% Gamma Adjusted UCL (use when n<50)	0.0114
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	8.4000E-4	SD (KM)	3.1798E-4
Variance (KM)	1.0111E-7	SE of Mean (KM)	1.1617E-4
k hat (KM)	6.978	k star (KM)	4.951
nu hat (KM)	139.6	nu star (KM)	99.03
theta hat (KM)	1.2037E-4	theta star (KM)	1.6965E-4
80% gamma percentile (KM)	0.00113	90% gamma percentile (KM)	0.00135
95% gamma percentile (KM)	0.00154	99% gamma percentile (KM)	0.00196
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (99.03, α)	77.07	Adjusted Chi Square Value (99.03, β)	73.71
95% Gamma Approximate KM-UCL (use when n>=50)	0.00108	95% Gamma Adjusted KM-UCL (use when n<50)	0.00113
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	8.4181E-4		Mean in Log Scale	-7.132
SD in Original Scale	3.2479E-4		SD in Log Scale	0.32
95% t UCL (assumes normality of ROS data)	0.00103		95% Percentile Bootstrap UCL	0.00101
95% BCA Bootstrap UCL	0.00106		95% Bootstrap t UCL	0.00141
95% H-UCL (Log ROS)	0.00104			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-7.14		KM Geo Mean	7.9253E-4
KM SD (logged)	0.325		95% Critical H Value (KM-Log)	2.004
KM Standard Error of Mean (logged)	0.125		95% H-UCL (KM -Log)	0.00104
KM SD (logged)	0.325		95% Critical H Value (KM-Log)	2.004
KM Standard Error of Mean (logged)	0.125			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	7.4953E-4		Mean in Log Scale	-7.291
SD in Original Scale	3.8443E-4		SD in Log Scale	0.434
95% t UCL (Assumes normality)	9.7237E-4		95% H-Stat UCL	0.00102
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.00105			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Molybdenum				
General Statistics				
Total Number of Observations	10		Number of Distinct Observations	10
Number of Detects	5		Number of Non-Detects	5
Number of Distinct Detects	5		Number of Distinct Non-Detects	5
Minimum Detect	0.00627		Minimum Non-Detect	0.0113
Maximum Detect	0.0688		Maximum Non-Detect	0.0133
Variance Detects	6.3763E-4		Percent Non-Detects	50%
Mean Detects	0.0245		SD Detects	0.0253
Median Detects	0.0172		CV Detects	1.029
Skewness Detects	2.006		Kurtosis Detects	4.221
Mean of Logged Detects	-4.05		SD of Logged Detects	0.886
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.742		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762		Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.382		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343		Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.0166		KM Standard Error of Mean	0.00643
KM SD	0.0179		95% KM (BCA) UCL	0.0291
95% KM (t) UCL	0.0284		95% KM (Percentile Bootstrap) UCL	0.0284
95% KM (z) UCL	0.0272		95% KM Bootstrap t UCL	0.0458
90% KM Chebyshev UCL	0.0359		95% KM Chebyshev UCL	0.0447
97.5% KM Chebyshev UCL	0.0568		99% KM Chebyshev UCL	0.0807
Gamma GOF Tests on Detected Observations Only				

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

A-D Test Statistic	0.421	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.686	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.309	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.361	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.603	k star (bias corrected MLE)	0.774	
Theta hat (MLE)	0.0153	Theta star (bias corrected MLE)	0.0317	
nu hat (MLE)	16.03	nu star (bias corrected)	7.745	
Mean (detects)	0.0245			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.00627	Mean	0.0173	
Maximum	0.0688	Median	0.01	
SD	0.0185	CV	1.071	
k hat (MLE)	2.008	k star (bias corrected MLE)	1.472	
Theta hat (MLE)	0.0086	Theta star (bias corrected MLE)	0.0117	
nu hat (MLE)	40.16	nu star (bias corrected)	29.44	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (29.44, α)	18.06	Adjusted Chi Square Value (29.44, β)	16.52	
95% Gamma Approximate UCL (use when n>=50)	0.0282	95% Gamma Adjusted UCL (use when n<50)	0.0308	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.0166	SD (KM)	0.0179	
Variance (KM)	3.2063E-4	SE of Mean (KM)	0.00643	
k hat (KM)	0.863	k star (KM)	0.671	
nu hat (KM)	17.27	nu star (KM)	13.42	
theta hat (KM)	0.0193	theta star (KM)	0.0248	
80% gamma percentile (KM)	0.0274	90% gamma percentile (KM)	0.0422	
95% gamma percentile (KM)	0.0575	99% gamma percentile (KM)	0.0942	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (13.42, α)	6.178	Adjusted Chi Square Value (13.42, β)	5.347	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0362	95% Gamma Adjusted KM-UCL (use when n<50)	0.0418	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.254	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.0162	Mean in Log Scale	-4.453	
SD in Original Scale	0.019	SD in Log Scale	0.727	
95% t UCL (assumes normality of ROS data)	0.0272	95% Percentile Bootstrap UCL	0.0279	
95% BCA Bootstrap UCL	0.0325	95% Bootstrap t UCL	0.0598	
95% H-UCL (Log ROS)	0.0283			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-4.416	KM Geo Mean	0.0121	
KM SD (logged)	0.7	95% Critical H Value (KM-Log)	2.531	
KM Standard Error of Mean (logged)	0.282	95% H-UCL (KM -Log)	0.0278	
KM SD (logged)	0.7	95% Critical H Value (KM-Log)	2.531	
KM Standard Error of Mean (logged)	0.282			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.0154	Mean in Log Scale	-4.563	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	0.0194	SD in Log Scale	0.801
95% t UCL (Assumes normality)	0.0267	95% H-Stat UCL	0.0297

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	0.0458	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.0418

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.339	Mean	1.065
Maximum	3.801	Median	0.709
SD	1.054	Std. Error of Mean	0.333
Coefficient of Variation	0.99	Skewness	2.305

Normal GOF Test

Shapiro Wilk Test Statistic	0.701	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.676	95% Adjusted-CLT UCL (Chen-1995)	1.873
		95% Modified-t UCL (Johnson-1978)	1.716

Gamma GOF Test

A-D Test Statistic	0.633	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.231	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.78	k star (bias corrected MLE)	1.313
Theta hat (MLE)	0.598	Theta star (bias corrected MLE)	0.811
nu hat (MLE)	35.61	nu star (bias corrected)	26.26
MLE Mean (bias corrected)	1.065	MLE Sd (bias corrected)	0.929
		Approximate Chi Square Value (0.05)	15.58
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	14.17

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	1.795	95% Adjusted Gamma UCL (use when n<50)	1.974

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-1.083	Mean of logged Data	-0.244

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum of Logged Data	1.335	SD of logged Data	0.766
Assuming Lognormal Distribution			
95% H-UCL	2.066	90% Chebyshev (MVUE) UCL	1.778
95% Chebyshev (MVUE) UCL	2.123	97.5% Chebyshev (MVUE) UCL	2.603
99% Chebyshev (MVUE) UCL	3.546		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.613	95% Jackknife UCL	1.676
95% Standard Bootstrap UCL	1.584	95% Bootstrap-t UCL	2.555
95% Hall's Bootstrap UCL	3.932	95% Percentile Bootstrap UCL	1.638
95% BCA Bootstrap UCL	1.912		
90% Chebyshev(Mean, Sd) UCL	2.065	95% Chebyshev(Mean, Sd) UCL	2.517
97.5% Chebyshev(Mean, Sd) UCL	3.146	99% Chebyshev(Mean, Sd) UCL	4.381
Suggested UCL to Use			
95% Adjusted Gamma UCL	1.974		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Selenium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Selenium was not processed!			
Silver			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	10
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!			
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!			
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable Silver was not processed!			
Thallium			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
Number of Detects	4	Number of Non-Detects	6
Number of Distinct Detects	4	Number of Distinct Non-Detects	6
Minimum Detect	8.6000E-4	Minimum Non-Detect	9.4500E-4
Maximum Detect	0.0029	Maximum Non-Detect	0.00115
Variance Detects	8.2054E-7	Percent Non-Detects	60%
Mean Detects	0.0016	SD Detects	9.0584E-4

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Median Detects	0.00133	CV Detects	0.564
Skewness Detects	1.458	Kurtosis Detects	2.062
Mean of Logged Detects	-6.543	SD of Logged Detects	0.524
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.00117	KM Standard Error of Mean	2.2473E-4
KM SD	6.1343E-4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.00158	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.00154	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.00184	95% KM Chebyshev UCL	0.00215
97.5% KM Chebyshev UCL	0.00257	99% KM Chebyshev UCL	0.0034
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.302	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.222	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	4.784	k star (bias corrected MLE)	1.363
Theta hat (MLE)	3.3543E-4	Theta star (bias corrected MLE)	0.00118
nu hat (MLE)	38.27	nu star (bias corrected)	10.9
Mean (detects)	0.0016		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	8.6000E-4	Mean	0.00664
Maximum	0.01	Median	0.01
SD	0.00437	CV	0.657
k hat (MLE)	1.512	k star (bias corrected MLE)	1.125
Theta hat (MLE)	0.00439	Theta star (bias corrected MLE)	0.00591
nu hat (MLE)	30.23	nu star (bias corrected)	22.49
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (22.49, α)	12.71	Adjusted Chi Square Value (22.49, β)	11.45
95% Gamma Approximate UCL (use when n>=50)	0.0118	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.00117	SD (KM)	6.1343E-4
Variance (KM)	3.7630E-7	SE of Mean (KM)	2.2473E-4
k hat (KM)	3.616	k star (KM)	2.598
nu hat (KM)	72.33	nu star (KM)	51.96
theta hat (KM)	3.2258E-4	theta star (KM)	4.4900E-4
80% gamma percentile (KM)	0.00169	90% gamma percentile (KM)	0.00214
95% gamma percentile (KM)	0.00255	99% gamma percentile (KM)	0.00346
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (51.96, α)	36.4	Adjusted Chi Square Value (51.96, β)	34.15
95% Gamma Approximate KM-UCL (use when n>=50)	0.00167	95% Gamma Adjusted KM-UCL (use when n<50)	0.00177
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00111	Mean in Log Scale	-6.909	
SD in Original Scale	6.7395E-4	SD in Log Scale	0.438	
95% t UCL (assumes normality of ROS data)	0.0015	95% Percentile Bootstrap UCL	0.00148	
95% BCA Bootstrap UCL	0.0017	95% Bootstrap t UCL	0.00285	
95% H-UCL (Log ROS)	0.0015			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-6.844	KM Geo Mean	0.00107	
KM SD (logged)	0.38	95% Critical H Value (KM-Log)	2.066	
KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	0.00149	
KM SD (logged)	0.38	95% Critical H Value (KM-Log)	2.066	
KM Standard Error of Mean (logged)	0.14			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	9.6500E-4	Mean in Log Scale	-7.135	
SD in Original Scale	7.5997E-4	SD in Log Scale	0.595	
95% t UCL (Assumes normality)	0.00141	95% H-Stat UCL	0.00152	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.00158			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	10	
Number of Detects	9	Number of Non-Detects	1	
Number of Distinct Detects	9	Number of Distinct Non-Detects	1	
Minimum Detect	0.124	Minimum Non-Detect	0.0711	
Maximum Detect	0.302	Maximum Non-Detect	0.0711	
Variance Detects	0.00275	Percent Non-Detects	10%	
Mean Detects	0.174	SD Detects	0.0524	
Median Detects	0.162	CV Detects	0.301	
Skewness Detects	2.168	Kurtosis Detects	5.375	
Mean of Logged Detects	-1.782	SD of Logged Detects	0.255	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.761	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.164	KM Standard Error of Mean	0.0188	
KM SD	0.0561	95% KM (BCA) UCL	0.194	
95% KM (t) UCL	0.198	95% KM (Percentile Bootstrap) UCL	0.195	
95% KM (z) UCL	0.195	95% KM Bootstrap t UCL	0.209	
90% KM Chebyshev UCL	0.22	95% KM Chebyshev UCL	0.246	
97.5% KM Chebyshev UCL	0.281	99% KM Chebyshev UCL	0.351	

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.676	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.24	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	15.67	k star (bias corrected MLE)	10.52	
Theta hat (MLE)	0.0111	Theta star (bias corrected MLE)	0.0165	
nu hat (MLE)	282.1	nu star (bias corrected)	189.4	
Mean (detects)	0.174			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.0727	Mean	0.164	
Maximum	0.302	Median	0.156	
SD	0.0589	CV	0.36	
k hat (MLE)	9.046	k star (bias corrected MLE)	6.399	
Theta hat (MLE)	0.0181	Theta star (bias corrected MLE)	0.0256	
nu hat (MLE)	180.9	nu star (bias corrected)	128	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (127.98, α)	102.8	Adjusted Chi Square Value (127.98, β)	98.94	
95% Gamma Approximate UCL (use when n>=50)	0.204	95% Gamma Adjusted UCL (use when n<50)	0.212	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.164	SD (KM)	0.0561	
Variance (KM)	0.00315	SE of Mean (KM)	0.0188	
k hat (KM)	8.497	k star (KM)	6.015	
nu hat (KM)	169.9	nu star (KM)	120.3	
theta hat (KM)	0.0193	theta star (KM)	0.0272	
80% gamma percentile (KM)	0.215	90% gamma percentile (KM)	0.253	
95% gamma percentile (KM)	0.286	99% gamma percentile (KM)	0.357	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (120.30, α)	95.97	Adjusted Chi Square Value (120.30, β)	92.2	
95% Gamma Approximate KM-UCL (use when n>=50)	0.205	95% Gamma Adjusted KM-UCL (use when n<50)	0.213	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.224	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.166	Mean in Log Scale	-1.841	
SD in Original Scale	0.0556	SD in Log Scale	0.305	
95% t UCL (assumes normality of ROS data)	0.198	95% Percentile Bootstrap UCL	0.194	
95% BCA Bootstrap UCL	0.203	95% Bootstrap t UCL	0.219	
95% H-UCL (Log ROS)	0.203			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.868	KM Geo Mean	0.154	
KM SD (logged)	0.345	95% Critical H Value (KM-Log)	2.026	
KM Standard Error of Mean (logged)	0.116	95% H-UCL (KM -Log)	0.207	
KM SD (logged)	0.345	95% Critical H Value (KM-Log)	2.026	
KM Standard Error of Mean (logged)	0.116			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean in Original Scale	0.16	Mean in Log Scale	-1.937
SD in Original Scale	0.066	SD in Log Scale	0.548
95% t UCL (Assumes normality)	0.198	95% H-Stat UCL	0.254
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Adjusted Gamma UCL	0.213	95% GROS Adjusted Gamma UCL	0.212
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.523	Mean	4.832
Maximum	15.61	Median	1.36
SD	5.334	Std. Error of Mean	1.687
Coefficient of Variation	1.104	Skewness	1.045
Normal GOF Test			
Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.924	95% Adjusted-CLT UCL (Chen-1995)	8.202
		95% Modified-t UCL (Johnson-1978)	8.017
Gamma GOF Test			
A-D Test Statistic	0.861	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.307	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.275	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.873	k star (bias corrected MLE)	0.678
Theta hat (MLE)	5.532	Theta star (bias corrected MLE)	7.126
nu hat (MLE)	17.47	nu star (bias corrected)	13.56
MLE Mean (bias corrected)	4.832	MLE Sd (bias corrected)	5.868
		Approximate Chi Square Value (0.05)	6.272
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	5.434
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	10.45	95% Adjusted Gamma UCL (use when n<50)	12.06
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.258	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			

Table E1-13
Tule Roots, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum of Logged Data	-0.648	Mean of logged Data	0.903
Maximum of Logged Data	2.748	SD of logged Data	1.263
Assuming Lognormal Distribution			
95% H-UCL	25.67	90% Chebyshev (MVUE) UCL	11
95% Chebyshev (MVUE) UCL	13.79	97.5% Chebyshev (MVUE) UCL	17.66
99% Chebyshev (MVUE) UCL	25.25		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	7.606	95% Jackknife UCL	7.924
95% Standard Bootstrap UCL	7.525	95% Bootstrap-t UCL	8.901
95% Hall's Bootstrap UCL	7.614	95% Percentile Bootstrap UCL	7.641
95% BCA Bootstrap UCL	8.347		
90% Chebyshev(Mean, Sd) UCL	9.892	95% Chebyshev(Mean, Sd) UCL	12.18
97.5% Chebyshev(Mean, Sd) UCL	15.37	99% Chebyshev(Mean, Sd) UCL	21.62
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	12.18		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.11/3/2020 8:53:53 AM
From File	ProUCLData_SWHist_20200103.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum_FLT

General Statistics

Total Number of Observations	126	Number of Distinct Observations	69
Number of Detects	103	Number of Non-Detects	23
Number of Distinct Detects	65	Number of Distinct Non-Detects	7
Minimum Detect	5.1	Minimum Non-Detect	5
Maximum Detect	174000	Maximum Non-Detect	200
Variance Detects	5.336E+8	Percent Non-Detects	18.25%
Mean Detects	7742	SD Detects	23101
Median Detects	190	CV Detects	2.984
Skewness Detects	5.125	Kurtosis Detects	30.31
Mean of Logged Detects	5.681	SD of Logged Detects	2.965

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.391	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0876	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	6330	KM Standard Error of Mean	1880
KM SD	20998	95% KM (BCA) UCL	9940
95% KM (t) UCL	9445	95% KM (Percentile Bootstrap) UCL	9704
95% KM (z) UCL	9422	95% KM Bootstrap t UCL	12294
90% KM Chebyshev UCL	11970	95% KM Chebyshev UCL	14524
97.5% KM Chebyshev UCL	18070	99% KM Chebyshev UCL	25034

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.964	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.907	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.098	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.221	k star (bias corrected MLE)	0.221
Theta hat (MLE)	34990	Theta star (bias corrected MLE)	34986
nu hat (MLE)	45.58	nu star (bias corrected)	45.58
Mean (detects)	7742		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6329
Maximum	174000	Median	60
SD	21082	CV	3.331
k hat (MLE)	0.155	k star (bias corrected MLE)	0.156
Theta hat (MLE)	40936	Theta star (bias corrected MLE)	40514
nu hat (MLE)	38.96	nu star (bias corrected)	39.36
Adjusted Level of Significance (β)	0.0481		
Approximate Chi Square Value (39.36, α)	25.99	Adjusted Chi Square Value (39.36, β)	25.87

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	9585	95% Gamma Adjusted UCL (use when n<50)	9631
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6330	SD (KM)	20998
Variance (KM)	4.409E+8	SE of Mean (KM)	1880
k hat (KM)	0.0909	k star (KM)	0.094
nu hat (KM)	22.9	nu star (KM)	23.69
theta hat (KM)	69653	theta star (KM)	67336
80% gamma percentile (KM)	4001	90% gamma percentile (KM)	16395
95% gamma percentile (KM)	36845	99% gamma percentile (KM)	103690
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (23.69, α)	13.61	Adjusted Chi Square Value (23.69, β)	13.53
95% Gamma Approximate KM-UCL (use when n>=50)	11016	95% Gamma Adjusted KM-UCL (use when n<50)	11088
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.898	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.7428E-9	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0876	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6329	Mean in Log Scale	4.685
SD in Original Scale	21082	SD in Log Scale	3.498
95% t UCL (assumes normality of ROS data)	9442	95% Percentile Bootstrap UCL	9531
95% BCA Bootstrap UCL	10647	95% Bootstrap t UCL	11801
95% H-UCL (Log ROS)	247463		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.002	KM Geo Mean	148.8
KM SD (logged)	3.039	95% Critical H Value (KM-Log)	4.558
KM Standard Error of Mean (logged)	0.273	95% H-UCL (KM -Log)	51911
KM SD (logged)	3.039	95% Critical H Value (KM-Log)	4.558
KM Standard Error of Mean (logged)	0.273		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6332	Mean in Log Scale	5.03
SD in Original Scale	21082	SD in Log Scale	3.049
95% t UCL (Assumes normality)	9444	95% H-Stat UCL	55538
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	14524		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Aluminum_Total			
General Statistics			
Total Number of Observations	133	Number of Distinct Observations	85
Number of Detects	122	Number of Non-Detects	11
Number of Distinct Detects	83	Number of Distinct Non-Detects	5
Minimum Detect	10	Minimum Non-Detect	10
Maximum Detect	164000	Maximum Non-Detect	105
Variance Detects	6.301E+8	Percent Non-Detects	8.271%
Mean Detects	8411	SD Detects	25103
Median Detects	575	CV Detects	2.985

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Skewness Detects	4.624	Kurtosis Detects	22.58
Mean of Logged Detects	6.345	SD of Logged Detects	2.612
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.377	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.369	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0806	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	7716	KM Standard Error of Mean	2094
KM SD	24055	95% KM (BCA) UCL	11261
95% KM (t) UCL	11186	95% KM (Percentile Bootstrap) UCL	11302
95% KM (z) UCL	11161	95% KM Bootstrap t UCL	13383
90% KM Chebyshev UCL	13999	95% KM Chebyshev UCL	16846
97.5% KM Chebyshev UCL	20796	99% KM Chebyshev UCL	28555
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	5.307	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.887	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.158	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0917	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.262	k star (bias corrected MLE)	0.261
Theta hat (MLE)	32118	Theta star (bias corrected MLE)	32238
nu hat (MLE)	63.9	nu star (bias corrected)	63.66
Mean (detects)	8411		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	7715
Maximum	164000	Median	348
SD	24146	CV	3.13
k hat (MLE)	0.208	k star (bias corrected MLE)	0.209
Theta hat (MLE)	37047	Theta star (bias corrected MLE)	36991
nu hat (MLE)	55.4	nu star (bias corrected)	55.48
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (55.48, α)	39.36	Adjusted Chi Square Value (55.48, β)	39.21
95% Gamma Approximate UCL (use when n>=50)	10874	95% Gamma Adjusted UCL (use when n<50)	10915
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	7716	SD (KM)	24055
Variance (KM)	5.786E+8	SE of Mean (KM)	2094
k hat (KM)	0.103	k star (KM)	0.106
nu hat (KM)	27.37	nu star (KM)	28.09
theta hat (KM)	74990	theta star (KM)	73078
80% gamma percentile (KM)	5777	90% gamma percentile (KM)	20980
95% gamma percentile (KM)	44620	99% gamma percentile (KM)	119262
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (28.09, α)	17	Adjusted Chi Square Value (28.09, β)	16.9
95% Gamma Approximate KM-UCL (use when n>=50)	12752	95% Gamma Adjusted KM-UCL (use when n<50)	12823
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.944	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	8.7804E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0805	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0806	Detected Data appear Lognormal at 5% Significance Level	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	7716		Mean in Log Scale	5.908
SD in Original Scale	24146		SD in Log Scale	2.927
95% t UCL (assumes normality of ROS data)	11184		95% Percentile Bootstrap UCL	11676
95% BCA Bootstrap UCL	12604		95% Bootstrap t UCL	13040
95% H-UCL (Log ROS)	82534			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	6.025		KM Geo Mean	413.7
KM SD (logged)	2.713		95% Critical H Value (KM-Log)	4.155
KM Standard Error of Mean (logged)	0.236		95% H-UCL (KM -Log)	43765
KM SD (logged)	2.713		95% Critical H Value (KM-Log)	4.155
KM Standard Error of Mean (logged)	0.236			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	7717		Mean in Log Scale	6.015
SD in Original Scale	24146		SD in Log Scale	2.749
95% t UCL (Assumes normality)	11185		95% H-Stat UCL	48977
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	43765			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony_FLT				
General Statistics				
Total Number of Observations	126		Number of Distinct Observations	11
Number of Detects	6		Number of Non-Detects	120
Number of Distinct Detects	4		Number of Distinct Non-Detects	7
Minimum Detect	0.07		Minimum Non-Detect	0.215
Maximum Detect	6.1		Maximum Non-Detect	30
Variance Detects	4.72		Percent Non-Detects	95.24%
Mean Detects	1.815		SD Detects	2.173
Median Detects	1.4		CV Detects	1.197
Skewness Detects	2.077		Kurtosis Detects	4.726
Mean of Logged Detects	-0.0826		SD of Logged Detects	1.488
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.721		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788		Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.409		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325		Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.156		KM Standard Error of Mean	0.0567
KM SD	0.576		95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.25		95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.249		95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.326		95% KM Chebyshev UCL	0.403
97.5% KM Chebyshev UCL	0.51		99% KM Chebyshev UCL	0.72
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.41		**Anderson-Darling GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

					5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level					
					K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**					
					5% K-S Critical Value	0.342	Detected data appear Gamma Distributed at 5% Significance Level					
					Detected data appear Gamma Distributed at 5% Significance Level							
					Gamma Statistics on Detected Data Only							
					k hat (MLE)	0.866	k star (bias corrected MLE)	0.544				
					Theta hat (MLE)	2.097	Theta star (bias corrected MLE)	3.337				
					nu hat (MLE)	10.39	nu star (bias corrected)	6.527				
					Mean (detects)	1.815						
					Gamma ROS Statistics using Imputed Non-Detects							
					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
					GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)							
					For such situations, GROS method may yield incorrect values of UCLs and BTVs							
					This is especially true when the sample size is small.							
					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
					Minimum	0.01	Mean	0.149				
					Maximum	6.1	Median	0.01				
					SD	0.604	CV	4.044				
					k hat (MLE)	0.324	k star (bias corrected MLE)	0.322				
					Theta hat (MLE)	0.461	Theta star (bias corrected MLE)	0.464				
					nu hat (MLE)	81.72	nu star (bias corrected)	81.11				
					Adjusted Level of Significance (β)	0.0481						
					Approximate Chi Square Value (81.11, α)	61.35	Adjusted Chi Square Value (81.11, β)	61.16				
					95% Gamma Approximate UCL (use when n>=50)	0.198	95% Gamma Adjusted UCL (use when n<50)	0.198				
					Estimates of Gamma Parameters using KM Estimates							
					Mean (KM)	0.156	SD (KM)	0.576				
					Variance (KM)	0.331	SE of Mean (KM)	0.0567				
					k hat (KM)	0.0731	k star (KM)	0.0766				
					nu hat (KM)	18.42	nu star (KM)	19.31				
					theta hat (KM)	2.129	theta star (KM)	2.031				
					80% gamma percentile (KM)	0.0679	90% gamma percentile (KM)	0.359				
					95% gamma percentile (KM)	0.903	99% gamma percentile (KM)	2.812				
					Gamma Kaplan-Meier (KM) Statistics							
					Approximate Chi Square Value (19.31, α)	10.34	Adjusted Chi Square Value (19.31, β)	10.27				
					95% Gamma Approximate KM-UCL (use when n>=50)	0.29	95% Gamma Adjusted KM-UCL (use when n<50)	0.293				
					Lognormal GOF Test on Detected Observations Only							
					Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**					
					5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level					
					Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**					
					5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level					
					Detected Data appear Lognormal at 5% Significance Level							
					Lognormal ROS Statistics Using Imputed Non-Detects							
					Mean in Original Scale	0.195	Mean in Log Scale	-2.771				
					SD in Original Scale	0.584	SD in Log Scale	1.447				
					95% t UCL (assumes normality of ROS data)	0.281	95% Percentile Bootstrap UCL	0.284				
					95% BCA Bootstrap UCL	0.356	95% Bootstrap t UCL	0.41				
					95% H-UCL (Log ROS)	0.25						
					Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution							
					KM Mean (logged)	-2.531	KM Geo Mean	0.0796				
					KM SD (logged)	0.635	95% Critical H Value (KM-Log)	1.905				
					KM Standard Error of Mean (logged)	0.0633	95% H-UCL (KM -Log)	0.109				
					KM SD (logged)	0.635	95% Critical H Value (KM-Log)	1.905				
					KM Standard Error of Mean (logged)	0.0633						
					DL/2 Statistics							
					DL/2 Normal		**DL/2 Log-Transformed**					
					Mean in Original Scale	0.606	Mean in Log Scale	-1.153				
					SD in Original Scale	1.92	SD in Log Scale	0.703				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (Assumes normality)	0.89	95% H-Stat UCL	0.457
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	0.29		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Antimony_Total			
General Statistics			
Total Number of Observations	133	Number of Distinct Observations	14
Number of Detects	6	Number of Non-Detects	127
Number of Distinct Detects	5	Number of Distinct Non-Detects	9
Minimum Detect	1.3	Minimum Non-Detect	0.5
Maximum Detect	8.8	Maximum Non-Detect	30
Variance Detects	9.156	Percent Non-Detects	95.49%
Mean Detects	3.6	SD Detects	3.026
Median Detects	2.3	CV Detects	0.841
Skewness Detects	1.234	Kurtosis Detects	0.589
Mean of Logged Detects	0.996	SD of Logged Detects	0.816
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.821	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.644	KM Standard Error of Mean	0.0838
KM SD	0.876	95% KM (BCA) UCL	0.802
95% KM (t) UCL	0.783	95% KM (Percentile Bootstrap) UCL	0.784
95% KM (z) UCL	0.782	95% KM Bootstrap t UCL	0.87
90% KM Chebyshev UCL	0.895	95% KM Chebyshev UCL	1.009
97.5% KM Chebyshev UCL	1.167	99% KM Chebyshev UCL	1.478
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.517	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.705	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.308	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.336	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.907	k star (bias corrected MLE)	1.064
Theta hat (MLE)	1.888	Theta star (bias corrected MLE)	3.382
nu hat (MLE)	22.88	nu star (bias corrected)	12.77
Mean (detects)	3.6		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.172
Maximum	8.8	Median	0.01
SD	0.952	CV	5.536

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	0.271	k star (bias corrected MLE)	0.269
Theta hat (MLE)	0.636	Theta star (bias corrected MLE)	0.638
nu hat (MLE)	71.97	nu star (bias corrected)	71.68
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (71.68, α)	53.18	Adjusted Chi Square Value (71.68, β)	53.01
95% Gamma Approximate UCL (use when n>=50)	0.232	95% Gamma Adjusted UCL (use when n<50)	0.233
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.644	SD (KM)	0.876
Variance (KM)	0.768	SE of Mean (KM)	0.0838
k hat (KM)	0.54	k star (KM)	0.533
nu hat (KM)	143.7	nu star (KM)	141.8
theta hat (KM)	1.192	theta star (KM)	1.208
80% gamma percentile (KM)	1.06	90% gamma percentile (KM)	1.719
95% gamma percentile (KM)	2.418	99% gamma percentile (KM)	4.126
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (141.76, α)	115.2	Adjusted Chi Square Value (141.76, β)	115
95% Gamma Approximate KM-UCL (use when n>=50)	0.792	95% Gamma Adjusted KM-UCL (use when n<50)	0.794
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.227	Mean in Log Scale	-4.068
SD in Original Scale	0.951	SD in Log Scale	2.305
95% t UCL (assumes normality of ROS data)	0.364	95% Percentile Bootstrap UCL	0.376
95% BCA Bootstrap UCL	0.436	95% Bootstrap t UCL	0.6
95% H-UCL (Log ROS)	0.505		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.613	KM Geo Mean	0.541
KM SD (logged)	0.39	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0377	95% H-UCL (KM -Log)	0.62
KM SD (logged)	0.39	95% Critical H Value (KM-Log)	1.768
KM Standard Error of Mean (logged)	0.0377		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.676	Mean in Log Scale	-1.011
SD in Original Scale	1.612	SD in Log Scale	0.807
95% t UCL (Assumes normality)	0.908	95% H-Stat UCL	0.581
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.783		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_FLT			
General Statistics			
Total Number of Observations	125	Number of Distinct Observations	53
Number of Detects	74	Number of Non-Detects	51
Number of Distinct Detects	50	Number of Distinct Non-Detects	4

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum Detect	0.36	Minimum Non-Detect	0.5
Maximum Detect	6.9	Maximum Non-Detect	2.5
Variance Detects	2.353	Percent Non-Detects	40.8%
Mean Detects	1.383	SD Detects	1.534
Median Detects	0.785	CV Detects	1.109
Skewness Detects	2.504	Kurtosis Detects	5.538
Mean of Logged Detects	-0.0109	SD of Logged Detects	0.716
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.585	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.331	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.103	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.972	KM Standard Error of Mean	0.115
KM SD	1.274	95% KM (BCA) UCL	1.258
95% KM (t) UCL	1.162	95% KM (Percentile Bootstrap) UCL	1.19
95% KM (z) UCL	1.161	95% KM Bootstrap t UCL	1.198
90% KM Chebyshev UCL	1.317	95% KM Chebyshev UCL	1.473
97.5% KM Chebyshev UCL	1.689	99% KM Chebyshev UCL	2.114
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	7.587	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.768	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.284	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.106	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.638	k star (bias corrected MLE)	1.58
Theta hat (MLE)	0.845	Theta star (bias corrected MLE)	0.875
nu hat (MLE)	242.4	nu star (bias corrected)	233.9
Mean (detects)	1.383		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.826
Maximum	6.9	Median	0.57
SD	1.357	CV	1.642
k hat (MLE)	0.398	k star (bias corrected MLE)	0.394
Theta hat (MLE)	2.076	Theta star (bias corrected MLE)	2.098
nu hat (MLE)	99.5	nu star (bias corrected)	98.44
Adjusted Level of Significance (β)	0.0481		
Approximate Chi Square Value (98.44, α)	76.56	Adjusted Chi Square Value (98.44, β)	76.33
95% Gamma Approximate UCL (use when n>=50)	1.062	95% Gamma Adjusted UCL (use when n<50)	1.066
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.972	SD (KM)	1.274
Variance (KM)	1.623	SE of Mean (KM)	0.115
k hat (KM)	0.582	k star (KM)	0.574
nu hat (KM)	145.6	nu star (KM)	143.4
theta hat (KM)	1.67	theta star (KM)	1.695
80% gamma percentile (KM)	1.602	90% gamma percentile (KM)	2.554
95% gamma percentile (KM)	3.555	99% gamma percentile (KM)	5.986
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (143.41, α)	116.7	Adjusted Chi Square Value (143.41, β)	116.5
95% Gamma Approximate KM-UCL (use when n>=50)	1.194	95% Gamma Adjusted KM-UCL (use when n<50)	1.197

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.806	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.810E-13	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.103	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.914	Mean in Log Scale	-0.657	
SD in Original Scale	1.309	SD in Log Scale	1.022	
95% t UCL (assumes normality of ROS data)	1.108	95% Percentile Bootstrap UCL	1.12	
95% BCA Bootstrap UCL	1.14	95% Bootstrap t UCL	1.17	
95% H-UCL (Log ROS)	1.069			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.412	KM Geo Mean	0.662	
KM SD (logged)	0.735	95% Critical H Value (KM-Log)	1.974	
KM Standard Error of Mean (logged)	0.0665	95% H-UCL (KM -Log)	0.989	
KM SD (logged)	0.735	95% Critical H Value (KM-Log)	1.974	
KM Standard Error of Mean (logged)	0.0665			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.935	Mean in Log Scale	-0.543	
SD in Original Scale	1.3	SD in Log Scale	0.863	
95% t UCL (Assumes normality)	1.127	95% H-Stat UCL	0.99	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.473			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Arsenic_Total				
General Statistics				
Total Number of Observations	132	Number of Distinct Observations	53	
Number of Detects	72	Number of Non-Detects	60	
Number of Distinct Detects	51	Number of Distinct Non-Detects	5	
Minimum Detect	0.41	Minimum Non-Detect	0.5	
Maximum Detect	27.3	Maximum Non-Detect	5	
Variance Detects	16.08	Percent Non-Detects	45.45%	
Mean Detects	1.985	SD Detects	4.009	
Median Detects	0.82	CV Detects	2.02	
Skewness Detects	4.727	Kurtosis Detects	25.1	
Mean of Logged Detects	0.0726	SD of Logged Detects	0.853	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.399	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.361	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.104	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.291	KM Standard Error of Mean	0.267	
KM SD	3.041	95% KM (BCA) UCL	1.811	
95% KM (t) UCL	1.733	95% KM (Percentile Bootstrap) UCL	1.776	
95% KM (z) UCL	1.73	95% KM Bootstrap t UCL	2.104	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% KM Chebyshev UCL	2.091	95% KM Chebyshev UCL	2.454
97.5% KM Chebyshev UCL	2.957	99% KM Chebyshev UCL	3.946
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	10.62	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.358	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.108	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.948	k star (bias corrected MLE)	0.917
Theta hat (MLE)	2.095	Theta star (bias corrected MLE)	2.164
nu hat (MLE)	136.4	nu star (bias corrected)	132.1
Mean (detects)	1.985		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.112
Maximum	27.3	Median	0.555
SD	3.112	CV	2.8
k hat (MLE)	0.326	k star (bias corrected MLE)	0.324
Theta hat (MLE)	3.408	Theta star (bias corrected MLE)	3.433
nu hat (MLE)	86.11	nu star (bias corrected)	85.48
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (85.48, α)	65.17	Adjusted Chi Square Value (85.48, β)	64.98
95% Gamma Approximate UCL (use when n>=50)	1.458	95% Gamma Adjusted UCL (use when n<50)	1.462
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.291	SD (KM)	3.041
Variance (KM)	9.25	SE of Mean (KM)	0.267
k hat (KM)	0.18	k star (KM)	0.181
nu hat (KM)	47.54	nu star (KM)	47.79
theta hat (KM)	7.167	theta star (KM)	7.129
80% gamma percentile (KM)	1.607	90% gamma percentile (KM)	3.893
95% gamma percentile (KM)	6.818	99% gamma percentile (KM)	15.01
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (47.79, α)	32.93	Adjusted Chi Square Value (47.79, β)	32.79
95% Gamma Approximate KM-UCL (use when n>=50)	1.873	95% Gamma Adjusted KM-UCL (use when n<50)	1.881
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.751	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.110E-16	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.298	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.104	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.194	Mean in Log Scale	-0.72
SD in Original Scale	3.081	SD in Log Scale	1.184
95% t UCL (assumes normality of ROS data)	1.639	95% Percentile Bootstrap UCL	1.667
95% BCA Bootstrap UCL	1.832	95% Bootstrap t UCL	1.984
95% H-UCL (Log ROS)	1.254		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.336	KM Geo Mean	0.714
KM SD (logged)	0.786	95% Critical H Value (KM-Log)	2.015
KM Standard Error of Mean (logged)	0.0699	95% H-UCL (KM -Log)	1.117
KM SD (logged)	0.786	95% Critical H Value (KM-Log)	2.015
KM Standard Error of Mean (logged)	0.0699		

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	1.317		Mean in Log Scale	-0.452
SD in Original Scale	3.077		SD in Log Scale	0.986
95% t UCL (Assumes normality)	1.76		95% H-Stat UCL	1.248
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	2.454			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Barium_FLT				
General Statistics				
Total Number of Observations	115		Number of Distinct Observations	48
Number of Detects	106		Number of Non-Detects	9
Number of Distinct Detects	43		Number of Distinct Non-Detects	5
Minimum Detect	7.8		Minimum Non-Detect	36.7
Maximum Detect	89.7		Maximum Non-Detect	500
Variance Detects	335.4		Percent Non-Detects	7.826%
Mean Detects	25.98		SD Detects	18.31
Median Detects	20		CV Detects	0.705
Skewness Detects	1.797		Kurtosis Detects	2.367
Mean of Logged Detects	3.078		SD of Logged Detects	0.565
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.741		**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0		Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.257		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0863		Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	25.85		KM Standard Error of Mean	1.753
KM SD	18.1		95% KM (BCA) UCL	28.93
95% KM (t) UCL	28.76		95% KM (Percentile Bootstrap) UCL	28.81
95% KM (z) UCL	28.74		95% KM Bootstrap t UCL	29.22
90% KM Chebyshev UCL	31.11		95% KM Chebyshev UCL	33.49
97.5% KM Chebyshev UCL	36.8		99% KM Chebyshev UCL	43.29
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	4.914		**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.759		Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.184		**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0885		Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.936		k star (bias corrected MLE)	2.859
Theta hat (MLE)	8.851		Theta star (bias corrected MLE)	9.088
nu hat (MLE)	622.3		nu star (bias corrected)	606.1
Mean (detects)	25.98			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	7.8	Mean	25.72	
Maximum	89.7	Median	20	
SD	17.74	CV	0.69	
k hat (MLE)	3.076	k star (bias corrected MLE)	3.002	
Theta hat (MLE)	8.362	Theta star (bias corrected MLE)	8.569	
nu hat (MLE)	707.6	nu star (bias corrected)	690.4	
Adjusted Level of Significance (β)	0.0479			
Approximate Chi Square Value (690.45, α)	630.5	Adjusted Chi Square Value (690.45, β)	629.8	
95% Gamma Approximate UCL (use when n>=50)	28.17	95% Gamma Adjusted UCL (use when n<50)	28.2	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	25.85	SD (KM)	18.1	
Variance (KM)	327.8	SE of Mean (KM)	1.753	
k hat (KM)	2.039	k star (KM)	1.992	
nu hat (KM)	469	nu star (KM)	458.1	
theta hat (KM)	12.68	theta star (KM)	12.98	
80% gamma percentile (KM)	38.73	90% gamma percentile (KM)	50.33	
95% gamma percentile (KM)	61.4	99% gamma percentile (KM)	85.97	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (458.13, α)	409.5	Adjusted Chi Square Value (458.13, β)	408.9	
95% Gamma Approximate KM-UCL (use when n>=50)	28.92	95% Gamma Adjusted KM-UCL (use when n<50)	28.96	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.916	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.5857E-7	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0863	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	25.66	Mean in Log Scale	3.075	
SD in Original Scale	17.69	SD in Log Scale	0.548	
95% t UCL (assumes normality of ROS data)	28.4	95% Percentile Bootstrap UCL	28.39	
95% BCA Bootstrap UCL	28.79	95% Bootstrap t UCL	28.91	
95% H-UCL (Log ROS)	27.69			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	3.074	KM Geo Mean	21.63	
KM SD (logged)	0.56	95% Critical H Value (KM-Log)	1.872	
KM Standard Error of Mean (logged)	0.0544	95% H-UCL (KM -Log)	27.91	
KM SD (logged)	0.56	95% Critical H Value (KM-Log)	1.872	
KM Standard Error of Mean (logged)	0.0544			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	31.67	Mean in Log Scale	3.163	
SD in Original Scale	36.23	SD in Log Scale	0.67	
95% t UCL (Assumes normality)	37.27	95% H-Stat UCL	33.46	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	33.49			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Barium_Total				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	118	Number of Distinct Observations	50	
Number of Detects	108	Number of Non-Detects	10	
Number of Distinct Detects	46	Number of Distinct Non-Detects	5	
Minimum Detect	7.6	Minimum Non-Detect	38.9	
Maximum Detect	90.5	Maximum Non-Detect	500	
Variance Detects	286	Percent Non-Detects	8.475%	
Mean Detects	25.13	SD Detects	16.91	
Median Detects	20.5	CV Detects	0.673	
Skewness Detects	2.242	Kurtosis Detects	5.261	
Mean of Logged Detects	3.067	SD of Logged Detects	0.53	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.737	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.239	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0855	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	25.04	KM Standard Error of Mean	1.604	
KM SD	16.72	95% KM (BCA) UCL	27.69	
95% KM (t) UCL	27.7	95% KM (Percentile Bootstrap) UCL	27.55	
95% KM (z) UCL	27.67	95% KM Bootstrap t UCL	27.95	
90% KM Chebyshev UCL	29.85	95% KM Chebyshev UCL	32.03	
97.5% KM Chebyshev UCL	35.06	99% KM Chebyshev UCL	41	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.348	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.162	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0879	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.341	k star (bias corrected MLE)	3.254	
Theta hat (MLE)	7.523	Theta star (bias corrected MLE)	7.723	
nu hat (MLE)	721.6	nu star (bias corrected)	702.9	
Mean (detects)	25.13			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	7.6	Mean	24.93	
Maximum	90.5	Median	20.6	
SD	16.38	CV	0.657	
k hat (MLE)	3.48	k star (bias corrected MLE)	3.398	
Theta hat (MLE)	7.161	Theta star (bias corrected MLE)	7.336	
nu hat (MLE)	821.4	nu star (bias corrected)	801.8	
Adjusted Level of Significance (β)	0.048			
Approximate Chi Square Value (801.83, α)	737.1	Adjusted Chi Square Value (801.83, β)	736.4	
95% Gamma Approximate UCL (use when n>=50)	27.11	95% Gamma Adjusted UCL (use when n<50)	27.14	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	25.04	SD (KM)	16.72	
Variance (KM)	279.6	SE of Mean (KM)	1.604	
k hat (KM)	2.242	k star (KM)	2.191	
nu hat (KM)	529.1	nu star (KM)	517	
theta hat (KM)	11.17	theta star (KM)	11.43	
80% gamma percentile (KM)	37.08	90% gamma percentile (KM)	47.67	
95% gamma percentile (KM)	57.71	99% gamma percentile (KM)	79.88	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (517.00, α)	465.3	Adjusted Chi Square Value (517.00, β)	464.7
95% Gamma Approximate KM-UCL (use when n>=50)	27.82	95% Gamma Adjusted KM-UCL (use when n<50)	27.86
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.7412E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0855	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	24.87	Mean in Log Scale	3.065
SD in Original Scale	16.31	SD in Log Scale	0.514
95% t UCL (assumes normality of ROS data)	27.36	95% Percentile Bootstrap UCL	27.48
95% BCA Bootstrap UCL	27.81	95% Bootstrap t UCL	27.89
95% H-UCL (Log ROS)	26.71		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.064	KM Geo Mean	21.42
KM SD (logged)	0.525	95% Critical H Value (KM-Log)	1.852
KM Standard Error of Mean (logged)	0.0506	95% H-UCL (KM -Log)	26.91
KM SD (logged)	0.525	95% Critical H Value (KM-Log)	1.852
KM Standard Error of Mean (logged)	0.0506		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	29.69	Mean in Log Scale	3.148
SD in Original Scale	31.09	SD in Log Scale	0.617
95% t UCL (Assumes normality)	34.43	95% H-Stat UCL	31.43
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	32.03		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium_FLT			
General Statistics			
Total Number of Observations	115	Number of Distinct Observations	33
Number of Detects	36	Number of Non-Detects	79
Number of Distinct Detects	28	Number of Distinct Non-Detects	5
Minimum Detect	0.33	Minimum Non-Detect	0.15
Maximum Detect	25.9	Maximum Non-Detect	2.5
Variance Detects	26.85	Percent Non-Detects	68.7%
Mean Detects	4.167	SD Detects	5.182
Median Detects	3	CV Detects	1.244
Skewness Detects	3.144	Kurtosis Detects	10.75
Mean of Logged Detects	0.954	SD of Logged Detects	0.978
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.616	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.283	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.145	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.422	KM Standard Error of Mean	0.323	
KM SD	3.408	95% KM (BCA) UCL	2.097	
95% KM (t) UCL	1.957	95% KM (Percentile Bootstrap) UCL	1.987	
95% KM (z) UCL	1.952	95% KM Bootstrap t UCL	2.308	
90% KM Chebyshev UCL	2.39	95% KM Chebyshev UCL	2.828	
97.5% KM Chebyshev UCL	3.436	99% KM Chebyshev UCL	4.631	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.874	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.772	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.166	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.151	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.196	k star (bias corrected MLE)	1.115	
Theta hat (MLE)	3.484	Theta star (bias corrected MLE)	3.738	
nu hat (MLE)	86.11	nu star (bias corrected)	80.27	
Mean (detects)	4.167			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.311	
Maximum	25.9	Median	0.01	
SD	3.463	CV	2.641	
k hat (MLE)	0.23	k star (bias corrected MLE)	0.229	
Theta hat (MLE)	5.711	Theta star (bias corrected MLE)	5.716	
nu hat (MLE)	52.81	nu star (bias corrected)	52.77	
Adjusted Level of Significance (β)	0.0479			
Approximate Chi Square Value (52.77, α)	37.08	Adjusted Chi Square Value (52.77, β)	36.91	
95% Gamma Approximate UCL (use when n>=50)	1.866	95% Gamma Adjusted UCL (use when n<50)	1.874	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.422	SD (KM)	3.408	
Variance (KM)	11.62	SE of Mean (KM)	0.323	
k hat (KM)	0.174	k star (KM)	0.175	
nu hat (KM)	40.03	nu star (KM)	40.32	
theta hat (KM)	8.17	theta star (KM)	8.111	
80% gamma percentile (KM)	1.735	90% gamma percentile (KM)	4.282	
95% gamma percentile (KM)	7.569	99% gamma percentile (KM)	16.83	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (40.32, α)	26.77	Adjusted Chi Square Value (40.32, β)	26.63	
95% Gamma Approximate KM-UCL (use when n>=50)	2.142	95% Gamma Adjusted KM-UCL (use when n<50)	2.153	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.935	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.145	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.452	Mean in Log Scale	-1.123	
SD in Original Scale	3.414	SD in Log Scale	1.797	
95% t UCL (assumes normality of ROS data)	1.981	95% Percentile Bootstrap UCL	1.984	
95% BCA Bootstrap UCL	2.256	95% Bootstrap t UCL	2.418	
95% H-UCL (Log ROS)	2.747			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	-0.965	KM Geo Mean	0.381
KM SD (logged)	1.423	95% Critical H Value (KM-Log)	2.65
KM Standard Error of Mean (logged)	0.137	95% H-UCL (KM -Log)	1.492
KM SD (logged)	1.423	95% Critical H Value (KM-Log)	2.65
KM Standard Error of Mean (logged)	0.137		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.512	Mean in Log Scale	-0.717
SD in Original Scale	3.397	SD in Log Scale	1.381
95% t UCL (Assumes normality)	2.037	95% H-Stat UCL	1.774

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	1.492		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Beryllium_Total

General Statistics

Total Number of Observations	118	Number of Distinct Observations	37
Number of Detects	42	Number of Non-Detects	76
Number of Distinct Detects	32	Number of Distinct Non-Detects	5
Minimum Detect	0.17	Minimum Non-Detect	0.25
Maximum Detect	33.2	Maximum Non-Detect	2.5
Variance Detects	54.09	Percent Non-Detects	64.41%
Mean Detects	4.363	SD Detects	7.355
Median Detects	1.9	CV Detects	1.686
Skewness Detects	3.05	Kurtosis Detects	8.826
Mean of Logged Detects	0.676	SD of Logged Detects	1.233

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.526	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.332	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.135	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.678	KM Standard Error of Mean	0.445
KM SD	4.774	95% KM (BCA) UCL	2.573
95% KM (t) UCL	2.416	95% KM (Percentile Bootstrap) UCL	2.448
95% KM (z) UCL	2.41	95% KM Bootstrap t UCL	3.104
90% KM Chebyshev UCL	3.013	95% KM Chebyshev UCL	3.617
97.5% KM Chebyshev UCL	4.457	99% KM Chebyshev UCL	6.105

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.862	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.202	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.751	k star (bias corrected MLE)	0.713
Theta hat (MLE)	5.811	Theta star (bias corrected MLE)	6.119
nu hat (MLE)	63.07	nu star (bias corrected)	59.9
Mean (detects)	4.363		

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.559	
Maximum	33.2	Median	0.01	
SD	4.831	CV	3.098	
k hat (MLE)	0.228	k star (bias corrected MLE)	0.227	
Theta hat (MLE)	6.855	Theta star (bias corrected MLE)	6.859	
nu hat (MLE)	53.69	nu star (bias corrected)	53.66	
Adjusted Level of Significance (β)	0.048			
Approximate Chi Square Value (53.66, α)	37.83	Adjusted Chi Square Value (53.66, β)	37.67	
95% Gamma Approximate UCL (use when n>=50)	2.212	95% Gamma Adjusted UCL (use when n<50)	2.222	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.678	SD (KM)	4.774	
Variance (KM)	22.79	SE of Mean (KM)	0.445	
k hat (KM)	0.124	k star (KM)	0.126	
nu hat (KM)	29.17	nu star (KM)	29.76	
theta hat (KM)	13.58	theta star (KM)	13.31	
80% gamma percentile (KM)	1.554	90% gamma percentile (KM)	4.816	
95% gamma percentile (KM)	9.513	99% gamma percentile (KM)	23.68	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (29.76, α)	18.3	Adjusted Chi Square Value (29.76, β)	18.19	
95% Gamma Approximate KM-UCL (use when n>=50)	2.729	95% Gamma Adjusted KM-UCL (use when n<50)	2.745	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.107	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.135	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.647	Mean in Log Scale	-1.393	
SD in Original Scale	4.804	SD in Log Scale	1.989	
95% t UCL (assumes normality of ROS data)	2.38	95% Percentile Bootstrap UCL	2.379	
95% BCA Bootstrap UCL	2.714	95% Bootstrap t UCL	2.831	
95% H-UCL (Log ROS)	3.302			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.857	KM Geo Mean	0.424	
KM SD (logged)	1.37	95% Critical H Value (KM-Log)	2.596	
KM Standard Error of Mean (logged)	0.13	95% H-UCL (KM -Log)	1.507	
KM SD (logged)	1.37	95% Critical H Value (KM-Log)	2.596	
KM Standard Error of Mean (logged)	0.13			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.747	Mean in Log Scale	-0.7	
SD in Original Scale	4.776	SD in Log Scale	1.377	
95% t UCL (Assumes normality)	2.476	95% H-Stat UCL	1.784	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	1.507			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Boron_FLT

General Statistics

Total Number of Observations	113	Number of Distinct Observations	76
		Number of Missing Observations	0
Minimum	850	Mean	15843
Maximum	249000	Median	8800
SD	26266	Std. Error of Mean	2471
Coefficient of Variation	1.658	Skewness	6.613

Normal GOF Test

Shapiro Wilk Test Statistic	0.491	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.284	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0837	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19941	95% Adjusted-CLT UCL (Chen-1995)	21549
		95% Modified-t UCL (Johnson-1978)	20197

Gamma GOF Test

A-D Test Statistic	1.256	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.788	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0952	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.089	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.897	k star (bias corrected MLE)	0.879
Theta hat (MLE)	17655	Theta star (bias corrected MLE)	18015
nu hat (MLE)	202.8	nu star (bias corrected)	198.7
MLE Mean (bias corrected)	15843	MLE Sd (bias corrected)	16894
		Approximate Chi Square Value (0.05)	167.1
Adjusted Level of Significance	0.0479	Adjusted Chi Square Value	166.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	18840	95% Adjusted Gamma UCL (use when n<50)	18882

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00224	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0976	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0837	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.745	Mean of logged Data	9.019
Maximum of Logged Data	12.43	SD of logged Data	1.186

Assuming Lognormal Distribution

95% H-UCL	21813	90% Chebyshev (MVUE) UCL	23520
95% Chebyshev (MVUE) UCL	26698	97.5% Chebyshev (MVUE) UCL	31108
99% Chebyshev (MVUE) UCL	39773		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	19907	95% Jackknife UCL	19941
95% Standard Bootstrap UCL	19986	95% Bootstrap-t UCL	23153
95% Hall's Bootstrap UCL	38011	95% Percentile Bootstrap UCL	20240
95% BCA Bootstrap UCL	22775		
90% Chebyshev(Mean, Sd) UCL	23255	95% Chebyshev(Mean, Sd) UCL	26613
97.5% Chebyshev(Mean, Sd) UCL	31273	99% Chebyshev(Mean, Sd) UCL	40428

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	26613

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Boron_Total

General Statistics

Total Number of Observations	111	Number of Distinct Observations	67
		Number of Missing Observations	0
Minimum	880	Mean	16069
Maximum	248000	Median	8800
SD	26303	Std. Error of Mean	2497
Coefficient of Variation	1.637	Skewness	6.587

Normal GOF Test

Shapiro Wilk Test Statistic	0.493	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.282	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0844	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20211	95% Adjusted-CLT UCL (Chen-1995)	21844
		95% Modified-t UCL (Johnson-1978)	20471

Gamma GOF Test

A-D Test Statistic	1.247	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.787	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.105	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0895	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.916	k star (bias corrected MLE)	0.897
Theta hat (MLE)	17551	Theta star (bias corrected MLE)	17918
nu hat (MLE)	203.3	nu star (bias corrected)	199.1
MLE Mean (bias corrected)	16069	MLE Sd (bias corrected)	16969
		Approximate Chi Square Value (0.05)	167.4
Adjusted Level of Significance	0.0478	Adjusted Chi Square Value	167.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19107	95% Adjusted Gamma UCL (use when n<50)	19150

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00113	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0844	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.78	Mean of logged Data	9.048

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Maximum of Logged Data	12.42	SD of logged Data	1.176
	Assuming Lognormal Distribution			
	95% H-UCL	22171	90% Chebyshev (MVUE) UCL	23916
	95% Chebyshev (MVUE) UCL	27141	97.5% Chebyshev (MVUE) UCL	31618
	99% Chebyshev (MVUE) UCL	40413		
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution (0.05)			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	20176	95% Jackknife UCL	20211
	95% Standard Bootstrap UCL	20032	95% Bootstrap-t UCL	23884
	95% Hall's Bootstrap UCL	37947	95% Percentile Bootstrap UCL	20723
	95% BCA Bootstrap UCL	22410		
	90% Chebyshev(Mean, Sd) UCL	23559	95% Chebyshev(Mean, Sd) UCL	26952
	97.5% Chebyshev(Mean, Sd) UCL	31661	99% Chebyshev(Mean, Sd) UCL	40910
	Suggested UCL to Use			
	95% Chebyshev (Mean, Sd) UCL	26952		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Cadmium_FLT			
	General Statistics			
	Total Number of Observations	126	Number of Distinct Observations	27
	Number of Detects	29	Number of Non-Detects	97
	Number of Distinct Detects	22	Number of Distinct Non-Detects	6
	Minimum Detect	0.36	Minimum Non-Detect	0.1
	Maximum Detect	4.3	Maximum Non-Detect	2.5
	Variance Detects	0.668	Percent Non-Detects	76.98%
	Mean Detects	1.3	SD Detects	0.817
	Median Detects	0.99	CV Detects	0.628
	Skewness Detects	1.954	Kurtosis Detects	5.252
	Mean of Logged Detects	0.109	SD of Logged Detects	0.549
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.803	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.264	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.414	KM Standard Error of Mean	0.0617
	KM SD	0.632	95% KM (BCA) UCL	0.523
	95% KM (t) UCL	0.516	95% KM (Percentile Bootstrap) UCL	0.518
	95% KM (z) UCL	0.515	95% KM Bootstrap t UCL	0.534
	90% KM Chebyshev UCL	0.599	95% KM Chebyshev UCL	0.683
	97.5% KM Chebyshev UCL	0.799	99% KM Chebyshev UCL	1.028
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.95	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.752	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.231	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.164	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	3.419	k star (bias corrected MLE)	3.088
	Theta hat (MLE)	0.38	Theta star (bias corrected MLE)	0.421

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	198.3	nu star (bias corrected)	179.1
	Mean (detects)	1.3		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.335
	Maximum	4.3	Median	0.01
	SD	0.662	CV	1.977
	k hat (MLE)	0.33	k star (bias corrected MLE)	0.327
	Theta hat (MLE)	1.015	Theta star (bias corrected MLE)	1.023
	nu hat (MLE)	83.09	nu star (bias corrected)	82.44
	Adjusted Level of Significance (β)	0.0481		
	Approximate Chi Square Value (82.44, α)	62.52	Adjusted Chi Square Value (82.44, β)	62.32
	95% Gamma Approximate UCL (use when n>=50)	0.442	95% Gamma Adjusted UCL (use when n<50)	0.443
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.414	SD (KM)	0.632
	Variance (KM)	0.4	SE of Mean (KM)	0.0617
	k hat (KM)	0.428	k star (KM)	0.423
	nu hat (KM)	107.9	nu star (KM)	106.7
	theta hat (KM)	0.966	theta star (KM)	0.977
	80% gamma percentile (KM)	0.672	90% gamma percentile (KM)	1.157
	95% gamma percentile (KM)	1.686	99% gamma percentile (KM)	3.008
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (106.71, α)	83.87	Adjusted Chi Square Value (106.71, β)	83.63
	95% Gamma Approximate KM-UCL (use when n>=50)	0.527	95% Gamma Adjusted KM-UCL (use when n<50)	0.528
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.926	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.161	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.48	Mean in Log Scale	-1.276
	SD in Original Scale	0.608	SD in Log Scale	1.039
	95% t UCL (assumes normality of ROS data)	0.569	95% Percentile Bootstrap UCL	0.569
	95% BCA Bootstrap UCL	0.595	95% Bootstrap t UCL	0.592
	95% H-UCL (Log ROS)	0.589		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-1.594	KM Geo Mean	0.203
	KM SD (logged)	1.067	95% Critical H Value (KM-Log)	2.25
	KM Standard Error of Mean (logged)	0.138	95% H-UCL (KM -Log)	0.445
	KM SD (logged)	1.067	95% Critical H Value (KM-Log)	2.25
	KM Standard Error of Mean (logged)	0.138		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.503	Mean in Log Scale	-1.134
	SD in Original Scale	0.606	SD in Log Scale	0.913
	95% t UCL (Assumes normality)	0.592	95% H-Stat UCL	0.58
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	0.445		

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium_Total

General Statistics

Total Number of Observations	133	Number of Distinct Observations	31
Number of Detects	35	Number of Non-Detects	98
Number of Distinct Detects	29	Number of Distinct Non-Detects	5
Minimum Detect	0.39	Minimum Non-Detect	0.1
Maximum Detect	4	Maximum Non-Detect	2.5
Variance Detects	0.782	Percent Non-Detects	73.68%
Mean Detects	1.305	SD Detects	0.885
Median Detects	0.94	CV Detects	0.678
Skewness Detects	1.587	Kurtosis Detects	2.243
Mean of Logged Detects	0.083	SD of Logged Detects	0.595

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.934	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.453	KM Standard Error of Mean	0.0637
KM SD	0.69	95% KM (BCA) UCL	0.558
95% KM (t) UCL	0.558	95% KM (Percentile Bootstrap) UCL	0.56
95% KM (z) UCL	0.558	95% KM Bootstrap t UCL	0.575
90% KM Chebyshev UCL	0.644	95% KM Chebyshev UCL	0.73
97.5% KM Chebyshev UCL	0.85	99% KM Chebyshev UCL	1.086

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.081	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.754	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.15	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.883	k star (bias corrected MLE)	2.655
Theta hat (MLE)	0.453	Theta star (bias corrected MLE)	0.492
nu hat (MLE)	201.8	nu star (bias corrected)	185.9
Mean (detects)	1.305		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.372
Maximum	4	Median	0.01
SD	0.722	CV	1.942
k hat (MLE)	0.324	k star (bias corrected MLE)	0.321
Theta hat (MLE)	1.149	Theta star (bias corrected MLE)	1.157
nu hat (MLE)	86.07	nu star (bias corrected)	85.47
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (85.47, α)	65.16	Adjusted Chi Square Value (85.47, β)	64.96
95% Gamma Approximate UCL (use when n>=50)	0.488	95% Gamma Adjusted UCL (use when n<50)	0.489

Estimates of Gamma Parameters using KM Estimates

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (KM)	0.453	SD (KM)	0.69
Variance (KM)	0.477	SE of Mean (KM)	0.0637
k hat (KM)	0.43	k star (KM)	0.426
nu hat (KM)	114.4	nu star (KM)	113.2
theta hat (KM)	1.053	theta star (KM)	1.064
80% gamma percentile (KM)	0.736	90% gamma percentile (KM)	1.265
95% gamma percentile (KM)	1.841	99% gamma percentile (KM)	3.282
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (113.19, α)	89.63	Adjusted Chi Square Value (113.19, β)	89.4
95% Gamma Approximate KM-UCL (use when n>=50)	0.572	95% Gamma Adjusted KM-UCL (use when n<50)	0.573
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.934	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.148	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.502	Mean in Log Scale	-1.305
SD in Original Scale	0.67	SD in Log Scale	1.112
95% t UCL (assumes normality of ROS data)	0.598	95% Percentile Bootstrap UCL	0.605
95% BCA Bootstrap UCL	0.615	95% Bootstrap t UCL	0.617
95% H-UCL (Log ROS)	0.629		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.537	KM Geo Mean	0.215
KM SD (logged)	1.107	95% Critical H Value (KM-Log)	2.292
KM Standard Error of Mean (logged)	0.125	95% H-UCL (KM -Log)	0.495
KM SD (logged)	1.107	95% Critical H Value (KM-Log)	2.292
KM Standard Error of Mean (logged)	0.125		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.543	Mean in Log Scale	-1.1
SD in Original Scale	0.662	SD in Log Scale	0.981
95% t UCL (Assumes normality)	0.638	95% H-Stat UCL	0.649
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	0.495		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chromium_FLT			
General Statistics			
Total Number of Observations	115	Number of Distinct Observations	16
Number of Detects	11	Number of Non-Detects	104
Number of Distinct Detects	10	Number of Distinct Non-Detects	6
Minimum Detect	0.52	Minimum Non-Detect	0.45
Maximum Detect	14.1	Maximum Non-Detect	25
Variance Detects	22.88	Percent Non-Detects	90.43%
Mean Detects	2.939	SD Detects	4.784
Median Detects	0.89	CV Detects	1.628
Skewness Detects	2.017	Kurtosis Detects	2.738
Mean of Logged Detects	0.27	SD of Logged Detects	1.133

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.542	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.468	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.696	KM Standard Error of Mean	0.158	
KM SD	1.603	95% KM (BCA) UCL	1.019	
95% KM (t) UCL	0.958	95% KM (Percentile Bootstrap) UCL	1.002	
95% KM (z) UCL	0.956	95% KM Bootstrap t UCL	3.455	
90% KM Chebyshev UCL	1.171	95% KM Chebyshev UCL	1.385	
97.5% KM Chebyshev UCL	1.684	99% KM Chebyshev UCL	2.27	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.195	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.763	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.442	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.265	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.742	k star (bias corrected MLE)	0.6	
Theta hat (MLE)	3.963	Theta star (bias corrected MLE)	4.898	
nu hat (MLE)	16.32	nu star (bias corrected)	13.2	
Mean (detects)	2.939			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.29	
Maximum	14.1	Median	0.01	
SD	1.66	CV	5.721	
k hat (MLE)	0.246	k star (bias corrected MLE)	0.245	
Theta hat (MLE)	1.182	Theta star (bias corrected MLE)	1.185	
nu hat (MLE)	56.47	nu star (bias corrected)	56.33	
Adjusted Level of Significance (β)	0.0479			
Approximate Chi Square Value (56.33, α)	40.08	Adjusted Chi Square Value (56.33, β)	39.9	
95% Gamma Approximate UCL (use when n>=50)	0.408	95% Gamma Adjusted UCL (use when n<50)	0.41	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.696	SD (KM)	1.603	
Variance (KM)	2.569	SE of Mean (KM)	0.158	
k hat (KM)	0.188	k star (KM)	0.189	
nu hat (KM)	43.35	nu star (KM)	43.55	
theta hat (KM)	3.692	theta star (KM)	3.675	
80% gamma percentile (KM)	0.89	90% gamma percentile (KM)	2.103	
95% gamma percentile (KM)	3.636	99% gamma percentile (KM)	7.896	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (43.55, α)	29.42	Adjusted Chi Square Value (43.55, β)	29.27	
95% Gamma Approximate KM-UCL (use when n>=50)	1.03	95% Gamma Adjusted KM-UCL (use when n<50)	1.035	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.675	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.379	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.251	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.318	Mean in Log Scale	-4.253	
SD in Original Scale	1.657	SD in Log Scale	2.498	
95% t UCL (assumes normality of ROS data)	0.574	95% Percentile Bootstrap UCL	0.581	
95% BCA Bootstrap UCL	0.726	95% Bootstrap t UCL	1.962	
95% H-UCL (Log ROS)	0.812			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.689	KM Geo Mean	0.502	
KM SD (logged)	0.465	95% Critical H Value (KM-Log)	1.816	
KM Standard Error of Mean (logged)	0.0463	95% H-UCL (KM -Log)	0.606	
KM SD (logged)	0.465	95% Critical H Value (KM-Log)	1.816	
KM Standard Error of Mean (logged)	0.0463			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.861	Mean in Log Scale	-0.961	
SD in Original Scale	2.123	SD in Log Scale	0.931	
95% t UCL (Assumes normality)	1.19	95% H-Stat UCL	0.712	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.385			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Chromium_Total				
General Statistics				
Total Number of Observations	118	Number of Distinct Observations	26	
Number of Detects	21	Number of Non-Detects	97	
Number of Distinct Detects	21	Number of Distinct Non-Detects	5	
Minimum Detect	0.46	Minimum Non-Detect	0.5	
Maximum Detect	15.5	Maximum Non-Detect	20	
Variance Detects	16.53	Percent Non-Detects	82.2%	
Mean Detects	2.187	SD Detects	4.066	
Median Detects	0.66	CV Detects	1.86	
Skewness Detects	2.749	Kurtosis Detects	6.799	
Mean of Logged Detects	-0.0128	SD of Logged Detects	1.026	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.465	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.443	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.188	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.777	KM Standard Error of Mean	0.171	
KM SD	1.807	95% KM (BCA) UCL	1.148	
95% KM (t) UCL	1.061	95% KM (Percentile Bootstrap) UCL	1.104	
95% KM (z) UCL	1.059	95% KM Bootstrap t UCL	1.641	
90% KM Chebyshev UCL	1.291	95% KM Chebyshev UCL	1.523	
97.5% KM Chebyshev UCL	1.846	99% KM Chebyshev UCL	2.481	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	4.108	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.783	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.392	**Kolmogorov-Smirnov GOF**		

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.197	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.753	k star (bias corrected MLE)	0.677	
Theta hat (MLE)	2.906	Theta star (bias corrected MLE)	3.231	
nu hat (MLE)	31.61	nu star (bias corrected)	28.42	
Mean (detects)	2.187			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.406	
Maximum	15.5	Median	0.01	
SD	1.878	CV	4.628	
k hat (MLE)	0.25	k star (bias corrected MLE)	0.249	
Theta hat (MLE)	1.626	Theta star (bias corrected MLE)	1.63	
nu hat (MLE)	58.9	nu star (bias corrected)	58.73	
Adjusted Level of Significance (β)	0.048			
Approximate Chi Square Value (58.73, α)	42.11	Adjusted Chi Square Value (58.73, β)	41.94	
95% Gamma Approximate UCL (use when n>=50)	0.566	95% Gamma Adjusted UCL (use when n<50)	0.568	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.777	SD (KM)	1.807	
Variance (KM)	3.264	SE of Mean (KM)	0.171	
k hat (KM)	0.185	k star (KM)	0.186	
nu hat (KM)	43.64	nu star (KM)	43.87	
theta hat (KM)	4.201	theta star (KM)	4.18	
80% gamma percentile (KM)	0.983	90% gamma percentile (KM)	2.346	
95% gamma percentile (KM)	4.078	99% gamma percentile (KM)	8.905	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (43.87, α)	29.68	Adjusted Chi Square Value (43.87, β)	29.53	
95% Gamma Approximate KM-UCL (use when n>=50)	1.148	95% Gamma Adjusted KM-UCL (use when n<50)	1.154	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.659	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.188	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.515	Mean in Log Scale	-1.936	
SD in Original Scale	1.858	SD in Log Scale	1.389	
95% t UCL (assumes normality of ROS data)	0.798	95% Percentile Bootstrap UCL	0.825	
95% BCA Bootstrap UCL	0.967	95% Bootstrap t UCL	1.347	
95% H-UCL (Log ROS)	0.53			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.628	KM Geo Mean	0.534	
KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.848	
KM Standard Error of Mean (logged)	0.0497	95% H-UCL (KM -Log)	0.667	
KM SD (logged)	0.519	95% Critical H Value (KM-Log)	1.848	
KM Standard Error of Mean (logged)	0.0497			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.925	Mean in Log Scale	-0.816	
SD in Original Scale	2.083	SD in Log Scale	0.951	
95% t UCL (Assumes normality)	1.243	95% H-Stat UCL	0.842	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.523			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cobalt_FLT				
General Statistics				
Total Number of Observations	115	Number of Distinct Observations	83	
Number of Detects	93	Number of Non-Detects	22	
Number of Distinct Detects	78	Number of Distinct Non-Detects	6	
Minimum Detect	0.29	Minimum Non-Detect	0.25	
Maximum Detect	531	Maximum Non-Detect	125	
Variance Detects	5801	Percent Non-Detects	19.13%	
Mean Detects	33.08	SD Detects	76.16	
Median Detects	5.7	CV Detects	2.302	
Skewness Detects	4.855	Kurtosis Detects	27.23	
Mean of Logged Detects	1.895	SD of Logged Detects	1.904	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.46	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.333	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0921	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	27.28	KM Standard Error of Mean	6.501	
KM SD	69.26	95% KM (BCA) UCL	37.96	
95% KM (t) UCL	38.06	95% KM (Percentile Bootstrap) UCL	39.05	
95% KM (z) UCL	37.97	95% KM Bootstrap t UCL	46.79	
90% KM Chebyshev UCL	46.78	95% KM Chebyshev UCL	55.61	
97.5% KM Chebyshev UCL	67.87	99% KM Chebyshev UCL	91.96	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.292	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.841	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.179	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0993	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.409	k star (bias corrected MLE)	0.403	
Theta hat (MLE)	80.89	Theta star (bias corrected MLE)	82.1	
nu hat (MLE)	76.06	nu star (bias corrected)	74.94	
Mean (detects)	33.08			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	26.95	
Maximum	531	Median	3.4	
SD	69.6	CV	2.583	
k hat (MLE)	0.277	k star (bias corrected MLE)	0.275	
Theta hat (MLE)	97.34	Theta star (bias corrected MLE)	97.85	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	63.67	nu star (bias corrected)	63.34
	Adjusted Level of Significance (β)	0.0479		
	Approximate Chi Square Value (63.34, α)	46.03	Adjusted Chi Square Value (63.34, β)	45.85
	95% Gamma Approximate UCL (use when n>=50)	37.08	95% Gamma Adjusted UCL (use when n<50)	37.23
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	27.28	SD (KM)	69.26
	Variance (KM)	4796	SE of Mean (KM)	6.501
	k hat (KM)	0.155	k star (KM)	0.157
	nu hat (KM)	35.68	nu star (KM)	36.08
	theta hat (KM)	175.8	theta star (KM)	173.9
	80% gamma percentile (KM)	30.77	90% gamma percentile (KM)	81.34
	95% gamma percentile (KM)	148.8	99% gamma percentile (KM)	342.7
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (36.08, α)	23.33	Adjusted Chi Square Value (36.08, β)	23.2
	95% Gamma Approximate KM-UCL (use when n>=50)	42.18	95% Gamma Adjusted KM-UCL (use when n<50)	42.41
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.941	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	6.2031E-4	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0997	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0921	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	27.01	Mean in Log Scale	1.324
	SD in Original Scale	69.57	SD in Log Scale	2.211
	95% t UCL (assumes normality of ROS data)	37.76	95% Percentile Bootstrap UCL	39.04
	95% BCA Bootstrap UCL	42.54	95% Bootstrap t UCL	48.22
	95% H-UCL (Log ROS)	90.9		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	1.433	KM Geo Mean	4.193
	KM SD (logged)	2.043	95% Critical H Value (KM-Log)	3.379
	KM Standard Error of Mean (logged)	0.196	95% H-UCL (KM -Log)	64.5
	KM SD (logged)	2.043	95% Critical H Value (KM-Log)	3.379
	KM Standard Error of Mean (logged)	0.196		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	28.4	Mean in Log Scale	1.537
	SD in Original Scale	69.4	SD in Log Scale	2.137
	95% t UCL (Assumes normality)	39.13	95% H-Stat UCL	91.88
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	55.61		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Cobalt_Total			
	General Statistics			
	Total Number of Observations	118	Number of Distinct Observations	79
	Number of Detects	100	Number of Non-Detects	18
	Number of Distinct Detects	76	Number of Distinct Non-Detects	3
	Minimum Detect	0.33	Minimum Non-Detect	0.25
	Maximum Detect	626	Maximum Non-Detect	25

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance Detects	9195	Percent Non-Detects	15.25%
Mean Detects	37.75	SD Detects	95.89
Median Detects	5.15	CV Detects	2.54
Skewness Detects	4.694	Kurtosis Detects	23.72
Mean of Logged Detects	1.816	SD of Logged Detects	1.989
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.421	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.348	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0889	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	32.34	KM Standard Error of Mean	8.215
KM SD	88.77	95% KM (BCA) UCL	47.64
95% KM (t) UCL	45.96	95% KM (Percentile Bootstrap) UCL	47.21
95% KM (z) UCL	45.86	95% KM Bootstrap t UCL	56.23
90% KM Chebyshev UCL	56.99	95% KM Chebyshev UCL	68.15
97.5% KM Chebyshev UCL	83.65	99% KM Chebyshev UCL	114.1
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.55	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.851	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.181	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0962	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.368	k star (bias corrected MLE)	0.363
Theta hat (MLE)	102.7	Theta star (bias corrected MLE)	103.9
nu hat (MLE)	73.51	nu star (bias corrected)	72.64
Mean (detects)	37.75		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	32.25
Maximum	626	Median	2.75
SD	89.19	CV	2.765
k hat (MLE)	0.278	k star (bias corrected MLE)	0.276
Theta hat (MLE)	116.2	Theta star (bias corrected MLE)	116.8
nu hat (MLE)	65.52	nu star (bias corrected)	65.19
Adjusted Level of Significance (β)	0.048		
Approximate Chi Square Value (65.19, α)	47.61	Adjusted Chi Square Value (65.19, β)	47.43
95% Gamma Approximate UCL (use when n>=50)	44.16	95% Gamma Adjusted UCL (use when n<50)	44.33
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	32.34	SD (KM)	88.77
Variance (KM)	7880	SE of Mean (KM)	8.215
k hat (KM)	0.133	k star (KM)	0.135
nu hat (KM)	31.33	nu star (KM)	31.87
theta hat (KM)	243.6	theta star (KM)	239.5
80% gamma percentile (KM)	32.07	90% gamma percentile (KM)	94.23
95% gamma percentile (KM)	181.4	99% gamma percentile (KM)	440.2
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (31.87, α)	19.97	Adjusted Chi Square Value (31.87, β)	19.85
95% Gamma Approximate KM-UCL (use when n>=50)	51.62	95% Gamma Adjusted KM-UCL (use when n<50)	51.92
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.924	**Shapiro Wilk GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk P Value	4.8400E-6	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.102	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0889	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	32.26	Mean in Log Scale	1.388	
SD in Original Scale	89.17	SD in Log Scale	2.223	
95% t UCL (assumes normality of ROS data)	45.87	95% Percentile Bootstrap UCL	46.22	
95% BCA Bootstrap UCL	51.76	95% Bootstrap t UCL	55.13	
95% H-UCL (Log ROS)	99.47			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.484	KM Geo Mean	4.412	
KM SD (logged)	2.051	95% Critical H Value (KM-Log)	3.396	
KM Standard Error of Mean (logged)	0.193	95% H-UCL (KM -Log)	68.77	
KM SD (logged)	2.051	95% Critical H Value (KM-Log)	3.396	
KM Standard Error of Mean (logged)	0.193			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	32.98	Mean in Log Scale	1.599	
SD in Original Scale	88.96	SD in Log Scale	2.093	
95% t UCL (Assumes normality)	46.56	95% H-Stat UCL	86.25	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	68.15			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Copper_FLT				
General Statistics				
Total Number of Observations	126	Number of Distinct Observations	30	
Number of Detects	56	Number of Non-Detects	70	
Number of Distinct Detects	25	Number of Distinct Non-Detects	8	
Minimum Detect	0.57	Minimum Non-Detect	0.7	
Maximum Detect	13.4	Maximum Non-Detect	5	
Variance Detects	3.576	Percent Non-Detects	55.56%	
Mean Detects	1.958	SD Detects	1.891	
Median Detects	1.4	CV Detects	0.966	
Skewness Detects	4.436	Kurtosis Detects	24.65	
Mean of Logged Detects	0.461	SD of Logged Detects	0.572	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.557	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.118	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.289	KM Standard Error of Mean	0.131	
KM SD	1.396	95% KM (BCA) UCL	1.55	
95% KM (t) UCL	1.506	95% KM (Percentile Bootstrap) UCL	1.523	
95% KM (z) UCL	1.504	95% KM Bootstrap t UCL	1.596	
90% KM Chebyshev UCL	1.681	95% KM Chebyshev UCL	1.858	
97.5% KM Chebyshev UCL	2.105	99% KM Chebyshev UCL	2.588	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.373	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.2	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.12	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.525	k star (bias corrected MLE)	2.402	
Theta hat (MLE)	0.775	Theta star (bias corrected MLE)	0.815	
nu hat (MLE)	282.8	nu star (bias corrected)	269	
Mean (detects)	1.958			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.909	
Maximum	13.4	Median	0.237	
SD	1.574	CV	1.731	
k hat (MLE)	0.351	k star (bias corrected MLE)	0.348	
Theta hat (MLE)	2.591	Theta star (bias corrected MLE)	2.614	
nu hat (MLE)	88.4	nu star (bias corrected)	87.63	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (87.63, α)	67.05	Adjusted Chi Square Value (87.63, β)	66.84	
95% Gamma Approximate UCL (use when n>=50)	1.188	95% Gamma Adjusted UCL (use when n<50)	1.191	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.289	SD (KM)	1.396	
Variance (KM)	1.948	SE of Mean (KM)	0.131	
k hat (KM)	0.853	k star (KM)	0.838	
nu hat (KM)	215.1	nu star (KM)	211.3	
theta hat (KM)	1.511	theta star (KM)	1.538	
80% gamma percentile (KM)	2.101	90% gamma percentile (KM)	3.1	
95% gamma percentile (KM)	4.113	99% gamma percentile (KM)	6.496	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (211.29, α)	178.7	Adjusted Chi Square Value (211.29, β)	178.3	
95% Gamma Approximate KM-UCL (use when n>=50)	1.525	95% Gamma Adjusted KM-UCL (use when n<50)	1.528	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.895	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	4.4359E-5	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.118	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.17	Mean in Log Scale	-0.196	
SD in Original Scale	1.45	SD in Log Scale	0.791	
95% t UCL (assumes normality of ROS data)	1.384	95% Percentile Bootstrap UCL	1.384	
95% BCA Bootstrap UCL	1.44	95% Bootstrap t UCL	1.497	
95% H-UCL (Log ROS)	1.296			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.0304	KM Geo Mean	1.031	
KM SD (logged)	0.569	95% Critical H Value (KM-Log)	1.863	
KM Standard Error of Mean (logged)	0.0707	95% H-UCL (KM -Log)	1.332	
KM SD (logged)	0.569	95% Critical H Value (KM-Log)	1.863	
KM Standard Error of Mean (logged)	0.0707			
DL/2 Statistics				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.202	Mean in Log Scale	-0.127
SD in Original Scale	1.451	SD in Log Scale	0.695
95% t UCL (Assumes normality)	1.416	95% H-Stat UCL	1.266
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.858		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_Total			
General Statistics			
Total Number of Observations	132	Number of Distinct Observations	29
Number of Detects	53	Number of Non-Detects	79
Number of Distinct Detects	27	Number of Distinct Non-Detects	5
Minimum Detect	0.46	Minimum Non-Detect	1
Maximum Detect	11.4	Maximum Non-Detect	5
Variance Detects	4.449	Percent Non-Detects	59.85%
Mean Detects	2.283	SD Detects	2.109
Median Detects	1.5	CV Detects	0.924
Skewness Detects	2.856	Kurtosis Detects	9.082
Mean of Logged Detects	0.579	SD of Logged Detects	0.644
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.65	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	2.220E-15	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.234	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.121	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.278	KM Standard Error of Mean	0.145
KM SD	1.575	95% KM (BCA) UCL	1.685
95% KM (t) UCL	1.518	95% KM (Percentile Bootstrap) UCL	1.628
95% KM (z) UCL	1.516	95% KM Bootstrap t UCL	1.594
90% KM Chebyshev UCL	1.712	95% KM Chebyshev UCL	1.909
97.5% KM Chebyshev UCL	2.182	99% KM Chebyshev UCL	2.719
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.994	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.184	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.124	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.179	k star (bias corrected MLE)	2.069
Theta hat (MLE)	1.048	Theta star (bias corrected MLE)	1.104
nu hat (MLE)	231	nu star (bias corrected)	219.3
Mean (detects)	2.283		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	0.01	Mean	0.96
Maximum	11.4	Median	0.01
SD	1.733	CV	1.805
k hat (MLE)	0.305	k star (bias corrected MLE)	0.303
Theta hat (MLE)	3.147	Theta star (bias corrected MLE)	3.167
nu hat (MLE)	80.56	nu star (bias corrected)	80.06
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (80.06, α)	60.44	Adjusted Chi Square Value (80.06, β)	60.26
95% Gamma Approximate UCL (use when n>=50)	1.272	95% Gamma Adjusted UCL (use when n<50)	1.276
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.278	SD (KM)	1.575
Variance (KM)	2.48	SE of Mean (KM)	0.145
k hat (KM)	0.658	k star (KM)	0.649
nu hat (KM)	173.8	nu star (KM)	171.2
theta hat (KM)	1.941	theta star (KM)	1.971
80% gamma percentile (KM)	2.105	90% gamma percentile (KM)	3.265
95% gamma percentile (KM)	4.471	99% gamma percentile (KM)	7.369
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (171.21, α)	141.9	Adjusted Chi Square Value (171.21, β)	141.7
95% Gamma Approximate KM-UCL (use when n>=50)	1.541	95% Gamma Adjusted KM-UCL (use when n<50)	1.545
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.913	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	6.5674E-4	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.121	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.203	Mean in Log Scale	-0.322
SD in Original Scale	1.615	SD in Log Scale	0.983
95% t UCL (assumes normality of ROS data)	1.436	95% Percentile Bootstrap UCL	1.433
95% BCA Bootstrap UCL	1.499	95% Bootstrap t UCL	1.517
95% H-UCL (Log ROS)	1.416		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.101	KM Geo Mean	0.904
KM SD (logged)	0.722	95% Critical H Value (KM-Log)	1.967
KM Standard Error of Mean (logged)	0.0965	95% H-UCL (KM -Log)	1.328
KM SD (logged)	0.722	95% Critical H Value (KM-Log)	1.967
KM Standard Error of Mean (logged)	0.0965		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.33	Mean in Log Scale	-0.0849
SD in Original Scale	1.605	SD in Log Scale	0.769
95% t UCL (Assumes normality)	1.562	95% H-Stat UCL	1.413
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.909		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Fluoride_Total			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics			
Total Number of Observations	69	Number of Distinct Observations	38
		Number of Missing Observations	0
Minimum	60	Mean	414.9
Maximum	1900	Median	330
SD	382	Std. Error of Mean	45.98
Coefficient of Variation	0.921	Skewness	2.31
Normal GOF Test			
Shapiro Wilk Test Statistic	0.744	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	2.220E-16	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.213	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	491.6	95% Adjusted-CLT UCL (Chen-1995)	504.2
		95% Modified-t UCL (Johnson-1978)	493.7
Gamma GOF Test			
A-D Test Statistic	1.145	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.767	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.135	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.109	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.667	k star (bias corrected MLE)	1.604
Theta hat (MLE)	248.9	Theta star (bias corrected MLE)	258.7
nu hat (MLE)	230	nu star (bias corrected)	221.4
MLE Mean (bias corrected)	414.9	MLE Sd (bias corrected)	327.6
		Approximate Chi Square Value (0.05)	187.9
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	187.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	488.7	95% Adjusted Gamma UCL (use when n<50)	490.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0908	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.107	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics			
Minimum of Logged Data	4.094	Mean of logged Data	5.699
Maximum of Logged Data	7.55	SD of logged Data	0.813
Assuming Lognormal Distribution			
95% H-UCL	511.7	90% Chebyshev (MVUE) UCL	549.9
95% Chebyshev (MVUE) UCL	612	97.5% Chebyshev (MVUE) UCL	698.2
99% Chebyshev (MVUE) UCL	867.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	490.6	95% Jackknife UCL	491.6
95% Standard Bootstrap UCL	489.8	95% Bootstrap-t UCL	511.8
95% Hall's Bootstrap UCL	518.2	95% Percentile Bootstrap UCL	495.4
95% BCA Bootstrap UCL	505.5		
90% Chebyshev(Mean, Sd) UCL	552.9	95% Chebyshev(Mean, Sd) UCL	615.4
97.5% Chebyshev(Mean, Sd) UCL	702.1	99% Chebyshev(Mean, Sd) UCL	872.5
Suggested UCL to Use			
95% H-UCL	511.7		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Iron_FLT

General Statistics			
Total Number of Observations	126	Number of Distinct Observations	22
Number of Detects	34	Number of Non-Detects	92
Number of Distinct Detects	17	Number of Distinct Non-Detects	6
Minimum Detect	20	Minimum Non-Detect	10
Maximum Detect	460	Maximum Non-Detect	50000
Variance Detects	8973	Percent Non-Detects	73.02%
Mean Detects	110.8	SD Detects	94.72
Median Detects	75	CV Detects	0.855
Skewness Detects	2.383	Kurtosis Detects	6.077
Mean of Logged Detects	4.459	SD of Logged Detects	0.688

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.716	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	41.39	KM Standard Error of Mean	6.199	
KM SD	65	95% KM (BCA) UCL	54.78	
95% KM (t) UCL	51.67	95% KM (Percentile Bootstrap) UCL	54.23	
95% KM (z) UCL	51.59	95% KM Bootstrap t UCL	54.82	
90% KM Chebyshev UCL	59.99	95% KM Chebyshev UCL	68.42	
97.5% KM Chebyshev UCL	80.11	99% KM Chebyshev UCL	103.1	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.302	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.758	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.161	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.153	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.164	k star (bias corrected MLE)	1.992	
Theta hat (MLE)	51.22	Theta star (bias corrected MLE)	55.63	
nu hat (MLE)	147.1	nu star (bias corrected)	135.5	
Mean (detects)	110.8			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	30.68	
Maximum	460	Median	0.01	
SD	69.09	CV	2.252	
k hat (MLE)	0.149	k star (bias corrected MLE)	0.151	
Theta hat (MLE)	205.4	Theta star (bias corrected MLE)	203	
nu hat (MLE)	37.64	nu star (bias corrected)	38.08	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (38.08, α)	24.95	Adjusted Chi Square Value (38.08, β)	24.83	
95% Gamma Approximate UCL (use when n>=50)	46.82	95% Gamma Adjusted UCL (use when n<50)	47.05	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	41.39	SD (KM)	65	
Variance (KM)	4225	SE of Mean (KM)	6.199	
k hat (KM)	0.406	k star (KM)	0.401	
nu hat (KM)	102.2	nu star (KM)	101.1	
theta hat (KM)	102.1	theta star (KM)	103.2	
80% gamma percentile (KM)	66.83	90% gamma percentile (KM)	116.9	
95% gamma percentile (KM)	171.8	99% gamma percentile (KM)	309.9	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (101.10, α)	78.9	Adjusted Chi Square Value (101.10, β)	78.67	
95% Gamma Approximate KM-UCL (use when n>=50)	53.04	95% Gamma Adjusted KM-UCL (use when n<50)	53.19	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.15	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean in Original Scale	41.22	Mean in Log Scale	2.977
SD in Original Scale	65.28	SD in Log Scale	1.226
95% t UCL (assumes normality of ROS data)	50.86	95% Percentile Bootstrap UCL	51.36
95% BCA Bootstrap UCL	53.74	95% Bootstrap t UCL	55.07
95% H-UCL (Log ROS)	54.11		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	3.146	KM Geo Mean	23.24
KM SD (logged)	0.935	95% Critical H Value (KM-Log)	2.133
KM Standard Error of Mean (logged)	0.153	95% H-UCL (KM -Log)	43.01
KM SD (logged)	0.935	95% Critical H Value (KM-Log)	2.133
KM Standard Error of Mean (logged)	0.153		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	248.1	Mean in Log Scale	3.62
SD in Original Scale	2224	SD in Log Scale	0.92
95% t UCL (Assumes normality)	576.3	95% H-Stat UCL	67.9
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	43.01		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_Total			
General Statistics			
Total Number of Observations	126	Number of Distinct Observations	45
Number of Detects	86	Number of Non-Detects	40
Number of Distinct Detects	44	Number of Distinct Non-Detects	2
Minimum Detect	50	Minimum Non-Detect	50
Maximum Detect	1490	Maximum Non-Detect	250
Variance Detects	81329	Percent Non-Detects	31.75%
Mean Detects	224.7	SD Detects	285.2
Median Detects	125	CV Detects	1.269
Skewness Detects	3.176	Kurtosis Detects	10.85
Mean of Logged Detects	4.99	SD of Logged Detects	0.833
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.587	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0957	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	169.6	KM Standard Error of Mean	22.22
KM SD	247.9	95% KM (BCA) UCL	209.3
95% KM (t) UCL	206.4	95% KM (Percentile Bootstrap) UCL	207.4
95% KM (z) UCL	206.1	95% KM Bootstrap t UCL	217.7
90% KM Chebyshev UCL	236.2	95% KM Chebyshev UCL	266.4
97.5% KM Chebyshev UCL	308.3	99% KM Chebyshev UCL	390.6
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.146	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.775	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.167	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0986	Detected Data Not Gamma Distributed at 5% Significance Level	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.319	k star (bias corrected MLE)	1.28	
Theta hat (MLE)	170.4	Theta star (bias corrected MLE)	175.5	
nu hat (MLE)	226.8	nu star (bias corrected)	220.2	
Mean (detects)	224.7			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	153.4	
Maximum	1490	Median	80	
SD	257.6	CV	1.679	
k hat (MLE)	0.233	k star (bias corrected MLE)	0.232	
Theta hat (MLE)	659.4	Theta star (bias corrected MLE)	660.1	
nu hat (MLE)	58.62	nu star (bias corrected)	58.56	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (58.56, α)	41.96	Adjusted Chi Square Value (58.56, β)	41.8	
95% Gamma Approximate UCL (use when n>=50)	214	95% Gamma Adjusted UCL (use when n<50)	214.9	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	169.6	SD (KM)	247.9	
Variance (KM)	61439	SE of Mean (KM)	22.22	
k hat (KM)	0.468	k star (KM)	0.462	
nu hat (KM)	117.9	nu star (KM)	116.5	
theta hat (KM)	362.3	theta star (KM)	366.9	
80% gamma percentile (KM)	277.3	90% gamma percentile (KM)	466.1	
95% gamma percentile (KM)	669.8	99% gamma percentile (KM)	1175	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (116.46, α)	92.54	Adjusted Chi Square Value (116.46, β)	92.29	
95% Gamma Approximate KM-UCL (use when n>=50)	213.4	95% Gamma Adjusted KM-UCL (use when n<50)	214	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.911	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	2.0124E-6	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0988	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0957	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	161.1	Mean in Log Scale	4.368	
SD in Original Scale	253.3	SD in Log Scale	1.193	
95% t UCL (assumes normality of ROS data)	198.5	95% Percentile Bootstrap UCL	199.7	
95% BCA Bootstrap UCL	207.3	95% Bootstrap t UCL	210.9	
95% H-UCL (Log ROS)	207			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.651	KM Geo Mean	104.7	
KM SD (logged)	0.847	95% Critical H Value (KM-Log)	2.06	
KM Standard Error of Mean (logged)	0.076	95% H-UCL (KM -Log)	175.3	
KM SD (logged)	0.847	95% Critical H Value (KM-Log)	2.06	
KM Standard Error of Mean (logged)	0.076			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	162.1	Mean in Log Scale	4.441	
SD in Original Scale	252.7	SD in Log Scale	1.071	
95% t UCL (Assumes normality)	199.4	95% H-Stat UCL	186.7	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	266.4			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead_FLT				
General Statistics				
Total Number of Observations	115	Number of Distinct Observations	7	
Number of Detects	1	Number of Non-Detects	114	
Number of Distinct Detects	1	Number of Distinct Non-Detects	6	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Lead_FLT was not processed!				
Lead_Total				
General Statistics				
Total Number of Observations	118	Number of Distinct Observations	6	
Number of Detects	1	Number of Non-Detects	117	
Number of Distinct Detects	1	Number of Distinct Non-Detects	5	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Lead_Total was not processed!				
Lithium_FLT				
General Statistics				
Total Number of Observations	35	Number of Distinct Observations	31	
Number of Detects	34	Number of Non-Detects	1	
Number of Distinct Detects	30	Number of Distinct Non-Detects	1	
Minimum Detect	14	Minimum Non-Detect	8.5	
Maximum Detect	3320	Maximum Non-Detect	8.5	
Variance Detects	401339	Percent Non-Detects	2.857%	
Mean Detects	362.9	SD Detects	633.5	
Median Detects	145	CV Detects	1.746	
Skewness Detects	3.625	Kurtosis Detects	15.06	
Mean of Logged Detects	4.884	SD of Logged Detects	1.501	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.557	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.933	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.15	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	352.7	KM Standard Error of Mean	106	
KM SD	618	95% KM (BCA) UCL	525.8	
95% KM (t) UCL	532	95% KM (Percentile Bootstrap) UCL	525.6	
95% KM (z) UCL	527.1	95% KM Bootstrap t UCL	746.3	
90% KM Chebyshev UCL	670.8	95% KM Chebyshev UCL	814.9	
97.5% KM Chebyshev UCL	1015	99% KM Chebyshev UCL	1408	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.976	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.133	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.158	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.61	k star (bias corrected MLE)	0.576	
Theta hat (MLE)	594.9	Theta star (bias corrected MLE)	630.2	
nu hat (MLE)	41.48	nu star (bias corrected)	39.15	
Mean (detects)	362.9			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	352.5	
Maximum	3320	Median	140	
SD	627.1	CV	1.779	
k hat (MLE)	0.506	k star (bias corrected MLE)	0.482	
Theta hat (MLE)	696.4	Theta star (bias corrected MLE)	731.6	
nu hat (MLE)	35.43	nu star (bias corrected)	33.73	
Adjusted Level of Significance (β)	0.0425			
Approximate Chi Square Value (33.73, α)	21.45	Adjusted Chi Square Value (33.73, β)	20.98	
95% Gamma Approximate UCL (use when n>=50)	554.3	95% Gamma Adjusted UCL (use when n<50)	566.6	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	352.7	SD (KM)	618	
Variance (KM)	381891	SE of Mean (KM)	106	
k hat (KM)	0.326	k star (KM)	0.317	
nu hat (KM)	22.81	nu star (KM)	22.19	
theta hat (KM)	1083	theta star (KM)	1113	
80% gamma percentile (KM)	547.9	90% gamma percentile (KM)	1033	
95% gamma percentile (KM)	1585	99% gamma percentile (KM)	3010	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (22.19, α)	12.48	Adjusted Chi Square Value (22.19, β)	12.13	
95% Gamma Approximate KM-UCL (use when n>=50)	627.2	95% Gamma Adjusted KM-UCL (use when n<50)	645.1	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.933	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.15	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	352.6	Mean in Log Scale	4.776	
SD in Original Scale	627.1	SD in Log Scale	1.61	
95% t UCL (assumes normality of ROS data)	531.8	95% Percentile Bootstrap UCL	547.5	
95% BCA Bootstrap UCL	627.7	95% Bootstrap t UCL	770.5	
95% H-UCL (Log ROS)	1077			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.805	KM Geo Mean	122.1	
KM SD (logged)	1.527	95% Critical H Value (KM-Log)	3.171	
KM Standard Error of Mean (logged)	0.262	95% H-UCL (KM -Log)	899.5	
KM SD (logged)	1.527	95% Critical H Value (KM-Log)	3.171	
KM Standard Error of Mean (logged)	0.262			
DL/2 Statistics				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	352.6	Mean in Log Scale	4.785
SD in Original Scale	627.1	SD in Log Scale	1.588
95% t UCL (Assumes normality)	531.8	95% H-Stat UCL	1028
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	645.1		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Lithium_Total			
General Statistics			
Total Number of Observations	33	Number of Distinct Observations	28
		Number of Missing Observations	0
Minimum	14	Mean	363.2
Maximum	3200	Median	140
SD	616.3	Std. Error of Mean	107.3
Coefficient of Variation	1.697	Skewness	3.573
Normal GOF Test			
Shapiro Wilk Test Statistic	0.564	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.285	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.152	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	545	95% Adjusted-CLT UCL (Chen-1995)	611
		95% Modified-t UCL (Johnson-1978)	556.1
Gamma GOF Test			
A-D Test Statistic	0.868	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.799	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.12	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.161	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.627	k star (bias corrected MLE)	0.59
Theta hat (MLE)	579.5	Theta star (bias corrected MLE)	615.6
nu hat (MLE)	41.37	nu star (bias corrected)	38.94
MLE Mean (bias corrected)	363.2	MLE Sd (bias corrected)	472.9
		Approximate Chi Square Value (0.05)	25.65
Adjusted Level of Significance	0.0419	Adjusted Chi Square Value	25.09
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	551.5	95% Adjusted Gamma UCL (use when n<50)	563.7
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.931	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.133	**Lilliefors Lognormal GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% Lilliefors Critical Value	0.152	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	2.639	Mean of logged Data	4.915
	Maximum of Logged Data	8.071	SD of logged Data	1.496
	Assuming Lognormal Distribution			
	95% H-UCL	948.3	90% Chebyshev (MVUE) UCL	780.6
	95% Chebyshev (MVUE) UCL	957.1	97.5% Chebyshev (MVUE) UCL	1202
	99% Chebyshev (MVUE) UCL	1683		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	539.7	95% Jackknife UCL	545
	95% Standard Bootstrap UCL	537.4	95% Bootstrap-t UCL	790.6
	95% Hall's Bootstrap UCL	1380	95% Percentile Bootstrap UCL	550.3
	95% BCA Bootstrap UCL	627.6		
	90% Chebyshev(Mean, Sd) UCL	685.1	95% Chebyshev(Mean, Sd) UCL	830.9
	97.5% Chebyshev(Mean, Sd) UCL	1033	99% Chebyshev(Mean, Sd) UCL	1431
	Suggested UCL to Use			
	95% Adjusted Gamma UCL	563.7		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Manganese_FLT			
	General Statistics			
	Total Number of Observations	126	Number of Distinct Observations	83
	Number of Detects	123	Number of Non-Detects	3
	Number of Distinct Detects	80	Number of Distinct Non-Detects	3
	Minimum Detect	4.8	Minimum Non-Detect	0.2
	Maximum Detect	28400	Maximum Non-Detect	37.5
	Variance Detects	15230318	Percent Non-Detects	2.381%
	Mean Detects	2080	SD Detects	3903
	Median Detects	570	CV Detects	1.876
	Skewness Detects	4.064	Kurtosis Detects	20.83
	Mean of Logged Detects	6.089	SD of Logged Detects	2.102
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.562	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0802	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	2031	KM Standard Error of Mean	344.7
	KM SD	3853	95% KM (BCA) UCL	2710
	95% KM (t) UCL	2602	95% KM (Percentile Bootstrap) UCL	2619
	95% KM (z) UCL	2598	95% KM Bootstrap t UCL	2830
	90% KM Chebyshev UCL	3065	95% KM Chebyshev UCL	3533
	97.5% KM Chebyshev UCL	4183	99% KM Chebyshev UCL	5460
	Gamma GOF Tests on Detected Observations Only			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

A-D Test Statistic	1.628	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.838	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0934	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0893	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.421	k star (bias corrected MLE)	0.416	
Theta hat (MLE)	4945	Theta star (bias corrected MLE)	5002	
nu hat (MLE)	103.5	nu star (bias corrected)	102.3	
Mean (detects)	2080			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	2031	
Maximum	28400	Median	535	
SD	3869	CV	1.905	
k hat (MLE)	0.373	k star (bias corrected MLE)	0.37	
Theta hat (MLE)	5439	Theta star (bias corrected MLE)	5492	
nu hat (MLE)	94.1	nu star (bias corrected)	93.2	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (93.20, α)	71.93	Adjusted Chi Square Value (93.20, β)	71.72	
95% Gamma Approximate UCL (use when n>=50)	2631	95% Gamma Adjusted UCL (use when n<50)	2639	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	2031	SD (KM)	3853	
Variance (KM)	14846888	SE of Mean (KM)	344.7	
k hat (KM)	0.278	k star (KM)	0.277	
nu hat (KM)	70.02	nu star (KM)	69.68	
theta hat (KM)	7310	theta star (KM)	7345	
80% gamma percentile (KM)	3047	90% gamma percentile (KM)	6044	
95% gamma percentile (KM)	9534	99% gamma percentile (KM)	18697	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (69.68, α)	51.47	Adjusted Chi Square Value (69.68, β)	51.29	
95% Gamma Approximate KM-UCL (use when n>=50)	2750	95% Gamma Adjusted KM-UCL (use when n<50)	2760	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.941	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	3.3454E-5	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0979	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0802	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	2031	Mean in Log Scale	5.978	
SD in Original Scale	3869	SD in Log Scale	2.202	
95% t UCL (assumes normality of ROS data)	2602	95% Percentile Bootstrap UCL	2630	
95% BCA Bootstrap UCL	2800	95% Bootstrap t UCL	2826	
95% H-UCL (Log ROS)	8886			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	5.937	KM Geo Mean	378.9	
KM SD (logged)	2.307	95% Critical H Value (KM-Log)	3.63	
KM Standard Error of Mean (logged)	0.207	95% H-UCL (KM -Log)	11466	
KM SD (logged)	2.307	95% Critical H Value (KM-Log)	3.63	
KM Standard Error of Mean (logged)	0.207			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	2031	Mean in Log Scale	5.943	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	3869	SD in Log Scale	2.305
95% t UCL (Assumes normality)	2602	95% H-Stat UCL	11475

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	3533		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Manganese_Total

General Statistics

Total Number of Observations	133	Number of Distinct Observations	93
Number of Detects	132	Number of Non-Detects	1
Number of Distinct Detects	92	Number of Distinct Non-Detects	1
Minimum Detect	10	Minimum Non-Detect	7.5
Maximum Detect	28800	Maximum Non-Detect	7.5
Variance Detects	19062214	Percent Non-Detects	0.752%
Mean Detects	2271	SD Detects	4366
Median Detects	693	CV Detects	1.923
Skewness Detects	4.138	Kurtosis Detects	20.01
Mean of Logged Detects	6.368	SD of Logged Detects	1.895

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.528	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.302	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0775	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2254	KM Standard Error of Mean	377.5
KM SD	4337	95% KM (BCA) UCL	2849
95% KM (t) UCL	2879	95% KM (Percentile Bootstrap) UCL	2921
95% KM (z) UCL	2875	95% KM Bootstrap t UCL	3157
90% KM Chebyshev UCL	3386	95% KM Chebyshev UCL	3899
97.5% KM Chebyshev UCL	4611	99% KM Chebyshev UCL	6010

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.532	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.826	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0714	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0862	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.471	k star (bias corrected MLE)	0.466
Theta hat (MLE)	4817	Theta star (bias corrected MLE)	4875
nu hat (MLE)	124.4	nu star (bias corrected)	123
Mean (detects)	2271		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2253
Maximum	28800	Median	680

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD	4354	CV	1.932
k hat (MLE)	0.45	k star (bias corrected MLE)	0.445
Theta hat (MLE)	5007	Theta star (bias corrected MLE)	5065
nu hat (MLE)	119.7	nu star (bias corrected)	118.3
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (118.34, α)	94.22	Adjusted Chi Square Value (118.34, β)	93.99
95% Gamma Approximate UCL (use when n>=50)	2830	95% Gamma Adjusted UCL (use when n<50)	2837
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2254	SD (KM)	4337
Variance (KM)	18813781	SE of Mean (KM)	377.5
k hat (KM)	0.27	k star (KM)	0.269
nu hat (KM)	71.8	nu star (KM)	71.51
theta hat (KM)	8349	theta star (KM)	8382
80% gamma percentile (KM)	3353	90% gamma percentile (KM)	6724
95% gamma percentile (KM)	10670	99% gamma percentile (KM)	21072
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (71.51, α)	53.04	Adjusted Chi Square Value (71.51, β)	52.87
95% Gamma Approximate KM-UCL (use when n>=50)	3038	95% Gamma Adjusted KM-UCL (use when n<50)	3048
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.955	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0013	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0908	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0775	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	2253	Mean in Log Scale	6.328
SD in Original Scale	4354	SD in Log Scale	1.943
95% t UCL (assumes normality of ROS data)	2879	95% Percentile Bootstrap UCL	2908
95% BCA Bootstrap UCL	3044	95% Bootstrap t UCL	3127
95% H-UCL (Log ROS)	6356		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	6.335	KM Geo Mean	564
KM SD (logged)	1.918	95% Critical H Value (KM-Log)	3.17
KM Standard Error of Mean (logged)	0.167	95% H-UCL (KM -Log)	6027
KM SD (logged)	1.918	95% Critical H Value (KM-Log)	3.17
KM Standard Error of Mean (logged)	0.167		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2253	Mean in Log Scale	6.33
SD in Original Scale	4354	SD in Log Scale	1.938
95% t UCL (Assumes normality)	2879	95% H-Stat UCL	6290
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	3038		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Mercury_FLT			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	124	Number of Distinct Observations	23	
Number of Detects	57	Number of Non-Detects	67	
Number of Distinct Detects	20	Number of Distinct Non-Detects	5	
Minimum Detect	0.01	Minimum Non-Detect	0.015	
Maximum Detect	5.9	Maximum Non-Detect	0.1	
Variance Detects	0.652	Percent Non-Detects	54.03%	
Mean Detects	0.213	SD Detects	0.807	
Median Detects	0.03	CV Detects	3.79	
Skewness Detects	6.556	Kurtosis Detects	45.95	
Mean of Logged Detects	-3.165	SD of Logged Detects	1.388	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.271	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.401	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.117	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.104	KM Standard Error of Mean	0.05	
KM SD	0.552	95% KM (BCA) UCL	0.2	
95% KM (t) UCL	0.186	95% KM (Percentile Bootstrap) UCL	0.196	
95% KM (z) UCL	0.186	95% KM Bootstrap t UCL	0.421	
90% KM Chebyshev UCL	0.253	95% KM Chebyshev UCL	0.321	
97.5% KM Chebyshev UCL	0.416	99% KM Chebyshev UCL	0.601	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	8.323	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.838	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.331	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.126	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.406	k star (bias corrected MLE)	0.396	
Theta hat (MLE)	0.525	Theta star (bias corrected MLE)	0.538	
nu hat (MLE)	46.26	nu star (bias corrected)	45.16	
Mean (detects)	0.213			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.103	
Maximum	5.9	Median	0.01	
SD	0.554	CV	5.363	
k hat (MLE)	0.394	k star (bias corrected MLE)	0.39	
Theta hat (MLE)	0.262	Theta star (bias corrected MLE)	0.265	
nu hat (MLE)	97.78	nu star (bias corrected)	96.75	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (96.75, α)	75.06	Adjusted Chi Square Value (96.75, β)	74.84	
95% Gamma Approximate UCL (use when n>=50)	0.133	95% Gamma Adjusted UCL (use when n<50)	0.134	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.104	SD (KM)	0.552	
Variance (KM)	0.304	SE of Mean (KM)	0.05	
k hat (KM)	0.0352	k star (KM)	0.0397	
nu hat (KM)	8.727	nu star (KM)	9.849	
theta hat (KM)	2.941	theta star (KM)	2.606	
80% gamma percentile (KM)	0.0055	90% gamma percentile (KM)	0.111	
95% gamma percentile (KM)	0.495	99% gamma percentile (KM)	2.452	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (9.85, α)	3.848	Adjusted Chi Square Value (9.85, β)	3.804	
95% Gamma Approximate KM-UCL (use when n>=50)	0.265	95% Gamma Adjusted KM-UCL (use when n<50)	0.268	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.82	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	4.4395E-9	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.117	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.102	Mean in Log Scale	-4.254	
SD in Original Scale	0.554	SD in Log Scale	1.537	
95% t UCL (assumes normality of ROS data)	0.185	95% Percentile Bootstrap UCL	0.194	
95% BCA Bootstrap UCL	0.271	95% Bootstrap t UCL	0.425	
95% H-UCL (Log ROS)	0.0675			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-3.931	KM Geo Mean	0.0196	
KM SD (logged)	1.175	95% Critical H Value (KM-Log)	2.35	
KM Standard Error of Mean (logged)	0.107	95% H-UCL (KM -Log)	0.0502	
KM SD (logged)	1.175	95% Critical H Value (KM-Log)	2.35	
KM Standard Error of Mean (logged)	0.107			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.103	Mean in Log Scale	-4.04	
SD in Original Scale	0.554	SD in Log Scale	1.268	
95% t UCL (Assumes normality)	0.185	95% H-Stat UCL	0.052	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.321			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury_Total				
General Statistics				
Total Number of Observations	131	Number of Distinct Observations	47	
Number of Detects	96	Number of Non-Detects	35	
Number of Distinct Detects	44	Number of Distinct Non-Detects	4	
Minimum Detect	0.01	Minimum Non-Detect	0.015	
Maximum Detect	23	Maximum Non-Detect	0.1	
Variance Detects	9.546	Percent Non-Detects	26.72%	
Mean Detects	0.841	SD Detects	3.09	
Median Detects	0.065	CV Detects	3.675	
Skewness Detects	5.669	Kurtosis Detects	34.54	
Mean of Logged Detects	-2.294	SD of Logged Detects	1.768	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.301	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.397	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0907	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean	0.62	KM Standard Error of Mean	0.233
KM SD	2.656	95% KM (BCA) UCL	1.042
95% KM (t) UCL	1.006	95% KM (Percentile Bootstrap) UCL	1.029
95% KM (z) UCL	1.003	95% KM Bootstrap t UCL	1.688
90% KM Chebyshev UCL	1.32	95% KM Chebyshev UCL	1.637
97.5% KM Chebyshev UCL	2.077	99% KM Chebyshev UCL	2.941
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	10.36	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.862	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.233	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0989	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.322	k star (bias corrected MLE)	0.318
Theta hat (MLE)	2.614	Theta star (bias corrected MLE)	2.639
nu hat (MLE)	61.75	nu star (bias corrected)	61.15
Mean (detects)	0.841		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.619
Maximum	23	Median	0.03
SD	2.667	CV	4.31
k hat (MLE)	0.286	k star (bias corrected MLE)	0.284
Theta hat (MLE)	2.164	Theta star (bias corrected MLE)	2.175
nu hat (MLE)	74.9	nu star (bias corrected)	74.52
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (74.52, α)	55.64	Adjusted Chi Square Value (74.52, β)	55.46
95% Gamma Approximate UCL (use when n>=50)	0.829	95% Gamma Adjusted UCL (use when n<50)	0.831
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.62	SD (KM)	2.656
Variance (KM)	7.057	SE of Mean (KM)	0.233
k hat (KM)	0.0544	k star (KM)	0.0583
nu hat (KM)	14.26	nu star (KM)	15.26
theta hat (KM)	11.39	theta star (KM)	10.64
80% gamma percentile (KM)	0.137	90% gamma percentile (KM)	1.131
95% gamma percentile (KM)	3.45	99% gamma percentile (KM)	12.66
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (15.26, α)	7.445	Adjusted Chi Square Value (15.26, β)	7.384
95% Gamma Approximate KM-UCL (use when n>=50)	1.27	95% Gamma Adjusted KM-UCL (use when n<50)	1.281
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.906	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	9.0730E-8	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.148	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0907	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.619	Mean in Log Scale	-3.057
SD in Original Scale	2.667	SD in Log Scale	2.058
95% t UCL (assumes normality of ROS data)	1.005	95% Percentile Bootstrap UCL	1.018
95% BCA Bootstrap UCL	1.213	95% Bootstrap t UCL	1.554
95% H-UCL (Log ROS)	0.713		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.868	KM Geo Mean	0.0568

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM SD (logged)	1.796	95% Critical H Value (KM-Log)	3.024
KM Standard Error of Mean (logged)	0.158	95% H-UCL (KM -Log)	0.458
KM SD (logged)	1.796	95% Critical H Value (KM-Log)	3.024
KM Standard Error of Mean (logged)	0.158		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.621	Mean in Log Scale	-2.872
SD in Original Scale	2.666	SD in Log Scale	1.836
95% t UCL (Assumes normality)	1.006	95% H-Stat UCL	0.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	1.637		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Methyl Mercury_FLT

General Statistics

Total Number of Observations	34	Number of Distinct Observations	29
Number of Detects	28	Number of Non-Detects	6
Number of Distinct Detects	26	Number of Distinct Non-Detects	3
Minimum Detect	3.0000E-5	Minimum Non-Detect	0
Maximum Detect	0.00295	Maximum Non-Detect	2.5000E-5
Variance Detects	3.6428E-7	Percent Non-Detects	17.65%
Mean Detects	5.5750E-4	SD Detects	6.0356E-4
Median Detects	3.6500E-4	CV Detects	1.083
Skewness Detects	2.583	Kurtosis Detects	8.728

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.741	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.924	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.164	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.5912E-4	KM Standard Error of Mean	1.0100E-4
KM SD	5.7832E-4	95% KM (BCA) UCL	6.5853E-4
95% KM (t) UCL	6.3005E-4	95% KM (Percentile Bootstrap) UCL	6.3235E-4
95% KM (z) UCL	6.2525E-4	95% KM Bootstrap t UCL	7.1454E-4
90% KM Chebyshev UCL	7.6212E-4	95% KM Chebyshev UCL	8.9937E-4
97.5% KM Chebyshev UCL	0.00109	99% KM Chebyshev UCL	0.00146

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.254	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.771	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0845	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.17	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.108	k star (bias corrected MLE)	1.013
Theta hat (MLE)	5.0301E-4	Theta star (bias corrected MLE)	5.5014E-4
nu hat (MLE)	62.07	nu star (bias corrected)	56.75
Mean (detects)	5.5750E-4		

Estimates of Gamma Parameters using KM Estimates

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (KM)	4.5912E-4	SD (KM)	5.7832E-4
Variance (KM)	3.3445E-7	SE of Mean (KM)	1.0100E-4
k hat (KM)	0.63	k star (KM)	0.594
nu hat (KM)	42.86	nu star (KM)	40.41
theta hat (KM)	7.2846E-4	theta star (KM)	7.7259E-4
80% gamma percentile (KM)	7.5678E-4	90% gamma percentile (KM)	0.0012
95% gamma percentile (KM)	0.00166	99% gamma percentile (KM)	0.00277

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0422
Approximate Chi Square Value (40.41, α)	26.84	Adjusted Chi Square Value (40.41, β)	26.3
95% Gamma Approximate KM-UCL (use when n>=50)	6.9115E-4	95% Gamma Adjusted KM-UCL (use when n<50)	7.0554E-4

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	N/A	KM Geo Mean	N/A
KM SD (logged)	N/A	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	N/A	95% H-UCL (KM -Log)	N/A
KM SD (logged)	N/A	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	N/A		

DL/2 Statistics

Mean in Original Scale	4.6015E-4	SD in Original Scale	5.8619E-4
95% t UCL (Assumes normality)	6.3028E-4		

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Adjusted Gamma UCL	7.0554E-4	95% GROS Adjusted Gamma UCL	N/A

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Methyl Mercury_Total

General Statistics

Total Number of Observations	33	Number of Distinct Observations	32
Number of Detects	31	Number of Non-Detects	2
Number of Distinct Detects	30	Number of Distinct Non-Detects	2
Minimum Detect	2.0000E-5	Minimum Non-Detect	0
Maximum Detect	0.00622	Maximum Non-Detect	2.5000E-5
Variance Detects	1.7909E-6	Percent Non-Detects	6.061%
Mean Detects	9.8871E-4	SD Detects	0.00134
Median Detects	6.2000E-4	CV Detects	1.354
Skewness Detects	2.675	Kurtosis Detects	7.815

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.665	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.266	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.156	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	9.2909E-4	KM Standard Error of Mean	2.2958E-4
KM SD	0.0013	95% KM (BCA) UCL	0.00133
95% KM (t) UCL	0.00132	95% KM (Percentile Bootstrap) UCL	0.00131
95% KM (z) UCL	0.00131	95% KM Bootstrap t UCL	0.00159
90% KM Chebyshev UCL	0.00162	95% KM Chebyshev UCL	0.00193
97.5% KM Chebyshev UCL	0.00236	99% KM Chebyshev UCL	0.00321

Gamma GOF Tests on Detected Observations Only

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	A-D Test Statistic	0.46	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.784	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.135	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.163	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.831	k star (bias corrected MLE)	0.772
	Theta hat (MLE)	0.00119	Theta star (bias corrected MLE)	0.00128
	nu hat (MLE)	51.52	nu star (bias corrected)	47.87
	Mean (detects)	9.8871E-4		
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	9.2909E-4	SD (KM)	0.0013
	Variance (KM)	1.6832E-6	SE of Mean (KM)	2.2958E-4
	k hat (KM)	0.513	k star (KM)	0.486
	nu hat (KM)	33.85	nu star (KM)	32.1
	theta hat (KM)	0.00181	theta star (KM)	0.00191
	80% gamma percentile (KM)	0.00152	90% gamma percentile (KM)	0.00253
	95% gamma percentile (KM)	0.0036	99% gamma percentile (KM)	0.00626
	Gamma Kaplan-Meier (KM) Statistics			
			Adjusted Level of Significance (β)	0.0419
	Approximate Chi Square Value (32.10, α)	20.15	Adjusted Chi Square Value (32.10, β)	19.67
	95% Gamma Approximate KM-UCL (use when n>=50)	0.00148	95% Gamma Adjusted KM-UCL (use when n<50)	0.00152
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	N/A	KM Geo Mean	N/A
	KM SD (logged)	N/A	95% Critical H Value (KM-Log)	N/A
	KM Standard Error of Mean (logged)	N/A	95% H-UCL (KM -Log)	N/A
	KM SD (logged)	N/A	95% Critical H Value (KM-Log)	N/A
	KM Standard Error of Mean (logged)	N/A		
	DL/2 Statistics			
	Mean in Original Scale	9.2917E-4	SD in Original Scale	0.00132
	95% t UCL (Assumes normality)	0.00132		
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Gamma Distributed at 5% Significance Level			
	Suggested UCL to Use			
	ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	0.00152		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Molybdenum_FLT			
	General Statistics			
	Total Number of Observations	113	Number of Distinct Observations	14
	Number of Detects	12	Number of Non-Detects	101
	Number of Distinct Detects	10	Number of Distinct Non-Detects	5
	Minimum Detect	0.27	Minimum Non-Detect	0.135
	Maximum Detect	0.56	Maximum Non-Detect	10
	Variance Detects	0.0101	Percent Non-Detects	89.38%
	Mean Detects	0.408	SD Detects	0.101
	Median Detects	0.38	CV Detects	0.247
	Skewness Detects	0.28	Kurtosis Detects	-1.469
	Mean of Logged Detects	-0.924	SD of Logged Detects	0.248
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% Shapiro Wilk Critical Value	0.859	Detected Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.243	Detected Data appear Normal at 5% Significance Level	
	Detected Data appear Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.166	KM Standard Error of Mean	0.00936
	KM SD	0.0923	95% KM (BCA) UCL	0.277
	95% KM (t) UCL	0.182	95% KM (Percentile Bootstrap) UCL	0.274
	95% KM (z) UCL	0.182	95% KM Bootstrap t UCL	0.182
	90% KM Chebyshev UCL	0.194	95% KM Chebyshev UCL	0.207
	97.5% KM Chebyshev UCL	0.225	99% KM Chebyshev UCL	0.259
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.428	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.171	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	17.99	k star (bias corrected MLE)	13.55
	Theta hat (MLE)	0.0227	Theta star (bias corrected MLE)	0.0301
	nu hat (MLE)	431.8	nu star (bias corrected)	325.2
	Mean (detects)	0.408		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.104
	Maximum	0.56	Median	0.031
	SD	0.133	CV	1.286
	k hat (MLE)	0.65	k star (bias corrected MLE)	0.639
	Theta hat (MLE)	0.16	Theta star (bias corrected MLE)	0.162
	nu hat (MLE)	146.9	nu star (bias corrected)	144.4
	Adjusted Level of Significance (β)	0.0479		
	Approximate Chi Square Value (144.35, α)	117.6	Adjusted Chi Square Value (144.35, β)	117.3
	95% Gamma Approximate UCL (use when n>=50)	0.127	95% Gamma Adjusted UCL (use when n<50)	0.128
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.166	SD (KM)	0.0923
	Variance (KM)	0.00851	SE of Mean (KM)	0.00936
	k hat (KM)	3.248	k star (KM)	3.168
	nu hat (KM)	734	nu star (KM)	715.9
	theta hat (KM)	0.0512	theta star (KM)	0.0525
	80% gamma percentile (KM)	0.236	90% gamma percentile (KM)	0.292
	95% gamma percentile (KM)	0.344	99% gamma percentile (KM)	0.456
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (715.87, α)	654.8	Adjusted Chi Square Value (715.87, β)	654
	95% Gamma Approximate KM-UCL (use when n>=50)	0.182	95% Gamma Adjusted KM-UCL (use when n<50)	0.182
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.243	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.168	Mean in Log Scale	-1.958
	SD in Original Scale	0.107	SD in Log Scale	0.589

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (assumes normality of ROS data)	0.184	95% Percentile Bootstrap UCL	0.184
95% BCA Bootstrap UCL	0.186	95% Bootstrap t UCL	0.187
95% H-UCL (Log ROS)	0.186		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.878	KM Geo Mean	0.153
KM SD (logged)	0.352	95% Critical H Value (KM-Log)	1.759
KM Standard Error of Mean (logged)	0.0359	95% H-UCL (KM -Log)	0.172
KM SD (logged)	0.352	95% Critical H Value (KM-Log)	1.759
KM Standard Error of Mean (logged)	0.0359		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.261	Mean in Log Scale	-1.821
SD in Original Scale	0.654	SD in Log Scale	0.644
95% t UCL (Assumes normality)	0.363	95% H-Stat UCL	0.224
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.182		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Molybdenum_Total			
General Statistics			
Total Number of Observations	118	Number of Distinct Observations	20
Number of Detects	19	Number of Non-Detects	99
Number of Distinct Detects	17	Number of Distinct Non-Detects	5
Minimum Detect	0.25	Minimum Non-Detect	0.25
Maximum Detect	3.7	Maximum Non-Detect	10
Variance Detects	1.275	Percent Non-Detects	83.9%
Mean Detects	1.129	SD Detects	1.129
Median Detects	0.48	CV Detects	1
Skewness Detects	1.08	Kurtosis Detects	-0.154
Mean of Logged Detects	-0.359	SD of Logged Detects	0.994
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.768	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.197	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.397	KM Standard Error of Mean	0.0532
KM SD	0.554	95% KM (BCA) UCL	0.487
95% KM (t) UCL	0.485	95% KM (Percentile Bootstrap) UCL	0.489
95% KM (z) UCL	0.484	95% KM Bootstrap t UCL	0.528
90% KM Chebyshev UCL	0.556	95% KM Chebyshev UCL	0.628
97.5% KM Chebyshev UCL	0.729	99% KM Chebyshev UCL	0.926
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.675	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.295	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.204	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	1.18	k star (bias corrected MLE)	1.029	
Theta hat (MLE)	0.957	Theta star (bias corrected MLE)	1.098	
nu hat (MLE)	44.83	nu star (bias corrected)	39.08	
Mean (detects)	1.129			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.19	
Maximum	3.7	Median	0.01	
SD	0.606	CV	3.184	
k hat (MLE)	0.305	k star (bias corrected MLE)	0.303	
Theta hat (MLE)	0.624	Theta star (bias corrected MLE)	0.629	
nu hat (MLE)	71.89	nu star (bias corrected)	71.39	
Adjusted Level of Significance (β)	0.048			
Approximate Chi Square Value (71.39, α)	52.94	Adjusted Chi Square Value (71.39, β)	52.74	
95% Gamma Approximate UCL (use when n>=50)	0.257	95% Gamma Adjusted UCL (use when n<50)	0.257	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.397	SD (KM)	0.554	
Variance (KM)	0.307	SE of Mean (KM)	0.0532	
k hat (KM)	0.513	k star (KM)	0.505	
nu hat (KM)	121	nu star (KM)	119.3	
theta hat (KM)	0.774	theta star (KM)	0.785	
80% gamma percentile (KM)	0.652	90% gamma percentile (KM)	1.071	
95% gamma percentile (KM)	1.518	99% gamma percentile (KM)	2.617	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (119.28, α)	95.06	Adjusted Chi Square Value (119.28, β)	94.8	
95% Gamma Approximate KM-UCL (use when n>=50)	0.498	95% Gamma Adjusted KM-UCL (use when n<50)	0.499	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.197	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.216	Mean in Log Scale	-3.535	
SD in Original Scale	0.6	SD in Log Scale	2.064	
95% t UCL (assumes normality of ROS data)	0.307	95% Percentile Bootstrap UCL	0.305	
95% BCA Bootstrap UCL	0.325	95% Bootstrap t UCL	0.35	
95% H-UCL (Log ROS)	0.471			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.213	KM Geo Mean	0.297	
KM SD (logged)	0.549	95% Critical H Value (KM-Log)	1.867	
KM Standard Error of Mean (logged)	0.0529	95% H-UCL (KM -Log)	0.38	
KM SD (logged)	0.549	95% Critical H Value (KM-Log)	1.867	
KM Standard Error of Mean (logged)	0.0529			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.438	Mean in Log Scale	-1.613	
SD in Original Scale	0.943	SD in Log Scale	0.941	
95% t UCL (Assumes normality)	0.582	95% H-Stat UCL	0.375	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.628			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nickel_FLT				
General Statistics				
Total Number of Observations	126	Number of Distinct Observations	87	
Number of Detects	119	Number of Non-Detects	7	
Number of Distinct Detects	84	Number of Distinct Non-Detects	4	
Minimum Detect	1.6	Minimum Non-Detect	0.48	
Maximum Detect	265	Maximum Non-Detect	100	
Variance Detects	1594	Percent Non-Detects	5.556%	
Mean Detects	24.75	SD Detects	39.92	
Median Detects	9.6	CV Detects	1.613	
Skewness Detects	4.06	Kurtosis Detects	19.05	
Mean of Logged Detects	2.544	SD of Logged Detects	1.094	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.539	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.281	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0816	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	23.75	KM Standard Error of Mean	3.484	
KM SD	38.91	95% KM (BCA) UCL	29.99	
95% KM (t) UCL	29.53	95% KM (Percentile Bootstrap) UCL	29.43	
95% KM (z) UCL	29.49	95% KM Bootstrap t UCL	31.78	
90% KM Chebyshev UCL	34.21	95% KM Chebyshev UCL	38.94	
97.5% KM Chebyshev UCL	45.51	99% KM Chebyshev UCL	58.42	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.85	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.171	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0875	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.882	k star (bias corrected MLE)	0.865	
Theta hat (MLE)	28.07	Theta star (bias corrected MLE)	28.61	
nu hat (MLE)	209.9	nu star (bias corrected)	205.9	
Mean (detects)	24.75			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	23.61	
Maximum	265	Median	9.5	
SD	39.1	CV	1.656	
k hat (MLE)	0.708	k star (bias corrected MLE)	0.696	
Theta hat (MLE)	33.35	Theta star (bias corrected MLE)	33.91	
nu hat (MLE)	178.4	nu star (bias corrected)	175.5	
Adjusted Level of Significance (β)	0.0481			
Approximate Chi Square Value (175.48, α)	145.8	Adjusted Chi Square Value (175.48, β)	145.5	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	28.41	95% Gamma Adjusted UCL (use when n<50)	28.47
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	23.75	SD (KM)	38.91
Variance (KM)	1514	SE of Mean (KM)	3.484
k hat (KM)	0.373	k star (KM)	0.369
nu hat (KM)	93.94	nu star (KM)	93.04
theta hat (KM)	63.72	theta star (KM)	64.34
80% gamma percentile (KM)	37.93	90% gamma percentile (KM)	68.02
95% gamma percentile (KM)	101.5	99% gamma percentile (KM)	186.2
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (93.04, α)	71.79	Adjusted Chi Square Value (93.04, β)	71.58
95% Gamma Approximate KM-UCL (use when n>=50)	30.78	95% Gamma Adjusted KM-UCL (use when n<50)	30.88
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.959	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.009	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0816	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	23.72	Mean in Log Scale	2.479
SD in Original Scale	39.04	SD in Log Scale	1.129
95% t UCL (assumes normality of ROS data)	29.48	95% Percentile Bootstrap UCL	29.61
95% BCA Bootstrap UCL	30.63	95% Bootstrap t UCL	31.79
95% H-UCL (Log ROS)	28.46		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.467	KM Geo Mean	11.79
KM SD (logged)	1.152	95% Critical H Value (KM-Log)	2.33
KM Standard Error of Mean (logged)	0.104	95% H-UCL (KM -Log)	29.12
KM SD (logged)	1.152	95% Critical H Value (KM-Log)	2.33
KM Standard Error of Mean (logged)	0.104		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	24.09	Mean in Log Scale	2.485
SD in Original Scale	39.06	SD in Log Scale	1.178
95% t UCL (Assumes normality)	29.86	95% H-Stat UCL	30.79
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	38.94		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel_Total			
General Statistics			
Total Number of Observations	133	Number of Distinct Observations	88
Number of Detects	123	Number of Non-Detects	10
Number of Distinct Detects	87	Number of Distinct Non-Detects	2
Minimum Detect	1.8	Minimum Non-Detect	0.8
Maximum Detect	269	Maximum Non-Detect	20
Variance Detects	2135	Percent Non-Detects	7.519%
Mean Detects	27.99	SD Detects	46.2
Median Detects	11	CV Detects	1.651

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Skewness Detects	3.774	Kurtosis Detects	15.41
Mean of Logged Detects	2.646	SD of Logged Detects	1.104
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.526	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.285	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0802	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	26.44	KM Standard Error of Mean	3.885
KM SD	44.6	95% KM (BCA) UCL	33.82
95% KM (t) UCL	32.88	95% KM (Percentile Bootstrap) UCL	32.86
95% KM (z) UCL	32.83	95% KM Bootstrap t UCL	35.25
90% KM Chebyshev UCL	38.1	95% KM Chebyshev UCL	43.38
97.5% KM Chebyshev UCL	50.7	99% KM Chebyshev UCL	65.1
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	4.211	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.79	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0865	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.858	k star (bias corrected MLE)	0.842
Theta hat (MLE)	32.63	Theta star (bias corrected MLE)	33.24
nu hat (MLE)	211	nu star (bias corrected)	207.2
Mean (detects)	27.99		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	26.25
Maximum	269	Median	10
SD	44.88	CV	1.71
k hat (MLE)	0.655	k star (bias corrected MLE)	0.645
Theta hat (MLE)	40.1	Theta star (bias corrected MLE)	40.7
nu hat (MLE)	174.1	nu star (bias corrected)	171.5
Adjusted Level of Significance (β)	0.0482		
Approximate Chi Square Value (171.52, α)	142.2	Adjusted Chi Square Value (171.52, β)	141.9
95% Gamma Approximate UCL (use when n>=50)	31.65	95% Gamma Adjusted UCL (use when n<50)	31.71
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	26.44	SD (KM)	44.6
Variance (KM)	1989	SE of Mean (KM)	3.885
k hat (KM)	0.351	k star (KM)	0.349
nu hat (KM)	93.5	nu star (KM)	92.72
theta hat (KM)	75.23	theta star (KM)	75.86
80% gamma percentile (KM)	41.84	90% gamma percentile (KM)	76.41
95% gamma percentile (KM)	115.1	99% gamma percentile (KM)	214
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (92.72, α)	71.52	Adjusted Chi Square Value (92.72, β)	71.31
95% Gamma Approximate KM-UCL (use when n>=50)	34.28	95% Gamma Adjusted KM-UCL (use when n<50)	34.38
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.961	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.0128	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.107	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0802	Detected Data Not Lognormal at 5% Significance Level	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	26.47		Mean in Log Scale	2.577
SD in Original Scale	44.76		SD in Log Scale	1.118
95% t UCL (assumes normality of ROS data)	32.9		95% Percentile Bootstrap UCL	33.34
95% BCA Bootstrap UCL	34.39		95% Bootstrap t UCL	34.46
95% H-UCL (Log ROS)	30.78			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.575		KM Geo Mean	13.13
KM SD (logged)	1.114		95% Critical H Value (KM-Log)	2.298
KM Standard Error of Mean (logged)	0.0982		95% H-UCL (KM -Log)	30.51
KM SD (logged)	1.114		95% Critical H Value (KM-Log)	2.298
KM Standard Error of Mean (logged)	0.0982			
DL/2 Statistics				
DL/2 Normal			**DL/2 Log-Transformed**	
Mean in Original Scale	26.57		Mean in Log Scale	2.596
SD in Original Scale	44.71		SD in Log Scale	1.109
95% t UCL (Assumes normality)	32.99		95% H-Stat UCL	30.94
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	43.38			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nitrate+Nitrite as N_Total				
General Statistics				
Total Number of Observations	17		Number of Distinct Observations	13
Number of Detects	9		Number of Non-Detects	8
Number of Distinct Detects	9		Number of Distinct Non-Detects	4
Minimum Detect	20		Minimum Non-Detect	15
Maximum Detect	150000		Maximum Non-Detect	1500
Variance Detects	2.454E+9		Percent Non-Detects	47.06%
Mean Detects	18061		SD Detects	49541
Median Detects	120		CV Detects	2.743
Skewness Detects	2.985		Kurtosis Detects	8.934
Mean of Logged Detects	6.141		SD of Logged Detects	3.005
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.426		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829		Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.483		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274		Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	9576		KM Standard Error of Mean	9044
KM SD	35156		95% KM (BCA) UCL	26926
95% KM (t) UCL	25365		95% KM (Percentile Bootstrap) UCL	27167
95% KM (z) UCL	24451		95% KM Bootstrap t UCL	259569
90% KM Chebyshev UCL	36707		95% KM Chebyshev UCL	48997
97.5% KM Chebyshev UCL	66055		99% KM Chebyshev UCL	99561
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.053		**Anderson-Darling GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% A-D Critical Value	0.847	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.308	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data follow Appr. Gamma Distribution at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.201	k star (bias corrected MLE)	0.208
	Theta hat (MLE)	89895	Theta star (bias corrected MLE)	86826
	nu hat (MLE)	3.616	nu star (bias corrected)	3.744
	Mean (detects)	18061		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	9562
	Maximum	150000	Median	20
	SD	36242	CV	3.79
	k hat (MLE)	0.1	k star (bias corrected MLE)	0.122
	Theta hat (MLE)	95203	Theta star (bias corrected MLE)	78423
	nu hat (MLE)	3.415	nu star (bias corrected)	4.146
	Adjusted Level of Significance (β)	0.0346		
	Approximate Chi Square Value (4.15, α)	0.78	Adjusted Chi Square Value (4.15, β)	0.644
	95% Gamma Approximate UCL (use when n>=50)	50818	95% Gamma Adjusted UCL (use when n<50)	61563
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	9576	SD (KM)	35156
	Variance (KM)	1.236E+9	SE of Mean (KM)	9044
	k hat (KM)	0.0742	k star (KM)	0.1
	nu hat (KM)	2.522	nu star (KM)	3.411
	theta hat (KM)	129076	theta star (KM)	95460
	80% gamma percentile (KM)	6674	90% gamma percentile (KM)	25518
	95% gamma percentile (KM)	55570	99% gamma percentile (KM)	151870
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (3.41, α)	0.504	Adjusted Chi Square Value (3.41, β)	0.406
	95% Gamma Approximate KM-UCL (use when n>=50)	64827	95% Gamma Adjusted KM-UCL (use when n<50)	80395
	95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.274	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	9563	Mean in Log Scale	3.206
	SD in Original Scale	36242	SD in Log Scale	4.102
	95% t UCL (assumes normality of ROS data)	24909	95% Percentile Bootstrap UCL	26862
	95% BCA Bootstrap UCL	36437	95% Bootstrap t UCL	261030
	95% H-UCL (Log ROS)	6.502E+8		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	4.652	KM Geo Mean	104.8
	KM SD (logged)	2.637	95% Critical H Value (KM-Log)	5.591
	KM Standard Error of Mean (logged)	0.688	95% H-UCL (KM -Log)	135411
	KM SD (logged)	2.637	95% Critical H Value (KM-Log)	5.591
	KM Standard Error of Mean (logged)	0.688		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	9622	Mean in Log Scale	4.782

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	36226	SD in Log Scale	2.859
95% t UCL (Assumes normality)	24961	95% H-Stat UCL	525141

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	80395		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nitrogen, Nitrate (as N)_Total

General Statistics

Total Number of Observations	101	Number of Distinct Observations	35
Number of Detects	48	Number of Non-Detects	53
Number of Distinct Detects	34	Number of Distinct Non-Detects	3
Minimum Detect	60	Minimum Non-Detect	50
Maximum Detect	46400	Maximum Non-Detect	250
Variance Detects	70221488	Percent Non-Detects	52.48%
Mean Detects	3371	SD Detects	8380
Median Detects	1300	CV Detects	2.486
Skewness Detects	4.607	Kurtosis Detects	20.99
Mean of Logged Detects	7.101	SD of Logged Detects	1.363

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.353	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.399	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1629	KM Standard Error of Mean	598.5
KM SD	5952	95% KM (BCA) UCL	2770
95% KM (t) UCL	2622	95% KM (Percentile Bootstrap) UCL	2688
95% KM (z) UCL	2613	95% KM Bootstrap t UCL	5951
90% KM Chebyshev UCL	3424	95% KM Chebyshev UCL	4237
97.5% KM Chebyshev UCL	5366	99% KM Chebyshev UCL	7584

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.748	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.805	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.234	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.134	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.604	k star (bias corrected MLE)	0.58
Theta hat (MLE)	5582	Theta star (bias corrected MLE)	5812
nu hat (MLE)	57.97	nu star (bias corrected)	55.68
Mean (detects)	3371		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1602	
Maximum	46400	Median	0.01	
SD	5989	CV	3.738	
k hat (MLE)	0.123	k star (bias corrected MLE)	0.126	
Theta hat (MLE)	13017	Theta star (bias corrected MLE)	12713	
nu hat (MLE)	24.86	nu star (bias corrected)	25.46	
Adjusted Level of Significance (β)	0.0476			
Approximate Chi Square Value (25.46, α)	14.96	Adjusted Chi Square Value (25.46, β)	14.85	
95% Gamma Approximate UCL (use when n>=50)	2726	95% Gamma Adjusted UCL (use when n<50)	2747	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1629	SD (KM)	5952	
Variance (KM)	35427714	SE of Mean (KM)	598.5	
k hat (KM)	0.0749	k star (KM)	0.0792	
nu hat (KM)	15.12	nu star (KM)	16.01	
theta hat (KM)	21754	theta star (KM)	20552	
80% gamma percentile (KM)	760.8	90% gamma percentile (KM)	3838	
95% gamma percentile (KM)	9466	99% gamma percentile (KM)	28973	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (16.01, α)	7.967	Adjusted Chi Square Value (16.01, β)	7.885	
95% Gamma Approximate KM-UCL (use when n>=50)	3272	95% Gamma Adjusted KM-UCL (use when n<50)	3306	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.127	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1635	Mean in Log Scale	5.243	
SD in Original Scale	5980	SD in Log Scale	2.208	
95% t UCL (assumes normality of ROS data)	2623	95% Percentile Bootstrap UCL	2744	
95% BCA Bootstrap UCL	3277	95% Bootstrap t UCL	5888	
95% H-UCL (Log ROS)	4745			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	5.43	KM Geo Mean	228.1	
KM SD (logged)	1.843	95% Critical H Value (KM-Log)	3.106	
KM Standard Error of Mean (logged)	0.185	95% H-UCL (KM -Log)	2207	
KM SD (logged)	1.843	95% Critical H Value (KM-Log)	3.106	
KM Standard Error of Mean (logged)	0.185			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1620	Mean in Log Scale	5.134	
SD in Original Scale	5984	SD in Log Scale	2.123	
95% t UCL (Assumes normality)	2608	95% H-Stat UCL	3363	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	2207			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nitrogen, Nitrite (as N)_Total				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	100	Number of Distinct Observations	6	
Number of Detects	9	Number of Non-Detects	91	
Number of Distinct Detects	1	Number of Distinct Non-Detects	6	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Nitrogen, Nitrite (as N)_Total was not processed!				
Selenium_FLT				
General Statistics				
Total Number of Observations	114	Number of Distinct Observations	20	
Number of Detects	10	Number of Non-Detects	104	
Number of Distinct Detects	10	Number of Distinct Non-Detects	10	
Minimum Detect	0.52	Minimum Non-Detect	0.3	
Maximum Detect	10.3	Maximum Non-Detect	17.5	
Variance Detects	12.33	Percent Non-Detects	91.23%	
Mean Detects	3.025	SD Detects	3.512	
Median Detects	1.68	CV Detects	1.161	
Skewness Detects	1.467	Kurtosis Detects	1.051	
Mean of Logged Detects	0.484	SD of Logged Detects	1.187	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.745	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.562	KM Standard Error of Mean	0.13	
KM SD	1.28	95% KM (BCA) UCL	0.99	
95% KM (t) UCL	0.777	95% KM (Percentile Bootstrap) UCL	0.903	
95% KM (z) UCL	0.776	95% KM Bootstrap t UCL	0.951	
90% KM Chebyshev UCL	0.951	95% KM Chebyshev UCL	1.127	
97.5% KM Chebyshev UCL	1.372	99% KM Chebyshev UCL	1.852	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.818	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.751	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.274	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.934	k star (bias corrected MLE)	0.721	
Theta hat (MLE)	3.237	Theta star (bias corrected MLE)	4.197	
nu hat (MLE)	18.69	nu star (bias corrected)	14.42	
Mean (detects)	3.025			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.274	
Maximum	10.3	Median	0.01	
SD	1.31	CV	4.773	
k hat (MLE)	0.248	k star (bias corrected MLE)	0.247	
Theta hat (MLE)	1.106	Theta star (bias corrected MLE)	1.109	
nu hat (MLE)	56.58	nu star (bias corrected)	56.42	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance (β)	0.0479			
Approximate Chi Square Value (56.42, α)	40.16	Adjusted Chi Square Value (56.42, β)		39.98
95% Gamma Approximate UCL (use when n>=50)	0.386	95% Gamma Adjusted UCL (use when n<50)		0.387
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.562	SD (KM)		1.28
Variance (KM)	1.638	SE of Mean (KM)		0.13
k hat (KM)	0.193	k star (KM)		0.194
nu hat (KM)	44.03	nu star (KM)		44.21
theta hat (KM)	2.912	theta star (KM)		2.9
80% gamma percentile (KM)	0.729	90% gamma percentile (KM)		1.7
95% gamma percentile (KM)	2.921	99% gamma percentile (KM)		6.299
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (44.21, α)	29.96	Adjusted Chi Square Value (44.21, β)		29.81
95% Gamma Approximate KM-UCL (use when n>=50)	0.83	95% Gamma Adjusted KM-UCL (use when n<50)		0.834
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.276	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.306	Mean in Log Scale		-4.078
SD in Original Scale	1.305	SD in Log Scale		2.394
95% t UCL (assumes normality of ROS data)	0.509	95% Percentile Bootstrap UCL		0.541
95% BCA Bootstrap UCL	0.612	95% Bootstrap t UCL		0.782
95% H-UCL (Log ROS)	0.704			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.03	KM Geo Mean		0.357
KM SD (logged)	0.609	95% Critical H Value (KM-Log)		1.904
KM Standard Error of Mean (logged)	0.0637	95% H-UCL (KM -Log)		0.479
KM SD (logged)	0.609	95% Critical H Value (KM-Log)		1.904
KM Standard Error of Mean (logged)	0.0637			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.122	Mean in Log Scale		-0.639
SD in Original Scale	1.869	SD in Log Scale		1.083
95% t UCL (Assumes normality)	1.412	95% H-Stat UCL		1.199
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	1.127			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium_Total				
General Statistics				
Total Number of Observations	118	Number of Distinct Observations		27
Number of Detects	22	Number of Non-Detects		96
Number of Distinct Detects	17	Number of Distinct Non-Detects		11
Minimum Detect	0.1	Minimum Non-Detect		0.5
Maximum Detect	14.3	Maximum Non-Detect		17.5
Variance Detects	11.1	Percent Non-Detects		81.36%

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean Detects	1.909	SD Detects	3.331
Median Detects	0.705	CV Detects	1.745
Skewness Detects	3.126	Kurtosis Detects	9.912
Mean of Logged Detects	-0.081	SD of Logged Detects	1.086
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.502	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.184	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.57	KM Standard Error of Mean	0.162
KM SD	1.586	95% KM (BCA) UCL	1.012
95% KM (t) UCL	0.838	95% KM (Percentile Bootstrap) UCL	0.915
95% KM (z) UCL	0.836	95% KM Bootstrap t UCL	1.122
90% KM Chebyshev UCL	1.056	95% KM Chebyshev UCL	1.276
97.5% KM Chebyshev UCL	1.581	99% KM Chebyshev UCL	2.181
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	2.441	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.78	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.311	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.192	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.814	k star (bias corrected MLE)	0.733
Theta hat (MLE)	2.346	Theta star (bias corrected MLE)	2.604
nu hat (MLE)	35.81	nu star (bias corrected)	32.26
Mean (detects)	1.909		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.39
Maximum	14.3	Median	0.01
SD	1.598	CV	4.093
k hat (MLE)	0.264	k star (bias corrected MLE)	0.263
Theta hat (MLE)	1.478	Theta star (bias corrected MLE)	1.484
nu hat (MLE)	62.3	nu star (bias corrected)	62.05
Adjusted Level of Significance (β)	0.048		
Approximate Chi Square Value (62.05, α)	44.93	Adjusted Chi Square Value (62.05, β)	44.75
95% Gamma Approximate UCL (use when n>=50)	0.539	95% Gamma Adjusted UCL (use when n<50)	0.541
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.57	SD (KM)	1.586
Variance (KM)	2.516	SE of Mean (KM)	0.162
k hat (KM)	0.129	k star (KM)	0.131
nu hat (KM)	30.46	nu star (KM)	31.02
theta hat (KM)	4.415	theta star (KM)	4.335
80% gamma percentile (KM)	0.551	90% gamma percentile (KM)	1.651
95% gamma percentile (KM)	3.21	99% gamma percentile (KM)	7.866
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (31.02, α)	19.3	Adjusted Chi Square Value (31.02, β)	19.18
95% Gamma Approximate KM-UCL (use when n>=50)	0.916	95% Gamma Adjusted KM-UCL (use when n<50)	0.922
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Lognormal at 5% Significance Level	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Lilliefors Test Statistic	0.252	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.184	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.498	Mean in Log Scale	-1.813
	SD in Original Scale	1.574	SD in Log Scale	1.337
	95% t UCL (assumes normality of ROS data)	0.738	95% Percentile Bootstrap UCL	0.748
	95% BCA Bootstrap UCL	0.903	95% Bootstrap t UCL	1.269
	95% H-UCL (Log ROS)	0.547		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-1.347	KM Geo Mean	0.26
	KM SD (logged)	0.98	95% Critical H Value (KM-Log)	2.202
	KM Standard Error of Mean (logged)	0.307	95% H-UCL (KM -Log)	0.513
	KM SD (logged)	0.98	95% Critical H Value (KM-Log)	2.202
	KM Standard Error of Mean (logged)	0.307		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	1.303	Mean in Log Scale	-0.455
	SD in Original Scale	2.061	SD in Log Scale	1.118
	95% t UCL (Assumes normality)	1.618	95% H-Stat UCL	1.508
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	1.276		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Silver_FLT			
	General Statistics			
	Total Number of Observations	115	Number of Distinct Observations	8
	Number of Detects	2	Number of Non-Detects	113
	Number of Distinct Detects	2	Number of Distinct Non-Detects	6
	Minimum Detect	0.63	Minimum Non-Detect	0.25
	Maximum Detect	1.7	Maximum Non-Detect	25
	Variance Detects	0.572	Percent Non-Detects	98.26%
	Mean Detects	1.165	SD Detects	0.757
	Median Detects	1.165	CV Detects	0.649
	Skewness Detects	N/A	Kurtosis Detects	N/A
	Mean of Logged Detects	0.0343	SD of Logged Detects	0.702
	Warning: Data set has only 2 Detected Values.			
	This is not enough to compute meaningful or reliable statistics and estimates.			
	Normal GOF Test on Detects Only			
	Not Enough Data to Perform GOF Test			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.267	KM Standard Error of Mean	0.019
	KM SD	0.141	95% KM (BCA) UCL	N/A
	95% KM (t) UCL	0.298	95% KM (Percentile Bootstrap) UCL	N/A
	95% KM (z) UCL	0.298	95% KM Bootstrap t UCL	N/A
	90% KM Chebyshev UCL	0.324	95% KM Chebyshev UCL	0.349
	97.5% KM Chebyshev UCL	0.385	99% KM Chebyshev UCL	0.456

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	4.382	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.266	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	17.53	nu star (bias corrected)	N/A	
Mean (detects)	1.165			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.267	SD (KM)	0.141	
Variance (KM)	0.02	SE of Mean (KM)	0.019	
k hat (KM)	3.554	k star (KM)	3.467	
nu hat (KM)	817.4	nu star (KM)	797.4	
theta hat (KM)	0.075	theta star (KM)	0.0769	
80% gamma percentile (KM)	0.374	90% gamma percentile (KM)	0.459	
95% gamma percentile (KM)	0.537	99% gamma percentile (KM)	0.706	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0479	
Approximate Chi Square Value (797.38, α)	732.8	Adjusted Chi Square Value (797.38, β)	732.1	
95% Gamma Approximate KM-UCL (use when n>=50)	0.29	95% Gamma Adjusted KM-UCL (use when n<50)	0.29	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.037	Mean in Log Scale	-5.892	
SD in Original Scale	0.172	SD in Log Scale	2.313	
95% t UCL (assumes normality of ROS data)	0.0635	95% Percentile Bootstrap UCL	0.065	
95% BCA Bootstrap UCL	0.0847	95% Bootstrap t UCL	0.13	
95% H-UCL (Log ROS)	0.0897			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.361	KM Geo Mean	0.257	
KM SD (logged)	0.201	95% Critical H Value (KM-Log)	1.7	
KM Standard Error of Mean (logged)	0.027	95% H-UCL (KM -Log)	0.27	
KM SD (logged)	0.201	95% Critical H Value (KM-Log)	1.7	
KM Standard Error of Mean (logged)	0.027			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.335	Mean in Log Scale	-1.823	
SD in Original Scale	1.216	SD in Log Scale	0.735	
95% t UCL (Assumes normality)	0.524	95% H-Stat UCL	0.243	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.349			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Silver_Total				
General Statistics				
Total Number of Observations	118	Number of Distinct Observations	6	
Number of Detects	1	Number of Non-Detects	117	
Number of Distinct Detects	1	Number of Distinct Non-Detects	6	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_Total was not processed!

Thallium_FLT

General Statistics

Total Number of Observations	115	Number of Distinct Observations	7
Number of Detects	2	Number of Non-Detects	113
Number of Distinct Detects	2	Number of Distinct Non-Detects	6
Minimum Detect	1	Minimum Non-Detect	0.5
Maximum Detect	2.4	Maximum Non-Detect	12.5
Variance Detects	0.98	Percent Non-Detects	98.26%
Mean Detects	1.7	SD Detects	0.99
Median Detects	1.7	CV Detects	0.582
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.438	SD of Logged Detects	0.619

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only
Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.522	KM Standard Error of Mean	0.0247
KM SD	0.185	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.563	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.562	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.596	95% KM Chebyshev UCL	0.629
97.5% KM Chebyshev UCL	0.676	99% KM Chebyshev UCL	0.768

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	5.544	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.307	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	22.18	nu star (bias corrected)	N/A
Mean (detects)	1.7		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.522	SD (KM)	0.185
Variance (KM)	0.0341	SE of Mean (KM)	0.0247
k hat (KM)	7.979	k star (KM)	7.777
nu hat (KM)	1835	nu star (KM)	1789
theta hat (KM)	0.0654	theta star (KM)	0.0671
80% gamma percentile (KM)	0.669	90% gamma percentile (KM)	0.771
95% gamma percentile (KM)	0.862	99% gamma percentile (KM)	1.052

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0479
Approximate Chi Square Value (N/A, α)	1691	Adjusted Chi Square Value (N/A, β)	1690
95% Gamma Approximate KM-UCL (use when n>=50)	0.552	95% Gamma Adjusted KM-UCL (use when n<50)	0.552

Lognormal GOF Test on Detected Observations Only
Not Enough Data to Perform GOF Test

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0639	Mean in Log Scale	-4.748
SD in Original Scale	0.248	SD in Log Scale	2.003

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (assumes normality of ROS data)	0.102	95% Percentile Bootstrap UCL	0.108
95% BCA Bootstrap UCL	0.136	95% Bootstrap t UCL	0.189
95% H-UCL (Log ROS)	0.12		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.673	KM Geo Mean	0.51
KM SD (logged)	0.161	95% Critical H Value (KM-Log)	1.688
KM Standard Error of Mean (logged)	0.0217	95% H-UCL (KM -Log)	0.53
KM SD (logged)	0.161	95% Critical H Value (KM-Log)	1.688
KM Standard Error of Mean (logged)	0.0217		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.556	Mean in Log Scale	-0.868
SD in Original Scale	0.824	SD in Log Scale	0.582
95% t UCL (Assumes normality)	0.683	95% H-Stat UCL	0.551
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.629		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium_Total			
General Statistics			
Total Number of Observations	118	Number of Distinct Observations	7
Number of Detects	2	Number of Non-Detects	116
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	2.5	Minimum Non-Detect	0.5
Maximum Detect	13.9	Maximum Non-Detect	12.5
Variance Detects	64.98	Percent Non-Detects	98.31%
Mean Detects	8.2	SD Detects	8.061
Median Detects	8.2	CV Detects	0.983
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	1.774	SD of Logged Detects	1.213
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.632	KM Standard Error of Mean	0.162
KM SD	1.241	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.9	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.898	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.118	95% KM Chebyshev UCL	1.337
97.5% KM Chebyshev UCL	1.643	99% KM Chebyshev UCL	2.242
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.662	k star (bias corrected MLE)	N/A
Theta hat (MLE)	4.934	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	6.648	nu star (bias corrected)	N/A

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (detects)	8.2		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.632	SD (KM)	1.241
Variance (KM)	1.541	SE of Mean (KM)	0.162
k hat (KM)	0.259	k star (KM)	0.258
nu hat (KM)	61.18	nu star (KM)	60.95
theta hat (KM)	2.438	theta star (KM)	2.447
80% gamma percentile (KM)	0.928	90% gamma percentile (KM)	1.893
95% gamma percentile (KM)	3.03	99% gamma percentile (KM)	6.044
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.048
Approximate Chi Square Value (60.95, α)	44	Adjusted Chi Square Value (60.95, β)	43.82
95% Gamma Approximate KM-UCL (use when n>=50)	0.876	95% Gamma Adjusted KM-UCL (use when n<50)	0.879
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.154	Mean in Log Scale	-8.372
SD in Original Scale	1.298	SD in Log Scale	3.888
95% t UCL (assumes normality of ROS data)	0.352	95% Percentile Bootstrap UCL	0.388
95% BCA Bootstrap UCL	0.531	95% Bootstrap t UCL	3.787
95% H-UCL (Log ROS)	3.605		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.65	KM Geo Mean	0.522
KM SD (logged)	0.34	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0447	95% H-UCL (KM -Log)	0.585
KM SD (logged)	0.34	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0447		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.787	Mean in Log Scale	-0.734
SD in Original Scale	1.535	SD in Log Scale	0.773
95% t UCL (Assumes normality)	1.022	95% H-Stat UCL	0.748
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.337		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium_FLT			
General Statistics			
Total Number of Observations	115	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	113
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.73	Minimum Non-Detect	0.85
Maximum Detect	1.6	Maximum Non-Detect	125
Variance Detects	0.378	Percent Non-Detects	98.26%
Mean Detects	1.165	SD Detects	0.615
Median Detects	1.165	CV Detects	0.528
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	0.0776	SD of Logged Detects	0.555

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Warning: Data set has only 2 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Not Enough Data to Perform GOF Test				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.02	KM Standard Error of Mean	0.335	
KM SD	0.41	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	1.575	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	1.571	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	2.025	95% KM Chebyshev UCL	2.48	
97.5% KM Chebyshev UCL	3.111	99% KM Chebyshev UCL	4.352	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	6.822	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.171	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	27.29	nu star (bias corrected)	N/A	
Mean (detects)	1.165			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.02	SD (KM)	0.41	
Variance (KM)	0.168	SE of Mean (KM)	0.335	
k hat (KM)	6.185	k star (KM)	6.03	
nu hat (KM)	1423	nu star (KM)	1387	
theta hat (KM)	0.165	theta star (KM)	0.169	
80% gamma percentile (KM)	1.343	90% gamma percentile (KM)	1.575	
95% gamma percentile (KM)	1.785	99% gamma percentile (KM)	2.225	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0479	
Approximate Chi Square Value (N/A, α)	1301	Adjusted Chi Square Value (N/A, β)	1300	
95% Gamma Approximate KM-UCL (use when n>=50)	1.087	95% Gamma Adjusted KM-UCL (use when n<50)	1.088	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.053	Mean in Log Scale	-0.0724	
SD in Original Scale	0.546	SD in Log Scale	0.502	
95% t UCL (assumes normality of ROS data)	1.137	95% Percentile Bootstrap UCL	1.135	
95% BCA Bootstrap UCL	1.137	95% Bootstrap t UCL	1.147	
95% H-UCL (Log ROS)	1.15			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.0531	KM Geo Mean	0.948	
KM SD (logged)	0.37	95% Critical H Value (KM-Log)	1.768	
KM Standard Error of Mean (logged)	0.302	95% H-UCL (KM -Log)	1.08	
KM SD (logged)	0.37	95% Critical H Value (KM-Log)	1.768	
KM Standard Error of Mean (logged)	0.302			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	4.646	Mean in Log Scale	0.853	
SD in Original Scale	8.97	SD in Log Scale	1.038	
95% t UCL (Assumes normality)	6.033	95% H-Stat UCL	5.007	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use				
95% KM (Chebyshev) UCL	2.48			
Warning: Recommended UCL exceeds the maximum observation				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium_Total				
General Statistics				
Total Number of Observations	118	Number of Distinct Observations	11	
Number of Detects	4	Number of Non-Detects	114	
Number of Distinct Detects	4	Number of Distinct Non-Detects	7	
Minimum Detect	0.63	Minimum Non-Detect	2	
Maximum Detect	2.9	Maximum Non-Detect	125	
Variance Detects	1.532	Percent Non-Detects	96.61%	
Mean Detects	1.78	SD Detects	1.238	
Median Detects	1.795	CV Detects	0.695	
Skewness Detects	-0.0088	Kurtosis Detects	-5.884	
Mean of Logged Detects	0.349	SD of Logged Detects	0.811	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.295	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.779	KM Standard Error of Mean	0.0841	
KM SD	0.386	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	0.918	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	0.917	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	1.031	95% KM Chebyshev UCL	1.146	
97.5% KM Chebyshev UCL	1.304	99% KM Chebyshev UCL	1.616	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.583	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.332	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.397	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.351	k star (bias corrected MLE)	0.754	
Theta hat (MLE)	0.757	Theta star (bias corrected MLE)	2.359	
nu hat (MLE)	18.81	nu star (bias corrected)	6.036	
Mean (detects)	1.78			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.86	
Maximum	2.9	Median	0.744	
SD	0.593	CV	0.689	
k hat (MLE)	1.78	k star (bias corrected MLE)	1.741	
Theta hat (MLE)	0.483	Theta star (bias corrected MLE)	0.494	
nu hat (MLE)	420.2	nu star (bias corrected)	410.8	
Adjusted Level of Significance (β)	0.048			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Approximate Chi Square Value (410.80, α)	364.8	Adjusted Chi Square Value (410.80, β)	364.3
95% Gamma Approximate UCL (use when n>=50)	0.969	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.779	SD (KM)	0.386
Variance (KM)	0.149	SE of Mean (KM)	0.0841
k hat (KM)	4.067	k star (KM)	3.969
nu hat (KM)	959.7	nu star (KM)	936.7
theta hat (KM)	0.192	theta star (KM)	0.196
80% gamma percentile (KM)	1.075	90% gamma percentile (KM)	1.303
95% gamma percentile (KM)	1.513	99% gamma percentile (KM)	1.962
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (936.65, α)	866.6	Adjusted Chi Square Value (936.65, β)	865.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.842	95% Gamma Adjusted KM-UCL (use when n<50)	0.843
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.299	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.867	Mean in Log Scale	-0.29
SD in Original Scale	0.504	SD in Log Scale	0.544
95% t UCL (assumes normality of ROS data)	0.944	95% Percentile Bootstrap UCL	0.948
95% BCA Bootstrap UCL	0.947	95% Bootstrap t UCL	0.952
95% H-UCL (Log ROS)	0.953		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.304	KM Geo Mean	0.738
KM SD (logged)	0.271	95% Critical H Value (KM-Log)	1.726
KM Standard Error of Mean (logged)	0.0965	95% H-UCL (KM -Log)	0.799
KM SD (logged)	0.271	95% Critical H Value (KM-Log)	1.726
KM Standard Error of Mean (logged)	0.0965		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3.993	Mean in Log Scale	0.801
SD in Original Scale	7.543	SD in Log Scale	0.949
95% t UCL (Assumes normality)	5.144	95% H-Stat UCL	4.226
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.918		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Zinc_FLT			
General Statistics			
Total Number of Observations	126	Number of Distinct Observations	76
Number of Detects	96	Number of Non-Detects	30
Number of Distinct Detects	70	Number of Distinct Non-Detects	8
Minimum Detect	2	Minimum Non-Detect	2.3
Maximum Detect	639	Maximum Non-Detect	30
Variance Detects	11693	Percent Non-Detects	23.81%
Mean Detects	57.2	SD Detects	108.1

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Median Detects	17.5	CV Detects	1.89
Skewness Detects	3.651	Kurtosis Detects	14.51
Mean of Logged Detects	2.946	SD of Logged Detects	1.484
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.531	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.305	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0907	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	44.43	KM Standard Error of Mean	8.657
KM SD	96.65	95% KM (BCA) UCL	58.43
95% KM (t) UCL	58.77	95% KM (Percentile Bootstrap) UCL	59.73
95% KM (z) UCL	58.66	95% KM Bootstrap t UCL	63.99
90% KM Chebyshev UCL	70.39	95% KM Chebyshev UCL	82.16
97.5% KM Chebyshev UCL	98.49	99% KM Chebyshev UCL	130.6
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	3.651	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.148	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0962	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.566	k star (bias corrected MLE)	0.556
Theta hat (MLE)	101	Theta star (bias corrected MLE)	102.9
nu hat (MLE)	108.7	nu star (bias corrected)	106.7
Mean (detects)	57.2		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	43.69
Maximum	639	Median	6.15
SD	97.35	CV	2.228
k hat (MLE)	0.272	k star (bias corrected MLE)	0.271
Theta hat (MLE)	160.4	Theta star (bias corrected MLE)	161.1
nu hat (MLE)	68.64	nu star (bias corrected)	68.34
Adjusted Level of Significance (β)	0.0481		
Approximate Chi Square Value (68.34, α)	50.31	Adjusted Chi Square Value (68.34, β)	50.13
95% Gamma Approximate UCL (use when n>=50)	59.34	95% Gamma Adjusted UCL (use when n<50)	59.55
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	44.43	SD (KM)	96.65
Variance (KM)	9341	SE of Mean (KM)	8.657
k hat (KM)	0.211	k star (KM)	0.212
nu hat (KM)	53.24	nu star (KM)	53.31
theta hat (KM)	210.3	theta star (KM)	210
80% gamma percentile (KM)	60.21	90% gamma percentile (KM)	134.3
95% gamma percentile (KM)	225.5	99% gamma percentile (KM)	474.3
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (53.31, α)	37.53	Adjusted Chi Square Value (53.31, β)	37.38
95% Gamma Approximate KM-UCL (use when n>=50)	63.09	95% Gamma Adjusted KM-UCL (use when n<50)	63.35
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Approximate Test Statistic	0.925	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	1.1307E-5	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% Lilliefors Critical Value	0.0907	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	44.22	Mean in Log Scale	2.346
	SD in Original Scale	97.12	SD in Log Scale	1.765
	95% t UCL (assumes normality of ROS data)	58.56	95% Percentile Bootstrap UCL	59.79
	95% BCA Bootstrap UCL	63.05	95% Bootstrap t UCL	64.91
	95% H-UCL (Log ROS)	79.4		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	2.491	KM Geo Mean	12.07
	KM SD (logged)	1.55	95% Critical H Value (KM-Log)	2.74
	KM Standard Error of Mean (logged)	0.14	95% H-UCL (KM -Log)	58.63
	KM SD (logged)	1.55	95% Critical H Value (KM-Log)	2.74
	KM Standard Error of Mean (logged)	0.14		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	44.83	Mean in Log Scale	2.513
	SD in Original Scale	96.89	SD in Log Scale	1.59
	95% t UCL (Assumes normality)	59.13	95% H-Stat UCL	64.89
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	82.16		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Zinc_Total			
	General Statistics			
	Total Number of Observations	133	Number of Distinct Observations	84
	Number of Detects	106	Number of Non-Detects	27
	Number of Distinct Detects	82	Number of Distinct Non-Detects	7
	Minimum Detect	2.5	Minimum Non-Detect	2.5
	Maximum Detect	653	Maximum Non-Detect	40
	Variance Detects	15580	Percent Non-Detects	20.3%
	Mean Detects	65.18	SD Detects	124.8
	Median Detects	18	CV Detects	1.915
	Skewness Detects	3.462	Kurtosis Detects	12.29
	Mean of Logged Detects	3.086	SD of Logged Detects	1.448
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.517	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.308	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0863	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	52.82	KM Standard Error of Mean	9.897
	KM SD	113.6	95% KM (BCA) UCL	69.52
	95% KM (t) UCL	69.22	95% KM (Percentile Bootstrap) UCL	69.53
	95% KM (z) UCL	69.1	95% KM Bootstrap t UCL	75.4
	90% KM Chebyshev UCL	82.51	95% KM Chebyshev UCL	95.96
	97.5% KM Chebyshev UCL	114.6	99% KM Chebyshev UCL	151.3
	Gamma GOF Tests on Detected Observations Only			

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

A-D Test Statistic	4.299	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.157	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0925	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.571	k star (bias corrected MLE)	0.561	
Theta hat (MLE)	114.2	Theta star (bias corrected MLE)	116.2	
nu hat (MLE)	121	nu star (bias corrected)	118.9	
Mean (detects)	65.18			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	52.04	
Maximum	653	Median	10.7	
SD	114.4	CV	2.197	
k hat (MLE)	0.292	k star (bias corrected MLE)	0.29	
Theta hat (MLE)	178.3	Theta star (bias corrected MLE)	179.3	
nu hat (MLE)	77.62	nu star (bias corrected)	77.21	
Adjusted Level of Significance (β)	0.0482			
Approximate Chi Square Value (77.21, α)	57.96	Adjusted Chi Square Value (77.21, β)	57.78	
95% Gamma Approximate UCL (use when n>=50)	69.32	95% Gamma Adjusted UCL (use when n<50)	69.53	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	52.82	SD (KM)	113.6	
Variance (KM)	12903	SE of Mean (KM)	9.897	
k hat (KM)	0.216	k star (KM)	0.216	
nu hat (KM)	57.52	nu star (KM)	57.55	
theta hat (KM)	244.3	theta star (KM)	244.1	
80% gamma percentile (KM)	72.35	90% gamma percentile (KM)	159.6	
95% gamma percentile (KM)	266.5	99% gamma percentile (KM)	557	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (57.55, α)	41.11	Adjusted Chi Square Value (57.55, β)	40.96	
95% Gamma Approximate KM-UCL (use when n>=50)	73.94	95% Gamma Adjusted KM-UCL (use when n<50)	74.22	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.931	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.1827E-5	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0966	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0863	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	52.55	Mean in Log Scale	2.563	
SD in Original Scale	114.1	SD in Log Scale	1.732	
95% t UCL (assumes normality of ROS data)	68.95	95% Percentile Bootstrap UCL	69.79	
95% BCA Bootstrap UCL	73.58	95% Bootstrap t UCL	74.33	
95% H-UCL (Log ROS)	90.81			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.71	KM Geo Mean	15.02	
KM SD (logged)	1.51	95% Critical H Value (KM-Log)	2.705	
KM Standard Error of Mean (logged)	0.133	95% H-UCL (KM -Log)	66.98	
KM SD (logged)	1.51	95% Critical H Value (KM-Log)	2.705	
KM Standard Error of Mean (logged)	0.133			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	53.12	Mean in Log Scale	2.69	

Table E1-14
Surface Water (Clear Lake), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	SD in Original Scale					113.9	SD in Log Scale					1.593
	95% t UCL (Assumes normality)					69.49	95% H-Stat UCL					77.26
	DL/2 is not a recommended method, provided for comparisons and historical reasons											
	Nonparametric Distribution Free UCL Statistics											
	Data do not follow a Discernible Distribution at 5% Significance Level											
	Suggested UCL to Use											
	95% KM (Chebyshev) UCL					95.96						
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
	Recommendations are based upon data size, data distribution, and skewness.											
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.18/16/2019 8:56:12 AM
From File	ProUCLData_SW_20190816.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Aluminum_FLT was not processed!

Aluminum_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	5
Number of Detects	4	Number of Non-Detects	6
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	14	Minimum Non-Detect	10
Maximum Detect	50	Maximum Non-Detect	10
Variance Detects	306.9	Percent Non-Detects	60%
Mean Detects	23.75	SD Detects	17.52
Median Detects	15.5	CV Detects	0.738
Skewness Detects	1.987	Kurtosis Detects	3.957
Mean of Logged Detects	3.008	SD of Logged Detects	0.605

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.674	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.421	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	15.5	KM Standard Error of Mean	4.281
KM SD	11.72	95% KM (BCA) UCL	N/A
95% KM (t) UCL	23.35	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	22.54	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	28.34	95% KM Chebyshev UCL	34.16
97.5% KM Chebyshev UCL	42.23	99% KM Chebyshev UCL	58.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.799	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.435	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.396	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.289	k star (bias corrected MLE)	0.989
Theta hat (MLE)	7.221	Theta star (bias corrected MLE)	24.02
nu hat (MLE)	26.31	nu star (bias corrected)	7.912
Mean (detects)	23.75		

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	9.506	
Maximum	50	Median	0.01	
SD	15.89	CV	1.672	
k hat (MLE)	0.194	k star (bias corrected MLE)	0.202	
Theta hat (MLE)	49	Theta star (bias corrected MLE)	46.95	
nu hat (MLE)	3.88	nu star (bias corrected)	4.049	
Adjusted Level of Significance (β)	0.0267			
Approximate Chi Square Value (4.05, α)	0.741	Adjusted Chi Square Value (4.05, β)	0.534	
95% Gamma Approximate UCL (use when n>=50)	51.93	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	15.5	SD (KM)	11.72	
Variance (KM)	137.5	SE of Mean (KM)	4.281	
k hat (KM)	1.748	k star (KM)	1.29	
nu hat (KM)	34.96	nu star (KM)	25.8	
theta hat (KM)	8.868	theta star (KM)	12.01	
80% gamma percentile (KM)	24.37	90% gamma percentile (KM)	33.51	
95% gamma percentile (KM)	42.49	99% gamma percentile (KM)	62.96	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (25.80, α)	15.23	Adjusted Chi Square Value (25.80, β)	13.83	
95% Gamma Approximate KM-UCL (use when n>=50)	26.26	95% Gamma Adjusted KM-UCL (use when n<50)	28.91	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.401	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	11.51	Mean in Log Scale	1.823	
SD in Original Scale	14.68	SD in Log Scale	1.194	
95% t UCL (assumes normality of ROS data)	20.02	95% Percentile Bootstrap UCL	19.55	
95% BCA Bootstrap UCL	23.13	95% Bootstrap t UCL	28.98	
95% H-UCL (Log ROS)	51.19			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.585	KM Geo Mean	13.26	
KM SD (logged)	0.479	95% Critical H Value (KM-Log)	2.191	
KM Standard Error of Mean (logged)	0.175	95% H-UCL (KM -Log)	21.09	
KM SD (logged)	0.479	95% Critical H Value (KM-Log)	2.191	
KM Standard Error of Mean (logged)	0.175			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	12.5	Mean in Log Scale	2.169	
SD in Original Scale	14	SD in Log Scale	0.802	
95% t UCL (Assumes normality)	20.62	95% H-Stat UCL	24.94	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	34.16			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony_FLT was not processed!

Antimony_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony_Total was not processed!

Arsenic_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	3.1	Mean	3.24
Maximum	3.5	Median	3.2
SD	0.135	Std. Error of Mean	0.0427
Coefficient of Variation	0.0417	Skewness	0.772

Normal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.318	95% Adjusted-CLT UCL (Chen-1995)	3.321
		95% Modified-t UCL (Johnson-1978)	3.32

Gamma GOF Test

A-D Test Statistic	0.464	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	650.3	k star (bias corrected MLE)	455.2
Theta hat (MLE)	0.00498	Theta star (bias corrected MLE)	0.00712
nu hat (MLE)	13005	nu star (bias corrected)	9105
MLE Mean (bias corrected)	3.24	MLE Sd (bias corrected)	0.152

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

			Approximate Chi Square Value (0.05)	8884
	Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	8846
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	3.321	95% Adjusted Gamma UCL (use when n<50)	3.335
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	1.131	Mean of logged Data	1.175
	Maximum of Logged Data	1.253	SD of logged Data	0.0412
	Assuming Lognormal Distribution			
	95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	3.367
	95% Chebyshev (MVUE) UCL	3.424	97.5% Chebyshev (MVUE) UCL	3.504
	99% Chebyshev (MVUE) UCL	3.66		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	3.31	95% Jackknife UCL	3.318
	95% Standard Bootstrap UCL	3.307	95% Bootstrap-t UCL	3.343
	95% Hall's Bootstrap UCL	3.337	95% Percentile Bootstrap UCL	3.31
	95% BCA Bootstrap UCL	3.32		
	90% Chebyshev(Mean, Sd) UCL	3.368	95% Chebyshev(Mean, Sd) UCL	3.426
	97.5% Chebyshev(Mean, Sd) UCL	3.507	99% Chebyshev(Mean, Sd) UCL	3.665
	Suggested UCL to Use			
	95% Student's-t UCL	3.318		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Arsenic_Total			
	General Statistics			
	Total Number of Observations	10	Number of Distinct Observations	6
			Number of Missing Observations	0
	Minimum	3.1	Mean	3.35
	Maximum	3.6	Median	3.35
	SD	0.172	Std. Error of Mean	0.0543
	Coefficient of Variation	0.0512	Skewness	-8.79E-17
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
	Data appear Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	3.449	95% Adjusted-CLT UCL (Chen-1995)	3.439
			95% Modified-t UCL (Johnson-1978)	3.449
	Gamma GOF Test			

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

A-D Test Statistic	0.533	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.222	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	422.9	k star (bias corrected MLE)	296.1	
Theta hat (MLE)	0.00792	Theta star (bias corrected MLE)	0.0113	
nu hat (MLE)	8458	nu star (bias corrected)	5922	
MLE Mean (bias corrected)	3.35	MLE Sd (bias corrected)	0.195	
		Approximate Chi Square Value (0.05)	5744	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	5713	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	3.454	95% Adjusted Gamma UCL (use when n<50)	3.472	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.21	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.131	Mean of logged Data	1.208	
Maximum of Logged Data	1.281	SD of logged Data	0.0513	
Assuming Lognormal Distribution				
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	3.513	
95% Chebyshev (MVUE) UCL	3.587	97.5% Chebyshev (MVUE) UCL	3.689	
99% Chebyshev (MVUE) UCL	3.891			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	3.439	95% Jackknife UCL	3.449	
95% Standard Bootstrap UCL	3.435	95% Bootstrap-t UCL	3.453	
95% Hall's Bootstrap UCL	3.35	95% Percentile Bootstrap UCL	3.43	
95% BCA Bootstrap UCL	3.43			
90% Chebyshev(Mean, Sd) UCL	3.513	95% Chebyshev(Mean, Sd) UCL	3.587	
97.5% Chebyshev(Mean, Sd) UCL	3.689	99% Chebyshev(Mean, Sd) UCL	3.89	
Suggested UCL to Use				
95% Student's-t UCL	3.449			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be				
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Barium_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	3	
		Number of Missing Observations	0	
Minimum	74	Mean	76.2	
Maximum	77	Median	76	
SD	0.919	Std. Error of Mean	0.291	
Coefficient of Variation	0.0121	Skewness	-1.546	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test				
Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.314	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	76.73	95% Adjusted-CLT UCL (Chen-1995)	76.53	
		95% Modified-t UCL (Johnson-1978)	76.71	
Gamma GOF Test				
A-D Test Statistic	1.028	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.272	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	7563	k star (bias corrected MLE)	5294	
Theta hat (MLE)	0.0101	Theta star (bias corrected MLE)	0.0144	
nu hat (MLE)	151256	nu star (bias corrected)	105881	
MLE Mean (bias corrected)	76.2	MLE Sd (bias corrected)	1.047	
		Approximate Chi Square Value (0.05)	105125	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	104994	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	76.75	95% Adjusted Gamma UCL (use when n<50)	76.84	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.747	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.317	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.304	Mean of logged Data	4.333	
Maximum of Logged Data	4.344	SD of logged Data	0.0122	
Assuming Lognormal Distribution				
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	77.08	
95% Chebyshev (MVUE) UCL	77.48	97.5% Chebyshev (MVUE) UCL	78.03	
99% Chebyshev (MVUE) UCL	79.11			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	76.68	95% Jackknife UCL	76.73	
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A	
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	77.07	95% Chebyshev(Mean, Sd) UCL	77.47	
97.5% Chebyshev(Mean, Sd) UCL	78.01	99% Chebyshev(Mean, Sd) UCL	79.09	
Suggested UCL to Use				
95% Student's-t UCL	76.73	or 95% Modified-t UCL	76.71	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Barium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	77	Mean	79.4
Maximum	83	Median	79
SD	1.776	Std. Error of Mean	0.562
Coefficient of Variation	0.0224	Skewness	0.577

Normal GOF Test

Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	80.43	95% Adjusted-CLT UCL (Chen-1995)	80.43
		95% Modified-t UCL (Johnson-1978)	80.45

Gamma GOF Test

A-D Test Statistic	0.462	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.201	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2234	k star (bias corrected MLE)	1564
Theta hat (MLE)	0.0355	Theta star (bias corrected MLE)	0.0508
nu hat (MLE)	44678	nu star (bias corrected)	31276
MLE Mean (bias corrected)	79.4	MLE Sd (bias corrected)	2.008
		Approximate Chi Square Value (0.05)	30866
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	30795

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	80.46	95% Adjusted Gamma UCL (use when n<50)	80.64

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.344	Mean of logged Data	4.374
Maximum of Logged Data	4.419	SD of logged Data	0.0223

Assuming Lognormal Distribution

95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	81.08
95% Chebyshev (MVUE) UCL	81.84	97.5% Chebyshev (MVUE) UCL	82.89
99% Chebyshev (MVUE) UCL	84.96		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	80.32	95% Jackknife UCL	80.43
95% Standard Bootstrap UCL	80.28	95% Bootstrap-t UCL	80.6
95% Hall's Bootstrap UCL	80.87	95% Percentile Bootstrap UCL	80.3
95% BCA Bootstrap UCL	80.2		
90% Chebyshev(Mean, Sd) UCL	81.09	95% Chebyshev(Mean, Sd) UCL	81.85
97.5% Chebyshev(Mean, Sd) UCL	82.91	99% Chebyshev(Mean, Sd) UCL	84.99

Suggested UCL to Use

95% Student's-t UCL	80.43		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Beryllium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium_FLT was not processed!

Beryllium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium_Total was not processed!

Boron_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	2
		Number of Missing Observations	0
Minimum	1200	Mean	1290
Maximum	1300	Median	1300
SD	31.62	Std. Error of Mean	10
Coefficient of Variation	0.0245	Skewness	-3.162

Normal GOF Test

Shapiro Wilk Test Statistic	0.366	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.524	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1308	95% Adjusted-CLT UCL (Chen-1995)	1296
		95% Modified-t UCL (Johnson-1978)	1307

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Test				
A-D Test Statistic	3.294	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.531	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1772	k star (bias corrected MLE)	1240	
Theta hat (MLE)	0.728	Theta star (bias corrected MLE)	1.04	
nu hat (MLE)	35436	nu star (bias corrected)	24807	
MLE Mean (bias corrected)	1290	MLE Sd (bias corrected)	36.63	
		Approximate Chi Square Value (0.05)	24441	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	24378	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	1309	95% Adjusted Gamma UCL (use when n<50)	1313	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.366	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.524	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	7.09	Mean of logged Data	7.162	
Maximum of Logged Data	7.17	SD of logged Data	0.0253	
Assuming Lognormal Distribution				
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	1321	
95% Chebyshev (MVUE) UCL	1335	97.5% Chebyshev (MVUE) UCL	1354	
99% Chebyshev (MVUE) UCL	1393			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	1306	95% Jackknife UCL	N/A	
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A	
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	1320	95% Chebyshev(Mean, Sd) UCL	1334	
97.5% Chebyshev(Mean, Sd) UCL	1352	99% Chebyshev(Mean, Sd) UCL	1389	
Suggested UCL to Use				
95% Student's-t UCL	1308	or 95% Modified-t UCL	1307	
Recommended UCL exceeds the maximum observation				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Boron_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
		Number of Missing Observations	0	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	1200	Mean	1200
Maximum	1200	Median	1200

Warning: There is only one distinct observation value in this data set - resulting in '0' variance!
ProUCL (or any other software) should not be used on such a data set!
The data set for variable Boron_Total was not processed!

If possible, compute and collect Data Quality Objectives (DQOs) based sample size and analytical results.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Cadmium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium_FLT was not processed!

Cadmium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium_Total was not processed!

Chromium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chromium_FLT was not processed!

Chromium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Chromium_Total was not processed!

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Cobalt_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt_FLT was not processed!

Cobalt_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	3
Number of Detects	3	Number of Non-Detects	7
Number of Distinct Detects	2	Number of Distinct Non-Detects	1
Minimum Detect	0.13	Minimum Non-Detect	0.125
Maximum Detect	0.15	Maximum Non-Detect	0.125
Variance Detects	1.3333E-4	Percent Non-Detects	70%
Mean Detects	0.137	SD Detects	0.0115
Median Detects	0.13	CV Detects	0.0845
Skewness Detects	1.732	Kurtosis Detects	N/A
Mean of Logged Detects	-1.993	SD of Logged Detects	0.0826

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.129	KM Standard Error of Mean	0.00288
KM SD	0.00743	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.134	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.133	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.137	95% KM Chebyshev UCL	0.141
97.5% KM Chebyshev UCL	0.146	99% KM Chebyshev UCL	0.157

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	216.6	k star (bias corrected MLE)	N/A
Theta hat (MLE)	6.3095E-4	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	1300	nu star (bias corrected)	N/A
Mean (detects)	0.137		

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0659	Mean	0.105

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum	0.15	Median	0.103
SD	0.0261	CV	0.248
k hat (MLE)	17.72	k star (bias corrected MLE)	12.47
Theta hat (MLE)	0.00594	Theta star (bias corrected MLE)	0.00843
nu hat (MLE)	354.3	nu star (bias corrected)	249.4
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (249.38, α)	213.8	Adjusted Chi Square Value (249.38, β)	208.1
95% Gamma Approximate UCL (use when n>=50)	0.123	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.129	SD (KM)	0.00743
Variance (KM)	5.5250E-5	SE of Mean (KM)	0.00288
k hat (KM)	298.9	k star (KM)	209.3
nu hat (KM)	5977	nu star (KM)	4185
theta hat (KM)	4.2996E-4	theta star (KM)	6.1403E-4
80% gamma percentile (KM)	0.136	90% gamma percentile (KM)	0.14
95% gamma percentile (KM)	0.143	99% gamma percentile (KM)	0.15

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	4036	Adjusted Chi Square Value (N/A, β)	4011
95% Gamma Approximate KM-UCL (use when n>=50)	0.133	95% Gamma Adjusted KM-UCL (use when n<50)	0.134

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.75	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.385	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.11	Mean in Log Scale	-2.226
SD in Original Scale	0.0217	SD in Log Scale	0.195
95% t UCL (assumes normality of ROS data)	0.122	95% Percentile Bootstrap UCL	0.121
95% BCA Bootstrap UCL	0.122	95% Bootstrap t UCL	0.124
95% H-UCL (Log ROS)	0.124		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-2.053	KM Geo Mean	0.128
KM SD (logged)	0.0543	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.021	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0543	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.021		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0848	Mean in Log Scale	-2.539
SD in Original Scale	0.0362	SD in Log Scale	0.379
95% t UCL (Assumes normality)	0.106	95% H-Stat UCL	0.11

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.134		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper_FLT

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Copper_FLT was not processed!				
Copper_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	4	
Number of Detects	3	Number of Non-Detects	7	
Number of Distinct Detects	3	Number of Distinct Non-Detects	1	
Minimum Detect	1.3	Minimum Non-Detect	1	
Maximum Detect	3.8	Maximum Non-Detect	1	
Variance Detects	1.803	Percent Non-Detects	70%	
Mean Detects	2.267	SD Detects	1.343	
Median Detects	1.7	CV Detects	0.592	
Skewness Detects	1.561	Kurtosis Detects	N/A	
Mean of Logged Detects	0.709	SD of Logged Detects	0.558	
Warning: Data set has only 3 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.33	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	1.38	KM Standard Error of Mean	0.323	
KM SD	0.835	95% KM (BCA) UCL	N/A	
95% KM (t) UCL	1.973	95% KM (Percentile Bootstrap) UCL	N/A	
95% KM (z) UCL	1.912	95% KM Bootstrap t UCL	N/A	
90% KM Chebyshev UCL	2.35	95% KM Chebyshev UCL	2.79	
97.5% KM Chebyshev UCL	3.4	99% KM Chebyshev UCL	4.599	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	4.748	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.477	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	28.49	nu star (bias corrected)	N/A	
Mean (detects)	2.267			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.687	
Maximum	3.8	Median	0.01	
SD	1.261	CV	1.835	
k hat (MLE)	0.267	k star (bias corrected MLE)	0.253	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Theta hat (MLE)	2.576	Theta star (bias corrected MLE)	2.711
nu hat (MLE)	5.334	nu star (bias corrected)	5.067
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (5.07, α)	1.183	Adjusted Chi Square Value (5.07, β)	0.893
95% Gamma Approximate UCL (use when n>=50)	2.942	95% Gamma Adjusted UCL (use when n<50)	N/A
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.38	SD (KM)	0.835
Variance (KM)	0.698	SE of Mean (KM)	0.323
k hat (KM)	2.73	k star (KM)	1.978
nu hat (KM)	54.6	nu star (KM)	39.55
theta hat (KM)	0.506	theta star (KM)	0.698
80% gamma percentile (KM)	2.069	90% gamma percentile (KM)	2.691
95% gamma percentile (KM)	3.285	99% gamma percentile (KM)	4.603
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (39.55, α)	26.14	Adjusted Chi Square Value (39.55, β)	24.26
95% Gamma Approximate KM-UCL (use when n>=50)	2.088	95% Gamma Adjusted KM-UCL (use when n<50)	2.249
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.851	Mean in Log Scale	-0.994
SD in Original Scale	1.174	SD in Log Scale	1.419
95% t UCL (assumes normality of ROS data)	1.532	95% Percentile Bootstrap UCL	1.503
95% BCA Bootstrap UCL	1.758	95% Bootstrap t UCL	2.416
95% H-UCL (Log ROS)	6.779		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.213	KM Geo Mean	1.237
KM SD (logged)	0.41	95% Critical H Value (KM-Log)	2.101
KM Standard Error of Mean (logged)	0.159	95% H-UCL (KM -Log)	1.793
KM SD (logged)	0.41	95% Critical H Value (KM-Log)	2.101
KM Standard Error of Mean (logged)	0.159		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.03	Mean in Log Scale	-0.272
SD in Original Scale	1.063	SD in Log Scale	0.727
95% t UCL (Assumes normality)	1.646	95% H-Stat UCL	1.852
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.973		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron_FLT			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Iron_FLT was not processed!

Iron_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	2
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	1

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Iron_Total was not processed!

Lead_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead_FLT was not processed!

Lead_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead_Total was not processed!

Lithium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	3
		Number of Missing Observations	0
Minimum	20	Mean	20.9
Maximum	22	Median	21
SD	0.568	Std. Error of Mean	0.18
Coefficient of Variation	0.0272	Skewness	-0.0911

Normal GOF Test

Shapiro Wilk Test Statistic	0.752	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.37	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	21.23		95% Adjusted-CLT UCL (Chen-1995)	21.19
			95% Modified-t UCL (Johnson-1978)	21.23
Gamma GOF Test				
A-D Test Statistic	1.48		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.724		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.377		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.266		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1503		k star (bias corrected MLE)	1052
Theta hat (MLE)	0.0139		Theta star (bias corrected MLE)	0.0199
nu hat (MLE)	30056		nu star (bias corrected)	21040
MLE Mean (bias corrected)	20.9		MLE Sd (bias corrected)	0.644
			Approximate Chi Square Value (0.05)	20704
Adjusted Level of Significance	0.0267		Adjusted Chi Square Value	20646
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	21.24		95% Adjusted Gamma UCL (use when n<50)	21.3
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.751		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.842		Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.374		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.262		Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.996		Mean of logged Data	3.039
Maximum of Logged Data	3.091		SD of logged Data	0.0272
Assuming Lognormal Distribution				
95% H-UCL	N/A		90% Chebyshev (MVUE) UCL	21.44
95% Chebyshev (MVUE) UCL	21.68		97.5% Chebyshev (MVUE) UCL	22.02
99% Chebyshev (MVUE) UCL	22.69			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	21.2		95% Jackknife UCL	21.23
95% Standard Bootstrap UCL	N/A		95% Bootstrap-t UCL	N/A
95% Hall's Bootstrap UCL	N/A		95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	21.44		95% Chebyshev(Mean, Sd) UCL	21.68
97.5% Chebyshev(Mean, Sd) UCL	22.02		99% Chebyshev(Mean, Sd) UCL	22.69
Suggested UCL to Use				
95% Student's-t UCL	21.23		or 95% Modified-t UCL	21.23
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be				
reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.				
Lithium_Total				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	10	Number of Distinct Observations	3	
		Number of Missing Observations	0	
Minimum	20	Mean	20.4	
Maximum	22	Median	20	
SD	0.699	Std. Error of Mean	0.221	
Coefficient of Variation	0.0343	Skewness	1.658	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.65	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.416	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	20.81	95% Adjusted-CLT UCL (Chen-1995)	20.89	
		95% Modified-t UCL (Johnson-1978)	20.82	
Gamma GOF Test				
A-D Test Statistic	1.769	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.428	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	973.7	k star (bias corrected MLE)	681.7	
Theta hat (MLE)	0.021	Theta star (bias corrected MLE)	0.0299	
nu hat (MLE)	19475	nu star (bias corrected)	13634	
MLE Mean (bias corrected)	20.4	MLE Sd (bias corrected)	0.781	
		Approximate Chi Square Value (0.05)	13363	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	13316	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	20.81	95% Adjusted Gamma UCL (use when n<50)	20.89	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.651	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.417	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.996	Mean of logged Data	3.015	
Maximum of Logged Data	3.091	SD of logged Data	0.0335	
Assuming Lognormal Distribution				
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	21.05	
95% Chebyshev (MVUE) UCL	21.34	97.5% Chebyshev (MVUE) UCL	21.75	
99% Chebyshev (MVUE) UCL	22.55			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	20.76	95% Jackknife UCL	20.81	
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A	
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A	
95% BCA Bootstrap UCL	N/A			
90% Chebyshev(Mean, Sd) UCL	21.06	95% Chebyshev(Mean, Sd) UCL	21.36	
97.5% Chebyshev(Mean, Sd) UCL	21.78	99% Chebyshev(Mean, Sd) UCL	22.6	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Suggested UCL to Use			
95% Student's-t UCL	20.81	or 95% Modified-t UCL	20.82
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_FLT			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	2
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	1
Maximum Detect	2.8	Maximum Non-Detect	1
Variance Detects	0.291	Percent Non-Detects	20%
Mean Detects	1.775	SD Detects	0.539
Median Detects	1.7	CV Detects	0.304
Skewness Detects	0.869	Kurtosis Detects	0.787
Mean of Logged Detects	0.535	SD of Logged Detects	0.296
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.62	KM Standard Error of Mean	0.185
KM SD	0.547	95% KM (BCA) UCL	1.91
95% KM (t) UCL	1.959	95% KM (Percentile Bootstrap) UCL	1.9
95% KM (z) UCL	1.924	95% KM Bootstrap t UCL	2.023
90% KM Chebyshev UCL	2.175	95% KM Chebyshev UCL	2.427
97.5% KM Chebyshev UCL	2.776	99% KM Chebyshev UCL	3.461
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.144	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	13.09	k star (bias corrected MLE)	8.263
Theta hat (MLE)	0.136	Theta star (bias corrected MLE)	0.215
nu hat (MLE)	209.4	nu star (bias corrected)	132.2
Mean (detects)	1.775		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.498	Mean	1.543
Maximum	2.8	Median	1.55
SD	0.685	CV	0.444
k hat (MLE)	4.85	k star (bias corrected MLE)	3.461
Theta hat (MLE)	0.318	Theta star (bias corrected MLE)	0.446
nu hat (MLE)	96.99	nu star (bias corrected)	69.23
Adjusted Level of Significance (β)	0.0267		

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Approximate Chi Square Value (69.23, α)	51.07	Adjusted Chi Square Value (69.23, β)	48.37
95% Gamma Approximate UCL (use when n>=50)	2.091	95% Gamma Adjusted UCL (use when n<50)	2.208
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	1.62	SD (KM)	0.547
Variance (KM)	0.3	SE of Mean (KM)	0.185
k hat (KM)	8.76	k star (KM)	6.198
nu hat (KM)	175.2	nu star (KM)	124
theta hat (KM)	0.185	theta star (KM)	0.261
80% gamma percentile (KM)	2.127	90% gamma percentile (KM)	2.49
95% gamma percentile (KM)	2.817	99% gamma percentile (KM)	3.503
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (123.97, α)	99.25	Adjusted Chi Square Value (123.97, β)	95.42
95% Gamma Approximate KM-UCL (use when n>=50)	2.023	95% Gamma Adjusted KM-UCL (use when n<50)	2.105
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.994	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.109	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.584	Mean in Log Scale	0.387
SD in Original Scale	0.624	SD in Log Scale	0.408
95% t UCL (assumes normality of ROS data)	1.946	95% Percentile Bootstrap UCL	1.898
95% BCA Bootstrap UCL	1.914	95% Bootstrap t UCL	1.974
95% H-UCL (Log ROS)	2.131		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.428	KM Geo Mean	1.534
KM SD (logged)	0.327	95% Critical H Value (KM-Log)	2.006
KM Standard Error of Mean (logged)	0.111	95% H-UCL (KM -Log)	2.014
KM SD (logged)	0.327	95% Critical H Value (KM-Log)	2.006
KM Standard Error of Mean (logged)	0.111		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.52	Mean in Log Scale	0.289
SD in Original Scale	0.718	SD in Log Scale	0.58
95% t UCL (Assumes normality)	1.936	95% H-Stat UCL	2.482
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	1.959		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese_Total			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	14	Mean	17.3
Maximum	27	Median	16.5
SD	4.001	Std. Error of Mean	1.265
Coefficient of Variation	0.231	Skewness	1.767

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test				
Shapiro Wilk Test Statistic	0.808	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.23	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	19.62	95% Adjusted-CLT UCL (Chen-1995)	20.14	
		95% Modified-t UCL (Johnson-1978)	19.74	
Gamma GOF Test				
A-D Test Statistic	0.569	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.207	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	24.34	k star (bias corrected MLE)	17.11	
Theta hat (MLE)	0.711	Theta star (bias corrected MLE)	1.011	
nu hat (MLE)	486.8	nu star (bias corrected)	342.1	
MLE Mean (bias corrected)	17.3	MLE Sd (bias corrected)	4.183	
		Approximate Chi Square Value (0.05)	300.3	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	293.4	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	19.71	95% Adjusted Gamma UCL (use when n<50)	20.17	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.866	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.194	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.639	Mean of logged Data	2.83	
Maximum of Logged Data	3.296	SD of logged Data	0.207	
Assuming Lognormal Distribution				
95% H-UCL	19.72	90% Chebyshev (MVUE) UCL	20.68	
95% Chebyshev (MVUE) UCL	22.22	97.5% Chebyshev (MVUE) UCL	24.36	
99% Chebyshev (MVUE) UCL	28.56			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	19.38	95% Jackknife UCL	19.62	
95% Standard Bootstrap UCL	19.28	95% Bootstrap-t UCL	21.19	
95% Hall's Bootstrap UCL	28.59	95% Percentile Bootstrap UCL	19.3	
95% BCA Bootstrap UCL	20			
90% Chebyshev(Mean, Sd) UCL	21.1	95% Chebyshev(Mean, Sd) UCL	22.82	
97.5% Chebyshev(Mean, Sd) UCL	25.2	99% Chebyshev(Mean, Sd) UCL	29.89	
Suggested UCL to Use				
95% Student's-t UCL	19.62			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	4.4000E-4	Mean	0.00106
Maximum	0.0025	Median	7.2000E-4
SD	7.9334E-4	Std. Error of Mean	2.5088E-4
Coefficient of Variation	0.747	Skewness	1.236

Normal GOF Test

Shapiro Wilk Test Statistic	0.771	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.00152	95% Adjusted-CLT UCL (Chen-1995)	0.00158
		95% Modified-t UCL (Johnson-1978)	0.00154

Gamma GOF Test

A-D Test Statistic	0.76	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.734	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.25	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.269	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.422	k star (bias corrected MLE)	1.762
Theta hat (MLE)	4.3849E-4	Theta star (bias corrected MLE)	6.0272E-4
nu hat (MLE)	48.44	nu star (bias corrected)	35.24
MLE Mean (bias corrected)	0.00106	MLE Sd (bias corrected)	8.0005E-4
		Approximate Chi Square Value (0.05)	22.66
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	20.92

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.00165	95% Adjusted Gamma UCL (use when n<50)	0.00179

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.233	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-7.729	Mean of logged Data	-7.068
Maximum of Logged Data	-5.991	SD of logged Data	0.675

Assuming Lognormal Distribution

95% H-UCL	0.00187	90% Chebyshev (MVUE) UCL	0.00173
95% Chebyshev (MVUE) UCL	0.00204	97.5% Chebyshev (MVUE) UCL	0.00247
99% Chebyshev (MVUE) UCL	0.00332		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	0.00147	95% Jackknife UCL	0.00152
95% Standard Bootstrap UCL	0.00145	95% Bootstrap-t UCL	0.00197
95% Hall's Bootstrap UCL	0.00177	95% Percentile Bootstrap UCL	0.00147
95% BCA Bootstrap UCL	0.00153		
90% Chebyshev(Mean, Sd) UCL	0.00181	95% Chebyshev(Mean, Sd) UCL	0.00216
97.5% Chebyshev(Mean, Sd) UCL	0.00263	99% Chebyshev(Mean, Sd) UCL	0.00356

Suggested UCL to Use

95% Student's-t UCL	0.00152		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.0033	Mean	0.015
Maximum	0.043	Median	0.0103
SD	0.0128	Std. Error of Mean	0.00406
Coefficient of Variation	0.856	Skewness	1.474

Normal GOF Test

Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.323	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.0225	95% Adjusted-CLT UCL (Chen-1995)	0.0237
		95% Modified-t UCL (Johnson-1978)	0.0228

Gamma GOF Test

A-D Test Statistic	0.409	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.259	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.85	k star (bias corrected MLE)	1.362
Theta hat (MLE)	0.00811	Theta star (bias corrected MLE)	0.011
nu hat (MLE)	37.01	nu star (bias corrected)	27.24
MLE Mean (bias corrected)	0.015	MLE Sd (bias corrected)	0.0129
		Approximate Chi Square Value (0.05)	16.34
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	14.89

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.025	95% Adjusted Gamma UCL (use when n<50)	0.0275

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.208	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics				
Minimum of Logged Data	-5.714	Mean of logged Data	-4.493
Maximum of Logged Data	-3.147	SD of logged Data	0.798
Assuming Lognormal Distribution				
95% H-UCL	0.0316	90% Chebyshev (MVUE) UCL	0.0264
95% Chebyshev (MVUE) UCL	0.0317	97.5% Chebyshev (MVUE) UCL	0.039
99% Chebyshev (MVUE) UCL	0.0533		
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.0217	95% Jackknife UCL	0.0225
95% Standard Bootstrap UCL	0.0213	95% Bootstrap-t UCL	0.0302
95% Hall's Bootstrap UCL	0.0285	95% Percentile Bootstrap UCL	0.0218
95% BCA Bootstrap UCL	0.0231		
90% Chebyshev(Mean, Sd) UCL	0.0272	95% Chebyshev(Mean, Sd) UCL	0.0327
97.5% Chebyshev(Mean, Sd) UCL	0.0404	99% Chebyshev(Mean, Sd) UCL	0.0554
Suggested UCL to Use				
95% Adjusted Gamma UCL	0.0275		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Methyl Mercury_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Methyl Mercury_FLT was not processed!				
Methyl Mercury_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	4.2000E-5	Mean	5.2500E-5
Maximum	6.2000E-5	Median	5.1000E-5
SD	6.0231E-6	Std. Error of Mean	1.9047E-6
Coefficient of Variation	N/A	Skewness	0.0953
Normal GOF Test				
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.5991E-5	95% Adjusted-CLT UCL (Chen-1995)	5.5694E-5
		95% Modified-t UCL (Johnson-1978)	5.6001E-5

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Test				
A-D Test Statistic	0.346	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.158	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	83.87	k star (bias corrected MLE)	58.78	
Theta hat (MLE)	6.2597E-7	Theta star (bias corrected MLE)	8.9323E-7	
nu hat (MLE)	1677	nu star (bias corrected)	1176	
MLE Mean (bias corrected)	5.2500E-5	MLE Sd (bias corrected)	6.8479E-6	
		Approximate Chi Square Value (0.05)	1097	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	1084	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	5.6262E-5	95% Adjusted Gamma UCL (use when n<50)	5.6949E-5	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.156	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-10.08	Mean of logged Data	-9.861	
Maximum of Logged Data	-9.688	SD of logged Data	0.116	
Assuming Lognormal Distribution				
95% H-UCL	5.6338E-5	90% Chebyshev (MVUE) UCL	5.8264E-5	
95% Chebyshev (MVUE) UCL	6.0875E-5	97.5% Chebyshev (MVUE) UCL	6.4497E-5	
99% Chebyshev (MVUE) UCL	7.1614E-5			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	5.5633E-5	95% Jackknife UCL	5.5991E-5	
95% Standard Bootstrap UCL	5.5413E-5	95% Bootstrap-t UCL	5.6401E-5	
95% Hall's Bootstrap UCL	5.6049E-5	95% Percentile Bootstrap UCL	5.5300E-5	
95% BCA Bootstrap UCL	5.5400E-5			
90% Chebyshev(Mean, Sd) UCL	5.8214E-5	95% Chebyshev(Mean, Sd) UCL	6.0802E-5	
97.5% Chebyshev(Mean, Sd) UCL	6.4395E-5	99% Chebyshev(Mean, Sd) UCL	7.1451E-5	
Suggested UCL to Use				
95% Student's-t UCL	5.5991E-5			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Molybdenum_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

The data set for variable Molybdenum_FLT was not processed!				
Molybdenum_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	1	Number of Non-Detects	9	
Number of Distinct Detects	1	Number of Distinct Non-Detects	1	
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!				
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Molybdenum_Total was not processed!				
Nickel_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	3	
		Number of Missing Observations	0	
Minimum	2	Mean	2.06	
Maximum	2.2	Median	2.05	
SD	0.0699	Std. Error of Mean	0.0221	
Coefficient of Variation	0.0339	Skewness	0.78	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.305	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	2.101	95% Adjusted-CLT UCL (Chen-1995)	2.102	
		95% Modified-t UCL (Johnson-1978)	2.101	
Gamma GOF Test				
A-D Test Statistic	1.108	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.318	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	977.3	k star (bias corrected MLE)	684.2	
Theta hat (MLE)	0.00211	Theta star (bias corrected MLE)	0.00301	
nu hat (MLE)	19545	nu star (bias corrected)	13683	
MLE Mean (bias corrected)	2.06	MLE Sd (bias corrected)	0.0788	
		Approximate Chi Square Value (0.05)	13412	
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	13365	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	2.102	95% Adjusted Gamma UCL (use when n<50)	2.109	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.306	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum of Logged Data	0.693	Mean of logged Data	0.722
Maximum of Logged Data	0.788	SD of logged Data	0.0336
Assuming Lognormal Distribution			
95% H-UCL	N/A	90% Chebyshev (MVUE) UCL	2.126
95% Chebyshev (MVUE) UCL	2.155	97.5% Chebyshev (MVUE) UCL	2.197
99% Chebyshev (MVUE) UCL	2.278		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	2.096	95% Jackknife UCL	2.101
95% Standard Bootstrap UCL	N/A	95% Bootstrap-t UCL	N/A
95% Hall's Bootstrap UCL	N/A	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A		
90% Chebyshev(Mean, Sd) UCL	2.126	95% Chebyshev(Mean, Sd) UCL	2.156
97.5% Chebyshev(Mean, Sd) UCL	2.198	99% Chebyshev(Mean, Sd) UCL	2.28
Suggested UCL to Use			
95% Student's-t UCL	2.101	or 95% Modified-t UCL	2.101
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nickel_Total			
General Statistics			
Total Number of Observations	10	Number of Distinct Observations	5
		Number of Missing Observations	0
Minimum	2.1	Mean	2.47
Maximum	4.6	Median	2.2
SD	0.753	Std. Error of Mean	0.238
Coefficient of Variation	0.305	Skewness	3.094
Normal GOF Test			
Shapiro Wilk Test Statistic	0.461	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.437	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.906	95% Adjusted-CLT UCL (Chen-1995)	3.11
		95% Modified-t UCL (Johnson-1978)	2.945
Gamma GOF Test			
A-D Test Statistic	2.417	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.725	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.416	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.37	k star (bias corrected MLE)	12.23
Theta hat (MLE)	0.142	Theta star (bias corrected MLE)	0.202
nu hat (MLE)	347.4	nu star (bias corrected)	244.5
MLE Mean (bias corrected)	2.47	MLE Sd (bias corrected)	0.706
		Approximate Chi Square Value (0.05)	209.3
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	203.6

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	2.885	95% Adjusted Gamma UCL (use when n<50)	2.966	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.505	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.399	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.742	Mean of logged Data	0.875	
Maximum of Logged Data	1.526	SD of logged Data	0.232	
Assuming Lognormal Distribution				
95% H-UCL	2.856	90% Chebyshev (MVUE) UCL	3	
95% Chebyshev (MVUE) UCL	3.246	97.5% Chebyshev (MVUE) UCL	3.586	
99% Chebyshev (MVUE) UCL	4.256			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	2.862	95% Jackknife UCL	2.906	
95% Standard Bootstrap UCL	2.842	95% Bootstrap-t UCL	5.918	
95% Hall's Bootstrap UCL	4.952	95% Percentile Bootstrap UCL	2.94	
95% BCA Bootstrap UCL	2.97			
90% Chebyshev(Mean, Sd) UCL	3.184	95% Chebyshev(Mean, Sd) UCL	3.508	
97.5% Chebyshev(Mean, Sd) UCL	3.957	99% Chebyshev(Mean, Sd) UCL	4.839	
Suggested UCL to Use				
95% Student's-t UCL	2.906	or 95% Modified-t UCL	2.945	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nitrate+Nitrite as N_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	6	
Number of Detects	5	Number of Non-Detects	5	
Number of Distinct Detects	5	Number of Distinct Non-Detects	1	
Minimum Detect	16	Minimum Non-Detect	15	
Maximum Detect	36	Maximum Non-Detect	15	
Variance Detects	75.7	Percent Non-Detects	50%	
Mean Detects	24.8	SD Detects	8.701	
Median Detects	21	CV Detects	0.351	
Skewness Detects	0.536	Kurtosis Detects	-2.381	
Mean of Logged Detects	3.162	SD of Logged Detects	0.347	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	19.9	KM Standard Error of Mean	2.605	
KM SD	7.368	95% KM (BCA) UCL	24	
95% KM (t) UCL	24.68	95% KM (Percentile Bootstrap) UCL	24.2	
95% KM (z) UCL	24.18	95% KM Bootstrap t UCL	28.08	
90% KM Chebyshev UCL	27.72	95% KM Chebyshev UCL	31.26	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

97.5% KM Chebyshev UCL	36.17	99% KM Chebyshev UCL	45.82
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.373	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.262	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	10.43	k star (bias corrected MLE)	4.307
Theta hat (MLE)	2.377	Theta star (bias corrected MLE)	5.758
nu hat (MLE)	104.3	nu star (bias corrected)	43.07
Mean (detects)	24.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	14.1
Maximum	36	Median	12.46
SD	12.95	CV	0.919
k hat (MLE)	0.431	k star (bias corrected MLE)	0.368
Theta hat (MLE)	32.71	Theta star (bias corrected MLE)	38.27
nu hat (MLE)	8.618	nu star (bias corrected)	7.366
Adjusted Level of Significance (β)	0.0267		
Approximate Chi Square Value (7.37, α)	2.374	Adjusted Chi Square Value (7.37, β)	1.912
95% Gamma Approximate UCL (use when n>=50)	43.74	95% Gamma Adjusted UCL (use when n<50)	54.31
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	19.9	SD (KM)	7.368
Variance (KM)	54.29	SE of Mean (KM)	2.605
k hat (KM)	7.294	k star (KM)	5.173
nu hat (KM)	145.9	nu star (KM)	103.5
theta hat (KM)	2.728	theta star (KM)	3.847
80% gamma percentile (KM)	26.65	90% gamma percentile (KM)	31.61
95% gamma percentile (KM)	36.13	99% gamma percentile (KM)	45.66
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (103.45, α)	80.98	Adjusted Chi Square Value (103.45, β)	77.54
95% Gamma Approximate KM-UCL (use when n>=50)	25.42	95% Gamma Adjusted KM-UCL (use when n<50)	26.55
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.233	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	16.6	Mean in Log Scale	2.623
SD in Original Scale	10.56	SD in Log Scale	0.654
95% t UCL (assumes normality of ROS data)	22.72	95% Percentile Bootstrap UCL	22.23
95% BCA Bootstrap UCL	22.94	95% Bootstrap t UCL	25.82
95% H-UCL (Log ROS)	29.12		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	2.935	KM Geo Mean	18.82
KM SD (logged)	0.316	95% Critical H Value (KM-Log)	1.994
KM Standard Error of Mean (logged)	0.112	95% H-UCL (KM -Log)	24.41
KM SD (logged)	0.316	95% Critical H Value (KM-Log)	1.994
KM Standard Error of Mean (logged)	0.112		

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	16.15	Mean in Log Scale	2.589	
SD in Original Scale	10.81	SD in Log Scale	0.647	
95% t UCL (Assumes normality)	22.41	95% H-Stat UCL	27.82	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	24.68			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Selenium_FLT was not processed!				
Selenium_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Selenium_Total was not processed!				
Silver_FLT				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	
Number of Detects	0	Number of Non-Detects	10	
Number of Distinct Detects	0	Number of Distinct Non-Detects	1	
Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!				
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!				
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).				
The data set for variable Silver_FLT was not processed!				
Silver_Total				
General Statistics				
Total Number of Observations	10	Number of Distinct Observations	1	

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver_Total was not processed!

Thallium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium_FLT was not processed!

Thallium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium_Total was not processed!

Vanadium_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium_FLT was not processed!

Vanadium_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium_Total was not processed!

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects				
User Selected Options				
Date/Time of Computation	ProUCL 5.19/11/2019 11:03:05 AM			
From File	ProUCLData_SWHermanImp_20190911.xls			
Full Precision	OFF			
Confidence Coefficient	95%			
Number of Bootstrap Operations	2000			
Aluminum_FLT				
General Statistics				
Total Number of Observations	49		Number of Distinct Observations	49
			Number of Missing Observations	0
Minimum	155		Mean	1371251
Maximum	8690000		Median	261000
SD	2338480		Std. Error of Mean	334069
Coefficient of Variation	1.705		Skewness	2.088
Normal GOF Test				
Shapiro Wilk Test Statistic	0.62		**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947		Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.282		**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126		Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1931558		95% Adjusted-CLT UCL (Chen-1995)	2027239
			95% Modified-t UCL (Johnson-1978)	1948170
Gamma GOF Test				
A-D Test Statistic	1.272		**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.838		Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.19		**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.136		Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.402		k star (bias corrected MLE)	0.391
Theta hat (MLE)	3409157		Theta star (bias corrected MLE)	3505197
nu hat (MLE)	39.42		nu star (bias corrected)	38.34
MLE Mean (bias corrected)	1371251		MLE Sd (bias corrected)	2192374
			Approximate Chi Square Value (0.05)	25.16
Adjusted Level of Significance	0.0451		Adjusted Chi Square Value	24.83
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	2089633		95% Adjusted Gamma UCL (use when n<50)	2116936
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.951		**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.947		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0861		**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.126		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	5.043		Mean of logged Data	12.5
Maximum of Logged Data	15.98		SD of logged Data	2.229
Assuming Lognormal Distribution				
95% H-UCL	11361104		90% Chebyshev (MVUE) UCL	6673252
95% Chebyshev (MVUE) UCL	8454639		97.5% Chebyshev (MVUE) UCL	10927136
99% Chebyshev (MVUE) UCL	15783877			

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	1920745	95% Jackknife UCL	1931558
	95% Standard Bootstrap UCL	1905738	95% Bootstrap-t UCL	2105428
	95% Hall's Bootstrap UCL	1960467	95% Percentile Bootstrap UCL	1948534
	95% BCA Bootstrap UCL	2057497		
	90% Chebyshev(Mean, Sd) UCL	2373456	95% Chebyshev(Mean, Sd) UCL	2827422
	97.5% Chebyshev(Mean, Sd) UCL	3457508	99% Chebyshev(Mean, Sd) UCL	4695190
	Suggested UCL to Use			
	97.5% Chebyshev (Mean, Sd) UCL	3457508		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Aluminum_Total			
	General Statistics			
	Total Number of Observations	51	Number of Distinct Observations	51
			Number of Missing Observations	0
	Minimum	1380	Mean	1316408
	Maximum	9880000	Median	295000
	SD	2134640	Std. Error of Mean	298909
	Coefficient of Variation	1.622	Skewness	2.578
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.635	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	3.664E-15	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.269	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.123	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	1817352	95% Adjusted-CLT UCL (Chen-1995)	1923362
			95% Modified-t UCL (Johnson-1978)	1835335
	Gamma GOF Test			
	A-D Test Statistic	0.703	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.818	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.145	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level	
	Detected data follow Appr. Gamma Distribution at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	0.484	k star (bias corrected MLE)	0.469
	Theta hat (MLE)	2719517	Theta star (bias corrected MLE)	2808892
	nu hat (MLE)	49.37	nu star (bias corrected)	47.8
	MLE Mean (bias corrected)	1316408	MLE Sd (bias corrected)	1922927
			Approximate Chi Square Value (0.05)	32.93
	Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	32.57
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50)	1910715	95% Adjusted Gamma UCL (use when n<50)	1931805
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk P Value	0.011	Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0999	**Lilliefors Lognormal GOF Test**	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% Lilliefors Critical Value	0.123	Data appear Lognormal at 5% Significance Level	
	Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	7.23	Mean of logged Data	12.77
	Maximum of Logged Data	16.11	SD of logged Data	2.023
	Assuming Lognormal Distribution			
	95% H-UCL	7542647	90% Chebyshev (MVUE) UCL	5479255
	95% Chebyshev (MVUE) UCL	6857398	97.5% Chebyshev (MVUE) UCL	8770208
	99% Chebyshev (MVUE) UCL	12527552		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	1808070	95% Jackknife UCL	1817352
	95% Standard Bootstrap UCL	1800649	95% Bootstrap-t UCL	1993434
	95% Hall's Bootstrap UCL	1933525	95% Percentile Bootstrap UCL	1849259
	95% BCA Bootstrap UCL	1958580		
	90% Chebyshev(Mean, Sd) UCL	2213136	95% Chebyshev(Mean, Sd) UCL	2619324
	97.5% Chebyshev(Mean, Sd) UCL	3183096	99% Chebyshev(Mean, Sd) UCL	4290518
	Suggested UCL to Use			
	95% Adjusted Gamma UCL	1931805		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Antimony_FLT			
	General Statistics			
	Total Number of Observations	49	Number of Distinct Observations	21
	Number of Detects	11	Number of Non-Detects	38
	Number of Distinct Detects	11	Number of Distinct Non-Detects	10
	Minimum Detect	2.7	Minimum Non-Detect	0.1
	Maximum Detect	417	Maximum Non-Detect	30
	Variance Detects	25645	Percent Non-Detects	77.55%
	Mean Detects	107.3	SD Detects	160.1
	Median Detects	10.9	CV Detects	1.492
	Skewness Detects	1.259	Kurtosis Detects	-0.232
	Mean of Logged Detects	3.121	SD of Logged Detects	2.011
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.688	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	24.27	KM Standard Error of Mean	12.74
	KM SD	85.04	95% KM (BCA) UCL	47.76
	95% KM (t) UCL	45.64	95% KM (Percentile Bootstrap) UCL	45.88
	95% KM (z) UCL	45.22	95% KM Bootstrap t UCL	56.34
	90% KM Chebyshev UCL	62.49	95% KM Chebyshev UCL	79.81
	97.5% KM Chebyshev UCL	103.8	99% KM Chebyshev UCL	151
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.884	**Anderson-Darling GOF Test**	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% A-D Critical Value	0.797	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.249	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.272	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data follow Appr. Gamma Distribution at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.42	k star (bias corrected MLE)	0.366
	Theta hat (MLE)	255.6	Theta star (bias corrected MLE)	293.2
	nu hat (MLE)	9.239	nu star (bias corrected)	8.052
	Mean (detects)	107.3		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	24.1
	Maximum	417	Median	0.01
	SD	85.96	CV	3.567
	k hat (MLE)	0.13	k star (bias corrected MLE)	0.135
	Theta hat (MLE)	185.9	Theta star (bias corrected MLE)	178.1
	nu hat (MLE)	12.7	nu star (bias corrected)	13.26
	Adjusted Level of Significance (β)	0.0451		
	Approximate Chi Square Value (13.26, α)	6.068	Adjusted Chi Square Value (13.26, β)	5.92
	95% Gamma Approximate UCL (use when n>=50)	52.66	95% Gamma Adjusted UCL (use when n<50)	53.98
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	24.27	SD (KM)	85.04
	Variance (KM)	7231	SE of Mean (KM)	12.74
	k hat (KM)	0.0814	k star (KM)	0.0901
	nu hat (KM)	7.981	nu star (KM)	8.826
	theta hat (KM)	298	theta star (KM)	269.5
	80% gamma percentile (KM)	14.3	90% gamma percentile (KM)	61.54
	95% gamma percentile (KM)	141.4	99% gamma percentile (KM)	406
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (8.83, α)	3.222	Adjusted Chi Square Value (8.83, β)	3.12
	95% Gamma Approximate KM-UCL (use when n>=50)	66.47	95% Gamma Adjusted KM-UCL (use when n<50)	68.65
	95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.188	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.251	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	24.18	Mean in Log Scale	-2.444
	SD in Original Scale	85.94	SD in Log Scale	3.862
	95% t UCL (assumes normality of ROS data)	44.77	95% Percentile Bootstrap UCL	46.44
	95% BCA Bootstrap UCL	53.45	95% Bootstrap t UCL	58.62
	95% H-UCL (Log ROS)	5273		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-1.007	KM Geo Mean	0.365
	KM SD (logged)	2.459	95% Critical H Value (KM-Log)	4.267
	KM Standard Error of Mean (logged)	0.377	95% H-UCL (KM -Log)	34.17
	KM SD (logged)	2.459	95% Critical H Value (KM-Log)	4.267
	KM Standard Error of Mean (logged)	0.377		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	25.7	Mean in Log Scale	0.506

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	85.57	SD in Log Scale	2.022
95% t UCL (Assumes normality)	46.2	95% H-Stat UCL	37.02

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

ma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 but k<=1)	68.65		

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Antimony_Total

General Statistics

Total Number of Observations	51	Number of Distinct Observations	31
Number of Detects	30	Number of Non-Detects	21
Number of Distinct Detects	27	Number of Distinct Non-Detects	4
Minimum Detect	2.2	Minimum Non-Detect	1
Maximum Detect	579	Maximum Non-Detect	30
Variance Detects	16092	Percent Non-Detects	41.18%
Mean Detects	56.64	SD Detects	126.9
Median Detects	11.25	CV Detects	2.24
Skewness Detects	3.413	Kurtosis Detects	11.74
Mean of Logged Detects	2.714	SD of Logged Detects	1.495

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.467	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.35	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.159	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	34.2	KM Standard Error of Mean	14.15
KM SD	99.37	95% KM (BCA) UCL	61.7
95% KM (t) UCL	57.92	95% KM (Percentile Bootstrap) UCL	60.24
95% KM (z) UCL	57.48	95% KM Bootstrap t UCL	114.6
90% KM Chebyshev UCL	76.66	95% KM Chebyshev UCL	95.9
97.5% KM Chebyshev UCL	122.6	99% KM Chebyshev UCL	175

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.64	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.813	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.289	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.17	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.483	k star (bias corrected MLE)	0.457
Theta hat (MLE)	117.3	Theta star (bias corrected MLE)	124
nu hat (MLE)	28.98	nu star (bias corrected)	27.41
Mean (detects)	56.64		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	33.76	
Maximum	579	Median	4.1	
SD	100.5	CV	2.978	
k hat (MLE)	0.201	k star (bias corrected MLE)	0.202	
Theta hat (MLE)	168.3	Theta star (bias corrected MLE)	167.3	
nu hat (MLE)	20.46	nu star (bias corrected)	20.59	
Adjusted Level of Significance (β)	0.0453			
Approximate Chi Square Value (20.59, α)	11.29	Adjusted Chi Square Value (20.59, β)	11.08	
95% Gamma Approximate UCL (use when n>=50)	61.59	95% Gamma Adjusted UCL (use when n<50)	62.7	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	34.2	SD (KM)	99.37	
Variance (KM)	9874	SE of Mean (KM)	14.15	
k hat (KM)	0.118	k star (KM)	0.125	
nu hat (KM)	12.08	nu star (KM)	12.7	
theta hat (KM)	288.8	theta star (KM)	274.6	
80% gamma percentile (KM)	31.24	90% gamma percentile (KM)	97.84	
95% gamma percentile (KM)	194.2	99% gamma percentile (KM)	485.6	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (12.70, α)	5.693	Adjusted Chi Square Value (12.70, β)	5.557	
95% Gamma Approximate KM-UCL (use when n>=50)	76.3	95% Gamma Adjusted KM-UCL (use when n<50)	78.18	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.159	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	33.98	Mean in Log Scale	1.442	
SD in Original Scale	100.4	SD in Log Scale	2.071	
95% t UCL (assumes normality of ROS data)	57.55	95% Percentile Bootstrap UCL	59.43	
95% BCA Bootstrap UCL	70.21	95% Bootstrap t UCL	114.2	
95% H-UCL (Log ROS)	104.7			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.721	KM Geo Mean	5.592	
KM SD (logged)	1.704	95% Critical H Value (KM-Log)	3.141	
KM Standard Error of Mean (logged)	0.249	95% H-UCL (KM -Log)	50.96	
KM SD (logged)	1.704	95% Critical H Value (KM-Log)	3.141	
KM Standard Error of Mean (logged)	0.249			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	35.06	Mean in Log Scale	1.731	
SD in Original Scale	100.1	SD in Log Scale	1.887	
95% t UCL (Assumes normality)	58.56	95% H-Stat UCL	82.63	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	95.9			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Arsenic_FLT				

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	49	Number of Distinct Observations	39	
Number of Detects	37	Number of Non-Detects	12	
Number of Distinct Detects	36	Number of Distinct Non-Detects	3	
Minimum Detect	0.44	Minimum Non-Detect	0.5	
Maximum Detect	15800	Maximum Non-Detect	5	
Variance Detects	14102459	Percent Non-Detects	24.49%	
Mean Detects	1201	SD Detects	3755	
Median Detects	6.5	CV Detects	3.127	
Skewness Detects	3.39	Kurtosis Detects	10.97	
Mean of Logged Detects	2.711	SD of Logged Detects	2.772	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.364	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.487	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.144	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	907	KM Standard Error of Mean	472.1	
KM SD	3260	95% KM (BCA) UCL	1742	
95% KM (t) UCL	1699	95% KM (Percentile Bootstrap) UCL	1662	
95% KM (z) UCL	1684	95% KM Bootstrap t UCL	3509	
90% KM Chebyshev UCL	2323	95% KM Chebyshev UCL	2965	
97.5% KM Chebyshev UCL	3855	99% KM Chebyshev UCL	5605	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	6.04	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.935	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.348	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.162	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.172	k star (bias corrected MLE)	0.176	
Theta hat (MLE)	6985	Theta star (bias corrected MLE)	6823	
nu hat (MLE)	12.72	nu star (bias corrected)	13.03	
Mean (detects)	1201			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	906.9	
Maximum	15800	Median	3.5	
SD	3294	CV	3.632	
k hat (MLE)	0.133	k star (bias corrected MLE)	0.138	
Theta hat (MLE)	6831	Theta star (bias corrected MLE)	6560	
nu hat (MLE)	13.01	nu star (bias corrected)	13.55	
Adjusted Level of Significance (β)	0.0451			
Approximate Chi Square Value (13.55, α)	6.262	Adjusted Chi Square Value (13.55, β)	6.112	
95% Gamma Approximate UCL (use when n>=50)	1962	95% Gamma Adjusted UCL (use when n<50)	2010	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	907	SD (KM)	3260	
Variance (KM)	10627480	SE of Mean (KM)	472.1	
k hat (KM)	0.0774	k star (KM)	0.0863	
nu hat (KM)	7.586	nu star (KM)	8.455	
theta hat (KM)	11717	theta star (KM)	10513	
80% gamma percentile (KM)	496.7	90% gamma percentile (KM)	2249	
95% gamma percentile (KM)	5285	99% gamma percentile (KM)	15493	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (8.46, α)	3.001	Adjusted Chi Square Value (8.46, β)	2.903
95% Gamma Approximate KM-UCL (use when n>=50)	2555	95% Gamma Adjusted KM-UCL (use when n<50)	2641
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)			
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.856	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.144	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	906.9	Mean in Log Scale	1.373
SD in Original Scale	3294	SD in Log Scale	3.446
95% t UCL (assumes normality of ROS data)	1696	95% Percentile Bootstrap UCL	1749
95% BCA Bootstrap UCL	2010	95% Bootstrap t UCL	2773
95% H-UCL (Log ROS)	26053		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	1.868	KM Geo Mean	6.472
KM SD (logged)	2.805	95% Critical H Value (KM-Log)	4.777
KM Standard Error of Mean (logged)	0.407	95% H-UCL (KM -Log)	2288
KM SD (logged)	2.805	95% Critical H Value (KM-Log)	4.777
KM Standard Error of Mean (logged)	0.407		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	907	Mean in Log Scale	1.783
SD in Original Scale	3294	SD in Log Scale	2.929
95% t UCL (Assumes normality)	1696	95% H-Stat UCL	3532
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
97.5% KM (Chebyshev) UCL	3855		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Arsenic_Total			
General Statistics			
Total Number of Observations	51	Number of Distinct Observations	51
Number of Detects	49	Number of Non-Detects	2
Number of Distinct Detects	49	Number of Distinct Non-Detects	2
Minimum Detect	0.46	Minimum Non-Detect	0.5
Maximum Detect	16900	Maximum Non-Detect	5
Variance Detects	7653509	Percent Non-Detects	3.922%
Mean Detects	859.2	SD Detects	2766
Median Detects	38.7	CV Detects	3.22
Skewness Detects	4.692	Kurtosis Detects	24.61
Mean of Logged Detects	3.676	SD of Logged Detects	2.587
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.364	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.411	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	825.6	KM Standard Error of Mean	380.4	
KM SD	2689	95% KM (BCA) UCL	1556	
95% KM (t) UCL	1463	95% KM (Percentile Bootstrap) UCL	1524	
95% KM (z) UCL	1451	95% KM Bootstrap t UCL	2321	
90% KM Chebyshev UCL	1967	95% KM Chebyshev UCL	2484	
97.5% KM Chebyshev UCL	3201	99% KM Chebyshev UCL	4611	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	3.913	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.895	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.215	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.14	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.233	k star (bias corrected MLE)	0.233	
Theta hat (MLE)	3684	Theta star (bias corrected MLE)	3695	
nu hat (MLE)	22.85	nu star (bias corrected)	22.79	
Mean (detects)	859.2			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	825.5	
Maximum	16900	Median	27.4	
SD	2716	CV	3.29	
k hat (MLE)	0.216	k star (bias corrected MLE)	0.216	
Theta hat (MLE)	3821	Theta star (bias corrected MLE)	3814	
nu hat (MLE)	22.04	nu star (bias corrected)	22.08	
Adjusted Level of Significance (β)	0.0453			
Approximate Chi Square Value (22.08, α)	12.4	Adjusted Chi Square Value (22.08, β)	12.18	
95% Gamma Approximate UCL (use when n>=50)	1470	95% Gamma Adjusted UCL (use when n<50)	1496	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	825.6	SD (KM)	2689	
Variance (KM)	7231027	SE of Mean (KM)	380.4	
k hat (KM)	0.0943	k star (KM)	0.102	
nu hat (KM)	9.614	nu star (KM)	10.38	
theta hat (KM)	8759	theta star (KM)	8111	
80% gamma percentile (KM)	587.6	90% gamma percentile (KM)	2213	
95% gamma percentile (KM)	4787	99% gamma percentile (KM)	12998	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (10.38, α)	4.182	Adjusted Chi Square Value (10.38, β)	4.068	
95% Gamma Approximate KM-UCL (use when n>=50)	2050	95% Gamma Adjusted KM-UCL (use when n<50)	2107	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.959	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.126	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	825.6	Mean in Log Scale	3.507	
SD in Original Scale	2716	SD in Log Scale	2.679	
95% t UCL (assumes normality of ROS data)	1463	95% Percentile Bootstrap UCL	1507	
95% BCA Bootstrap UCL	1771	95% Bootstrap t UCL	2251	
95% H-UCL (Log ROS)	6592			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

KM Mean (logged)	3.527	KM Geo Mean	34.04
KM SD (logged)	2.621	95% Critical H Value (KM-Log)	4.4
KM Standard Error of Mean (logged)	0.371	95% H-UCL (KM -Log)	5399
KM SD (logged)	2.621	95% Critical H Value (KM-Log)	4.4
KM Standard Error of Mean (logged)	0.371		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	825.6	Mean in Log Scale	3.523
SD in Original Scale	2716	SD in Log Scale	2.658
95% t UCL (Assumes normality)	1463	95% H-Stat UCL	6179

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	3201		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium_FLT

General Statistics

Total Number of Observations	49	Number of Distinct Observations	44
Number of Detects	45	Number of Non-Detects	4
Number of Distinct Detects	42	Number of Distinct Non-Detects	2
Minimum Detect	0.13	Minimum Non-Detect	0.1
Maximum Detect	102	Maximum Non-Detect	2.5
Variance Detects	263.2	Percent Non-Detects	8.163%
Mean Detects	7.521	SD Detects	16.22
Median Detects	2.1	CV Detects	2.157
Skewness Detects	4.79	Kurtosis Detects	26.94
Mean of Logged Detects	0.847	SD of Logged Detects	1.512

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.468	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	6.952	KM Standard Error of Mean	2.238
KM SD	15.49	95% KM (BCA) UCL	10.98
95% KM (t) UCL	10.71	95% KM (Percentile Bootstrap) UCL	10.98
95% KM (z) UCL	10.63	95% KM Bootstrap t UCL	15.33
90% KM Chebyshev UCL	13.67	95% KM Chebyshev UCL	16.71
97.5% KM Chebyshev UCL	20.93	99% KM Chebyshev UCL	29.22

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.963	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.81	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.194	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.139	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.537	k star (bias corrected MLE)	0.516
Theta hat (MLE)	14.01	Theta star (bias corrected MLE)	14.58
nu hat (MLE)	48.3	nu star (bias corrected)	46.41

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (detects)	7.521		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	6.908
Maximum	102	Median	1.8
SD	15.67	CV	2.268
k hat (MLE)	0.426	k star (bias corrected MLE)	0.413
Theta hat (MLE)	16.23	Theta star (bias corrected MLE)	16.72
nu hat (MLE)	41.71	nu star (bias corrected)	40.49
Adjusted Level of Significance (β)	0.0451		
Approximate Chi Square Value (40.49, α)	26.91	Adjusted Chi Square Value (40.49, β)	26.57
95% Gamma Approximate UCL (use when n>=50)	10.39	95% Gamma Adjusted UCL (use when n<50)	10.53
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	6.952	SD (KM)	15.49
Variance (KM)	240	SE of Mean (KM)	2.238
k hat (KM)	0.201	k star (KM)	0.203
nu hat (KM)	19.74	nu star (KM)	19.86
theta hat (KM)	34.52	theta star (KM)	34.3
80% gamma percentile (KM)	9.225	90% gamma percentile (KM)	21.03
95% gamma percentile (KM)	35.7	99% gamma percentile (KM)	76
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (19.86, α)	10.75	Adjusted Chi Square Value (19.86, β)	10.55
95% Gamma Approximate KM-UCL (use when n>=50)	12.85	95% Gamma Adjusted KM-UCL (use when n<50)	13.09
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0925	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.948	Mean in Log Scale	0.655
SD in Original Scale	15.65	SD in Log Scale	1.635
95% t UCL (assumes normality of ROS data)	10.7	95% Percentile Bootstrap UCL	10.94
95% BCA Bootstrap UCL	13.49	95% Bootstrap t UCL	15.13
95% H-UCL (Log ROS)	15.29		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.671	KM Geo Mean	1.956
KM SD (logged)	1.586	95% Critical H Value (KM-Log)	3.047
KM Standard Error of Mean (logged)	0.231	95% H-UCL (KM -Log)	13.82
KM SD (logged)	1.586	95% Critical H Value (KM-Log)	3.047
KM Standard Error of Mean (logged)	0.231		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.96	Mean in Log Scale	0.665
SD in Original Scale	15.65	SD in Log Scale	1.641
95% t UCL (Assumes normality)	10.71	95% H-Stat UCL	15.64
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	16.71		

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium_Total

General Statistics

Total Number of Observations	51	Number of Distinct Observations	39
Number of Detects	44	Number of Non-Detects	7
Number of Distinct Detects	38	Number of Distinct Non-Detects	2
Minimum Detect	0.22	Minimum Non-Detect	0.1
Maximum Detect	94	Maximum Non-Detect	2.5
Variance Detects	218.9	Percent Non-Detects	13.73%
Mean Detects	6.964	SD Detects	14.8
Median Detects	2.15	CV Detects	2.125
Skewness Detects	5.033	Kurtosis Detects	28.97
Mean of Logged Detects	0.967	SD of Logged Detects	1.336

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.446	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.944	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.324	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.132	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	6.076	KM Standard Error of Mean	1.951
KM SD	13.77	95% KM (BCA) UCL	9.471
95% KM (t) UCL	9.345	95% KM (Percentile Bootstrap) UCL	9.7
95% KM (z) UCL	9.284	95% KM Bootstrap t UCL	13.65
90% KM Chebyshev UCL	11.93	95% KM Chebyshev UCL	14.58
97.5% KM Chebyshev UCL	18.26	99% KM Chebyshev UCL	25.48

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.954	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.801	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.218	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.14	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.63	k star (bias corrected MLE)	0.602
Theta hat (MLE)	11.05	Theta star (bias corrected MLE)	11.56
nu hat (MLE)	55.45	nu star (bias corrected)	53
Mean (detects)	6.964		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	6.012
Maximum	94	Median	1.8
SD	13.93	CV	2.317
k hat (MLE)	0.424	k star (bias corrected MLE)	0.412
Theta hat (MLE)	14.18	Theta star (bias corrected MLE)	14.59
nu hat (MLE)	43.25	nu star (bias corrected)	42.04
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (42.04, α)	28.17	Adjusted Chi Square Value (42.04, β)	27.84
95% Gamma Approximate UCL (use when n>=50)	8.97	95% Gamma Adjusted UCL (use when n<50)	9.077

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	6.076	SD (KM)	13.77

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Variance (KM)	189.6	SE of Mean (KM)	1.951
k hat (KM)	0.195	k star (KM)	0.196
nu hat (KM)	19.86	nu star (KM)	20.02
theta hat (KM)	31.21	theta star (KM)	30.95
80% gamma percentile (KM)	7.927	90% gamma percentile (KM)	18.37
95% gamma percentile (KM)	31.46	99% gamma percentile (KM)	67.59
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (20.02, α)	10.87	Adjusted Chi Square Value (20.02, β)	10.67
95% Gamma Approximate KM-UCL (use when n>=50)	11.19	95% Gamma Adjusted KM-UCL (use when n<50)	11.4
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.944	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.132	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	6.073	Mean in Log Scale	0.653
SD in Original Scale	13.91	SD in Log Scale	1.525
95% t UCL (assumes normality of ROS data)	9.337	95% Percentile Bootstrap UCL	9.438
95% BCA Bootstrap UCL	11.66	95% Bootstrap t UCL	13.78
95% H-UCL (Log ROS)	11.52		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.634	KM Geo Mean	1.885
KM SD (logged)	1.546	95% Critical H Value (KM-Log)	2.939
KM Standard Error of Mean (logged)	0.222	95% H-UCL (KM -Log)	11.84
KM SD (logged)	1.546	95% Critical H Value (KM-Log)	2.939
KM Standard Error of Mean (logged)	0.222		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	6.085	Mean in Log Scale	0.613
SD in Original Scale	13.9	SD in Log Scale	1.642
95% t UCL (Assumes normality)	9.348	95% H-Stat UCL	14.46
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	11.84		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Copper_FLT			
General Statistics			
Total Number of Observations	49	Number of Distinct Observations	48
Number of Detects	45	Number of Non-Detects	4
Number of Distinct Detects	44	Number of Distinct Non-Detects	4
Minimum Detect	0.4	Minimum Non-Detect	23.2
Maximum Detect	16900	Maximum Non-Detect	443.5
Variance Detects	6467331	Percent Non-Detects	8.163%
Mean Detects	813.9	SD Detects	2543
Median Detects	140	CV Detects	3.125
Skewness Detects	6.019	Kurtosis Detects	38.5
Mean of Logged Detects	4.766	SD of Logged Detects	2.252

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.321	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	750.2	KM Standard Error of Mean	349.5	
KM SD	2419	95% KM (BCA) UCL	1530	
95% KM (t) UCL	1336	95% KM (Percentile Bootstrap) UCL	1427	
95% KM (z) UCL	1325	95% KM Bootstrap t UCL	2713	
90% KM Chebyshev UCL	1799	95% KM Chebyshev UCL	2274	
97.5% KM Chebyshev UCL	2933	99% KM Chebyshev UCL	4228	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.453	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.85	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.168	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.348	k star (bias corrected MLE)	0.339	
Theta hat (MLE)	2340	Theta star (bias corrected MLE)	2398	
nu hat (MLE)	31.3	nu star (bias corrected)	30.54	
Mean (detects)	813.9			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	747.4	
Maximum	16900	Median	119	
SD	2445	CV	3.272	
k hat (MLE)	0.268	k star (bias corrected MLE)	0.266	
Theta hat (MLE)	2784	Theta star (bias corrected MLE)	2814	
nu hat (MLE)	26.31	nu star (bias corrected)	26.03	
Adjusted Level of Significance (β)	0.0451			
Approximate Chi Square Value (26.03, α)	15.4	Adjusted Chi Square Value (26.03, β)	15.15	
95% Gamma Approximate UCL (use when n>=50)	1263	95% Gamma Adjusted UCL (use when n<50)	1284	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	750.2	SD (KM)	2419	
Variance (KM)	5853390	SE of Mean (KM)	349.5	
k hat (KM)	0.0961	k star (KM)	0.104	
nu hat (KM)	9.422	nu star (KM)	10.18	
theta hat (KM)	7803	theta star (KM)	7223	
80% gamma percentile (KM)	549.2	90% gamma percentile (KM)	2027	
95% gamma percentile (KM)	4343	99% gamma percentile (KM)	11692	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (10.18, α)	4.053	Adjusted Chi Square Value (10.18, β)	3.936	
95% Gamma Approximate KM-UCL (use when n>=50)	1884	95% Gamma Adjusted KM-UCL (use when n<50)	1940	
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)				
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.119	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.131	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	748.9	Mean in Log Scale	4.583
	SD in Original Scale	2445	SD in Log Scale	2.255
	95% t UCL (assumes normality of ROS data)	1335	95% Percentile Bootstrap UCL	1388
	95% BCA Bootstrap UCL	1926	95% Bootstrap t UCL	2758
	95% H-UCL (Log ROS)	4530		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	4.553	KM Geo Mean	94.89
	KM SD (logged)	2.301	95% Critical H Value (KM-Log)	4.038
	KM Standard Error of Mean (logged)	0.338	95% H-UCL (KM -Log)	5122
	KM SD (logged)	2.301	95% Critical H Value (KM-Log)	4.038
	KM Standard Error of Mean (logged)	0.338		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	753.5	Mean in Log Scale	4.68
	SD in Original Scale	2444	SD in Log Scale	2.198
	95% t UCL (Assumes normality)	1339	95% H-Stat UCL	4139
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	97.5% KM (Chebyshev) UCL	2933		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Copper_Total			
	General Statistics			
	Total Number of Observations	51	Number of Distinct Observations	51
	Number of Detects	49	Number of Non-Detects	2
	Number of Distinct Detects	49	Number of Distinct Non-Detects	2
	Minimum Detect	3.1	Minimum Non-Detect	1
	Maximum Detect	9240	Maximum Non-Detect	1.7
	Variance Detects	2180344	Percent Non-Detects	3.922%
	Mean Detects	725.3	SD Detects	1477
	Median Detects	202	CV Detects	2.036
	Skewness Detects	4.421	Kurtosis Detects	23.48
	Mean of Logged Detects	5.242	SD of Logged Detects	1.87
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.506	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.313	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	696.9	KM Standard Error of Mean	203.6
	KM SD	1439	95% KM (BCA) UCL	1068
	95% KM (t) UCL	1038	95% KM (Percentile Bootstrap) UCL	1054
	95% KM (z) UCL	1032	95% KM Bootstrap t UCL	1375
	90% KM Chebyshev UCL	1308	95% KM Chebyshev UCL	1585
	97.5% KM Chebyshev UCL	1969	99% KM Chebyshev UCL	2723
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	0.951	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.82	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.123	**Kolmogorov-Smirnov GOF**	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.134	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.476	k star (bias corrected MLE)	0.461	
Theta hat (MLE)	1523	Theta star (bias corrected MLE)	1575	
nu hat (MLE)	46.65	nu star (bias corrected)	45.13	
Mean (detects)	725.3			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	696.8	
Maximum	9240	Median	173	
SD	1454	CV	2.086	
k hat (MLE)	0.391	k star (bias corrected MLE)	0.381	
Theta hat (MLE)	1784	Theta star (bias corrected MLE)	1830	
nu hat (MLE)	39.85	nu star (bias corrected)	38.84	
Adjusted Level of Significance (β)	0.0453			
Approximate Chi Square Value (38.84, α)	25.57	Adjusted Chi Square Value (38.84, β)	25.25	
95% Gamma Approximate UCL (use when n>=50)	1059	95% Gamma Adjusted UCL (use when n<50)	1072	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	696.9	SD (KM)	1439	
Variance (KM)	2071853	SE of Mean (KM)	203.6	
k hat (KM)	0.234	k star (KM)	0.234	
nu hat (KM)	23.91	nu star (KM)	23.83	
theta hat (KM)	2973	theta star (KM)	2982	
80% gamma percentile (KM)	986.6	90% gamma percentile (KM)	2100	
95% gamma percentile (KM)	3441	99% gamma percentile (KM)	7043	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (23.83, α)	13.72	Adjusted Chi Square Value (23.83, β)	13.5	
95% Gamma Approximate KM-UCL (use when n>=50)	1210	95% Gamma Adjusted KM-UCL (use when n<50)	1230	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0931	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.126	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	696.9	Mean in Log Scale	5.066	
SD in Original Scale	1454	SD in Log Scale	2.033	
95% t UCL (assumes normality of ROS data)	1038	95% Percentile Bootstrap UCL	1038	
95% BCA Bootstrap UCL	1206	95% Bootstrap t UCL	1364	
95% H-UCL (Log ROS)	3500			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	5.036	KM Geo Mean	153.9	
KM SD (logged)	2.08	95% Critical H Value (KM-Log)	3.642	
KM Standard Error of Mean (logged)	0.294	95% H-UCL (KM -Log)	3913	
KM SD (logged)	2.08	95% Critical H Value (KM-Log)	3.642	
KM Standard Error of Mean (logged)	0.294			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	696.9	Mean in Log Scale	5.02	
SD in Original Scale	1454	SD in Log Scale	2.144	
95% t UCL (Assumes normality)	1038	95% H-Stat UCL	4670	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM Approximate Gamma UCL	1210		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Fluoride_Total			
	General Statistics			
	Total Number of Observations	2	Number of Distinct Observations	2
			Number of Missing Observations	0
	Minimum	750	Mean	760
	Maximum	770	Median	760
	Warning: This data set only has 2 observations!			
	Data set is too small to compute reliable and meaningful statistics and estimates!			
	The data set for variable Fluoride_Total was not processed!			
	It is suggested to collect at least 8 to 10 observations before using these statistical methods!			
	If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.			
	Iron_FLT			
	General Statistics			
	Total Number of Observations	49	Number of Distinct Observations	49
			Number of Missing Observations	0
	Minimum	42.8	Mean	301328
	Maximum	4400000	Median	31900
	SD	917391	Std. Error of Mean	131056
	Coefficient of Variation	3.044	Skewness	3.902
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.363	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.444	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.126	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	521139	95% Adjusted-CLT UCL (Chen-1995)	594946
			95% Modified-t UCL (Johnson-1978)	533313
	Gamma GOF Test			
	A-D Test Statistic	3.676	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.875	Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.255	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.138	Data Not Gamma Distributed at 5% Significance Level	
	Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	0.273	k star (bias corrected MLE)	0.27
	Theta hat (MLE)	1101790	Theta star (bias corrected MLE)	1114582

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	26.8	nu star (bias corrected)	26.49
	MLE Mean (bias corrected)	301328	MLE Sd (bias corrected)	579530
			Approximate Chi Square Value (0.05)	15.76
	Adjusted Level of Significance	0.0451	Adjusted Chi Square Value	15.51
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	506549	95% Adjusted Gamma UCL (use when n<50)	514775
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.978	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.947	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0972	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.126	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	3.757	Mean of logged Data	10.06
	Maximum of Logged Data	15.3	SD of logged Data	2.391
	Assuming Lognormal Distribution			
	95% H-UCL	1710149	90% Chebyshev (MVUE) UCL	856196
	95% Chebyshev (MVUE) UCL	1092903	97.5% Chebyshev (MVUE) UCL	1421442
	99% Chebyshev (MVUE) UCL	2066795		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	516896	95% Jackknife UCL	521139
	95% Standard Bootstrap UCL	513914	95% Bootstrap-t UCL	769056
	95% Hall's Bootstrap UCL	648019	95% Percentile Bootstrap UCL	537945
	95% BCA Bootstrap UCL	614655		
	90% Chebyshev(Mean, Sd) UCL	694496	95% Chebyshev(Mean, Sd) UCL	872588
	97.5% Chebyshev(Mean, Sd) UCL	1119772	99% Chebyshev(Mean, Sd) UCL	1605318
	Suggested UCL to Use			
	97.5% Chebyshev (Mean, Sd) UCL	1119772		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Iron_Total			
	General Statistics			
	Total Number of Observations	51	Number of Distinct Observations	50
			Number of Missing Observations	0
	Minimum	458	Mean	589255
	Maximum	4090000	Median	144000
	SD	883353	Std. Error of Mean	123694
	Coefficient of Variation	1.499	Skewness	2.145
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.692	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	3.916E-13	Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.283	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.123	Data Not Normal at 5% Significance Level	
	Data Not Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	796555	95% Adjusted-CLT UCL (Chen-1995)	832403
			95% Modified-t UCL (Johnson-1978)	802745

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Test				
A-D Test Statistic	0.897	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.822	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.151	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.47	k star (bias corrected MLE)	0.455	
Theta hat (MLE)	1253561	Theta star (bias corrected MLE)	1293684	
nu hat (MLE)	47.95	nu star (bias corrected)	46.46	
MLE Mean (bias corrected)	589255	MLE Sd (bias corrected)	873104	
		Approximate Chi Square Value (0.05)	31.82	
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	31.47	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	860366	95% Adjusted Gamma UCL (use when n<50)	870018	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.0218	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.123	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	6.127	Mean of logged Data	11.92	
Maximum of Logged Data	15.22	SD of logged Data	2.07	
Assuming Lognormal Distribution				
95% H-UCL	3706647	90% Chebyshev (MVUE) UCL	2602646	
95% Chebyshev (MVUE) UCL	3266036	97.5% Chebyshev (MVUE) UCL	4186796	
99% Chebyshev (MVUE) UCL	5995451			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	792714	95% Jackknife UCL	796555	
95% Standard Bootstrap UCL	790453	95% Bootstrap-t UCL	864158	
95% Hall's Bootstrap UCL	838420	95% Percentile Bootstrap UCL	812701	
95% BCA Bootstrap UCL	846490			
90% Chebyshev(Mean, Sd) UCL	960337	95% Chebyshev(Mean, Sd) UCL	1128425	
97.5% Chebyshev(Mean, Sd) UCL	1361725	99% Chebyshev(Mean, Sd) UCL	1819996	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	1128425			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Manganese_FLT				
General Statistics				
Total Number of Observations	49	Number of Distinct Observations	48	
		Number of Missing Observations	0	
Minimum	45.8	Mean	12109	
Maximum	84200	Median	6840	
SD	15987	Std. Error of Mean	2284	
Coefficient of Variation	1.32	Skewness	2.553	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Normal GOF Test				
Shapiro Wilk Test Statistic	0.694	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.275	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.126	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	15940	95% Adjusted-CLT UCL (Chen-1995)	16756	
		95% Modified-t UCL (Johnson-1978)	16078	
Gamma GOF Test				
A-D Test Statistic	0.624	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.792	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.132	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.759	k star (bias corrected MLE)	0.726	
Theta hat (MLE)	15956	Theta star (bias corrected MLE)	16678	
nu hat (MLE)	74.37	nu star (bias corrected)	71.15	
MLE Mean (bias corrected)	12109	MLE Sd (bias corrected)	14211	
		Approximate Chi Square Value (0.05)	52.73	
Adjusted Level of Significance	0.0451	Adjusted Chi Square Value	52.25	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	16339	95% Adjusted Gamma UCL (use when n<50)	16489	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.114	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.126	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	3.824	Mean of logged Data	8.614	
Maximum of Logged Data	11.34	SD of logged Data	1.465	
Assuming Lognormal Distribution				
95% H-UCL	29658	90% Chebyshev (MVUE) UCL	28155	
95% Chebyshev (MVUE) UCL	33921	97.5% Chebyshev (MVUE) UCL	41924	
99% Chebyshev (MVUE) UCL	57645			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	15866	95% Jackknife UCL	15940	
95% Standard Bootstrap UCL	15884	95% Bootstrap-t UCL	17254	
95% Hall's Bootstrap UCL	17714	95% Percentile Bootstrap UCL	16144	
95% BCA Bootstrap UCL	16604			
90% Chebyshev(Mean, Sd) UCL	18961	95% Chebyshev(Mean, Sd) UCL	22064	
97.5% Chebyshev(Mean, Sd) UCL	26372	99% Chebyshev(Mean, Sd) UCL	34833	
Suggested UCL to Use				
95% Adjusted Gamma UCL	16489			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Manganese_Total				
General Statistics				
Total Number of Observations	51	Number of Distinct Observations	51	
		Number of Missing Observations	0	
Minimum	19.8	Mean	14037	
Maximum	102000	Median	6090	
SD	21362	Std. Error of Mean	2991	
Coefficient of Variation	1.522	Skewness	2.647	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.64	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	5.551E-15	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.123	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	19050	95% Adjusted-CLT UCL (Chen-1995)	20142	
		95% Modified-t UCL (Johnson-1978)	19235	
Gamma GOF Test				
A-D Test Statistic	0.873	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.805	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.15	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.13	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.611	k star (bias corrected MLE)	0.588	
Theta hat (MLE)	22984	Theta star (bias corrected MLE)	23878	
nu hat (MLE)	62.29	nu star (bias corrected)	59.96	
MLE Mean (bias corrected)	14037	MLE Sd (bias corrected)	18307	
		Approximate Chi Square Value (0.05)	43.16	
Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	42.74	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	19503	95% Adjusted Gamma UCL (use when n<50)	19692	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.0234	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.124	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.123	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.986	Mean of logged Data	8.54	
Maximum of Logged Data	11.53	SD of logged Data	1.697	
Assuming Lognormal Distribution				
95% H-UCL	45797	90% Chebyshev (MVUE) UCL	40285	
95% Chebyshev (MVUE) UCL	49356	97.5% Chebyshev (MVUE) UCL	61947	
99% Chebyshev (MVUE) UCL	86679			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	18957	95% Jackknife UCL	19050	
95% Standard Bootstrap UCL	18879	95% Bootstrap-t UCL	21325	
95% Hall's Bootstrap UCL	21233	95% Percentile Bootstrap UCL	19139	
95% BCA Bootstrap UCL	20355			

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% Chebyshev(Mean, Sd) UCL	23010	95% Chebyshev(Mean, Sd) UCL	27075
97.5% Chebyshev(Mean, Sd) UCL	32717	99% Chebyshev(Mean, Sd) UCL	43799

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	27075

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury_FLT

General Statistics

Total Number of Observations	49	Number of Distinct Observations	42
Number of Detects	48	Number of Non-Detects	1
Number of Distinct Detects	41	Number of Distinct Non-Detects	1
Minimum Detect	0.021	Minimum Non-Detect	0.025
Maximum Detect	1030	Maximum Non-Detect	0.025
Variance Detects	34525	Percent Non-Detects	2.041%
Mean Detects	49.88	SD Detects	185.8
Median Detects	0.845	CV Detects	3.725
Skewness Detects	4.28	Kurtosis Detects	18.75
Mean of Logged Detects	0.14	SD of Logged Detects	2.482

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.307	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.458	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	48.86	KM Standard Error of Mean	26.29
KM SD	182.1	95% KM (BCA) UCL	93
95% KM (t) UCL	92.96	95% KM (Percentile Bootstrap) UCL	99.64
95% KM (z) UCL	92.11	95% KM Bootstrap t UCL	127.2
90% KM Chebyshev UCL	127.7	95% KM Chebyshev UCL	163.5
97.5% KM Chebyshev UCL	213.1	99% KM Chebyshev UCL	310.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.913	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.916	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.313	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.142	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.196	k star (bias corrected MLE)	0.198
Theta hat (MLE)	254.7	Theta star (bias corrected MLE)	252.5
nu hat (MLE)	18.8	nu star (bias corrected)	18.96
Mean (detects)	49.88		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	48.86
Maximum	1030	Median	0.83
SD	184	CV	3.766
k hat (MLE)	0.192	k star (bias corrected MLE)	0.194
Theta hat (MLE)	253.8	Theta star (bias corrected MLE)	251.5
nu hat (MLE)	18.86	nu star (bias corrected)	19.04

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance (β)	0.0451			
Approximate Chi Square Value (19.04, α)	10.15	Adjusted Chi Square Value (19.04, β)		9.951
95% Gamma Approximate UCL (use when n>=50)	91.68	95% Gamma Adjusted UCL (use when n<50)		93.5
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	48.86	SD (KM)		182.1
Variance (KM)	33166	SE of Mean (KM)		26.29
k hat (KM)	0.072	k star (KM)		0.0812
nu hat (KM)	7.055	nu star (KM)		7.956
theta hat (KM)	678.8	theta star (KM)		601.9
80% gamma percentile (KM)	23.92	90% gamma percentile (KM)		116.9
95% gamma percentile (KM)	284.3	99% gamma percentile (KM)		859.4
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (7.96, α)	2.71	Adjusted Chi Square Value (7.96, β)		2.617
95% Gamma Approximate KM-UCL (use when n>=50)	143.5	95% Gamma Adjusted KM-UCL (use when n<50)		148.5
95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)				
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.127	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	48.86	Mean in Log Scale		0.029
SD in Original Scale	184	SD in Log Scale		2.576
95% t UCL (assumes normality of ROS data)	92.95	95% Percentile Bootstrap UCL		95.35
95% BCA Bootstrap UCL	111.2	95% Bootstrap t UCL		125.8
95% H-UCL (Log ROS)	147.8			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.0582	KM Geo Mean		1.06
KM SD (logged)	2.496	95% Critical H Value (KM-Log)		4.321
KM Standard Error of Mean (logged)	0.36	95% H-UCL (KM -Log)		113.2
KM SD (logged)	2.496	95% Critical H Value (KM-Log)		4.321
KM Standard Error of Mean (logged)	0.36			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	48.86	Mean in Log Scale		0.0476
SD in Original Scale	184	SD in Log Scale		2.539
95% t UCL (Assumes normality)	92.95	95% H-Stat UCL		131.5
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
97.5% KM (Chebyshev) UCL	213.1			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury_Total				
General Statistics				
Total Number of Observations	52	Number of Distinct Observations		52
		Number of Missing Observations		0
Minimum	0.17	Mean		1137
Maximum	14800	Median		337.5

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD	2389	Std. Error of Mean	331.2
Coefficient of Variation	2.1	Skewness	4.337
Normal GOF Test			
Shapiro Wilk Test Statistic	0.501	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.122	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1692	95% Adjusted-CLT UCL (Chen-1995)	1895
		95% Modified-t UCL (Johnson-1978)	1725
Gamma GOF Test			
A-D Test Statistic	0.358	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.842	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0858	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.132	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.388	k star (bias corrected MLE)	0.378
Theta hat (MLE)	2935	Theta star (bias corrected MLE)	3009
nu hat (MLE)	40.3	nu star (bias corrected)	39.31
MLE Mean (bias corrected)	1137	MLE Sd (bias corrected)	1850
		Approximate Chi Square Value (0.05)	25.95
Adjusted Level of Significance	0.0454	Adjusted Chi Square Value	25.64
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	1723	95% Adjusted Gamma UCL (use when n<50)	1744
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0234	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.122	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.772	Mean of logged Data	5.33
Maximum of Logged Data	9.602	SD of logged Data	2.43
Assuming Lognormal Distribution			
95% H-UCL	16492	90% Chebyshev (MVUE) UCL	8346
95% Chebyshev (MVUE) UCL	10655	97.5% Chebyshev (MVUE) UCL	13860
99% Chebyshev (MVUE) UCL	20155		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1682	95% Jackknife UCL	1692
95% Standard Bootstrap UCL	1690	95% Bootstrap-t UCL	2275
95% Hall's Bootstrap UCL	4083	95% Percentile Bootstrap UCL	1762
95% BCA Bootstrap UCL	1986		
90% Chebyshev(Mean, Sd) UCL	2131	95% Chebyshev(Mean, Sd) UCL	2581
97.5% Chebyshev(Mean, Sd) UCL	3206	99% Chebyshev(Mean, Sd) UCL	4433
Suggested UCL to Use			
95% Adjusted Gamma UCL	1744		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Nickel_FLT				
General Statistics				
Total Number of Observations	49	Number of Distinct Observations	47	
		Number of Missing Observations	0	
Minimum	1.6	Mean	2915	
Maximum	20100	Median	1100	
SD	4470	Std. Error of Mean	638.6	
Coefficient of Variation	1.533	Skewness	2.365	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.66	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.126	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	3986	95% Adjusted-CLT UCL (Chen-1995)	4196	
		95% Modified-t UCL (Johnson-1978)	4022	
Gamma GOF Test				
A-D Test Statistic	0.893	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.809	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.132	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.133	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.56	k star (bias corrected MLE)	0.539	
Theta hat (MLE)	5210	Theta star (bias corrected MLE)	5410	
nu hat (MLE)	54.83	nu star (bias corrected)	52.81	
MLE Mean (bias corrected)	2915	MLE Sd (bias corrected)	3971	
		Approximate Chi Square Value (0.05)	37.12	
Adjusted Level of Significance	0.0451	Adjusted Chi Square Value	36.72	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	4148	95% Adjusted Gamma UCL (use when n<50)	4193	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.947	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0712	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.126	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.47	Mean of logged Data	6.862	
Maximum of Logged Data	9.908	SD of logged Data	1.762	
Assuming Lognormal Distribution				
95% H-UCL	10402	90% Chebyshev (MVUE) UCL	8612	
95% Chebyshev (MVUE) UCL	10616	97.5% Chebyshev (MVUE) UCL	13397	
99% Chebyshev (MVUE) UCL	18860			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	3966	95% Jackknife UCL	3986	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Standard Bootstrap UCL	3980	95% Bootstrap-t UCL	4406
95% Hall's Bootstrap UCL	4170	95% Percentile Bootstrap UCL	4042
95% BCA Bootstrap UCL	4182		
90% Chebyshev(Mean, Sd) UCL	4831	95% Chebyshev(Mean, Sd) UCL	5699
97.5% Chebyshev(Mean, Sd) UCL	6903	99% Chebyshev(Mean, Sd) UCL	9269

Suggested UCL to Use

95% Adjusted Gamma UCL 4193

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel_Total

General Statistics

Total Number of Observations	51	Number of Distinct Observations	51
Number of Detects	50	Number of Non-Detects	1
Number of Distinct Detects	50	Number of Distinct Non-Detects	1
Minimum Detect	2.6	Minimum Non-Detect	20
Maximum Detect	20000	Maximum Non-Detect	20
Variance Detects	22695429	Percent Non-Detects	1.961%
Mean Detects	3077	SD Detects	4764
Median Detects	981	CV Detects	1.548
Skewness Detects	2.261	Kurtosis Detects	4.749
Mean of Logged Detects	6.887	SD of Logged Detects	1.743

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.655	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.125	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3016	KM Standard Error of Mean	663.3
KM SD	4689	95% KM (BCA) UCL	4172
95% KM (t) UCL	4128	95% KM (Percentile Bootstrap) UCL	4151
95% KM (z) UCL	4107	95% KM Bootstrap t UCL	4447
90% KM Chebyshev UCL	5006	95% KM Chebyshev UCL	5907
97.5% KM Chebyshev UCL	7158	99% KM Chebyshev UCL	9616

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.056	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.81	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.142	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.132	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.547	k star (bias corrected MLE)	0.528
Theta hat (MLE)	5621	Theta star (bias corrected MLE)	5829
nu hat (MLE)	54.73	nu star (bias corrected)	52.78
Mean (detects)	3077		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	0.01	Mean	3016
Maximum	20000	Median	952
SD	4736	CV	1.57
k hat (MLE)	0.474	k star (bias corrected MLE)	0.46
Theta hat (MLE)	6359	Theta star (bias corrected MLE)	6564
nu hat (MLE)	48.38	nu star (bias corrected)	46.87
Adjusted Level of Significance (β)	0.0453		
Approximate Chi Square Value (46.87, α)	32.16	Adjusted Chi Square Value (46.87, β)	31.81
95% Gamma Approximate UCL (use when n>=50)	4396	95% Gamma Adjusted UCL (use when n<50)	4445
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	3016	SD (KM)	4689
Variance (KM)	21987065	SE of Mean (KM)	663.3
k hat (KM)	0.414	k star (KM)	0.403
nu hat (KM)	42.21	nu star (KM)	41.06
theta hat (KM)	7289	theta star (KM)	7493
80% gamma percentile (KM)	4872	90% gamma percentile (KM)	8510
95% gamma percentile (KM)	12505	99% gamma percentile (KM)	22545
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (41.06, α)	27.37	Adjusted Chi Square Value (41.06, β)	27.05
95% Gamma Approximate KM-UCL (use when n>=50)	4524	95% Gamma Adjusted KM-UCL (use when n<50)	4579
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0569	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.125	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	3017	Mean in Log Scale	6.81
SD in Original Scale	4735	SD in Log Scale	1.81
95% t UCL (assumes normality of ROS data)	4128	95% Percentile Bootstrap UCL	4144
95% BCA Bootstrap UCL	4290	95% Bootstrap t UCL	4544
95% H-UCL (Log ROS)	10803		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	6.771	KM Geo Mean	872
KM SD (logged)	1.896	95% Critical H Value (KM-Log)	3.392
KM Standard Error of Mean (logged)	0.268	95% H-UCL (KM -Log)	13058
KM SD (logged)	1.896	95% Critical H Value (KM-Log)	3.392
KM Standard Error of Mean (logged)	0.268		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	3016	Mean in Log Scale	6.797
SD in Original Scale	4736	SD in Log Scale	1.841
95% t UCL (Assumes normality)	4128	95% H-Stat UCL	11558
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	13058		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Nitrate+Nitrite as N_Total			

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	2	Number of Distinct Observations	2	
		Number of Missing Observations	0	
Minimum	53	Mean	53.5	
Maximum	54	Median	53.5	

Warning: This data set only has 2 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Nitrate+Nitrite as N_Total was not processed!

It is suggested to collect at least 8 to 10 observations before using these statistical methods!
If possible, compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Zinc_FLT

General Statistics			
Total Number of Observations	49	Number of Distinct Observations	47
		Number of Missing Observations	0
Minimum	98.6	Mean	3900
Maximum	23300	Median	1410
SD	5200	Std. Error of Mean	742.9
Coefficient of Variation	1.334	Skewness	1.951
Normal GOF Test			
Shapiro Wilk Test Statistic	0.728	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.126	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5146	95% Adjusted-CLT UCL (Chen-1995)	5343
		95% Modified-t UCL (Johnson-1978)	5180
Gamma GOF Test			
A-D Test Statistic	1.335	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.798	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.172	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics			
k hat (MLE)	0.685	k star (bias corrected MLE)	0.657
Theta hat (MLE)	5692	Theta star (bias corrected MLE)	5938
nu hat (MLE)	67.13	nu star (bias corrected)	64.36
MLE Mean (bias corrected)	3900	MLE Sd (bias corrected)	4812
		Approximate Chi Square Value (0.05)	46.9
Adjusted Level of Significance	0.0451	Adjusted Chi Square Value	46.45
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5351	95% Adjusted Gamma UCL (use when n<50)	5403
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0945	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.126	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics			
Minimum of Logged Data	4.591	Mean of logged Data	7.384
Maximum of Logged Data	10.06	SD of logged Data	1.424

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	7942	90% Chebyshev (MVUE) UCL	7649	
95% Chebyshev (MVUE) UCL	9183	97.5% Chebyshev (MVUE) UCL	11313	
99% Chebyshev (MVUE) UCL	15496			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	5122	95% Jackknife UCL	5146	
95% Standard Bootstrap UCL	5119	95% Bootstrap-t UCL	5525	
95% Hall's Bootstrap UCL	5443	95% Percentile Bootstrap UCL	5168	
95% BCA Bootstrap UCL	5330			
90% Chebyshev(Mean, Sd) UCL	6128	95% Chebyshev(Mean, Sd) UCL	7138	
97.5% Chebyshev(Mean, Sd) UCL	8539	99% Chebyshev(Mean, Sd) UCL	11291	
Suggested UCL to Use				
95% H-UCL	7942			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.				
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.				
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.				
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.				
Zinc_Total				
General Statistics				
Total Number of Observations	51	Number of Distinct Observations	49	
		Number of Missing Observations	0	
Minimum	65.6	Mean	4245	
Maximum	25500	Median	1450	
SD	5681	Std. Error of Mean	795.5	
Coefficient of Variation	1.338	Skewness	1.925	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.733	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.328E-11	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.123	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	5578	95% Adjusted-CLT UCL (Chen-1995)	5783	
		95% Modified-t UCL (Johnson-1978)	5614	
Gamma GOF Test				
A-D Test Statistic	1.149	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.801	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.152	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.13	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.654	k star (bias corrected MLE)	0.628	
Theta hat (MLE)	6495	Theta star (bias corrected MLE)	6758	
nu hat (MLE)	66.66	nu star (bias corrected)	64.07	
MLE Mean (bias corrected)	4245	MLE Sd (bias corrected)	5356	
		Approximate Chi Square Value (0.05)	46.66	

Table E1-15
Surface Water (Herman Impoundment), 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Adjusted Level of Significance	0.0453	Adjusted Chi Square Value	46.22
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	5830	95% Adjusted Gamma UCL (use when n<50)	5884
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.216	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0923	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.123	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.184	Mean of logged Data	7.42
Maximum of Logged Data	10.15	SD of logged Data	1.494
Assuming Lognormal Distribution			
95% H-UCL	9346	90% Chebyshev (MVUE) UCL	8937
95% Chebyshev (MVUE) UCL	10777	97.5% Chebyshev (MVUE) UCL	13331
99% Chebyshev (MVUE) UCL	18347		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	5553	95% Jackknife UCL	5578
95% Standard Bootstrap UCL	5506	95% Bootstrap-t UCL	5943
95% Hall's Bootstrap UCL	5861	95% Percentile Bootstrap UCL	5605
95% BCA Bootstrap UCL	5774		
90% Chebyshev(Mean, Sd) UCL	6631	95% Chebyshev(Mean, Sd) UCL	7712
97.5% Chebyshev(Mean, Sd) UCL	9213	99% Chebyshev(Mean, Sd) UCL	12160
Suggested UCL to Use			
95% H-UCL	9346		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Table E1-16
Ambient Surface Water, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Zinc_FLT

General Statistics

Total Number of Observations	10	Number of Distinct Observations	2
Number of Detects	1	Number of Non-Detects	9
Number of Distinct Detects	1	Number of Distinct Non-Detects	1

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc_FLT was not processed!

Zinc_Total

General Statistics

Total Number of Observations	10	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	10
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc_Total was not processed!

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.19/16/2019 12:43:46 PM
From File	ProUCLData_Sed_20190916.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	159	Number of Distinct Observations	104
		Number of Missing Observations	0
Minimum	5790	Mean	29323
Maximum	180000	Median	22900
SD	23092	Std. Error of Mean	1831
Coefficient of Variation	0.788	Skewness	2.684

Normal GOF Test

Shapiro Wilk Test Statistic	0.784	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0707	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	32353	95% Adjusted-CLT UCL (Chen-1995)	32752
		95% Modified-t UCL (Johnson-1978)	32418

Gamma GOF Test

A-D Test Statistic	1.753	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.764	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0873	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.0751	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.316	k star (bias corrected MLE)	2.276
Theta hat (MLE)	12663	Theta star (bias corrected MLE)	12883
nu hat (MLE)	736.4	nu star (bias corrected)	723.8
MLE Mean (bias corrected)	29323	MLE Sd (bias corrected)	19436
		Approximate Chi Square Value (0.05)	662.4
Adjusted Level of Significance	0.0485	Adjusted Chi Square Value	661.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32042	95% Adjusted Gamma UCL (use when n<50)	32068

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.159	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0788	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0707	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	8.664	Mean of logged Data	10.05
Maximum of Logged Data	12.1	SD of logged Data	0.667

Assuming Lognormal Distribution

95% H-UCL	32221	90% Chebyshev (MVUE) UCL	34081
95% Chebyshev (MVUE) UCL	36375	97.5% Chebyshev (MVUE) UCL	39558
99% Chebyshev (MVUE) UCL	45810		

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	32335	95% Jackknife UCL	32353
	95% Standard Bootstrap UCL	32287	95% Bootstrap-t UCL	32944
	95% Hall's Bootstrap UCL	32970	95% Percentile Bootstrap UCL	32478
	95% BCA Bootstrap UCL	32490		
	90% Chebyshev(Mean, Sd) UCL	34817	95% Chebyshev(Mean, Sd) UCL	37306
	97.5% Chebyshev(Mean, Sd) UCL	40760	99% Chebyshev(Mean, Sd) UCL	47545
	Suggested UCL to Use			
	95% H-UCL	32221		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
	H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
	Antimony			
	General Statistics			
	Total Number of Observations	166	Number of Distinct Observations	103
	Number of Detects	47	Number of Non-Detects	119
	Number of Distinct Detects	43	Number of Distinct Non-Detects	68
	Minimum Detect	0.01	Minimum Non-Detect	0.265
	Maximum Detect	110	Maximum Non-Detect	465
	Variance Detects	1157	Percent Non-Detects	71.69%
	Mean Detects	25.07	SD Detects	34.01
	Median Detects	4.4	CV Detects	1.356
	Skewness Detects	1.18	Kurtosis Detects	0.0622
	Mean of Logged Detects	1.325	SD of Logged Detects	2.568
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.739	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.946	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.128	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	8.089	KM Standard Error of Mean	1.717
	KM SD	21.33	95% KM (BCA) UCL	10.88
	95% KM (t) UCL	10.93	95% KM (Percentile Bootstrap) UCL	10.96
	95% KM (z) UCL	10.91	95% KM Bootstrap t UCL	11.52
	90% KM Chebyshev UCL	13.24	95% KM Chebyshev UCL	15.58
	97.5% KM Chebyshev UCL	18.81	99% KM Chebyshev UCL	25.18
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	1.45	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.849	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.183	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.139	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.354	k star (bias corrected MLE)	0.345
	Theta hat (MLE)	70.85	Theta star (bias corrected MLE)	72.57
	nu hat (MLE)	33.26	nu star (bias corrected)	32.47

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (detects)	25.07		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	7.618
Maximum	110	Median	0.01
SD	21.17	CV	2.779
k hat (MLE)	0.17	k star (bias corrected MLE)	0.171
Theta hat (MLE)	44.7	Theta star (bias corrected MLE)	44.45
nu hat (MLE)	56.59	nu star (bias corrected)	56.9
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (56.90, α)	40.56	Adjusted Chi Square Value (56.90, β)	40.44
95% Gamma Approximate UCL (use when n>=50)	10.69	95% Gamma Adjusted UCL (use when n<50)	10.72
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	8.089	SD (KM)	21.33
Variance (KM)	454.9	SE of Mean (KM)	1.717
k hat (KM)	0.144	k star (KM)	0.145
nu hat (KM)	47.76	nu star (KM)	48.23
theta hat (KM)	56.24	theta star (KM)	55.69
80% gamma percentile (KM)	8.571	90% gamma percentile (KM)	23.87
95% gamma percentile (KM)	44.8	99% gamma percentile (KM)	105.9
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (48.23, α)	33.29	Adjusted Chi Square Value (48.23, β)	33.18
95% Gamma Approximate KM-UCL (use when n>=50)	11.72	95% Gamma Adjusted KM-UCL (use when n<50)	11.76
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.946	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.137	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.128	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	7.457	Mean in Log Scale	-0.602
SD in Original Scale	21.12	SD in Log Scale	2.076
95% t UCL (assumes normality of ROS data)	10.17	95% Percentile Bootstrap UCL	10.29
95% BCA Bootstrap UCL	10.71	95% Bootstrap t UCL	10.81
95% H-UCL (Log ROS)	8.031		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-0.69	KM Geo Mean	0.502
KM SD (logged)	2.403	95% Critical H Value (KM-Log)	3.669
KM Standard Error of Mean (logged)	0.308	95% H-UCL (KM -Log)	17.89
KM SD (logged)	2.403	95% Critical H Value (KM-Log)	3.669
KM Standard Error of Mean (logged)	0.308		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	15.4	Mean in Log Scale	1.481
SD in Original Scale	27.31	SD in Log Scale	1.908
95% t UCL (Assumes normality)	18.9	95% H-Stat UCL	42.95
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	15.58		

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic

General Statistics

Total Number of Observations	175	Number of Distinct Observations	115
Number of Detects	127	Number of Non-Detects	48
Number of Distinct Detects	91	Number of Distinct Non-Detects	33
Minimum Detect	0.68	Minimum Non-Detect	0.6
Maximum Detect	190	Maximum Non-Detect	50
Variance Detects	1331	Percent Non-Detects	27.43%
Mean Detects	24.57	SD Detects	36.48
Median Detects	6	CV Detects	1.484
Skewness Detects	2.266	Kurtosis Detects	5.518
Mean of Logged Detects	2.195	SD of Logged Detects	1.45

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.677	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.079	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	18.32	KM Standard Error of Mean	2.476
KM SD	32.61	95% KM (BCA) UCL	22.44
95% KM (t) UCL	22.41	95% KM (Percentile Bootstrap) UCL	22.47
95% KM (z) UCL	22.39	95% KM Bootstrap t UCL	23.25
90% KM Chebyshev UCL	25.74	95% KM Chebyshev UCL	29.11
97.5% KM Chebyshev UCL	33.78	99% KM Chebyshev UCL	42.95

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.572	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.187	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0866	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.612	k star (bias corrected MLE)	0.603
Theta hat (MLE)	40.16	Theta star (bias corrected MLE)	40.77
nu hat (MLE)	155.4	nu star (bias corrected)	153.1
Mean (detects)	24.57		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	17.84
Maximum	190	Median	3.1
SD	32.93	CV	1.846
k hat (MLE)	0.274	k star (bias corrected MLE)	0.273
Theta hat (MLE)	65.04	Theta star (bias corrected MLE)	65.25
nu hat (MLE)	95.98	nu star (bias corrected)	95.67
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (95.67, α)	74.11	Adjusted Chi Square Value (95.67, β)	73.95
95% Gamma Approximate UCL (use when n>=50)	23.03	95% Gamma Adjusted UCL (use when n<50)	23.07

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	18.32	SD (KM)	32.61

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Variance (KM)	1063	SE of Mean (KM)	2.476
	k hat (KM)	0.316	k star (KM)	0.314
	nu hat (KM)	110.4	nu star (KM)	109.9
	theta hat (KM)	58.05	theta star (KM)	58.35
	80% gamma percentile (KM)	28.39	90% gamma percentile (KM)	53.72
	95% gamma percentile (KM)	82.57	99% gamma percentile (KM)	157.1
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (109.87, α)	86.67	Adjusted Chi Square Value (109.87, β)	86.5
	95% Gamma Approximate KM-UCL (use when n>=50)	23.22	95% Gamma Adjusted KM-UCL (use when n<50)	23.26
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.915	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	1.6011E-9	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.079	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	18.18	Mean in Log Scale	1.593
	SD in Original Scale	32.75	SD in Log Scale	1.626
	95% t UCL (assumes normality of ROS data)	22.28	95% Percentile Bootstrap UCL	22.48
	95% BCA Bootstrap UCL	23.01	95% Bootstrap t UCL	22.71
	95% H-UCL (Log ROS)	26		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	1.683	KM Geo Mean	5.384
	KM SD (logged)	1.516	95% Critical H Value (KM-Log)	2.664
	KM Standard Error of Mean (logged)	0.118	95% H-UCL (KM -Log)	23.09
	KM SD (logged)	1.516	95% Critical H Value (KM-Log)	2.664
	KM Standard Error of Mean (logged)	0.118		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	18.52	Mean in Log Scale	1.701
	SD in Original Scale	32.65	SD in Log Scale	1.537
	95% t UCL (Assumes normality)	22.6	95% H-Stat UCL	24.44
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	29.11		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Barium			
	General Statistics			
	Total Number of Observations	166	Number of Distinct Observations	122
	Number of Detects	164	Number of Non-Detects	2
	Number of Distinct Detects	120	Number of Distinct Non-Detects	2
	Minimum Detect	43	Minimum Non-Detect	23
	Maximum Detect	1280	Maximum Non-Detect	50
	Variance Detects	41377	Percent Non-Detects	1.205%
	Mean Detects	383.6	SD Detects	203.4
	Median Detects	352.5	CV Detects	0.53
	Skewness Detects	0.995	Kurtosis Detects	2.057
	Mean of Logged Detects	5.791	SD of Logged Detects	0.611
	Normal GOF Test on Detects Only			

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Shapiro Wilk Test Statistic	0.947	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	7.3498E-6	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.0731	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0696	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	379.4	KM Standard Error of Mean	15.98	
KM SD	205.2	95% KM (BCA) UCL	407.1	
95% KM (t) UCL	405.8	95% KM (Percentile Bootstrap) UCL	406.3	
95% KM (z) UCL	405.7	95% KM Bootstrap t UCL	407.5	
90% KM Chebyshev UCL	427.3	95% KM Chebyshev UCL	449	
97.5% KM Chebyshev UCL	479.2	99% KM Chebyshev UCL	538.3	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.533	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0432	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0734	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.307	k star (bias corrected MLE)	3.25	
Theta hat (MLE)	116	Theta star (bias corrected MLE)	118	
nu hat (MLE)	1085	nu star (bias corrected)	1066	
Mean (detects)	383.6			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	43	Mean	379.7	
Maximum	1280	Median	347	
SD	205.3	CV	0.541	
k hat (MLE)	3.098	k star (bias corrected MLE)	3.046	
Theta hat (MLE)	122.6	Theta star (bias corrected MLE)	124.7	
nu hat (MLE)	1028	nu star (bias corrected)	1011	
Adjusted Level of Significance (β)	0.0486			
Approximate Chi Square Value (N/A, α)	938.4	Adjusted Chi Square Value (N/A, β)	937.8	
95% Gamma Approximate UCL (use when n>=50)	409.1	95% Gamma Adjusted UCL (use when n<50)	409.4	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	379.4	SD (KM)	205.2	
Variance (KM)	42118	SE of Mean (KM)	15.98	
k hat (KM)	3.417	k star (KM)	3.359	
nu hat (KM)	1134	nu star (KM)	1115	
theta hat (KM)	111	theta star (KM)	112.9	
80% gamma percentile (KM)	533.9	90% gamma percentile (KM)	656.9	
95% gamma percentile (KM)	771.1	99% gamma percentile (KM)	1017	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (N/A, α)	1039	Adjusted Chi Square Value (N/A, β)	1038	
95% Gamma Approximate KM-UCL (use when n>=50)	407.3	95% Gamma Adjusted KM-UCL (use when n<50)	407.6	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.948	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.1842E-5	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0807	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0696	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	379.9	Mean in Log Scale	5.772	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

SD in Original Scale	205.1	SD in Log Scale	0.63
95% t UCL (assumes normality of ROS data)	406.2	95% Percentile Bootstrap UCL	406.5
95% BCA Bootstrap UCL	409.3	95% Bootstrap t UCL	408
95% H-UCL (Log ROS)	429.8		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	5.762	KM Geo Mean	317.8
KM SD (logged)	0.662	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0516	95% H-UCL (KM -Log)	436.5
KM SD (logged)	0.662	95% Critical H Value (KM-Log)	1.906
KM Standard Error of Mean (logged)	0.0516		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	379.2	Mean in Log Scale	5.755
SD in Original Scale	206.1	SD in Log Scale	0.689
95% t UCL (Assumes normality)	405.7	95% H-Stat UCL	444.1
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Gamma Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM Approximate Gamma UCL	407.3	95% GROS Approximate Gamma UCL	409.1
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Beryllium			
General Statistics			
Total Number of Observations	166	Number of Distinct Observations	86
Number of Detects	163	Number of Non-Detects	3
Number of Distinct Detects	84	Number of Distinct Non-Detects	3
Minimum Detect	0.21	Minimum Non-Detect	0.195
Maximum Detect	21	Maximum Non-Detect	0.295
Variance Detects	11.29	Percent Non-Detects	1.807%
Mean Detects	1.791	SD Detects	3.36
Median Detects	0.76	CV Detects	1.875
Skewness Detects	4.212	Kurtosis Detects	18.19
Mean of Logged Detects	-0.0826	SD of Logged Detects	0.991
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.442	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0698	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	1.763	KM Standard Error of Mean	0.259
KM SD	3.326	95% KM (BCA) UCL	2.235
95% KM (t) UCL	2.191	95% KM (Percentile Bootstrap) UCL	2.204
95% KM (z) UCL	2.189	95% KM Bootstrap t UCL	2.311
90% KM Chebyshev UCL	2.54	95% KM Chebyshev UCL	2.891
97.5% KM Chebyshev UCL	3.38	99% KM Chebyshev UCL	4.339
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	10.3	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.17	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0757	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	0.881	k star (bias corrected MLE)	0.869	
Theta hat (MLE)	2.034	Theta star (bias corrected MLE)	2.063	
nu hat (MLE)	287.1	nu star (bias corrected)	283.1	
Mean (detects)	1.791			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	1.759	
Maximum	21	Median	0.75	
SD	3.337	CV	1.897	
k hat (MLE)	0.812	k star (bias corrected MLE)	0.802	
Theta hat (MLE)	2.166	Theta star (bias corrected MLE)	2.195	
nu hat (MLE)	269.7	nu star (bias corrected)	266.1	
Adjusted Level of Significance (β)	0.0486			
Approximate Chi Square Value (266.12, α)	229.3	Adjusted Chi Square Value (266.12, β)	229	
95% Gamma Approximate UCL (use when n>=50)	2.041	95% Gamma Adjusted UCL (use when n<50)	2.044	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	1.763	SD (KM)	3.326	
Variance (KM)	11.06	SE of Mean (KM)	0.259	
k hat (KM)	0.281	k star (KM)	0.28	
nu hat (KM)	93.29	nu star (KM)	92.94	
theta hat (KM)	6.274	theta star (KM)	6.297	
80% gamma percentile (KM)	2.654	90% gamma percentile (KM)	5.24	
95% gamma percentile (KM)	8.243	99% gamma percentile (KM)	16.12	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (92.94, α)	71.7	Adjusted Chi Square Value (92.94, β)	71.54	
95% Gamma Approximate KM-UCL (use when n>=50)	2.285	95% Gamma Adjusted KM-UCL (use when n<50)	2.29	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.905	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	1.332E-15	Detected Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0983	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0698	Detected Data Not Lognormal at 5% Significance Level		
Detected Data Not Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	1.761	Mean in Log Scale	-0.125	
SD in Original Scale	3.337	SD in Log Scale	1.031	
95% t UCL (assumes normality of ROS data)	2.189	95% Percentile Bootstrap UCL	2.206	
95% BCA Bootstrap UCL	2.308	95% Bootstrap t UCL	2.343	
95% H-UCL (Log ROS)	1.79			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.109	KM Geo Mean	0.896	
KM SD (logged)	0.998	95% Critical H Value (KM-Log)	2.161	
KM Standard Error of Mean (logged)	0.0777	95% H-UCL (KM -Log)	1.745	
KM SD (logged)	0.998	95% Critical H Value (KM-Log)	2.161	
KM Standard Error of Mean (logged)	0.0777			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	1.761	Mean in Log Scale	-0.12	
SD in Original Scale	3.336	SD in Log Scale	1.021	
95% t UCL (Assumes normality)	2.19	95% H-Stat UCL	1.775	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	2.891			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Boron				
General Statistics				
Total Number of Observations	115	Number of Distinct Observations	98	
		Number of Missing Observations	0	
Minimum	6.9	Mean	260.9	
Maximum	2800	Median	150	
SD	375.3	Std. Error of Mean	35	
Coefficient of Variation	1.438	Skewness	3.878	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.612	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0829	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	319	95% Adjusted-CLT UCL (Chen-1995)	332	
		95% Modified-t UCL (Johnson-1978)	321.1	
Gamma GOF Test				
A-D Test Statistic	1.575	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.788	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.101	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.0885	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.893	k star (bias corrected MLE)	0.876	
Theta hat (MLE)	292.1	Theta star (bias corrected MLE)	297.9	
nu hat (MLE)	205.5	nu star (bias corrected)	201.4	
MLE Mean (bias corrected)	260.9	MLE Sd (bias corrected)	278.8	
		Approximate Chi Square Value (0.05)	169.6	
Adjusted Level of Significance	0.0479	Adjusted Chi Square Value	169.2	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	309.9	95% Adjusted Gamma UCL (use when n<50)	310.6	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	0.24	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0548	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.0829	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.932	Mean of logged Data	4.909	
Maximum of Logged Data	7.937	SD of logged Data	1.194	
Assuming Lognormal Distribution				
95% H-UCL	361.5	90% Chebyshev (MVUE) UCL	389.7	
95% Chebyshev (MVUE) UCL	442.4	97.5% Chebyshev (MVUE) UCL	515.5	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	659.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	318.5	95% Jackknife UCL	319
95% Standard Bootstrap UCL	318	95% Bootstrap-t UCL	348
95% Hall's Bootstrap UCL	352.9	95% Percentile Bootstrap UCL	319.8
95% BCA Bootstrap UCL	332.5		
90% Chebyshev(Mean, Sd) UCL	365.9	95% Chebyshev(Mean, Sd) UCL	413.5
97.5% Chebyshev(Mean, Sd) UCL	479.5	99% Chebyshev(Mean, Sd) UCL	609.1
Suggested UCL to Use			
95% H-UCL	361.5		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Cadmium			
General Statistics			
Total Number of Observations	166	Number of Distinct Observations	90
Number of Detects	77	Number of Non-Detects	89
Number of Distinct Detects	62	Number of Distinct Non-Detects	37
Minimum Detect	0.02	Minimum Non-Detect	0.17
Maximum Detect	7.2	Maximum Non-Detect	23.5
Variance Detects	1.033	Percent Non-Detects	53.61%
Mean Detects	0.717	SD Detects	1.016
Median Detects	0.46	CV Detects	1.418
Skewness Detects	4.015	Kurtosis Detects	21.88
Mean of Logged Detects	-1.013	SD of Logged Detects	1.22
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.622	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.247	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.101	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.511	KM Standard Error of Mean	0.0634
KM SD	0.752	95% KM (BCA) UCL	0.616
95% KM (t) UCL	0.616	95% KM (Percentile Bootstrap) UCL	0.623
95% KM (z) UCL	0.616	95% KM Bootstrap t UCL	0.644
90% KM Chebyshev UCL	0.701	95% KM Chebyshev UCL	0.788
97.5% KM Chebyshev UCL	0.907	99% KM Chebyshev UCL	1.142
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.176	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.788	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.105	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.865	k star (bias corrected MLE)	0.84
Theta hat (MLE)	0.829	Theta star (bias corrected MLE)	0.854

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	133.2	nu star (bias corrected)	129.3
	Mean (detects)	0.717		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	0.46
	Maximum	7.2	Median	0.235
	SD	0.755	CV	1.643
	k hat (MLE)	0.628	k star (bias corrected MLE)	0.621
	Theta hat (MLE)	0.732	Theta star (bias corrected MLE)	0.74
	nu hat (MLE)	208.6	nu star (bias corrected)	206.1
	Adjusted Level of Significance (β)	0.0486		
	Approximate Chi Square Value (206.14, α)	173.9	Adjusted Chi Square Value (206.14, β)	173.7
	95% Gamma Approximate UCL (use when n>=50)	0.545	95% Gamma Adjusted UCL (use when n<50)	0.546
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	0.511	SD (KM)	0.752
	Variance (KM)	0.566	SE of Mean (KM)	0.0634
	k hat (KM)	0.462	k star (KM)	0.458
	nu hat (KM)	153.4	nu star (KM)	152
	theta hat (KM)	1.106	theta star (KM)	1.117
	80% gamma percentile (KM)	0.836	90% gamma percentile (KM)	1.408
	95% gamma percentile (KM)	2.027	99% gamma percentile (KM)	3.56
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (152.01, α)	124.5	Adjusted Chi Square Value (152.01, β)	124.3
	95% Gamma Approximate KM-UCL (use when n>=50)	0.624	95% Gamma Adjusted KM-UCL (use when n<50)	0.625
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.97	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0.207	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.112	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.101	Detected Data Not Lognormal at 5% Significance Level	
	Detected Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.473	Mean in Log Scale	-1.285
	SD in Original Scale	0.736	SD in Log Scale	0.979
	95% t UCL (assumes normality of ROS data)	0.568	95% Percentile Bootstrap UCL	0.578
	95% BCA Bootstrap UCL	0.602	95% Bootstrap t UCL	0.62
	95% H-UCL (Log ROS)	0.526		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-1.302	KM Geo Mean	0.272
	KM SD (logged)	1.132	95% Critical H Value (KM-Log)	2.279
	KM Standard Error of Mean (logged)	0.12	95% H-UCL (KM -Log)	0.631
	KM SD (logged)	1.132	95% Critical H Value (KM-Log)	2.279
	KM Standard Error of Mean (logged)	0.12		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	0.755	Mean in Log Scale	-0.777
	SD in Original Scale	1.173	SD in Log Scale	0.986
	95% t UCL (Assumes normality)	0.905	95% H-Stat UCL	0.881
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	0.631		

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Chromium

General Statistics

Total Number of Observations	166	Number of Distinct Observations	116
Number of Detects	164	Number of Non-Detects	2
Number of Distinct Detects	114	Number of Distinct Non-Detects	2
Minimum Detect	8.5	Minimum Non-Detect	10
Maximum Detect	170	Maximum Non-Detect	46.5
Variance Detects	732.5	Percent Non-Detects	1.205%
Mean Detects	49.63	SD Detects	27.06
Median Detects	43.7	CV Detects	0.545
Skewness Detects	1.968	Kurtosis Detects	5.567
Mean of Logged Detects	3.781	SD of Logged Detects	0.496

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.841	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0696	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	49.28	KM Standard Error of Mean	2.107
KM SD	27.05	95% KM (BCA) UCL	52.8
95% KM (t) UCL	52.77	95% KM (Percentile Bootstrap) UCL	52.9
95% KM (z) UCL	52.75	95% KM Bootstrap t UCL	53.18
90% KM Chebyshev UCL	55.6	95% KM Chebyshev UCL	58.47
97.5% KM Chebyshev UCL	62.44	99% KM Chebyshev UCL	70.24

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.952	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.756	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0636	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0732	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.203	k star (bias corrected MLE)	4.131
Theta hat (MLE)	11.81	Theta star (bias corrected MLE)	12.02
nu hat (MLE)	1379	nu star (bias corrected)	1355
Mean (detects)	49.63		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	4.434	Mean	49.25
Maximum	170	Median	43.2
SD	27.16	CV	0.551
k hat (MLE)	3.955	k star (bias corrected MLE)	3.888
Theta hat (MLE)	12.45	Theta star (bias corrected MLE)	12.67
nu hat (MLE)	1313	nu star (bias corrected)	1291
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (N/A, α)	1208	Adjusted Chi Square Value (N/A, β)	1208
95% Gamma Approximate UCL (use when n>=50)	52.61	95% Gamma Adjusted UCL (use when n<50)	52.64

Estimates of Gamma Parameters using KM Estimates

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Mean (KM)	49.28	SD (KM)	27.05
	Variance (KM)	731.6	SE of Mean (KM)	2.107
	k hat (KM)	3.32	k star (KM)	3.264
	nu hat (KM)	1102	nu star (KM)	1084
	theta hat (KM)	14.85	theta star (KM)	15.1
	80% gamma percentile (KM)	69.59	90% gamma percentile (KM)	85.86
	95% gamma percentile (KM)	101	99% gamma percentile (KM)	133.6
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (N/A, α)	1008	Adjusted Chi Square Value (N/A, β)	1008
	95% Gamma Approximate KM-UCL (use when n>=50)	52.97	95% Gamma Adjusted KM-UCL (use when n<50)	53
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.988	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0.855	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0504	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0696	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	49.3	Mean in Log Scale	3.771
	SD in Original Scale	27.09	SD in Log Scale	0.504
	95% t UCL (assumes normality of ROS data)	52.78	95% Percentile Bootstrap UCL	52.95
	95% BCA Bootstrap UCL	53.25	95% Bootstrap t UCL	53.21
	95% H-UCL (Log ROS)	52.96		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	3.769	KM Geo Mean	43.34
	KM SD (logged)	0.509	95% Critical H Value (KM-Log)	1.816
	KM Standard Error of Mean (logged)	0.0397	95% H-UCL (KM -Log)	53.03
	KM SD (logged)	0.509	95% Critical H Value (KM-Log)	1.816
	KM Standard Error of Mean (logged)	0.0397		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	49.21	Mean in Log Scale	3.764
	SD in Original Scale	27.2	SD in Log Scale	0.524
	95% t UCL (Assumes normality)	52.7	95% H-Stat UCL	53.28
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Gamma Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM Approximate Gamma UCL	52.97	95% GROS Approximate Gamma UCL	52.61
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Cobalt			
	General Statistics			
	Total Number of Observations	166	Number of Distinct Observations	121
	Number of Detects	164	Number of Non-Detects	2
	Number of Distinct Detects	119	Number of Distinct Non-Detects	2
	Minimum Detect	4.4	Minimum Non-Detect	3.9
	Maximum Detect	240	Maximum Non-Detect	4
	Variance Detects	849.6	Percent Non-Detects	1.205%
	Mean Detects	27.3	SD Detects	29.15
	Median Detects	18.15	CV Detects	1.068

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Skewness Detects	3.746	Kurtosis Detects	20.3
	Mean of Logged Detects	2.969	SD of Logged Detects	0.783
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.662	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0696	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	27.02	KM Standard Error of Mean	2.257
	KM SD	29	95% KM (BCA) UCL	31.05
	95% KM (t) UCL	30.75	95% KM (Percentile Bootstrap) UCL	30.96
	95% KM (z) UCL	30.73	95% KM Bootstrap t UCL	31.63
	90% KM Chebyshev UCL	33.79	95% KM Chebyshev UCL	36.86
	97.5% KM Chebyshev UCL	41.11	99% KM Chebyshev UCL	49.48
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	3.565	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.77	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.137	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.0742	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	1.628	k star (bias corrected MLE)	1.603
	Theta hat (MLE)	16.76	Theta star (bias corrected MLE)	17.03
	nu hat (MLE)	534.1	nu star (bias corrected)	525.7
	Mean (detects)	27.3		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	26.97
	Maximum	240	Median	18.05
	SD	29.12	CV	1.08
	k hat (MLE)	1.342	k star (bias corrected MLE)	1.322
	Theta hat (MLE)	20.09	Theta star (bias corrected MLE)	20.4
	nu hat (MLE)	445.7	nu star (bias corrected)	439
	Adjusted Level of Significance (β)	0.0486		
	Approximate Chi Square Value (438.96, α)	391.4	Adjusted Chi Square Value (438.96, β)	391
	95% Gamma Approximate UCL (use when n>=50)	30.25	95% Gamma Adjusted UCL (use when n<50)	30.28
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	27.02	SD (KM)	29
	Variance (KM)	840.7	SE of Mean (KM)	2.257
	k hat (KM)	0.868	k star (KM)	0.856
	nu hat (KM)	288.2	nu star (KM)	284.3
	theta hat (KM)	31.12	theta star (KM)	31.54
	80% gamma percentile (KM)	43.97	90% gamma percentile (KM)	64.61
	95% gamma percentile (KM)	85.52	99% gamma percentile (KM)	134.6
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (284.33, α)	246.3	Adjusted Chi Square Value (284.33, β)	246
	95% Gamma Approximate KM-UCL (use when n>=50)	31.19	95% Gamma Adjusted KM-UCL (use when n<50)	31.23
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.967	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0.0145	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0738	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0696	Detected Data Not Lognormal at 5% Significance Level	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Detected Data Not Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	27	Mean in Log Scale	2.944
	SD in Original Scale	29.1	SD in Log Scale	0.811
	95% t UCL (assumes normality of ROS data)	30.73	95% Percentile Bootstrap UCL	30.96
	95% BCA Bootstrap UCL	31.24	95% Bootstrap t UCL	31.63
	95% H-UCL (Log ROS)	29.95		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	2.95	KM Geo Mean	19.11
	KM SD (logged)	0.795	95% Critical H Value (KM-Log)	1.999
	KM Standard Error of Mean (logged)	0.0619	95% H-UCL (KM -Log)	29.66
	KM SD (logged)	0.795	95% Critical H Value (KM-Log)	1.999
	KM Standard Error of Mean (logged)	0.0619		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	26.99	Mean in Log Scale	2.942
	SD in Original Scale	29.1	SD in Log Scale	0.817
	95% t UCL (Assumes normality)	30.73	95% H-Stat UCL	30.08
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Data do not follow a Discernible Distribution at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (Chebyshev) UCL	36.86		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Copper			
	General Statistics			
	Total Number of Observations	166	Number of Distinct Observations	120
	Number of Detects	154	Number of Non-Detects	12
	Number of Distinct Detects	113	Number of Distinct Non-Detects	9
	Minimum Detect	3.5	Minimum Non-Detect	1.7
	Maximum Detect	160	Maximum Non-Detect	95
	Variance Detects	922.4	Percent Non-Detects	7.229%
	Mean Detects	34.38	SD Detects	30.37
	Median Detects	24	CV Detects	0.883
	Skewness Detects	1.936	Kurtosis Detects	3.943
	Mean of Logged Detects	3.219	SD of Logged Detects	0.801
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.781	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.216	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0718	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	32.47	KM Standard Error of Mean	2.347
	KM SD	30.08	95% KM (BCA) UCL	36.48
	95% KM (t) UCL	36.35	95% KM (Percentile Bootstrap) UCL	36.43
	95% KM (z) UCL	36.33	95% KM Bootstrap t UCL	36.79
	90% KM Chebyshev UCL	39.51	95% KM Chebyshev UCL	42.7
	97.5% KM Chebyshev UCL	47.13	99% KM Chebyshev UCL	55.82
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	2.123	**Anderson-Darling GOF Test**	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.124	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.0767	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	1.717	k star (bias corrected MLE)	1.688
	Theta hat (MLE)	20.02	Theta star (bias corrected MLE)	20.36
	nu hat (MLE)	529	nu star (bias corrected)	520
	Mean (detects)	34.38		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	32.25
	Maximum	160	Median	23
	SD	30.3	CV	0.94
	k hat (MLE)	0.931	k star (bias corrected MLE)	0.918
	Theta hat (MLE)	34.65	Theta star (bias corrected MLE)	35.13
	nu hat (MLE)	309	nu star (bias corrected)	304.8
	Adjusted Level of Significance (β)	0.0486		
	Approximate Chi Square Value (304.75, α)	265.3	Adjusted Chi Square Value (304.75, β)	265
	95% Gamma Approximate UCL (use when n>=50)	37.04	95% Gamma Adjusted UCL (use when n<50)	37.09
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	32.47	SD (KM)	30.08
	Variance (KM)	904.9	SE of Mean (KM)	2.347
	k hat (KM)	1.165	k star (KM)	1.148
	nu hat (KM)	386.8	nu star (KM)	381.1
	theta hat (KM)	27.87	theta star (KM)	28.28
	80% gamma percentile (KM)	51.63	90% gamma percentile (KM)	72.26
	95% gamma percentile (KM)	92.67	99% gamma percentile (KM)	139.6
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (381.13, α)	336.9	Adjusted Chi Square Value (381.13, β)	336.5
	95% Gamma Approximate KM-UCL (use when n>=50)	36.73	95% Gamma Adjusted KM-UCL (use when n<50)	36.77
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.976	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0.193	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0675	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0718	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	32.49	Mean in Log Scale	3.122
	SD in Original Scale	30.06	SD in Log Scale	0.864
	95% t UCL (assumes normality of ROS data)	36.35	95% Percentile Bootstrap UCL	36.47
	95% BCA Bootstrap UCL	36.75	95% Bootstrap t UCL	36.7
	95% H-UCL (Log ROS)	37.83		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	3.095	KM Geo Mean	22.08
	KM SD (logged)	0.929	95% Critical H Value (KM-Log)	2.102
	KM Standard Error of Mean (logged)	0.0733	95% H-UCL (KM -Log)	39.59
	KM SD (logged)	0.929	95% Critical H Value (KM-Log)	2.102
	KM Standard Error of Mean (logged)	0.0733		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	32.54	Mean in Log Scale	3.086
	SD in Original Scale	30.18	SD in Log Scale	0.969

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% t UCL (Assumes normality)	36.41	95% H-Stat UCL	41.14
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Lognormal Distributed at 5% Significance Level			
Suggested UCL to Use			
KM H-UCL	39.59		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	159	Number of Distinct Observations	103
		Number of Missing Observations	0
Minimum	2500	Mean	29640
Maximum	290000	Median	24700
SD	27574	Std. Error of Mean	2187
Coefficient of Variation	0.93	Skewness	6.028
Normal GOF Test			
Shapiro Wilk Test Statistic	0.572	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0707	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	33258	95% Adjusted-CLT UCL (Chen-1995)	34354
		95% Modified-t UCL (Johnson-1978)	33433
Gamma GOF Test			
A-D Test Statistic	3.143	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.117	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0749	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	2.548	k star (bias corrected MLE)	2.504
Theta hat (MLE)	11633	Theta star (bias corrected MLE)	11837
nu hat (MLE)	810.3	nu star (bias corrected)	796.3
MLE Mean (bias corrected)	29640	MLE Sd (bias corrected)	18731
		Approximate Chi Square Value (0.05)	731.8
Adjusted Level of Significance	0.0485	Adjusted Chi Square Value	731.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	32252	95% Adjusted Gamma UCL (use when n<50)	32277
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.122	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0849	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0707	Data Not Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.824	Mean of logged Data	10.09
Maximum of Logged Data	12.58	SD of logged Data	0.62

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	32028	90% Chebyshev (MVUE) UCL	33774	
95% Chebyshev (MVUE) UCL	35887	97.5% Chebyshev (MVUE) UCL	38820	
99% Chebyshev (MVUE) UCL	44582			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	33237	95% Jackknife UCL	33258	
95% Standard Bootstrap UCL	33251	95% Bootstrap-t UCL	35207	
95% Hall's Bootstrap UCL	47297	95% Percentile Bootstrap UCL	33344	
95% BCA Bootstrap UCL	34977			
90% Chebyshev(Mean, Sd) UCL	36200	95% Chebyshev(Mean, Sd) UCL	39172	
97.5% Chebyshev(Mean, Sd) UCL	43296	99% Chebyshev(Mean, Sd) UCL	51398	
Suggested UCL to Use				
95% H-UCL	32028			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.				
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.				
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.				
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.				
Lead				
General Statistics				
Total Number of Observations	166	Number of Distinct Observations	102	
Number of Detects	137	Number of Non-Detects	29	
Number of Distinct Detects	89	Number of Distinct Non-Detects	19	
Minimum Detect	1	Minimum Non-Detect	0.6	
Maximum Detect	58.4	Maximum Non-Detect	25	
Variance Detects	76.19	Percent Non-Detects	17.47%	
Mean Detects	9.76	SD Detects	8.729	
Median Detects	7.7	CV Detects	0.894	
Skewness Detects	3.002	Kurtosis Detects	11.53	
Mean of Logged Detects	2.019	SD of Logged Detects	0.696	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.7	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0761	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	8.457	KM Standard Error of Mean	0.659	
KM SD	8.432	95% KM (BCA) UCL	9.595	
95% KM (t) UCL	9.547	95% KM (Percentile Bootstrap) UCL	9.643	
95% KM (z) UCL	9.541	95% KM Bootstrap t UCL	9.772	
90% KM Chebyshev UCL	10.43	95% KM Chebyshev UCL	11.33	
97.5% KM Chebyshev UCL	12.57	99% KM Chebyshev UCL	15.02	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.588	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.113	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0809	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma Statistics on Detected Data Only				
k hat (MLE)	2.081	k star (bias corrected MLE)	2.04	
Theta hat (MLE)	4.69	Theta star (bias corrected MLE)	4.783	
nu hat (MLE)	570.2	nu star (bias corrected)	559.1	
Mean (detects)	9.76			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	8.169	
Maximum	58.4	Median	6.1	
SD	8.669	CV	1.061	
k hat (MLE)	0.63	k star (bias corrected MLE)	0.622	
Theta hat (MLE)	12.97	Theta star (bias corrected MLE)	13.13	
nu hat (MLE)	209	nu star (bias corrected)	206.6	
Adjusted Level of Significance (β)	0.0486			
Approximate Chi Square Value (206.59, α)	174.3	Adjusted Chi Square Value (206.59, β)	174.1	
95% Gamma Approximate UCL (use when n>=50)	9.681	95% Gamma Adjusted UCL (use when n<50)	9.695	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	8.457	SD (KM)	8.432	
Variance (KM)	71.1	SE of Mean (KM)	0.659	
k hat (KM)	1.006	k star (KM)	0.992	
nu hat (KM)	333.9	nu star (KM)	329.2	
theta hat (KM)	8.408	theta star (KM)	8.528	
80% gamma percentile (KM)	13.62	90% gamma percentile (KM)	19.51	
95% gamma percentile (KM)	25.41	99% gamma percentile (KM)	39.11	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (329.22, α)	288.2	Adjusted Chi Square Value (329.22, β)	287.9	
95% Gamma Approximate KM-UCL (use when n>=50)	9.661	95% Gamma Adjusted KM-UCL (use when n<50)	9.672	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.978	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.332	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0653	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0761	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	8.479	Mean in Log Scale	1.807	
SD in Original Scale	8.414	SD in Log Scale	0.799	
95% t UCL (assumes normality of ROS data)	9.559	95% Percentile Bootstrap UCL	9.568	
95% BCA Bootstrap UCL	9.842	95% Bootstrap t UCL	9.816	
95% H-UCL (Log ROS)	9.502			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	1.766	KM Geo Mean	5.846	
KM SD (logged)	0.889	95% Critical H Value (KM-Log)	2.07	
KM Standard Error of Mean (logged)	0.0757	95% H-UCL (KM -Log)	10.02	
KM SD (logged)	0.889	95% Critical H Value (KM-Log)	2.07	
KM Standard Error of Mean (logged)	0.0757			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	8.456	Mean in Log Scale	1.772	
SD in Original Scale	8.469	SD in Log Scale	0.869	
95% t UCL (Assumes normality)	9.543	95% H-Stat UCL	9.864	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Detected Data appear Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	10.02			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lithium				
General Statistics				
Total Number of Observations	26	Number of Distinct Observations	26	
		Number of Missing Observations	0	
Minimum	19.7	Mean	38.23	
Maximum	130	Median	33.4	
SD	22.83	Std. Error of Mean	4.477	
Coefficient of Variation	0.597	Skewness	3.061	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.643	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	45.88	95% Adjusted-CLT UCL (Chen-1995)	48.47	
		95% Modified-t UCL (Johnson-1978)	46.33	
Gamma GOF Test				
A-D Test Statistic	1.392	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.191	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.172	Data Not Gamma Distributed at 5% Significance Level		
Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	4.952	k star (bias corrected MLE)	4.406	
Theta hat (MLE)	7.721	Theta star (bias corrected MLE)	8.677	
nu hat (MLE)	257.5	nu star (bias corrected)	229.1	
MLE Mean (bias corrected)	38.23	MLE Sd (bias corrected)	18.21	
		Approximate Chi Square Value (0.05)	195.1	
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	193	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	44.91	95% Adjusted Gamma UCL (use when n<50)	45.39	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.92	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.981	Mean of logged Data	3.539	
Maximum of Logged Data	4.868	SD of logged Data	0.421	
Assuming Lognormal Distribution				
95% H-UCL	44.19	90% Chebyshev (MVUE) UCL	47.09	
95% Chebyshev (MVUE) UCL	51.42	97.5% Chebyshev (MVUE) UCL	57.45	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	69.28		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	45.6	95% Jackknife UCL	45.88
95% Standard Bootstrap UCL	45.43	95% Bootstrap-t UCL	54.38
95% Hall's Bootstrap UCL	83.25	95% Percentile Bootstrap UCL	45.8
95% BCA Bootstrap UCL	48.75		
90% Chebyshev(Mean, Sd) UCL	51.67	95% Chebyshev(Mean, Sd) UCL	57.75
97.5% Chebyshev(Mean, Sd) UCL	66.19	99% Chebyshev(Mean, Sd) UCL	82.78
Suggested UCL to Use			
95% Student's-t UCL	45.88	or 95% Modified-t UCL	46.33
or 95% H-UCL	44.19		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Manganese			
General Statistics			
Total Number of Observations	166	Number of Distinct Observations	133
		Number of Missing Observations	0
Minimum	98	Mean	1056
Maximum	19000	Median	436
SD	1937	Std. Error of Mean	150.3
Coefficient of Variation	1.834	Skewness	5.697
Normal GOF Test			
Shapiro Wilk Test Statistic	0.493	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.31	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0692	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1304	95% Adjusted-CLT UCL (Chen-1995)	1374
		95% Modified-t UCL (Johnson-1978)	1316
Gamma GOF Test			
A-D Test Statistic	8.616	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.791	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.159	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.075	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.845	k star (bias corrected MLE)	0.834
Theta hat (MLE)	1249	Theta star (bias corrected MLE)	1266
nu hat (MLE)	280.7	nu star (bias corrected)	276.9
MLE Mean (bias corrected)	1056	MLE Sd (bias corrected)	1156
		Approximate Chi Square Value (0.05)	239.4
Adjusted Level of Significance	0.0486	Adjusted Chi Square Value	239.1

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	1221	95% Adjusted Gamma UCL (use when n<50)	1223	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.937	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk P Value	3.1364E-8	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0976	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.0692	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	4.585	Mean of logged Data	6.265	
Maximum of Logged Data	9.852	SD of logged Data	1.063	
Assuming Lognormal Distribution				
95% H-UCL	1111	90% Chebyshev (MVUE) UCL	1200	
95% Chebyshev (MVUE) UCL	1328	97.5% Chebyshev (MVUE) UCL	1504	
99% Chebyshev (MVUE) UCL	1850			
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution (0.05)				
Nonparametric Distribution Free UCLs				
95% CLT UCL	1303	95% Jackknife UCL	1304	
95% Standard Bootstrap UCL	1304	95% Bootstrap-t UCL	1434	
95% Hall's Bootstrap UCL	1630	95% Percentile Bootstrap UCL	1332	
95% BCA Bootstrap UCL	1378			
90% Chebyshev(Mean, Sd) UCL	1507	95% Chebyshev(Mean, Sd) UCL	1711	
97.5% Chebyshev(Mean, Sd) UCL	1995	99% Chebyshev(Mean, Sd) UCL	2551	
Suggested UCL to Use				
95% Chebyshev (Mean, Sd) UCL	1711			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Mercury				
General Statistics				
Total Number of Observations	206	Number of Distinct Observations	168	
Number of Detects	204	Number of Non-Detects	2	
Number of Distinct Detects	166	Number of Distinct Non-Detects	2	
Minimum Detect	0.15	Minimum Non-Detect	0.05	
Maximum Detect	1900	Maximum Non-Detect	0.8	
Variance Detects	51493	Percent Non-Detects	0.971%	
Mean Detects	81.76	SD Detects	226.9	
Median Detects	10.5	CV Detects	2.776	
Skewness Detects	5.505	Kurtosis Detects	35.24	
Mean of Logged Detects	2.46	SD of Logged Detects	2.079	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.395	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.36	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0625	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	80.97	KM Standard Error of Mean	15.74	
KM SD	225.4	95% KM (BCA) UCL	107.5	
95% KM (t) UCL	107	95% KM (Percentile Bootstrap) UCL	107.7	
95% KM (z) UCL	106.9	95% KM Bootstrap t UCL	119.3	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	90% KM Chebyshev UCL	128.2	95% KM Chebyshev UCL	149.6
	97.5% KM Chebyshev UCL	179.3	99% KM Chebyshev UCL	237.6
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	8.426	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.858	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.153	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.0682	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.346	k star (bias corrected MLE)	0.345
	Theta hat (MLE)	236	Theta star (bias corrected MLE)	237.2
	nu hat (MLE)	141.3	nu star (bias corrected)	140.6
	Mean (detects)	81.76		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			
	This is especially true when the sample size is small.			
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
	Minimum	0.01	Mean	80.96
	Maximum	1900	Median	10.35
	SD	226	CV	2.791
	k hat (MLE)	0.338	k star (bias corrected MLE)	0.336
	Theta hat (MLE)	239.8	Theta star (bias corrected MLE)	241
	nu hat (MLE)	139.1	nu star (bias corrected)	138.4
	Adjusted Level of Significance (β)	0.0488		
	Approximate Chi Square Value (138.43, α)	112.2	Adjusted Chi Square Value (138.43, β)	112.1
	95% Gamma Approximate UCL (use when n>=50)	99.85	95% Gamma Adjusted UCL (use when n<50)	100
	Estimates of Gamma Parameters using KM Estimates			
	Mean (KM)	80.97	SD (KM)	225.4
	Variance (KM)	50807	SE of Mean (KM)	15.74
	k hat (KM)	0.129	k star (KM)	0.13
	nu hat (KM)	53.16	nu star (KM)	53.72
	theta hat (KM)	627.5	theta star (KM)	621
	80% gamma percentile (KM)	77.58	90% gamma percentile (KM)	234.2
	95% gamma percentile (KM)	456.7	99% gamma percentile (KM)	1122
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (53.72, α)	37.88	Adjusted Chi Square Value (53.72, β)	37.79
	95% Gamma Approximate KM-UCL (use when n>=50)	114.8	95% Gamma Adjusted KM-UCL (use when n<50)	115.1
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk P Value	0.0114	Detected Data Not Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.0555	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0625	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	80.97	Mean in Log Scale	2.412
	SD in Original Scale	226	SD in Log Scale	2.128
	95% t UCL (assumes normality of ROS data)	107	95% Percentile Bootstrap UCL	108.3
	95% BCA Bootstrap UCL	114.9	95% Bootstrap t UCL	117.7
	95% H-UCL (Log ROS)	175		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	2.415	KM Geo Mean	11.19
	KM SD (logged)	2.115	95% Critical H Value (KM-Log)	3.282
	KM Standard Error of Mean (logged)	0.148	95% H-UCL (KM -Log)	170
	KM SD (logged)	2.115	95% Critical H Value (KM-Log)	3.282
	KM Standard Error of Mean (logged)	0.148		

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	80.97	Mean in Log Scale	2.413
	SD in Original Scale	226	SD in Log Scale	2.125
	95% t UCL (Assumes normality)	107	95% H-Stat UCL	174.3
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Approximate Lognormal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	KM H-UCL	170		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Methyl Mercury			
	General Statistics			
	Total Number of Observations	100	Number of Distinct Observations	91
	Number of Detects	99	Number of Non-Detects	1
	Number of Distinct Detects	90	Number of Distinct Non-Detects	1
	Minimum Detect	5.0000E-5	Minimum Non-Detect	4.7500E-5
	Maximum Detect	0.117	Maximum Non-Detect	4.7500E-5
	Variance Detects	4.3502E-4	Percent Non-Detects	1%
	Mean Detects	0.00872	SD Detects	0.0209
	Median Detects	0.002	CV Detects	2.392
	Skewness Detects	3.689	Kurtosis Detects	13.64
	Mean of Logged Detects	-6.304	SD of Logged Detects	1.789
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.444	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.358	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0893	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			
	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
	KM Mean	0.00863	KM Standard Error of Mean	0.00208
	KM SD	0.0207	95% KM (BCA) UCL	0.0127
	95% KM (t) UCL	0.0121	95% KM (Percentile Bootstrap) UCL	0.0122
	95% KM (z) UCL	0.012	95% KM Bootstrap t UCL	0.0135
	90% KM Chebyshev UCL	0.0149	95% KM Chebyshev UCL	0.0177
	97.5% KM Chebyshev UCL	0.0216	99% KM Chebyshev UCL	0.0293
	Gamma GOF Tests on Detected Observations Only			
	A-D Test Statistic	4.598	**Anderson-Darling GOF Test**	
	5% A-D Critical Value	0.839	Detected Data Not Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.166	**Kolmogorov-Smirnov GOF**	
	5% K-S Critical Value	0.0961	Detected Data Not Gamma Distributed at 5% Significance Level	
	Detected Data Not Gamma Distributed at 5% Significance Level			
	Gamma Statistics on Detected Data Only			
	k hat (MLE)	0.418	k star (bias corrected MLE)	0.412
	Theta hat (MLE)	0.0208	Theta star (bias corrected MLE)	0.0211
	nu hat (MLE)	82.81	nu star (bias corrected)	81.64
	Mean (detects)	0.00872		
	Gamma ROS Statistics using Imputed Non-Detects			
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
	For such situations, GROS method may yield incorrect values of UCLs and BTVs			

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	5.0000E-5	Mean	0.00873	
Maximum	0.117	Median	0.002	
SD	0.0208	CV	2.377	
k hat (MLE)	0.422	k star (bias corrected MLE)	0.416	
Theta hat (MLE)	0.0207	Theta star (bias corrected MLE)	0.021	
nu hat (MLE)	84.37	nu star (bias corrected)	83.18	
Adjusted Level of Significance (β)	0.0476			
Approximate Chi Square Value (83.18, α)	63.16	Adjusted Chi Square Value (83.18, β)	62.9	
95% Gamma Approximate UCL (use when n>=50)	0.0115	95% Gamma Adjusted UCL (use when n<50)	0.0115	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.00863	SD (KM)	0.0207	
Variance (KM)	4.2706E-4	SE of Mean (KM)	0.00208	
k hat (KM)	0.174	k star (KM)	0.176	
nu hat (KM)	34.89	nu star (KM)	35.18	
theta hat (KM)	0.0495	theta star (KM)	0.0491	
80% gamma percentile (KM)	0.0106	90% gamma percentile (KM)	0.026	
95% gamma percentile (KM)	0.0459	99% gamma percentile (KM)	0.102	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (35.18, α)	22.61	Adjusted Chi Square Value (35.18, β)	22.46	
95% Gamma Approximate KM-UCL (use when n>=50)	0.0134	95% Gamma Adjusted KM-UCL (use when n<50)	0.0135	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.113	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0491	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0893	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.00863	Mean in Log Scale	-6.354	
SD in Original Scale	0.0208	SD in Log Scale	1.847	
95% t UCL (assumes normality of ROS data)	0.0121	95% Percentile Bootstrap UCL	0.012	
95% BCA Bootstrap UCL	0.0133	95% Bootstrap t UCL	0.0134	
95% H-UCL (Log ROS)	0.0174			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-6.341	KM Geo Mean	0.00176	
KM SD (logged)	1.808	95% Critical H Value (KM-Log)	3.176	
KM Standard Error of Mean (logged)	0.182	95% H-UCL (KM -Log)	0.0161	
KM SD (logged)	1.808	95% Critical H Value (KM-Log)	3.176	
KM Standard Error of Mean (logged)	0.182			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.00863	Mean in Log Scale	-6.348	
SD in Original Scale	0.0208	SD in Log Scale	1.832	
95% t UCL (Assumes normality)	0.0121	95% H-Stat UCL	0.0169	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	0.0161			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Molybdenum

General Statistics

Total Number of Observations	154	Number of Distinct Observations	69
Number of Detects	8	Number of Non-Detects	146
Number of Distinct Detects	8	Number of Distinct Non-Detects	63
Minimum Detect	0.32	Minimum Non-Detect	0.01
Maximum Detect	1.4	Maximum Non-Detect	235
Variance Detects	0.109	Percent Non-Detects	94.81%
Mean Detects	0.751	SD Detects	0.33
Median Detects	0.77	CV Detects	0.439
Skewness Detects	0.802	Kurtosis Detects	1.706
Mean of Logged Detects	-0.375	SD of Logged Detects	0.463

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.257	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.344	KM Standard Error of Mean	0.0989
KM SD	0.38	95% KM (BCA) UCL	0.517
95% KM (t) UCL	0.508	95% KM (Percentile Bootstrap) UCL	0.51
95% KM (z) UCL	0.507	95% KM Bootstrap t UCL	0.5
90% KM Chebyshev UCL	0.641	95% KM Chebyshev UCL	0.775
97.5% KM Chebyshev UCL	0.962	99% KM Chebyshev UCL	1.328

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.381	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.295	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	5.804	k star (bias corrected MLE)	3.711
Theta hat (MLE)	0.129	Theta star (bias corrected MLE)	0.202
nu hat (MLE)	92.86	nu star (bias corrected)	59.37
Mean (detects)	0.751		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0105	Mean	0.412
Maximum	1.4	Median	0.391
SD	0.207	CV	0.503
k hat (MLE)	3.604	k star (bias corrected MLE)	3.538
Theta hat (MLE)	0.114	Theta star (bias corrected MLE)	0.116
nu hat (MLE)	1110	nu star (bias corrected)	1090
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (N/A, α)	1014	Adjusted Chi Square Value (N/A, β)	1013
95% Gamma Approximate UCL (use when n>=50)	0.442	95% Gamma Adjusted UCL (use when n<50)	0.443

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.344	SD (KM)	0.38
Variance (KM)	0.145	SE of Mean (KM)	0.0989
k hat (KM)	0.819	k star (KM)	0.807
nu hat (KM)	252.2	nu star (KM)	248.6
theta hat (KM)	0.42	theta star (KM)	0.426
80% gamma percentile (KM)	0.562	90% gamma percentile (KM)	0.835

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	95% gamma percentile (KM)	1.113	99% gamma percentile (KM)	1.768
	Gamma Kaplan-Meier (KM) Statistics			
	Approximate Chi Square Value (248.58, α)	213.1	Adjusted Chi Square Value (248.58, β)	212.8
	95% Gamma Approximate KM-UCL (use when n>=50)	0.401	95% Gamma Adjusted KM-UCL (use when n<50)	0.402
	Lognormal GOF Test on Detected Observations Only			
	Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
	Detected Data appear Lognormal at 5% Significance Level			
	Lognormal ROS Statistics Using Imputed Non-Detects			
	Mean in Original Scale	0.431	Mean in Log Scale	-0.909
	SD in Original Scale	0.172	SD in Log Scale	0.359
	95% t UCL (assumes normality of ROS data)	0.454	95% Percentile Bootstrap UCL	0.454
	95% BCA Bootstrap UCL	0.455	95% Bootstrap t UCL	0.458
	95% H-UCL (Log ROS)	0.452		
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
	KM Mean (logged)	-2.544	KM Geo Mean	0.0786
	KM SD (logged)	2.093	95% Critical H Value (KM-Log)	3.415
	KM Standard Error of Mean (logged)	0.579	95% H-UCL (KM -Log)	1.253
	KM SD (logged)	2.093	95% Critical H Value (KM-Log)	3.415
	KM Standard Error of Mean (logged)	0.579		
	DL/2 Statistics			
	DL/2 Normal		**DL/2 Log-Transformed**	
	Mean in Original Scale	4.785	Mean in Log Scale	0.668
	SD in Original Scale	10.47	SD in Log Scale	1.527
	95% t UCL (Assumes normality)	6.181	95% H-Stat UCL	8.787
	DL/2 is not a recommended method, provided for comparisons and historical reasons			
	Nonparametric Distribution Free UCL Statistics			
	Detected Data appear Normal Distributed at 5% Significance Level			
	Suggested UCL to Use			
	95% KM (t) UCL	0.508		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Nickel			
	General Statistics			
	Total Number of Observations	166	Number of Distinct Observations	128
	Number of Detects	164	Number of Non-Detects	2
	Number of Distinct Detects	127	Number of Distinct Non-Detects	2
	Minimum Detect	11	Minimum Non-Detect	23
	Maximum Detect	400	Maximum Non-Detect	50
	Variance Detects	3165	Percent Non-Detects	1.205%
	Mean Detects	77.66	SD Detects	56.26
	Median Detects	64.85	CV Detects	0.724
	Skewness Detects	2.61	Kurtosis Detects	9.287
	Mean of Logged Detects	4.163	SD of Logged Detects	0.603
	Normal GOF Test on Detects Only			
	Shapiro Wilk Test Statistic	0.763	**Normal GOF Test on Detected Observations Only**	
	5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.0696	Detected Data Not Normal at 5% Significance Level	
	Detected Data Not Normal at 5% Significance Level			

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	77.03	KM Standard Error of Mean	4.365	
KM SD	56.06	95% KM (BCA) UCL	84.03	
95% KM (t) UCL	84.25	95% KM (Percentile Bootstrap) UCL	84.54	
95% KM (z) UCL	84.21	95% KM Bootstrap t UCL	85.74	
90% KM Chebyshev UCL	90.12	95% KM Chebyshev UCL	96.05	
97.5% KM Chebyshev UCL	104.3	99% KM Chebyshev UCL	120.5	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	2.763	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.761	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.13	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0735	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	2.801	k star (bias corrected MLE)	2.754	
Theta hat (MLE)	27.73	Theta star (bias corrected MLE)	28.2	
nu hat (MLE)	918.7	nu star (bias corrected)	903.3	
Mean (detects)	77.66			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.45	Mean	76.88	
Maximum	400	Median	64.4	
SD	56.38	CV	0.733	
k hat (MLE)	2.486	k star (bias corrected MLE)	2.445	
Theta hat (MLE)	30.93	Theta star (bias corrected MLE)	31.44	
nu hat (MLE)	825.3	nu star (bias corrected)	811.7	
Adjusted Level of Significance (β)	0.0486			
Approximate Chi Square Value (811.75, α)	746.6	Adjusted Chi Square Value (811.75, β)	746.1	
95% Gamma Approximate UCL (use when n>=50)	83.59	95% Gamma Adjusted UCL (use when n<50)	83.65	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	77.03	SD (KM)	56.06	
Variance (KM)	3142	SE of Mean (KM)	4.365	
k hat (KM)	1.888	k star (KM)	1.858	
nu hat (KM)	626.9	nu star (KM)	616.9	
theta hat (KM)	40.79	theta star (KM)	41.46	
80% gamma percentile (KM)	116.3	90% gamma percentile (KM)	152.4	
95% gamma percentile (KM)	187	99% gamma percentile (KM)	264.1	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (616.89, α)	560.3	Adjusted Chi Square Value (616.89, β)	559.8	
95% Gamma Approximate KM-UCL (use when n>=50)	84.81	95% Gamma Adjusted KM-UCL (use when n<50)	84.88	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.977	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.221	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0861	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0696	Detected Data Not Lognormal at 5% Significance Level		
Detected Data appear Approximate Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	77.04	Mean in Log Scale	4.152	
SD in Original Scale	56.21	SD in Log Scale	0.609	
95% t UCL (assumes normality of ROS data)	84.26	95% Percentile Bootstrap UCL	84.25	
95% BCA Bootstrap UCL	85.5	95% Bootstrap t UCL	85.54	
95% H-UCL (Log ROS)	83.61			

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	4.15	KM Geo Mean	63.46	
KM SD (logged)	0.611	95% Critical H Value (KM-Log)	1.874	
KM Standard Error of Mean (logged)	0.0477	95% H-UCL (KM -Log)	83.63	
KM SD (logged)	0.611	95% Critical H Value (KM-Log)	1.874	
KM Standard Error of Mean (logged)	0.0477			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	76.95	Mean in Log Scale	4.147	
SD in Original Scale	56.3	SD in Log Scale	0.618	
95% t UCL (Assumes normality)	84.17	95% H-Stat UCL	83.81	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Approximate Lognormal Distributed at 5% Significance Level				
Suggested UCL to Use				
KM H-UCL	83.63			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Selenium				
General Statistics				
Total Number of Observations	167	Number of Distinct Observations	103	
Number of Detects	98	Number of Non-Detects	69	
Number of Distinct Detects	66	Number of Distinct Non-Detects	48	
Minimum Detect	0.4	Minimum Non-Detect	0.18	
Maximum Detect	23	Maximum Non-Detect	50	
Variance Detects	10.88	Percent Non-Detects	41.32%	
Mean Detects	3.906	SD Detects	3.298	
Median Detects	3	CV Detects	0.844	
Skewness Detects	2.405	Kurtosis Detects	10.59	
Mean of Logged Detects	1.024	SD of Logged Detects	0.881	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.816	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.0897	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	2.705	KM Standard Error of Mean	0.239	
KM SD	2.986	95% KM (BCA) UCL	3.117	
95% KM (t) UCL	3.1	95% KM (Percentile Bootstrap) UCL	3.12	
95% KM (z) UCL	3.098	95% KM Bootstrap t UCL	3.16	
90% KM Chebyshev UCL	3.421	95% KM Chebyshev UCL	3.746	
97.5% KM Chebyshev UCL	4.196	99% KM Chebyshev UCL	5.08	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.978	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.0761	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.092	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data follow Appr. Gamma Distribution at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.625	k star (bias corrected MLE)	1.582	
Theta hat (MLE)	2.403	Theta star (bias corrected MLE)	2.468	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	nu hat (MLE)	318.6								nu star (bias corrected)	310.2	
	Mean (detects)	3.906										
	Gamma ROS Statistics using Imputed Non-Detects											
	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)											
	For such situations, GROS method may yield incorrect values of UCLs and BTVs											
	This is especially true when the sample size is small.											
	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
	Minimum	0.01								Mean	2.538	
	Maximum	23								Median	1.684	
	SD	3.029								CV	1.194	
	k hat (MLE)	0.593								k star (bias corrected MLE)	0.587	
	Theta hat (MLE)	4.278								Theta star (bias corrected MLE)	4.327	
	nu hat (MLE)	198.1								nu star (bias corrected)	195.9	
	Adjusted Level of Significance (β)	0.0486										
	Approximate Chi Square Value (195.90, α)	164.5								Adjusted Chi Square Value (195.90, β)	164.3	
	95% Gamma Approximate UCL (use when n>=50)	3.022								95% Gamma Adjusted UCL (use when n<50)	3.026	
	Estimates of Gamma Parameters using KM Estimates											
	Mean (KM)	2.705								SD (KM)	2.986	
	Variance (KM)	8.918								SE of Mean (KM)	0.239	
	k hat (KM)	0.821								k star (KM)	0.81	
	nu hat (KM)	274.1								nu star (KM)	270.5	
	theta hat (KM)	3.296								theta star (KM)	3.34	
	80% gamma percentile (KM)	4.418								90% gamma percentile (KM)	6.558	
	95% gamma percentile (KM)	8.737								99% gamma percentile (KM)	13.88	
	Gamma Kaplan-Meier (KM) Statistics											
	Approximate Chi Square Value (270.51, α)	233.4								Adjusted Chi Square Value (270.51, β)	233.1	
	95% Gamma Approximate KM-UCL (use when n>=50)	3.135								95% Gamma Adjusted KM-UCL (use when n<50)	3.139	
	Lognormal GOF Test on Detected Observations Only											
	Shapiro Wilk Approximate Test Statistic	0.94								**Shapiro Wilk GOF Test**		
	5% Shapiro Wilk P Value	2.9702E-4								Detected Data Not Lognormal at 5% Significance Level		
	Lilliefors Test Statistic	0.109								**Lilliefors GOF Test**		
	5% Lilliefors Critical Value	0.0897								Detected Data Not Lognormal at 5% Significance Level		
	Detected Data Not Lognormal at 5% Significance Level											
	Lognormal ROS Statistics Using Imputed Non-Detects											
	Mean in Original Scale	2.682								Mean in Log Scale	0.537	
	SD in Original Scale	2.925								SD in Log Scale	0.941	
	95% t UCL (assumes normality of ROS data)	3.056								95% Percentile Bootstrap UCL	3.052	
	95% BCA Bootstrap UCL	3.11								95% Bootstrap t UCL	3.127	
	95% H-UCL (Log ROS)	3.106										
	Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution											
	KM Mean (logged)	0.435								KM Geo Mean	1.545	
	KM SD (logged)	1.121								95% Critical H Value (KM-Log)	2.269	
	KM Standard Error of Mean (logged)	0.102								95% H-UCL (KM -Log)	3.527	
	KM SD (logged)	1.121								95% Critical H Value (KM-Log)	2.269	
	KM Standard Error of Mean (logged)	0.102										
	DL/2 Statistics											
	DL/2 Normal									**DL/2 Log-Transformed**		
	Mean in Original Scale	3.068								Mean in Log Scale	0.649	
	SD in Original Scale	3.475								SD in Log Scale	1.001	
	95% t UCL (Assumes normality)	3.513								95% H-Stat UCL	3.735	
	DL/2 is not a recommended method, provided for comparisons and historical reasons											
	Nonparametric Distribution Free UCL Statistics											
	Detected Data appear Approximate Gamma Distributed at 5% Significance Level											
	Suggested UCL to Use											
	95% KM Approximate Gamma UCL	3.135								95% GROS Approximate Gamma UCL	3.022	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Silver

General Statistics

Total Number of Observations	166	Number of Distinct Observations	89
Number of Detects	48	Number of Non-Detects	118
Number of Distinct Detects	39	Number of Distinct Non-Detects	60
Minimum Detect	0.04	Minimum Non-Detect	0.205
Maximum Detect	7.7	Maximum Non-Detect	46.5
Variance Detects	2.303	Percent Non-Detects	71.08%
Mean Detects	1.184	SD Detects	1.518
Median Detects	0.475	CV Detects	1.282
Skewness Detects	2.283	Kurtosis Detects	6.82
Mean of Logged Detects	-0.718	SD of Logged Detects	1.475

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.744	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.226	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.584	KM Standard Error of Mean	0.0895
KM SD	0.989	95% KM (BCA) UCL	0.755
95% KM (t) UCL	0.732	95% KM (Percentile Bootstrap) UCL	0.741
95% KM (z) UCL	0.731	95% KM Bootstrap t UCL	0.752
90% KM Chebyshev UCL	0.852	95% KM Chebyshev UCL	0.974
97.5% KM Chebyshev UCL	1.143	99% KM Chebyshev UCL	1.475

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.169	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.798	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.156	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.134	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.684	k star (bias corrected MLE)	0.655
Theta hat (MLE)	1.73	Theta star (bias corrected MLE)	1.806
nu hat (MLE)	65.68	nu star (bias corrected)	62.91
Mean (detects)	1.184		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.485
Maximum	7.7	Median	0.145
SD	0.957	CV	1.971
k hat (MLE)	0.436	k star (bias corrected MLE)	0.432
Theta hat (MLE)	1.113	Theta star (bias corrected MLE)	1.123
nu hat (MLE)	144.9	nu star (bias corrected)	143.6
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (143.57, α)	116.9	Adjusted Chi Square Value (143.57, β)	116.7

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Gamma Approximate UCL (use when n>=50)	0.596	95% Gamma Adjusted UCL (use when n<50)	0.597
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.584	SD (KM)	0.989
Variance (KM)	0.978	SE of Mean (KM)	0.0895
k hat (KM)	0.349	k star (KM)	0.346
nu hat (KM)	115.7	nu star (KM)	115
theta hat (KM)	1.675	theta star (KM)	1.686
80% gamma percentile (KM)	0.923	90% gamma percentile (KM)	1.689
95% gamma percentile (KM)	2.548	99% gamma percentile (KM)	4.743
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (114.99, α)	91.23	Adjusted Chi Square Value (114.99, β)	91.05
95% Gamma Approximate KM-UCL (use when n>=50)	0.736	95% Gamma Adjusted KM-UCL (use when n<50)	0.737
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.127	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.517	Mean in Log Scale	-1.349
SD in Original Scale	0.926	SD in Log Scale	1.035
95% t UCL (assumes normality of ROS data)	0.636	95% Percentile Bootstrap UCL	0.644
95% BCA Bootstrap UCL	0.669	95% Bootstrap t UCL	0.674
95% H-UCL (Log ROS)	0.529		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.421	KM Geo Mean	0.241
KM SD (logged)	1.252	95% Critical H Value (KM-Log)	2.391
KM Standard Error of Mean (logged)	0.153	95% H-UCL (KM -Log)	0.667
KM SD (logged)	1.252	95% Critical H Value (KM-Log)	2.391
KM Standard Error of Mean (logged)	0.153		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.275	Mean in Log Scale	-0.314
SD in Original Scale	2.092	SD in Log Scale	1.092
95% t UCL (Assumes normality)	1.544	95% H-Stat UCL	1.604
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.974		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Thallium			
General Statistics			
Total Number of Observations	166	Number of Distinct Observations	91
Number of Detects	5	Number of Non-Detects	161
Number of Distinct Detects	5	Number of Distinct Non-Detects	87
Minimum Detect	0.05	Minimum Non-Detect	0.1
Maximum Detect	0.42	Maximum Non-Detect	1650
Variance Detects	0.0189	Percent Non-Detects	96.99%
Mean Detects	0.192	SD Detects	0.137

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Median Detects	0.17	CV Detects	0.715
Skewness Detects	1.42	Kurtosis Detects	2.94
Mean of Logged Detects	-1.863	SD of Logged Detects	0.761
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.343	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.123	KM Standard Error of Mean	0.0292
KM SD	0.0805	95% KM (BCA) UCL	0.178
95% KM (t) UCL	0.171	95% KM (Percentile Bootstrap) UCL	0.175
95% KM (z) UCL	0.171	95% KM Bootstrap t UCL	0.164
90% KM Chebyshev UCL	0.211	95% KM Chebyshev UCL	0.251
97.5% KM Chebyshev UCL	0.306	99% KM Chebyshev UCL	0.414
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.327	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.684	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.255	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.36	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	2.502	k star (bias corrected MLE)	1.134
Theta hat (MLE)	0.0767	Theta star (bias corrected MLE)	0.169
nu hat (MLE)	25.02	nu star (bias corrected)	11.34
Mean (detects)	0.192		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.0156	Mean	0.111
Maximum	0.42	Median	0.105
SD	0.0522	CV	0.469
k hat (MLE)	4.821	k star (bias corrected MLE)	4.738
Theta hat (MLE)	0.0231	Theta star (bias corrected MLE)	0.0235
nu hat (MLE)	1601	nu star (bias corrected)	1573
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (N/A, α)	1482	Adjusted Chi Square Value (N/A, β)	1481
95% Gamma Approximate UCL (use when n>=50)	0.118	95% Gamma Adjusted UCL (use when n<50)	0.118
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.123	SD (KM)	0.0805
Variance (KM)	0.00649	SE of Mean (KM)	0.0292
k hat (KM)	2.336	k star (KM)	2.298
nu hat (KM)	775.6	nu star (KM)	762.9
theta hat (KM)	0.0527	theta star (KM)	0.0536
80% gamma percentile (KM)	0.181	90% gamma percentile (KM)	0.232
95% gamma percentile (KM)	0.28	99% gamma percentile (KM)	0.385
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (762.87, α)	699.8	Adjusted Chi Square Value (762.87, β)	699.3
95% Gamma Approximate KM-UCL (use when n>=50)	0.134	95% Gamma Adjusted KM-UCL (use when n<50)	0.134
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.343	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.109	Mean in Log Scale	-2.288	
SD in Original Scale	0.0447	SD in Log Scale	0.36	
95% t UCL (assumes normality of ROS data)	0.114	95% Percentile Bootstrap UCL	0.115	
95% BCA Bootstrap UCL	0.115	95% Bootstrap t UCL	0.115	
95% H-UCL (Log ROS)	0.114			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-2.295	KM Geo Mean	0.101	
KM SD (logged)	0.638	95% Critical H Value (KM-Log)	1.89	
KM Standard Error of Mean (logged)	0.282	95% H-UCL (KM -Log)	0.136	
KM SD (logged)	0.638	95% Critical H Value (KM-Log)	1.89	
KM Standard Error of Mean (logged)	0.282			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	19.21	Mean in Log Scale	0.943	
SD in Original Scale	71.68	SD in Log Scale	2.008	
95% t UCL (Assumes normality)	28.41	95% H-Stat UCL	31.8	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.171			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Vanadium				
General Statistics				
Total Number of Observations	166	Number of Distinct Observations	115	
Number of Detects	162	Number of Non-Detects	4	
Number of Distinct Detects	112	Number of Distinct Non-Detects	4	
Minimum Detect	7	Minimum Non-Detect	9.5	
Maximum Detect	157	Maximum Non-Detect	95	
Variance Detects	653.2	Percent Non-Detects	2.41%	
Mean Detects	40.55	SD Detects	25.56	
Median Detects	32	CV Detects	0.63	
Skewness Detects	1.638	Kurtosis Detects	3.568	
Mean of Logged Detects	3.528	SD of Logged Detects	0.592	
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.862	**Normal GOF Test on Detected Observations Only**		
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.07	Detected Data Not Normal at 5% Significance Level		
Detected Data Not Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	40.04	KM Standard Error of Mean	1.988	
KM SD	25.49	95% KM (BCA) UCL	43.58	
95% KM (t) UCL	43.33	95% KM (Percentile Bootstrap) UCL	43.28	
95% KM (z) UCL	43.31	95% KM Bootstrap t UCL	43.55	
90% KM Chebyshev UCL	46	95% KM Chebyshev UCL	48.7	
97.5% KM Chebyshev UCL	52.45	99% KM Chebyshev UCL	59.82	

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	1.06	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.76	Detected Data Not Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.1	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.0739	Detected Data Not Gamma Distributed at 5% Significance Level		
Detected Data Not Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	3.03	k star (bias corrected MLE)	2.978	
Theta hat (MLE)	13.38	Theta star (bias corrected MLE)	13.61	
nu hat (MLE)	981.8	nu star (bias corrected)	965	
Mean (detects)	40.55			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.641	Mean	39.95	
Maximum	157	Median	32	
SD	25.6	CV	0.641	
k hat (MLE)	2.735	k star (bias corrected MLE)	2.69	
Theta hat (MLE)	14.61	Theta star (bias corrected MLE)	14.85	
nu hat (MLE)	908.2	nu star (bias corrected)	893.1	
Adjusted Level of Significance (β)	0.0486			
Approximate Chi Square Value (893.10, α)	824.7	Adjusted Chi Square Value (893.10, β)	824.2	
95% Gamma Approximate UCL (use when n>=50)	43.26	95% Gamma Adjusted UCL (use when n<50)	43.29	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	40.04	SD (KM)	25.49	
Variance (KM)	649.6	SE of Mean (KM)	1.988	
k hat (KM)	2.467	k star (KM)	2.427	
nu hat (KM)	819.2	nu star (KM)	805.7	
theta hat (KM)	16.23	theta star (KM)	16.5	
80% gamma percentile (KM)	58.58	90% gamma percentile (KM)	74.46	
95% gamma percentile (KM)	89.44	99% gamma percentile (KM)	122.3	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (805.71, α)	740.8	Adjusted Chi Square Value (805.71, β)	740.3	
95% Gamma Approximate KM-UCL (use when n>=50)	43.54	95% Gamma Adjusted KM-UCL (use when n<50)	43.57	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Approximate Test Statistic	0.983	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk P Value	0.566	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0602	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.07	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	40.02	Mean in Log Scale	3.511	
SD in Original Scale	25.51	SD in Log Scale	0.602	
95% t UCL (assumes normality of ROS data)	43.29	95% Percentile Bootstrap UCL	43.45	
95% BCA Bootstrap UCL	43.72	95% Bootstrap t UCL	43.71	
95% H-UCL (Log ROS)	43.79			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	3.509	KM Geo Mean	33.43	
KM SD (logged)	0.604	95% Critical H Value (KM-Log)	1.87	
KM Standard Error of Mean (logged)	0.0472	95% H-UCL (KM -Log)	43.81	
KM SD (logged)	0.604	95% Critical H Value (KM-Log)	1.87	
KM Standard Error of Mean (logged)	0.0472			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean in Original Scale	40.03	Mean in Log Scale	3.506
SD in Original Scale	25.59	SD in Log Scale	0.616
95% t UCL (Assumes normality)	43.32	95% H-Stat UCL	44.08

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	43.81		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	166	Number of Distinct Observations	126
Number of Detects	165	Number of Non-Detects	1
Number of Distinct Detects	125	Number of Distinct Non-Detects	1
Minimum Detect	18.1	Minimum Non-Detect	8
Maximum Detect	320	Maximum Non-Detect	8
Variance Detects	3511	Percent Non-Detects	0.602%
Mean Detects	88.3	SD Detects	59.25
Median Detects	74	CV Detects	0.671
Skewness Detects	1.639	Kurtosis Detects	3.291
Mean of Logged Detects	4.282	SD of Logged Detects	0.634

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.847	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0694	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	87.82	KM Standard Error of Mean	4.61
KM SD	59.22	95% KM (BCA) UCL	95.86
95% KM (t) UCL	95.44	95% KM (Percentile Bootstrap) UCL	95.89
95% KM (z) UCL	95.4	95% KM Bootstrap t UCL	96.33
90% KM Chebyshev UCL	101.6	95% KM Chebyshev UCL	107.9
97.5% KM Chebyshev UCL	116.6	99% KM Chebyshev UCL	133.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.894	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0547	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0733	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.672	k star (bias corrected MLE)	2.628
Theta hat (MLE)	33.04	Theta star (bias corrected MLE)	33.6
nu hat (MLE)	881.9	nu star (bias corrected)	867.2
Mean (detects)	88.3		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	87.77

Table E1-17
Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Maximum	320	Median	73.85
SD	59.47	CV	0.678
k hat (MLE)	2.184	k star (bias corrected MLE)	2.148
Theta hat (MLE)	40.19	Theta star (bias corrected MLE)	40.86
nu hat (MLE)	725	nu star (bias corrected)	713.2
Adjusted Level of Significance (β)	0.0486		
Approximate Chi Square Value (713.23, α)	652.3	Adjusted Chi Square Value (713.23, β)	651.8
95% Gamma Approximate UCL (use when n>=50)	95.97	95% Gamma Adjusted UCL (use when n<50)	96.05

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	87.82	SD (KM)	59.22
Variance (KM)	3507	SE of Mean (KM)	4.61
k hat (KM)	2.199	k star (KM)	2.163
nu hat (KM)	730	nu star (KM)	718.2
theta hat (KM)	39.94	theta star (KM)	40.6
80% gamma percentile (KM)	130.3	90% gamma percentile (KM)	167.7
95% gamma percentile (KM)	203.2	99% gamma percentile (KM)	281.7

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (718.17, α)	657	Adjusted Chi Square Value (718.17, β)	656.5
95% Gamma Approximate KM-UCL (use when n>=50)	96	95% Gamma Adjusted KM-UCL (use when n<50)	96.07

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0308	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0575	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0694	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	87.84	Mean in Log Scale	4.271
SD in Original Scale	59.37	SD in Log Scale	0.648
95% t UCL (assumes normality of ROS data)	95.46	95% Percentile Bootstrap UCL	95.37
95% BCA Bootstrap UCL	95.8	95% Bootstrap t UCL	96.1
95% H-UCL (Log ROS)	97.2		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	4.269	KM Geo Mean	71.44
KM SD (logged)	0.653	95% Critical H Value (KM-Log)	1.9
KM Standard Error of Mean (logged)	0.0508	95% H-UCL (KM -Log)	97.39
KM SD (logged)	0.653	95% Critical H Value (KM-Log)	1.9
KM Standard Error of Mean (logged)	0.0508		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	87.79	Mean in Log Scale	4.265
SD in Original Scale	59.43	SD in Log Scale	0.671
95% t UCL (Assumes normality)	95.42	95% H-Stat UCL	98.47

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	96	95% GROS Approximate Gamma UCL	95.97

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.18/16/2019 9:24:16 AM
From File	ProUCLData_Sed_20190816.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1700	Mean	15639
Maximum	48800	Median	10900
SD	15083	Std. Error of Mean	5028
Coefficient of Variation	0.964	Skewness	1.66

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.326	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24988	95% Adjusted-CLT UCL (Chen-1995)	26880
		95% Modified-t UCL (Johnson-1978)	25452

Gamma GOF Test

A-D Test Statistic	0.408	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.285	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.363	k star (bias corrected MLE)	0.983
Theta hat (MLE)	11475	Theta star (bias corrected MLE)	15915
nu hat (MLE)	24.53	nu star (bias corrected)	17.69
MLE Mean (bias corrected)	15639	MLE Sd (bias corrected)	15776
		Approximate Chi Square Value (0.05)	9.166
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	7.906

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	30180	95% Adjusted Gamma UCL (use when n<50)	34990

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.213	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.438	Mean of logged Data	9.248
Maximum of Logged Data	10.8	SD of logged Data	1.015

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Assuming Lognormal Distribution				
95% H-UCL	56244	90% Chebyshev (MVUE) UCL	33038	
95% Chebyshev (MVUE) UCL	40709	97.5% Chebyshev (MVUE) UCL	51357	
99% Chebyshev (MVUE) UCL	72273			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	23909	95% Jackknife UCL	24988	
95% Standard Bootstrap UCL	23565	95% Bootstrap-t UCL	42132	
95% Hall's Bootstrap UCL	81810	95% Percentile Bootstrap UCL	24061	
95% BCA Bootstrap UCL	26661			
90% Chebyshev(Mean, Sd) UCL	30722	95% Chebyshev(Mean, Sd) UCL	37554	
97.5% Chebyshev(Mean, Sd) UCL	47036	99% Chebyshev(Mean, Sd) UCL	65663	
Suggested UCL to Use				
95% Adjusted Gamma UCL	34990			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Antimony				
General Statistics				
Total Number of Observations	9	Number of Distinct Observations	9	
		Number of Missing Observations	0	
Minimum	0.045	Mean	1.615	
Maximum	5.78	Median	1.05	
SD	1.753	Std. Error of Mean	0.584	
Coefficient of Variation	1.085	Skewness	1.923	
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use				
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.				
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).				
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test				
Shapiro Wilk Test Statistic	0.791	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	2.702	95% Adjusted-CLT UCL (Chen-1995)	2.977	
		95% Modified-t UCL (Johnson-1978)	2.764	
Gamma GOF Test				
A-D Test Statistic	0.461	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.252	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.289	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.781	k star (bias corrected MLE)	0.595	
Theta hat (MLE)	2.068	Theta star (bias corrected MLE)	2.716	
nu hat (MLE)	14.06	nu star (bias corrected)	10.71	
MLE Mean (bias corrected)	1.615	MLE Sd (bias corrected)	2.094	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

			Approximate Chi Square Value (0.05)	4.387
	Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	3.574
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	3.941	95% Adjusted Gamma UCL (use when n<50)	4.838
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.324	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level	
	Data appear Approximate Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	-3.101	Mean of logged Data	-0.283
	Maximum of Logged Data	1.754	SD of logged Data	1.657
	Assuming Lognormal Distribution			
	95% H-UCL	50.58	90% Chebyshev (MVUE) UCL	6.122
	95% Chebyshev (MVUE) UCL	7.867	97.5% Chebyshev (MVUE) UCL	10.29
	99% Chebyshev (MVUE) UCL	15.05		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	2.577	95% Jackknife UCL	2.702
	95% Standard Bootstrap UCL	2.516	95% Bootstrap-t UCL	3.8
	95% Hall's Bootstrap UCL	7.282	95% Percentile Bootstrap UCL	2.674
	95% BCA Bootstrap UCL	3.036		
	90% Chebyshev(Mean, Sd) UCL	3.368	95% Chebyshev(Mean, Sd) UCL	4.163
	97.5% Chebyshev(Mean, Sd) UCL	5.265	99% Chebyshev(Mean, Sd) UCL	7.43
	Suggested UCL to Use			
	95% Student's-t UCL	2.702		
	When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
	When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Arsenic			
	General Statistics			
	Total Number of Observations	9	Number of Distinct Observations	9
			Number of Missing Observations	0
	Minimum	1.09	Mean	11.4
	Maximum	31.7	Median	8.2
	SD	9.598	Std. Error of Mean	3.199
	Coefficient of Variation	0.842	Skewness	1.181
	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	17.35		95% Adjusted-CLT UCL (Chen-1995)	18.01
			95% Modified-t UCL (Johnson-1978)	17.56
Gamma GOF Test				
A-D Test Statistic	0.299		Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.738		Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.195		Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.285		Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.29		k star (bias corrected MLE)	0.934
Theta hat (MLE)	8.843		Theta star (bias corrected MLE)	12.21
nu hat (MLE)	23.21		nu star (bias corrected)	16.81
MLE Mean (bias corrected)	11.4		MLE Sd (bias corrected)	11.8
			Approximate Chi Square Value (0.05)	8.536
Adjusted Level of Significance	0.0231		Adjusted Chi Square Value	7.327
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	22.46		95% Adjusted Gamma UCL (use when n<50)	26.16
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.893		Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.829		Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.258		Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.274		Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	0.0862		Mean of logged Data	1.999
Maximum of Logged Data	3.456		SD of logged Data	1.142
Assuming Lognormal Distribution				
95% H-UCL	59.68		90% Chebyshev (MVUE) UCL	27.95
95% Chebyshev (MVUE) UCL	34.81		97.5% Chebyshev (MVUE) UCL	44.35
99% Chebyshev (MVUE) UCL	63.07			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	16.67		95% Jackknife UCL	17.35
95% Standard Bootstrap UCL	16.56		95% Bootstrap-t UCL	20.13
95% Hall's Bootstrap UCL	30.64		95% Percentile Bootstrap UCL	16.64
95% BCA Bootstrap UCL	17.55			
90% Chebyshev(Mean, Sd) UCL	21		95% Chebyshev(Mean, Sd) UCL	25.35
97.5% Chebyshev(Mean, Sd) UCL	31.38		99% Chebyshev(Mean, Sd) UCL	43.24
Suggested UCL to Use				
95% Student's-t UCL	17.35			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Barium				
General Statistics				
Total Number of Observations	9		Number of Distinct Observations	9

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

			Number of Missing Observations	0
	Minimum	21.8	Mean	260.6
	Maximum	757	Median	203
	SD	236.5	Std. Error of Mean	78.82
	Coefficient of Variation	0.908	Skewness	1.329
	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	
	Data appear Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	407.1	95% Adjusted-CLT UCL (Chen-1995)	427.5
			95% Modified-t UCL (Johnson-1978)	412.9
	Gamma GOF Test			
	A-D Test Statistic	0.322	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.186	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			
	k hat (MLE)	1.174	k star (bias corrected MLE)	0.857
	Theta hat (MLE)	221.9	Theta star (bias corrected MLE)	304
	nu hat (MLE)	21.14	nu star (bias corrected)	15.43
	MLE Mean (bias corrected)	260.6	MLE Sd (bias corrected)	281.5
			Approximate Chi Square Value (0.05)	7.559
	Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	6.433
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	531.7	95% Adjusted Gamma UCL (use when n<50)	624.8
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.252	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	3.082	Mean of logged Data	5.08
	Maximum of Logged Data	6.629	SD of logged Data	1.2
	Assuming Lognormal Distribution			
	95% H-UCL	1587	90% Chebyshev (MVUE) UCL	660.7
	95% Chebyshev (MVUE) UCL	826.8	97.5% Chebyshev (MVUE) UCL	1057
	99% Chebyshev (MVUE) UCL	1510		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	390.2	95% Jackknife UCL	407.1
	95% Standard Bootstrap UCL	382.6	95% Bootstrap-t UCL	547.9
	95% Hall's Bootstrap UCL	1271	95% Percentile Bootstrap UCL	396
	95% BCA Bootstrap UCL	415.6		

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

90% Chebyshev(Mean, Sd) UCL	497	95% Chebyshev(Mean, Sd) UCL	604.1
97.5% Chebyshev(Mean, Sd) UCL	752.8	99% Chebyshev(Mean, Sd) UCL	1045

Suggested UCL to Use

95% Student's-t UCL	407.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Beryllium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.061	Mean	0.662
Maximum	2.07	Median	0.448
SD	0.628	Std. Error of Mean	0.209
Coefficient of Variation	0.949	Skewness	1.617

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.249	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.051	95% Adjusted-CLT UCL (Chen-1995)	1.127
		95% Modified-t UCL (Johnson-1978)	1.07

Gamma GOF Test

A-D Test Statistic	0.334	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.216	k star (bias corrected MLE)	0.885
Theta hat (MLE)	0.544	Theta star (bias corrected MLE)	0.748
nu hat (MLE)	21.9	nu star (bias corrected)	15.93
MLE Mean (bias corrected)	0.662	MLE Sd (bias corrected)	0.704
		Approximate Chi Square Value (0.05)	7.913
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	6.757

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.333	95% Adjusted Gamma UCL (use when n<50)	1.561

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.269	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum of Logged Data	-2.797	Mean of logged Data	-0.877
Maximum of Logged Data	0.728	SD of logged Data	1.142

Assuming Lognormal Distribution

95% H-UCL	3.371	90% Chebyshev (MVUE) UCL	1.577
95% Chebyshev (MVUE) UCL	1.965	97.5% Chebyshev (MVUE) UCL	2.503
99% Chebyshev (MVUE) UCL	3.56		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.006	95% Jackknife UCL	1.051
95% Standard Bootstrap UCL	0.976	95% Bootstrap-t UCL	1.483
95% Hall's Bootstrap UCL	2.997	95% Percentile Bootstrap UCL	0.999
95% BCA Bootstrap UCL	1.113		
90% Chebyshev(Mean, Sd) UCL	1.29	95% Chebyshev(Mean, Sd) UCL	1.575
97.5% Chebyshev(Mean, Sd) UCL	1.969	99% Chebyshev(Mean, Sd) UCL	2.745

Suggested UCL to Use

95% Student's-t UCL	1.051

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Boron

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	2
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	2.2	Minimum Non-Detect	16.55
Maximum Detect	123	Maximum Non-Detect	19.8
Variance Detects	1917	Percent Non-Detects	22.22%
Mean Detects	41.71	SD Detects	43.78
Median Detects	31.7	CV Detects	1.05
Skewness Detects	1.24	Kurtosis Detects	0.957
Mean of Logged Detects	3.006	SD of Logged Detects	1.535

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.26	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	33.48	KM Standard Error of Mean	14.08
KM SD	39.01	95% KM (BCA) UCL	58.63
95% KM (t) UCL	59.66	95% KM (Percentile Bootstrap) UCL	57.39
95% KM (z) UCL	56.64	95% KM Bootstrap t UCL	85.98
90% KM Chebyshev UCL	75.71	95% KM Chebyshev UCL	94.85
97.5% KM Chebyshev UCL	121.4	99% KM Chebyshev UCL	173.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.254	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.183	**Kolmogorov-Smirnov GOF**

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% K-S Critical Value	0.322	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.817	k star (bias corrected MLE)	0.562	
Theta hat (MLE)	51.08	Theta star (bias corrected MLE)	74.24	
nu hat (MLE)	11.43	nu star (bias corrected)	7.867	
Mean (detects)	41.71			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	32.58	
Maximum	123	Median	19.1	
SD	42.03	CV	1.29	
k hat (MLE)	0.402	k star (bias corrected MLE)	0.342	
Theta hat (MLE)	81.09	Theta star (bias corrected MLE)	95.29	
nu hat (MLE)	7.231	nu star (bias corrected)	6.154	
Adjusted Level of Significance (β)	0.0231			
Approximate Chi Square Value (6.15, α)	1.719	Adjusted Chi Square Value (6.15, β)	1.272	
95% Gamma Approximate UCL (use when n>=50)	116.6	95% Gamma Adjusted UCL (use when n<50)	157.6	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	33.48	SD (KM)	39.01	
Variance (KM)	1522	SE of Mean (KM)	14.08	
k hat (KM)	0.737	k star (KM)	0.565	
nu hat (KM)	13.26	nu star (KM)	10.17	
theta hat (KM)	45.45	theta star (KM)	59.24	
80% gamma percentile (KM)	55.17	90% gamma percentile (KM)	88.24	
95% gamma percentile (KM)	123.1	99% gamma percentile (KM)	207.8	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (10.17, α)	4.05	Adjusted Chi Square Value (10.17, β)	3.276	
95% Gamma Approximate KM-UCL (use when n>=50)	84.1	95% Gamma Adjusted KM-UCL (use when n<50)	104	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	33.34	Mean in Log Scale	2.644	
SD in Original Scale	41.4	SD in Log Scale	1.515	
95% t UCL (assumes normality of ROS data)	59	95% Percentile Bootstrap UCL	56.93	
95% BCA Bootstrap UCL	61.39	95% Bootstrap t UCL	89.46	
95% H-UCL (Log ROS)	488.3			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	2.603	KM Geo Mean	13.51	
KM SD (logged)	1.497	95% Critical H Value (KM-Log)	4.436	
KM Standard Error of Mean (logged)	0.553	95% H-UCL (KM -Log)	433.7	
KM SD (logged)	1.497	95% Critical H Value (KM-Log)	4.436	
KM Standard Error of Mean (logged)	0.553			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	34.46	Mean in Log Scale	2.828	
SD in Original Scale	40.56	SD in Log Scale	1.377	
95% t UCL (Assumes normality)	59.6	95% H-Stat UCL	325.8	
DL/2 is not a recommended method, provided for comparisons and historical reasons				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	59.66			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Cadmium				
General Statistics				
Total Number of Observations	9	Number of Distinct Observations	9	
Number of Detects	8	Number of Non-Detects	1	
Number of Distinct Detects	8	Number of Distinct Non-Detects	1	
Minimum Detect	0.012	Minimum Non-Detect	0.023	
Maximum Detect	0.597	Maximum Non-Detect	0.023	
Variance Detects	0.0323	Percent Non-Detects	11.11%	
Mean Detects	0.224	SD Detects	0.18	
Median Detects	0.152	CV Detects	0.802	
Skewness Detects	1.379	Kurtosis Detects	2.261	
Mean of Logged Detects	-1.887	SD of Logged Detects	1.154	
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use				
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.				
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).				
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.256	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.201	KM Standard Error of Mean	0.0612	
KM SD	0.172	95% KM (BCA) UCL	0.31	
95% KM (t) UCL	0.314	95% KM (Percentile Bootstrap) UCL	0.298	
95% KM (z) UCL	0.301	95% KM Bootstrap t UCL	0.386	
90% KM Chebyshev UCL	0.384	95% KM Chebyshev UCL	0.468	
97.5% KM Chebyshev UCL	0.583	99% KM Chebyshev UCL	0.81	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.431	**Anderson-Darling GOF Test**		
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.27	**Kolmogorov-Smirnov GOF**		
5% K-S Critical Value	0.299	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.421	k star (bias corrected MLE)	0.971	
Theta hat (MLE)	0.158	Theta star (bias corrected MLE)	0.231	
nu hat (MLE)	22.74	nu star (bias corrected)	15.54	
Mean (detects)	0.224			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Minimum	0.01	Mean	0.2
Maximum	0.597	Median	0.14
SD	0.183	CV	0.911
k hat (MLE)	0.994	k star (bias corrected MLE)	0.737
Theta hat (MLE)	0.202	Theta star (bias corrected MLE)	0.272
nu hat (MLE)	17.89	nu star (bias corrected)	13.26
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (13.26, α)	6.067	Adjusted Chi Square Value (13.26, β)	5.079
95% Gamma Approximate UCL (use when n>=50)	0.438	95% Gamma Adjusted UCL (use when n<50)	0.523
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.201	SD (KM)	0.172
Variance (KM)	0.0295	SE of Mean (KM)	0.0612
k hat (KM)	1.362	k star (KM)	0.982
nu hat (KM)	24.51	nu star (KM)	17.67
theta hat (KM)	0.147	theta star (KM)	0.204
80% gamma percentile (KM)	0.323	90% gamma percentile (KM)	0.464
95% gamma percentile (KM)	0.605	99% gamma percentile (KM)	0.932
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.67, α)	9.154	Adjusted Chi Square Value (17.67, β)	7.895
95% Gamma Approximate KM-UCL (use when n>=50)	0.387	95% Gamma Adjusted KM-UCL (use when n<50)	0.449
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level	
Detected Data appear Approximate Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.202	Mean in Log Scale	-2.092
SD in Original Scale	0.181	SD in Log Scale	1.242
95% t UCL (assumes normality of ROS data)	0.314	95% Percentile Bootstrap UCL	0.305
95% BCA Bootstrap UCL	0.325	95% Bootstrap t UCL	0.387
95% H-UCL (Log ROS)	1.418		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.169	KM Geo Mean	0.114
KM SD (logged)	1.292	95% Critical H Value (KM-Log)	3.923
KM Standard Error of Mean (logged)	0.461	95% H-UCL (KM -Log)	1.582
KM SD (logged)	1.292	95% Critical H Value (KM-Log)	3.923
KM Standard Error of Mean (logged)	0.461		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.201	Mean in Log Scale	-2.173
SD in Original Scale	0.182	SD in Log Scale	1.38
95% t UCL (Assumes normality)	0.314	95% H-Stat UCL	2.217
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.314		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Chromium			

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	9	Number of Distinct Observations	9	
		Number of Missing Observations	0	
Minimum	6.19	Mean	77.17	
Maximum	222	Median	56.9	
SD	69.23	Std. Error of Mean	23.08	
Coefficient of Variation	0.897	Skewness	1.354	
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use				
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.				
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).				
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test				
Shapiro Wilk Test Statistic	0.851	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	120.1	95% Adjusted-CLT UCL (Chen-1995)	126.3	
		95% Modified-t UCL (Johnson-1978)	121.8	
Gamma GOF Test				
A-D Test Statistic	0.345	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.739	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.204	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.285	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.256	k star (bias corrected MLE)	0.912	
Theta hat (MLE)	61.41	Theta star (bias corrected MLE)	84.64	
nu hat (MLE)	22.62	nu star (bias corrected)	16.41	
MLE Mean (bias corrected)	77.17	MLE Sd (bias corrected)	80.82	
		Approximate Chi Square Value (0.05)	8.253	
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	7.067	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	153.4	95% Adjusted Gamma UCL (use when n<50)	179.2	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.268	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.823	Mean of logged Data	3.898	
Maximum of Logged Data	5.403	SD of logged Data	1.141	
Assuming Lognormal Distribution				
95% H-UCL	397.4	90% Chebyshev (MVUE) UCL	186.5	
95% Chebyshev (MVUE) UCL	232.3	97.5% Chebyshev (MVUE) UCL	295.8	
99% Chebyshev (MVUE) UCL	420.7			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	115.1	95% Jackknife UCL	120.1	
95% Standard Bootstrap UCL	112.9	95% Bootstrap-t UCL	165.4	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Hall's Bootstrap UCL	384.7	95% Percentile Bootstrap UCL	115.6
95% BCA Bootstrap UCL	125.1		
90% Chebyshev(Mean, Sd) UCL	146.4	95% Chebyshev(Mean, Sd) UCL	177.8
97.5% Chebyshev(Mean, Sd) UCL	221.3	99% Chebyshev(Mean, Sd) UCL	306.8

Suggested UCL to Use

95% Student's-t UCL	120.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	5.37	Mean	32.25
Maximum	89.1	Median	24.1
SD	26.83	Std. Error of Mean	8.944
Coefficient of Variation	0.832	Skewness	1.238

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.889	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.196	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	48.88	95% Adjusted-CLT UCL (Chen-1995)	50.91
		95% Modified-t UCL (Johnson-1978)	49.5

Gamma GOF Test

A-D Test Statistic	0.217	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.143	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.546	k star (bias corrected MLE)	1.105
Theta hat (MLE)	20.86	Theta star (bias corrected MLE)	29.19
nu hat (MLE)	27.83	nu star (bias corrected)	19.88
MLE Mean (bias corrected)	32.25	MLE Sd (bias corrected)	30.68
		Approximate Chi Square Value (0.05)	10.77
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	9.383

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	59.57	95% Adjusted Gamma UCL (use when n<50)	68.34

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Lognormal Statistics			
	Minimum of Logged Data	1.681	Mean of logged Data	3.117
	Maximum of Logged Data	4.49	SD of logged Data	0.967
	Assuming Lognormal Distribution			
	95% H-UCL	106.2	90% Chebyshev (MVUE) UCL	67.32
	95% Chebyshev (MVUE) UCL	82.57	97.5% Chebyshev (MVUE) UCL	103.7
	99% Chebyshev (MVUE) UCL	145.3		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	46.96	95% Jackknife UCL	48.88
	95% Standard Bootstrap UCL	46.19	95% Bootstrap-t UCL	56.57
	95% Hall's Bootstrap UCL	63.26	95% Percentile Bootstrap UCL	46.91
	95% BCA Bootstrap UCL	51		
	90% Chebyshev(Mean, Sd) UCL	59.08	95% Chebyshev(Mean, Sd) UCL	71.24
	97.5% Chebyshev(Mean, Sd) UCL	88.11	99% Chebyshev(Mean, Sd) UCL	121.2
	Suggested UCL to Use			
	95% Student's-t UCL	48.88		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Copper			
	General Statistics			
	Total Number of Observations	9	Number of Distinct Observations	9
			Number of Missing Observations	0
	Minimum	7.15	Mean	57.77
	Maximum	158	Median	45.2
	SD	47.83	Std. Error of Mean	15.94
	Coefficient of Variation	0.828	Skewness	1.206
	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**	
	5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	
	Data appear Normal at 5% Significance Level			
	Assuming Normal Distribution			
	95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
	95% Student's-t UCL	87.41	95% Adjusted-CLT UCL (Chen-1995)	90.83
			95% Modified-t UCL (Johnson-1978)	88.48
	Gamma GOF Test			
	A-D Test Statistic	0.301	**Anderson-Darling Gamma GOF Test**	
	5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.162	**Kolmogorov-Smirnov Gamma GOF Test**	
	5% K-S Critical Value	0.285	Detected data appear Gamma Distributed at 5% Significance Level	
	Detected data appear Gamma Distributed at 5% Significance Level			
	Gamma Statistics			

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

k hat (MLE)	1.41	k star (bias corrected MLE)	1.014
Theta hat (MLE)	40.97	Theta star (bias corrected MLE)	56.97
nu hat (MLE)	25.38	nu star (bias corrected)	18.25
MLE Mean (bias corrected)	57.77	MLE Sd (bias corrected)	57.36
		Approximate Chi Square Value (0.05)	9.574
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	8.282
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	110.1	95% Adjusted Gamma UCL (use when n<50)	127.3
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.894	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.224	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.967	Mean of logged Data	3.662
Maximum of Logged Data	5.063	SD of logged Data	1.064
Assuming Lognormal Distribution			
95% H-UCL	245	90% Chebyshev (MVUE) UCL	132.4
95% Chebyshev (MVUE) UCL	163.9	97.5% Chebyshev (MVUE) UCL	207.6
99% Chebyshev (MVUE) UCL	293.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	83.99	95% Jackknife UCL	87.41
95% Standard Bootstrap UCL	82.75	95% Bootstrap-t UCL	107.4
95% Hall's Bootstrap UCL	245.6	95% Percentile Bootstrap UCL	84.7
95% BCA Bootstrap UCL	88.73		
90% Chebyshev(Mean, Sd) UCL	105.6	95% Chebyshev(Mean, Sd) UCL	127.3
97.5% Chebyshev(Mean, Sd) UCL	157.3	99% Chebyshev(Mean, Sd) UCL	216.4
Suggested UCL to Use			
95% Student's-t UCL	87.41		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Iron			
General Statistics			
Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	6190	Mean	34454
Maximum	103000	Median	24200
SD	30392	Std. Error of Mean	10131
Coefficient of Variation	0.882	Skewness	1.719
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.806	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	53293	95% Adjusted-CLT UCL (Chen-1995)	57321	
		95% Modified-t UCL (Johnson-1978)	54260	
Gamma GOF Test				
A-D Test Statistic	0.344	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.223	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.748	k star (bias corrected MLE)	1.239	
Theta hat (MLE)	19716	Theta star (bias corrected MLE)	27806	
nu hat (MLE)	31.46	nu star (bias corrected)	22.3	
MLE Mean (bias corrected)	34454	MLE Sd (bias corrected)	30952	
		Approximate Chi Square Value (0.05)	12.57	
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	11.06	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	61153	95% Adjusted Gamma UCL (use when n<50)	69509	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.195	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	8.731	Mean of logged Data	10.13	
Maximum of Logged Data	11.54	SD of logged Data	0.85	
Assuming Lognormal Distribution				
95% H-UCL	86767	90% Chebyshev (MVUE) UCL	64532	
95% Chebyshev (MVUE) UCL	78179	97.5% Chebyshev (MVUE) UCL	97121	
99% Chebyshev (MVUE) UCL	134328			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	51118	95% Jackknife UCL	53293	
95% Standard Bootstrap UCL	49886	95% Bootstrap-t UCL	83168	
95% Hall's Bootstrap UCL	147649	95% Percentile Bootstrap UCL	51310	
95% BCA Bootstrap UCL	55956			
90% Chebyshev(Mean, Sd) UCL	64846	95% Chebyshev(Mean, Sd) UCL	78613	
97.5% Chebyshev(Mean, Sd) UCL	97720	99% Chebyshev(Mean, Sd) UCL	135253	
Suggested UCL to Use				
95% Adjusted Gamma UCL	69509			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Lead				
General Statistics				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.784	Mean	13.74
Maximum	37.1	Median	9.48
SD	11.53	Std. Error of Mean	3.843
Coefficient of Variation	0.839	Skewness	0.979

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.2	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	20.89	95% Adjusted-CLT UCL (Chen-1995)	21.4
		95% Modified-t UCL (Johnson-1978)	21.1

Gamma GOF Test

A-D Test Statistic	0.352	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.221	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.115	k star (bias corrected MLE)	0.817
Theta hat (MLE)	12.33	Theta star (bias corrected MLE)	16.81
nu hat (MLE)	20.07	nu star (bias corrected)	14.71
MLE Mean (bias corrected)	13.74	MLE Sd (bias corrected)	15.2
		Approximate Chi Square Value (0.05)	7.062
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	5.98

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	28.63	95% Adjusted Gamma UCL (use when n<50)	33.81

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.287	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.243	Mean of logged Data	2.109
Maximum of Logged Data	3.614	SD of logged Data	1.303

Assuming Lognormal Distribution

95% H-UCL	118.8	90% Chebyshev (MVUE) UCL	39.26
95% Chebyshev (MVUE) UCL	49.49	97.5% Chebyshev (MVUE) UCL	63.68
99% Chebyshev (MVUE) UCL	91.56		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	20.06	95% Jackknife UCL	20.89
95% Standard Bootstrap UCL	19.85	95% Bootstrap-t UCL	23.08
95% Hall's Bootstrap UCL	23.52	95% Percentile Bootstrap UCL	20.33

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% BCA Bootstrap UCL	21.34		
90% Chebyshev(Mean, Sd) UCL	25.27	95% Chebyshev(Mean, Sd) UCL	30.49
97.5% Chebyshev(Mean, Sd) UCL	37.74	99% Chebyshev(Mean, Sd) UCL	51.98

Suggested UCL to Use

95% Student's-t UCL	20.89		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Lithium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	6.26	Mean	27.18
Maximum	75.7	Median	18.7
SD	22.37	Std. Error of Mean	7.456
Coefficient of Variation	0.823	Skewness	1.563

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.272	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	41.04	95% Adjusted-CLT UCL (Chen-1995)	43.6
		95% Modified-t UCL (Johnson-1978)	41.69

Gamma GOF Test

A-D Test Statistic	0.35	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.177	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.975	k star (bias corrected MLE)	1.391
Theta hat (MLE)	13.76	Theta star (bias corrected MLE)	19.54
nu hat (MLE)	35.55	nu star (bias corrected)	25.03
MLE Mean (bias corrected)	27.18	MLE Sd (bias corrected)	23.05
		Approximate Chi Square Value (0.05)	14.64
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	12.99

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	46.48	95% Adjusted Gamma UCL (use when n<50)	52.38

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.183	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Lognormal Statistics				
Minimum of Logged Data	1.834	Mean of logged Data	3.028
Maximum of Logged Data	4.327	SD of logged Data	0.788
Assuming Lognormal Distribution			
95% H-UCL	61.34	90% Chebyshev (MVUE) UCL	48.96
95% Chebyshev (MVUE) UCL	58.89	97.5% Chebyshev (MVUE) UCL	72.67
99% Chebyshev (MVUE) UCL	99.74		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	39.44	95% Jackknife UCL	41.04
95% Standard Bootstrap UCL	38.95	95% Bootstrap-t UCL	61.78
95% Hall's Bootstrap UCL	119.3	95% Percentile Bootstrap UCL	38.99
95% BCA Bootstrap UCL	44.02		
90% Chebyshev(Mean, Sd) UCL	49.55	95% Chebyshev(Mean, Sd) UCL	59.68
97.5% Chebyshev(Mean, Sd) UCL	73.74	99% Chebyshev(Mean, Sd) UCL	101.4
Suggested UCL to Use			
95% Student's-t UCL	41.04		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Manganese			
General Statistics			
Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	165	Mean	724
Maximum	1960	Median	483
SD	568.3	Std. Error of Mean	189.4
Coefficient of Variation	0.785	Skewness	1.477
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.846	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1076	95% Adjusted-CLT UCL (Chen-1995)	1135
		95% Modified-t UCL (Johnson-1978)	1092
Gamma GOF Test			
A-D Test Statistic	0.308	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.204	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

	Gamma Statistics			
	k hat (MLE)	2.09	k star (bias corrected MLE)	1.467
	Theta hat (MLE)	346.4	Theta star (bias corrected MLE)	493.4
	nu hat (MLE)	37.62	nu star (bias corrected)	26.41
	MLE Mean (bias corrected)	724	MLE Sd (bias corrected)	597.7
			Approximate Chi Square Value (0.05)	15.7
	Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	13.98
	Assuming Gamma Distribution			
	95% Approximate Gamma UCL (use when n>=50))	1218	95% Adjusted Gamma UCL (use when n<50)	1368
	Lognormal GOF Test			
	Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
	5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level	
	Lilliefors Test Statistic	0.185	**Lilliefors Lognormal GOF Test**	
	5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level	
	Data appear Lognormal at 5% Significance Level			
	Lognormal Statistics			
	Minimum of Logged Data	5.106	Mean of logged Data	6.327
	Maximum of Logged Data	7.581	SD of logged Data	0.771
	Assuming Lognormal Distribution			
	95% H-UCL	1595	90% Chebyshev (MVUE) UCL	1297
	95% Chebyshev (MVUE) UCL	1556	97.5% Chebyshev (MVUE) UCL	1916
	99% Chebyshev (MVUE) UCL	2624		
	Nonparametric Distribution Free UCL Statistics			
	Data appear to follow a Discernible Distribution at 5% Significance Level			
	Nonparametric Distribution Free UCLs			
	95% CLT UCL	1036	95% Jackknife UCL	1076
	95% Standard Bootstrap UCL	1013	95% Bootstrap-t UCL	1392
	95% Hall's Bootstrap UCL	2294	95% Percentile Bootstrap UCL	1044
	95% BCA Bootstrap UCL	1119		
	90% Chebyshev(Mean, Sd) UCL	1292	95% Chebyshev(Mean, Sd) UCL	1550
	97.5% Chebyshev(Mean, Sd) UCL	1907	99% Chebyshev(Mean, Sd) UCL	2609
	Suggested UCL to Use			
	95% Student's-t UCL	1076		
	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
	Recommendations are based upon data size, data distribution, and skewness.			
	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
	Mercury			
	General Statistics			
	Total Number of Observations	9	Number of Distinct Observations	9
			Number of Missing Observations	0
	Minimum	0.173	Mean	49.31
	Maximum	216	Median	26.2
	SD	66.36	Std. Error of Mean	22.12
	Coefficient of Variation	1.346	Skewness	2.384
	Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
	guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
	For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			
	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1			
	Normal GOF Test			
	Shapiro Wilk Test Statistic	0.701	**Shapiro Wilk GOF Test**	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	90.44	95% Adjusted-CLT UCL (Chen-1995)	104.5	
		95% Modified-t UCL (Johnson-1978)	93.37	
Gamma GOF Test				
A-D Test Statistic	0.431	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.77	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.237	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	0.506	k star (bias corrected MLE)	0.411	
Theta hat (MLE)	97.43	Theta star (bias corrected MLE)	119.8	
nu hat (MLE)	9.109	nu star (bias corrected)	7.406	
MLE Mean (bias corrected)	49.31	MLE Sd (bias corrected)	76.87	
		Approximate Chi Square Value (0.05)	2.396	
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	1.84	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	152.4	95% Adjusted Gamma UCL (use when n<50)	198.5	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.824	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.325	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.274	Data Not Lognormal at 5% Significance Level		
Data Not Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.754	Mean of logged Data	2.645	
Maximum of Logged Data	5.375	SD of logged Data	2.39	
Assuming Lognormal Distribution				
95% H-UCL	72391	90% Chebyshev (MVUE) UCL	380.6	
95% Chebyshev (MVUE) UCL	500.2	97.5% Chebyshev (MVUE) UCL	666.3	
99% Chebyshev (MVUE) UCL	992.4			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	85.69	95% Jackknife UCL	90.44	
95% Standard Bootstrap UCL	83.05	95% Bootstrap-t UCL	145.5	
95% Hall's Bootstrap UCL	227.3	95% Percentile Bootstrap UCL	86.14	
95% BCA Bootstrap UCL	102.9			
90% Chebyshev(Mean, Sd) UCL	115.7	95% Chebyshev(Mean, Sd) UCL	145.7	
97.5% Chebyshev(Mean, Sd) UCL	187.4	99% Chebyshev(Mean, Sd) UCL	269.4	
Suggested UCL to Use				
95% Adjusted Gamma UCL	198.5			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
Methyl Mercury				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

General Statistics				
Total Number of Observations	9	Number of Distinct Observations	9	
		Number of Missing Observations	0	
Minimum	2.7700E-4	Mean	0.00386	
Maximum	0.00836	Median	0.00408	
SD	0.0031	Std. Error of Mean	0.00103	
Coefficient of Variation	0.804	Skewness	0.194	
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use				
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.				
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).				
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test				
Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	0.00578	95% Adjusted-CLT UCL (Chen-1995)	0.00563	
		95% Modified-t UCL (Johnson-1978)	0.00579	
Gamma GOF Test				
A-D Test Statistic	0.456	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.206	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.287	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.059	k star (bias corrected MLE)	0.78	
Theta hat (MLE)	0.00364	Theta star (bias corrected MLE)	0.00494	
nu hat (MLE)	19.06	nu star (bias corrected)	14.04	
MLE Mean (bias corrected)	0.00386	MLE Sd (bias corrected)	0.00437	
		Approximate Chi Square Value (0.05)	6.597	
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	5.558	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.0082	95% Adjusted Gamma UCL (use when n<50)	0.00974	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.862	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.231	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-8.191	Mean of logged Data	-6.1	
Maximum of Logged Data	-4.784	SD of logged Data	1.317	
Assuming Lognormal Distribution				
95% H-UCL	0.0341	90% Chebyshev (MVUE) UCL	0.0109	
95% Chebyshev (MVUE) UCL	0.0138	97.5% Chebyshev (MVUE) UCL	0.0177	
99% Chebyshev (MVUE) UCL	0.0255			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.00556	95% Jackknife UCL	0.00578	

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% Standard Bootstrap UCL	0.00547	95% Bootstrap-t UCL	0.00591
95% Hall's Bootstrap UCL	0.00561	95% Percentile Bootstrap UCL	0.00549
95% BCA Bootstrap UCL	0.00553		
90% Chebyshev(Mean, Sd) UCL	0.00696	95% Chebyshev(Mean, Sd) UCL	0.00836
97.5% Chebyshev(Mean, Sd) UCL	0.0103	99% Chebyshev(Mean, Sd) UCL	0.0141

Suggested UCL to Use

95% Student's-t UCL	0.00578		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Molybdenum

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	2
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	0.262	Minimum Non-Detect	0.101
Maximum Detect	1.69	Maximum Non-Detect	0.112
Variance Detects	0.236	Percent Non-Detects	22.22%
Mean Detects	0.705	SD Detects	0.486
Median Detects	0.537	CV Detects	0.689
Skewness Detects	1.668	Kurtosis Detects	2.952
Mean of Logged Detects	-0.522	SD of Logged Detects	0.618

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.571	KM Standard Error of Mean	0.169
KM SD	0.47	95% KM (BCA) UCL	0.814
95% KM (t) UCL	0.885	95% KM (Percentile Bootstrap) UCL	0.85
95% KM (z) UCL	0.849	95% KM Bootstrap t UCL	1.079
90% KM Chebyshev UCL	1.078	95% KM Chebyshev UCL	1.308
97.5% KM Chebyshev UCL	1.627	99% KM Chebyshev UCL	2.253

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.255	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.712	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.314	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.046	k star (bias corrected MLE)	1.836
Theta hat (MLE)	0.232	Theta star (bias corrected MLE)	0.384
nu hat (MLE)	42.64	nu star (bias corrected)	25.7
Mean (detects)	0.705		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	0.551	
Maximum	1.69	Median	0.457	
SD	0.521	CV	0.946	
k hat (MLE)	0.722	k star (bias corrected MLE)	0.556	
Theta hat (MLE)	0.762	Theta star (bias corrected MLE)	0.991	
nu hat (MLE)	13	nu star (bias corrected)	10	
Adjusted Level of Significance (β)	0.0231			
Approximate Chi Square Value (10.00, α)	3.942	Adjusted Chi Square Value (10.00, β)	3.181	
95% Gamma Approximate UCL (use when n>=50)	1.397	95% Gamma Adjusted UCL (use when n<50)	1.731	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.571	SD (KM)	0.47	
Variance (KM)	0.221	SE of Mean (KM)	0.169	
k hat (KM)	1.477	k star (KM)	1.059	
nu hat (KM)	26.59	nu star (KM)	19.06	
theta hat (KM)	0.386	theta star (KM)	0.539	
80% gamma percentile (KM)	0.914	90% gamma percentile (KM)	1.296	
95% gamma percentile (KM)	1.676	99% gamma percentile (KM)	2.555	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (19.06, α)	10.16	Adjusted Chi Square Value (19.06, β)	8.825	
95% Gamma Approximate KM-UCL (use when n>=50)	1.071	95% Gamma Adjusted KM-UCL (use when n<50)	1.233	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.135	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.304	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.576	Mean in Log Scale	-0.866	
SD in Original Scale	0.492	SD in Log Scale	0.867	
95% t UCL (assumes normality of ROS data)	0.882	95% Percentile Bootstrap UCL	0.861	
95% BCA Bootstrap UCL	0.91	95% Bootstrap t UCL	1.1	
95% H-UCL (Log ROS)	1.514			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-0.916	KM Geo Mean	0.4	
KM SD (logged)	0.892	95% Critical H Value (KM-Log)	3.004	
KM Standard Error of Mean (logged)	0.321	95% H-UCL (KM -Log)	1.537	
KM SD (logged)	0.892	95% Critical H Value (KM-Log)	3.004	
KM Standard Error of Mean (logged)	0.321			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	0.56	Mean in Log Scale	-1.059	
SD in Original Scale	0.51	SD in Log Scale	1.192	
95% t UCL (Assumes normality)	0.876	95% H-Stat UCL	3.325	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	0.885			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Nickel

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	12.5	Mean	144.8
Maximum	392	Median	115
SD	121.2	Std. Error of Mean	40.41
Coefficient of Variation	0.837	Skewness	1.072

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	220	95% Adjusted-CLT UCL (Chen-1995)	226.7
		95% Modified-t UCL (Johnson-1978)	222.4

Gamma GOF Test

A-D Test Statistic	0.333	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.739	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.195	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.222	k star (bias corrected MLE)	0.889
Theta hat (MLE)	118.5	Theta star (bias corrected MLE)	163
nu hat (MLE)	21.99	nu star (bias corrected)	16
MLE Mean (bias corrected)	144.8	MLE Sd (bias corrected)	153.6
		Approximate Chi Square Value (0.05)	7.959
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	6.799

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	291.1	95% Adjusted Gamma UCL (use when n<50)	340.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.26	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.526	Mean of logged Data	4.513
Maximum of Logged Data	5.971	SD of logged Data	1.201

Assuming Lognormal Distribution

95% H-UCL	905.4	90% Chebyshev (MVUE) UCL	375.7
95% Chebyshev (MVUE) UCL	470.2	97.5% Chebyshev (MVUE) UCL	601.4
99% Chebyshev (MVUE) UCL	859		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

95% CLT UCL	211.3	95% Jackknife UCL	220
95% Standard Bootstrap UCL	206.7	95% Bootstrap-t UCL	258
95% Hall's Bootstrap UCL	389.5	95% Percentile Bootstrap UCL	213.6
95% BCA Bootstrap UCL	221.5		
90% Chebyshev(Mean, Sd) UCL	266	95% Chebyshev(Mean, Sd) UCL	321
97.5% Chebyshev(Mean, Sd) UCL	397.2	99% Chebyshev(Mean, Sd) UCL	546.9

Suggested UCL to Use

95% Student's-t UCL	220

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Selenium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	4	Number of Non-Detects	5
Number of Distinct Detects	4	Number of Distinct Non-Detects	5
Minimum Detect	3.21	Minimum Non-Detect	0.505
Maximum Detect	10.7	Maximum Non-Detect	3.625
Variance Detects	11.05	Percent Non-Detects	55.56%
Mean Detects	6.453	SD Detects	3.324
Median Detects	5.95	CV Detects	0.515
Skewness Detects	0.656	Kurtosis Detects	-1.196
Mean of Logged Detects	1.761	SD of Logged Detects	0.531

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.219	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.375	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	3.299	KM Standard Error of Mean	1.359
KM SD	3.465	95% KM (BCA) UCL	N/A
95% KM (t) UCL	5.825	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	5.534	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	7.375	95% KM Chebyshev UCL	9.222
97.5% KM Chebyshev UCL	11.78	99% KM Chebyshev UCL	16.82

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.233	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.225	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.396	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.991	k star (bias corrected MLE)	1.414
Theta hat (MLE)	1.293	Theta star (bias corrected MLE)	4.562
nu hat (MLE)	39.93	nu star (bias corrected)	11.31
Mean (detects)	6.453		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean	2.873	
Maximum	10.7	Median	0.01	
SD	3.959	CV	1.378	
k hat (MLE)	0.251	k star (bias corrected MLE)	0.241	
Theta hat (MLE)	11.46	Theta star (bias corrected MLE)	11.91	
nu hat (MLE)	4.514	nu star (bias corrected)	4.342	
Adjusted Level of Significance (β)	0.0231			
Approximate Chi Square Value (4.34, α)	0.861	Adjusted Chi Square Value (4.34, β)	0.587	
95% Gamma Approximate UCL (use when n>=50)	14.48	95% Gamma Adjusted UCL (use when n<50)	N/A	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	3.299	SD (KM)	3.465	
Variance (KM)	12.01	SE of Mean (KM)	1.359	
k hat (KM)	0.906	k star (KM)	0.678	
nu hat (KM)	16.31	nu star (KM)	12.21	
theta hat (KM)	3.64	theta star (KM)	4.864	
80% gamma percentile (KM)	5.427	90% gamma percentile (KM)	8.342	
95% gamma percentile (KM)	11.36	99% gamma percentile (KM)	18.57	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (12.21, α)	5.364	Adjusted Chi Square Value (12.21, β)	4.446	
95% Gamma Approximate KM-UCL (use when n>=50)	7.507	95% Gamma Adjusted KM-UCL (use when n<50)	9.057	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.183	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.375	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	3.614	Mean in Log Scale	0.942	
SD in Original Scale	3.378	SD in Log Scale	0.848	
95% t UCL (assumes normality of ROS data)	5.708	95% Percentile Bootstrap UCL	5.411	
95% BCA Bootstrap UCL	5.819	95% Bootstrap t UCL	7.779	
95% H-UCL (Log ROS)	8.798			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	0.506	KM Geo Mean	1.658	
KM SD (logged)	1.235	95% Critical H Value (KM-Log)	3.784	
KM Standard Error of Mean (logged)	0.508	95% H-UCL (KM -Log)	18.55	
KM SD (logged)	1.235	95% Critical H Value (KM-Log)	3.784	
KM Standard Error of Mean (logged)	0.508			
DL/2 Statistics				
DL/2 Normal		**DL/2 Log-Transformed**		
Mean in Original Scale	3.416	Mean in Log Scale	0.601	
SD in Original Scale	3.566	SD in Log Scale	1.33	
95% t UCL (Assumes normality)	5.626	95% H-Stat UCL	29.16	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Detected Data appear Normal Distributed at 5% Significance Level				
Suggested UCL to Use				
95% KM (t) UCL	5.825			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Thallium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	0.0094	Minimum Non-Detect	0.0042
Maximum Detect	0.541	Maximum Non-Detect	0.0042
Variance Detects	0.0278	Percent Non-Detects	11.11%
Mean Detects	0.206	SD Detects	0.167
Median Detects	0.157	CV Detects	0.812
Skewness Detects	1.222	Kurtosis Detects	1.585
Mean of Logged Detects	-2.008	SD of Logged Detects	1.219

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.192	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.183	KM Standard Error of Mean	0.0571
KM SD	0.16	95% KM (BCA) UCL	0.277
95% KM (t) UCL	0.289	95% KM (Percentile Bootstrap) UCL	0.274
95% KM (z) UCL	0.277	95% KM Bootstrap t UCL	0.34
90% KM Chebyshev UCL	0.354	95% KM Chebyshev UCL	0.432
97.5% KM Chebyshev UCL	0.54	99% KM Chebyshev UCL	0.751

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.279	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.197	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.3	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.314	k star (bias corrected MLE)	0.905
Theta hat (MLE)	0.156	Theta star (bias corrected MLE)	0.227
nu hat (MLE)	21.03	nu star (bias corrected)	14.48
Mean (detects)	0.206		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0094	Mean	0.184
Maximum	0.541	Median	0.122
SD	0.169	CV	0.92
k hat (MLE)	0.961	k star (bias corrected MLE)	0.715
Theta hat (MLE)	0.191	Theta star (bias corrected MLE)	0.257
nu hat (MLE)	17.3	nu star (bias corrected)	12.87
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (12.87, α)	5.805	Adjusted Chi Square Value (12.87, β)	4.842
95% Gamma Approximate UCL (use when n>=50)	0.408	95% Gamma Adjusted UCL (use when n<50)	0.489

Estimates of Gamma Parameters using KM Estimates

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Mean (KM)	0.183	SD (KM)	0.16
Variance (KM)	0.0257	SE of Mean (KM)	0.0571
k hat (KM)	1.308	k star (KM)	0.946
nu hat (KM)	23.55	nu star (KM)	17.03
theta hat (KM)	0.14	theta star (KM)	0.194
80% gamma percentile (KM)	0.296	90% gamma percentile (KM)	0.428
95% gamma percentile (KM)	0.56	99% gamma percentile (KM)	0.868
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (17.03, α)	8.696	Adjusted Chi Square Value (17.03, β)	7.474
95% Gamma Approximate KM-UCL (use when n>=50)	0.359	95% Gamma Adjusted KM-UCL (use when n<50)	0.418
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.858	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.268	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.184	Mean in Log Scale	-2.31
SD in Original Scale	0.169	SD in Log Scale	1.457
95% t UCL (assumes normality of ROS data)	0.289	95% Percentile Bootstrap UCL	0.278
95% BCA Bootstrap UCL	0.292	95% Bootstrap t UCL	0.349
95% H-UCL (Log ROS)	2.667		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-2.393	KM Geo Mean	0.0913
KM SD (logged)	1.53	95% Critical H Value (KM-Log)	4.518
KM Standard Error of Mean (logged)	0.545	95% H-UCL (KM -Log)	3.391
KM SD (logged)	1.53	95% Critical H Value (KM-Log)	4.518
KM Standard Error of Mean (logged)	0.545		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.183	Mean in Log Scale	-2.47
SD in Original Scale	0.17	SD in Log Scale	1.795
95% t UCL (Assumes normality)	0.288	95% H-Stat UCL	11.31
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.289		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Vanadium			
General Statistics			
Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	5.83	Mean	49.86
Maximum	132	Median	37.6
SD	42.74	Std. Error of Mean	14.25
Coefficient of Variation	0.857	Skewness	1.234
Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use			
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.			
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).			

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1				
Normal GOF Test				
Shapiro Wilk Test Statistic	0.83	**Shapiro Wilk GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**		
5% Lilliefors Critical Value	0.274	Data Not Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**		
95% Student's-t UCL	76.35	95% Adjusted-CLT UCL (Chen-1995)	79.56	
		95% Modified-t UCL (Johnson-1978)	77.33	
Gamma GOF Test				
A-D Test Statistic	0.409	**Anderson-Darling Gamma GOF Test**		
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.2	**Kolmogorov-Smirnov Gamma GOF Test**		
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	1.482	k star (bias corrected MLE)	1.062	
Theta hat (MLE)	33.64	Theta star (bias corrected MLE)	46.95	
nu hat (MLE)	26.68	nu star (bias corrected)	19.12	
MLE Mean (bias corrected)	49.86	MLE Sd (bias corrected)	48.38	
		Approximate Chi Square Value (0.05)	10.2	
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	8.863	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	93.43	95% Adjusted Gamma UCL (use when n<50)	107.6	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk Lognormal GOF Test**		
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.259	**Lilliefors Lognormal GOF Test**		
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	1.763	Mean of logged Data	3.535	
Maximum of Logged Data	4.883	SD of logged Data	0.999	
Assuming Lognormal Distribution				
95% H-UCL	177.3	90% Chebyshev (MVUE) UCL	106.9	
95% Chebyshev (MVUE) UCL	131.5	97.5% Chebyshev (MVUE) UCL	165.6	
99% Chebyshev (MVUE) UCL	232.8			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	73.3	95% Jackknife UCL	76.35	
95% Standard Bootstrap UCL	72.63	95% Bootstrap-t UCL	110.1	
95% Hall's Bootstrap UCL	264.2	95% Percentile Bootstrap UCL	72.95	
95% BCA Bootstrap UCL	77.98			
90% Chebyshev(Mean, Sd) UCL	92.6	95% Chebyshev(Mean, Sd) UCL	112	
97.5% Chebyshev(Mean, Sd) UCL	138.8	99% Chebyshev(Mean, Sd) UCL	191.6	
Suggested UCL to Use				
95% Student's-t UCL	76.35			
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test				
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL				

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Zinc

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	11.9	Mean	86.24
Maximum	248	Median	64.3
SD	71.95	Std. Error of Mean	23.98
Coefficient of Variation	0.834	Skewness	1.543

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use
guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest.
For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012).
Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1

Normal GOF Test

Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	130.8	95% Adjusted-CLT UCL (Chen-1995)	138.9
		95% Modified-t UCL (Johnson-1978)	132.9

Gamma GOF Test

A-D Test Statistic	0.278	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.195	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.284	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.606	k star (bias corrected MLE)	1.145
Theta hat (MLE)	53.69	Theta star (bias corrected MLE)	75.32
nu hat (MLE)	28.91	nu star (bias corrected)	20.61
MLE Mean (bias corrected)	86.24	MLE Sd (bias corrected)	80.6
		Approximate Chi Square Value (0.05)	11.3
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	9.88

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	157.3	95% Adjusted Gamma UCL (use when n<50)	179.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.251	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.477	Mean of logged Data	4.115
Maximum of Logged Data	5.513	SD of logged Data	0.955

Assuming Lognormal Distribution

95% H-UCL	278.5	90% Chebyshev (MVUE) UCL	179.7
95% Chebyshev (MVUE) UCL	220.2	97.5% Chebyshev (MVUE) UCL	276.3

Table E1-18
Ambient Sediment, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	386.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	125.7	95% Jackknife UCL	130.8
95% Standard Bootstrap UCL	123.4	95% Bootstrap-t UCL	165.1
95% Hall's Bootstrap UCL	352.7	95% Percentile Bootstrap UCL	124.7
95% BCA Bootstrap UCL	140.3		
90% Chebyshev(Mean, Sd) UCL	158.2	95% Chebyshev(Mean, Sd) UCL	190.8
97.5% Chebyshev(Mean, Sd) UCL	236	99% Chebyshev(Mean, Sd) UCL	324.9
Suggested UCL to Use			
95% Student's-t UCL	130.8		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Table E1-19
Fish Tissue, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/13/2019 2:51:05 PM
From File	Fish_GameFishermen_UCLData_20191113.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics

Total Number of Observations	140	Number of Distinct Observations	108
		Number of Missing Observations	0
Minimum	0.03	Mean	0.289
Maximum	1.15	Median	0.235
SD	0.231	Std. Error of Mean	0.0195
Coefficient of Variation	0.799	Skewness	1.499

Normal GOF Test

Shapiro Wilk Test Statistic	0.848	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0753	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.321	95% Adjusted-CLT UCL (Chen-1995)	0.324
		95% Modified-t UCL (Johnson-1978)	0.322

Gamma GOF Test

A-D Test Statistic	0.525	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.051	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0804	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.742	k star (bias corrected MLE)	1.71
Theta hat (MLE)	0.166	Theta star (bias corrected MLE)	0.169
nu hat (MLE)	487.9	nu star (bias corrected)	478.7
MLE Mean (bias corrected)	0.289	MLE Sd (bias corrected)	0.221
		Approximate Chi Square Value (0.05)	429
Adjusted Level of Significance	0.0483	Adjusted Chi Square Value	428.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.322	95% Adjusted Gamma UCL (use when n<50)	0.323

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.0269	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0702	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.0753	Data appear Lognormal at 5% Significance Level	

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.507	Mean of logged Data	-1.555
Maximum of Logged Data	0.14	SD of logged Data	0.831

Assuming Lognormal Distribution

95% H-UCL	0.345	90% Chebyshev (MVUE) UCL	0.369
95% Chebyshev (MVUE) UCL	0.402	97.5% Chebyshev (MVUE) UCL	0.447

Table E1-19
Fish Tissue, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

99% Chebyshev (MVUE) UCL	0.536		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.321	95% Jackknife UCL	0.321
95% Standard Bootstrap UCL	0.321	95% Bootstrap-t UCL	0.324
95% Hall's Bootstrap UCL	0.325	95% Percentile Bootstrap UCL	0.322
95% BCA Bootstrap UCL	0.322		
90% Chebyshev(Mean, Sd) UCL	0.348	95% Chebyshev(Mean, Sd) UCL	0.374
97.5% Chebyshev(Mean, Sd) UCL	0.411	99% Chebyshev(Mean, Sd) UCL	0.483

Suggested UCL to Use

95% Approximate Gamma UCL	0.322		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.111/13/2019 9:46:54 AM
From File	Fish_Tribal_UCLData_20191113.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Mercury

General Statistics

Total Number of Observations	177	Number of Distinct Observations	123
		Number of Missing Observations	0
Minimum	0.027	Mean	0.248
Maximum	1.15	Median	0.17
SD	0.221	Std. Error of Mean	0.0166
Coefficient of Variation	0.89	Skewness	1.739

Normal GOF Test

Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.067	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.276	95% Adjusted-CLT UCL (Chen-1995)	0.278
		95% Modified-t UCL (Johnson-1978)	0.276

Gamma GOF Test

A-D Test Statistic	1.734	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.77	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0872	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.0708	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.555	k star (bias corrected MLE)	1.532
Theta hat (MLE)	0.16	Theta star (bias corrected MLE)	0.162
nu hat (MLE)	550.4	nu star (bias corrected)	542.4

Table E1-19
Fish Tissue, 95% UCL on the Mean (EPA ProUCL Software)
Sitewide Human Health Risk Assessment
Sulphur Bank Mercury Mine, Clearlake, California

MLE Mean (bias corrected)	0.248	MLE Sd (bias corrected)	0.201
		Approximate Chi Square Value (0.05)	489.4
Adjusted Level of Significance	0.0486	Adjusted Chi Square Value	489
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.275	95% Adjusted Gamma UCL (use when n<50)	0.276
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk P Value	0.00612	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0582	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.067	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.612	Mean of logged Data	-1.748
Maximum of Logged Data	0.14	SD of logged Data	0.858
Assuming Lognormal Distribution			
95% H-UCL	0.287	90% Chebyshev (MVUE) UCL	0.307
95% Chebyshev (MVUE) UCL	0.333	97.5% Chebyshev (MVUE) UCL	0.368
99% Chebyshev (MVUE) UCL	0.438		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.276	95% Jackknife UCL	0.276
95% Standard Bootstrap UCL	0.275	95% Bootstrap-t UCL	0.281
95% Hall's Bootstrap UCL	0.279	95% Percentile Bootstrap UCL	0.277
95% BCA Bootstrap UCL	0.279		
90% Chebyshev(Mean, Sd) UCL	0.298	95% Chebyshev(Mean, Sd) UCL	0.321
97.5% Chebyshev(Mean, Sd) UCL	0.352	99% Chebyshev(Mean, Sd) UCL	0.414
Suggested UCL to Use			
95% H-UCL	0.287		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			

Appendix F
Mercury Speciation Results

eurofins | Frontier Global Sciences

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17 January 2020

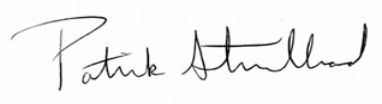
Ruth Siegmund
E2 Consulting Engineers, Inc.
1900 Powell St., Suite 250
Emeryville, CALIFORNIA 94608

RE: SBMM HHRA 2018

Enclosed are the analytical results for samples received by Eurofins Frontier Global Sciences. All quality control measurements are within established control limits and there were no analytical difficulties encountered with the exception of those listed in the case narrative section of this report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Patrick Garcia-Strickland
Business Unit Manager

eurofins | Frontier Global Sciences

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Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
PLNT02_11SS_1118	9B00908 01	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
AMBSI_07_1118	9B00908-02	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
PLNT01_15SS_1118	9B00908-03	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
PLNT01_01SS_1118	9B00908-04	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
CRM HgO	9B00908-05	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
CRM HgS	9B00908-06	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25
CRM HgCl2	9B00908-07	Soil/Sediment	21-Dec-18 00:00	21-Dec-18 11:25

Eurofins Frontier Global Sciences, LLC

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

This report was revisied for the following reason: See narrative for details

Patrick Garcia Strickland, Business Unit Manager

eurofins | Frontier Global Sciences

5755 8th Street East
Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

REVISED REPORT (4/16/19)

The results for F903280-Dup1 and F903280-Dup 2 were missing from the original report and are now included in this revised report. The Total Mercury results were mistakenly notated as being dry-weight corrected in the original report which was false as they were not dry-weight corrected. These results have been updated and are dry-weight corrected in this revised report.

REVISED REPORT (3/19/19)

The CRM percent recoveries were missing in the original report. They are included now, and can be found in the narrative under the Sample Preparation and Analysis portion.

REVISED REPORT (1/17/20)

The CRM utilized did not contain HgCl2. New CRMs were created from newer sources and ran in triplicate to verify the concentrations.

The new reference materials were analyzed along with each sample as new preparations. The mercury found in each fraction was consistent with referenced data and the recovery of each reference material was:

HgCl2: 75%
HgO: 102%
HgS: 86%

SAMPLE RECEIPT

Samples were originally received at Eurofins Frontier Global Sciences in November and logged in under work orders 8K00520, 8K00768, and 8K00475. After the original data was reported, the client identified the 4 samples in this report for the SSE analysis. The four samples are 8K00520-14 (PLNT02_11SS_1118), 8K00768-02 (AMBSI_07_1118), 8K00475-17 (PLNT01_15SS_1118), and 8K00475-20 (PLNT01_01SS_1118). The original COCs are included in this final report.

Work Order 8K00520 - Samples were received at Eurofins Frontier Global Sciences (EFGS) on 14-Nov-18 10:10. The samples were received intact, on-ice within a sealed cooler at

Cooler	Temp C°

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Default Cooler	0.7

Work Order 8K00768 - Samples were received at Eurofins Frontier Global Sciences (EFGS) on 21-Nov-18 10:30. The samples were received intact, on-ice within a sealed cooler at

Cooler	Temp C°
Default Cooler	0.5

Work Order 8K00475 - Samples were received at Eurofins Frontier Global Sciences (EFGS) on 13-Nov-18 09:45. The samples were received intact, on-ice within a sealed cooler at

Cooler	Temp C°
Default Cooler	5.5

SAMPLE PREPARATION AND ANALYSIS

Total solids analysis was performed in accordance with method SM2540B. The total solids results in this report was pulled from the original analysis.

Samples for the Selective Sequential Extraction (SSE) were prepared according to FGS-090, "Selective Sequential Extraction of Geological Samples for the Determination of Biogeochemically Relevant Inorganic Mercury Fractionation".

The following table explains the SSE extraction steps and their anticipated biogeochemical meaning:

Elemental Mercury: Free purgeable elemental mercury
Fraction F(1): Water soluble mercury, extracted with DI water (ie: Hg2Cl2, HgSO4)
Fraction F(2): Weak acid extractable mercury, pH2 HCl/HO Ac
Fraction F(3): Organo complexed mercury, extracted with 1N KOH
Fraction F(4): Strong complexed mercury, extracted with 12N HNO3
Fraction F(5): Aqua Regia (cinnabar, HgSe, HgAu)

Reference materials were analyzed along with each sample. The mercury found in each fraction was consistent with historical data and the recovery of each reference material was:

Hg2Cl2: 91.7%
HgO: 93.6%

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

HgS: 91.8%

ANALYTICAL AND QUALITY CONTROL ISSUES

Method blanks were prepared for every preparation to assess possible blank contribution from the sample preparation procedure. The method blanks were carried through the entire analytical procedure. All blanks fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

Liquid spikes, certified reference material (CRM) or a quality control samples (QCS) were prepared for every preparation as a measure of accuracy. All liquid spikes, CRMs and/or QCS samples fell within the established acceptance criteria with the exception of any items narrated above or flagged and described in the notes and definitions section of the report.

As an additional measure of the accuracy of the methods used and to check for matrix interference, matrix spikes (MS) and matrix spike duplicates (MSD) were digested and analyzed. All of the matrix spike recoveries fell within the established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

A reasonable measure of the precision of the analytical methods is the relative percent difference (RPD) between a matrix spike recovery and a matrix spike duplicate recovery and between laboratory control sample recovery and laboratory control sample duplicate recoveries. All of the relative percent differences fell within established acceptance criteria with the exception of any items flagged and described in the notes and definitions section of the report.

eurofins

Sample Receipt Checklist

Client: E2

Date & Time Received: 11/14/18 1030

Date Labeled: 11/14/18 Labeled By: BD

Project: Sulphur Bank Mercury

Received By: BD

Label Verified By: BD

# of Coolers Received: 1

Samples Arrived By: ✓ Shipping Service _____ Courier _____ Hand _____ Other (Specify:_____)

Coolant: ☐ None/Ambient ☑ Loose Ice ☐ Gel Ice ☐ Dry Ice Coolant Required: Y / N Temp Blank Used: Y/N for Cooler(s): 1

Notify Project Manager if packages/coolers are received without coolant or with thawed coolant and at a temperature in excess of 6°C. PM notified: Y/N

Cooler Information:	Y/N/NA	Comments
The coolers do not appear to be tampered with:	Y	
Custody Seals are present and intact:	Y	
Custody seals signed:	Y	

TID: 9804	CF: +0.5°C		Date/time: 11/14/18 1045	By: BD	
Cooler 1: 0.2 °C	w/ CF: 0.7 °C		Cooler 4: °C	w/ CF: °C	
Cooler 2: °C	w/ CF: °C		Cooler 5: °C	w/ CF: °C	
Cooler 3: °C	w/ CF: °C		Cooler 6: °C	w/ CF: °C	

Chain of Custody:	Y/N/NA	Comments
Sample ID/Description:	Y	
Date and time of collection:	Y	
Sampled by:	Y	
Preservation type:	Y	
Requested analyses:	Y	
Required signatures:	Y	
Internal COC required:	NA	

Sample Condition/Integrity:	Y/N/NA	Comments
Sample containers intact/present:	Y	
Sample labels are present and legible:	Y	
Sample ID on container/bag matches COC:	Y	
Correct sample containers used:	Y	
Samples received within holding times:	Y	
Sample volume sufficient for requested analyses:	Y	
Correct preservative used for requested analyses:	Y	

Anomalies/Non-conformances (attach additional pages if needed):

8K00520

B1K00520

E 2 **E2 Consulting Engineers, Inc.** CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE						
Location			**Preservatives:**	≤ -11°C					0-6°C						
Project Manager															
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA						
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days						
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)						
Turnaround Time:															
Shipping Date:															
COC Number:															
SAMPLE	**DATE**	**TIME**	**Matrix**										**Ship To:** Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	Number of Containers	COMMENTS
~~PLNT01_17PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT01_17SS_1118~~			~~Soil~~	x	x			x						~~1~~	
~~PLNT01_18PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT01_18SS_1118~~			~~Soil~~	x	x			x						~~1~~	
PLNT01_19PT_1118	11/12/18	1630	Plant	x	x	x	x	x						1	
~~PLNT01_19SS_1118~~			~~Soil~~	x	x			x						~~1~~	
PLNT01_20PT_1118	11/12/18	1638	Plant	x	x	x	x	x						1	
~~PLNT01_20SS_1118~~			~~Soil~~	x	x			x						~~1~~	
~~PLNT02_01PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT02_01SS_1118~~			~~Sed~~	x	x			x						~~1~~	
~~PLNT02_03PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT02_02SS_1118~~			~~Sed~~	x	x			x						~~1~~	
~~PLNT02_03PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT02_03SS_1118~~			~~Sed~~	x	x			x						~~1~~	
~~PLNT02_04PT_1118~~			~~Plant~~	x	x	x	x	x						~~1~~	
~~PLNT02_04SS_1118~~			~~Sed~~	x	x			x						~~1~~	
													TOTAL NUMBER OF CONTAINERS		

	Signatures	Date/Time
Approved by		
Sampled by		11/12/18 1700
Relinquished by		11/13/18 0800
Received by		11/14/18 1010
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX
On Ice: (yes) / no
Airbill No: 7736 3982 3243
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone:

Special Instructions:

Report Copy to

EFOS 7736 3982 3243 Fedex CS-yes 0.7°C

Pg 1 of 4

8K00520

E 2 **E2 Consulting Engineers, Inc.**

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE						
Location			**Preservatives:**	≤ -11°C					0-6°C						
Project Manager															
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA						
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days						
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)						
Turnaround Time:															
Shipping Date:															
COC Number:															
SAMPLE	**DATE**	**TIME**	**Matrix**												
PLNT02_07PT_1118R	11/12/18	1250	Plant	x	x	x	x	x							
~~PLNT02_05SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~							
PLNT02_08PT_1118R	11/12/18	1330	Plant	x	x	x	x	x							
~~PLNT02_06SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~							
PLNT02_07PT_1118S	11/12/18	1250	Plant	x	x	x	x	x							
PLNT02_07SS_1118	11/12/18	1250	Sed	x	x			x							
PLNT02_08PT_1118S	11/12/18	1330	Plant	x	x	x	x	x							
PLNT02_08SS_1118	11/12/18	1330	Sed	x	x			x							
PLNT02_09PT_1118S	11/12/18	1345	Plant	x	x	x	x	x							
PLNT02_09SS_1118	11/12/18	1345	Sed	x	x			x							
PLNT02_10PT_1118S	11/12/18	1420	Plant	x	x	x	x	x							
PLNT02_10SS_1118	11/12/18	1420	Sed	x	x			x							
PLNT02_11PT_1118S	11/12/18	1440	Plant	x	x	x	x	x							
PLNT02_11SS_1118	11/12/18	1440	Sed	x	x			x							
PLNT02_12PT_1118S	11/12/18	1500	Plant	x	x	x	x	x							
PLNT02_12SS_1118	11/12/18	1500	Sed	x	x			x							

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

ID PLNT02_07PT_1118R

ID PLNT02_08PT_1118R

SAMPLE	Number of Containers	COMMENTS
PLNT02_07PT_1118R	1	
~~PLNT02_05SS_1118~~	~~1~~	
PLNT02_08PT_1118R	1	
~~PLNT02_06SS_1118~~	~~1~~	
PLNT02_07PT_1118S	1	
PLNT02_07SS_1118	1	
PLNT02_08PT_1118S	1	
PLNT02_08SS_1118	1	
PLNT02_09PT_1118S	1	
PLNT02_09SS_1118	1	
PLNT02_10PT_1118S	1	
PLNT02_10SS_1118	1	
PLNT02_11PT_1118S	1	
PLNT02_11SS_1118	1	
PLNT02_12PT_1118S	1	
PLNT02_12SS_1118	1	
TOTAL NUMBER OF CONTAINERS	14	

	Signatures	Date/Time
Approved by		
Sampled by		11/12/18 1700
Relinquished by		11/13/18 0800
Received by		
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX
On Ice: (yes) / no
Airbill No: 7736 3982 3243
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone:

Special Instructions:

Report Copy to

8K00520

E2 Consulting Engineers, Inc.

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE			**Ship To:** Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	Number of Containers	COMMENTS
Location			**Preservatives:**	≤ -11°C					0-6°C					
Project Manager														
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA					
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days					
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)					
Turnaround Time:														
Shipping Date:														
COC Number:														
SAMPLE	**DATE**	**TIME**	**Matrix**											
PLNT02_13PT_1118S	11/12/18	1520	Plant	x	x	x	x	x					1	
PLNT02_13SS_1118	11/12/18	1520	Sed	x	x			x					1	
PLNT02_14PT_1118S	11/12/18	1600	Plant	x	x	x	x	x					1	
PLNT02_14SS_1118	11/12/18	1600	Sed	x	x			x					1	
PLNT02_14PT_1118R	11/12/18	1600	Plant	x	x	x	x	x				ID PLNT02_14PT_1118R	1	
~~PLNT02_15SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT02_13PT_1118	11/12/18	1520	Plant	x	x	x	x	x				ID PLNT02_13PT_1118R	1	
~~PLNT02_16SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT02_12PT_1118	11/12/18	1500	Plant	x	x	x	x	x				ID PLNT02_12PT_1118R	1	
~~PLNT02_17SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT02_11PT_1118	11/12/18	1440	Plant	x	x	x	x	x				ID PLNT02_11PT_1118R	1	
~~PLNT02_18SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT02_10PT_1118	11/12/18	1420	Plant	x	x	x	x	x				ID PLNT02_10PT_1118R	1	
~~PLNT02_19SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT02_09PT_1118	11/12/18	1345	Plant	x	x	x	x	x				ID PLNT02_09PT_1118R	1	
~~PLNT02_20SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
												TOTAL NUMBER OF CONTAINERS	10	

Signatures		**Date/Time**
Approved by		
Sampled by		11/12/18 1700
Relinquished by		11/13/18 0800
Received by		
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX

On Ice: (yes) / no

Airbill No: 773639823243

Lab Name: Eurofins Frontier Global Sciences, LLC

Lab Phone:

Special Instructions:

Report Copy to

8K00520

E | 2 **E2 Consulting Engineers, Inc.**

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE			**Ship To:** Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	Number of Containers	
Location			**Preservatives:**	≤-11°C					0-6°C					
Project Manager														
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA					
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days					
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)					
Turnaround Time:														
Shipping Date:														
COC Number:														
SAMPLE	**DATE**	**TIME**	**Matrix**											**COMMENTS**
~~PLNT03_17PT_1118~~			Plant	x	x	x	x	x					1	
~~PLNT03_17SS_1118~~			Sed	x	x			x					1	
~~PLNT03_18PT_1118~~			Plant	x	x	x	x	x					3	
~~PLNT03_18SS_1118~~			Sed	x	x			x					3	
PLNT03_19PT_1118			Plant	x	x	x	x	x					1	
~~PLNT03_19SS_1118~~			Sed	x	x			x					1	
~~PLNT03_20PT_1118~~			Plant	x	x	x	x	x					1	
PLNT03_20SS_1118			Sed	x	x			x					1	
~~PTSSEB_1118a~~			Water						x				1	
~~PTSSEB_1118b~~			Water						x				1	
~~PTSSEB_1118c~~			Water						x				1	
PTSSEB_1118d	11/12/18	1700	Water						x				1	
PTSSEB_1118e	11/12/18	1700	Water						x				1	
PTSSEB_1118f	11/12/18	1700	Water						x				1	
~~PTSSEB_1118g~~			Water						x				1	
~~PTEB_1118a~~			Water						x				1	
												TOTAL NUMBER OF CONTAINERS	3	

Signatures		**Date/Time**
Approved by		
Sampled by		11/12/18 1700
Relinquished by		11/13/18 0800
Received by		
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX

On Ice: (yes) / no

Airbill No: 773639823243

Lab Name: Eurofins Frontier Global Sciences, LLC

Lab Phone:

Special Instructions:

Report Copy to

Pg 4 of 4

eurofins

Sample Receipt Checklist

Client: EJ Date & Time Received: 11-21-18 1030 Date Labeled: 11-21-18 Labeled By: UEL

Project: Received By: ZKH Label Verified By: BD

# of Coolers Received: 1 Samples Arrived By: ✓ Shipping Service ____ Courier ____ Hand ____ Other (Specify:____)

Coolant: ☐ None/Ambient ☑ Loose Ice ☐ Gel Ice ☐ Dry Ice Coolant Required: Y / N Temp Blank Used: Y/N for Cooler(s):____

Notify Project Manager if packages/coolers are received without coolant or with thawed coolant and at a temperature in excess of 6°C PM notified: Y/N

Cooler Information:	Y/N/NA	Comments
The coolers do not appear to be tampered with:	Y	
Custody Seals are present and intact:	N	
Custody seals signed:	NA	

TID: 18113807	CF: +0.5 °C		Date/time: 11/21/18	By: ZKH	
Cooler 1: 0 °C	w/ CF: +0.5 °C		Cooler 4: °C	w/ CF:	°C
Cooler 2: °C	w/ CF:	°C	Cooler 5: °C	w/ CF:	°C
Cooler 3: °C	w/ CF:	°C	Cooler 6: °C	w/ CF:	°C

Chain of Custody:	Y/N/NA	Comments
Sample ID/Description:	Y	
Date and time of collection:	Y	
Sampled by:	Y	
Preservation type:	Y	
Requested analyses:	Y	
Required signatures:	Y	
Internal COC required:	NA	

Sample Condition/Integrity:	Y/N/NA	Comments
Sample containers intact/present:		
Sample labels are present and legible:		
Sample ID on container/bag matches COC:		
Correct sample containers used:		
Samples received within holding times:		
Sample volume sufficient for requested analyses:		
Correct preservative used for requested analyses:		

Anomalies/Non-conformances (attach additional pages if needed):

8K00768

8K00768

E2 **E2 Consulting Engineers, Inc.** CHAIN OF CUSTODY RECORD: SBMM-EFGSS2018 SBMM 2018 HHRA: SW & Collocated Sed Samples

Project Name: Sulphur Bank Mercury Mines
Location
Project Manager
QC Manager
Project Number
Project:
Turnaround Time:
Shipping Date:
COC Number:

Container:	Plastic bag / 1 X 2 oz HDPE					60 mL PETG	60 mL PETG	250 mL PETG	250 mL PETG					
Preservatives:	≤ -11°C					0-6°C 0.5% HCl	0-6°C 0.5% HCl	0-6°C 0.4% HCl	0-6°C 0.4% HCl					
Filtered:	NA	NA	NA	NA	NA	No	Yes	No	Yes					
Holding Time:	7 Days	180 Days	5 Days	180 Days	180 Days	28 Days	28 Days	180 Days	180 Days					
SAMPLE	DATE	TIME	Matrix	% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Arsenic Speciation (E1632)	Dissolved Arsenic Speciation (E1632)	Methyl Mercury (E1630)	Dissolved Methyl Mercury (E1630)		Number of Containers	COMMENTS
~~AMBSI 01 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
~~AMBSI 02 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
~~AMBSI 102 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
~~AMBSI 03 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
~~AMBSI 04 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
~~AMBSI 05 1118~~			~~Sed~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~							
AMBSI 06 1118	11 16 18	10:18	Sed	x	x	x	x	x						1	
AMBSI 07 1118	11 16 18	11:07	Sed	x	x	x	x	x						1	
AMBSI 08 1118	11 16 18	11:52	Sed	x	x	x	x	x						1	
AMBSI 09 1118	11 16 18	12:30	Sed	x	x	x	x	x						1	
AMBSI 10 1118	11 16 18	13:15	Sed	x	x	x	x	x						1	
~~AMBSW 01 1118~~			~~SW~~						~~x~~	~~x~~	~~x~~	~~x~~			
~~AMBSW 02 1118~~			~~SW~~						~~x~~	~~x~~	~~x~~	~~x~~			
~~AMBSW 03 1118~~			~~SW~~						~~x~~	~~x~~	~~x~~	~~x~~			
~~AMBSW 04 1118~~			~~SW~~						~~x~~	~~x~~	~~x~~	~~x~~			
~~AMBSW 05 1118~~			~~SW~~						~~x~~	~~x~~	~~x~~	~~x~~			
													TOTAL NUMBER OF CONTAINERS	5	

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

	Signatures	Date/Time
Approved by		
Sampled by	John D. Lucero	11/16/18 1700
Relinquished by	John D. Lucero	11/19/18 1100
Received by	[signature]	11/21/18 1030
Relinquished by		
Received by		

Shipping Details

Method of Shipment: Fed Ex
On Ice: yes / no
Airbill No: 7736 3982 6621
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone:

Special Instructions:

Report Copy to

ZKH
Zahra Hannani
EFGS
Ambient

9K00768

E2 Consulting Engineers, Inc.

CHAIN OF CUSTODY RECORD: SBMM-EFGSS2018

SBMM 2018 HHRA: SW & Collocated Sed Samples

Project Name: Sulphur Bank Mercury Mines
Location
Project Manager
QC Manager
Project Number
Project:
Turnaround Time:
Shipping Date:
COC Number:

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

	% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Arsenic Speciation (E1632)	Dissolved Arsenic Speciation (E1632)	Methyl Mercury (E1630)	Dissolved Methyl Mercury (E1630)
Container:	Plastic bag / 1 X 2 oz HDPE					60 mL PETG	60 mL PETG	250 mL PETG	250 mL PETG
Preservatives:	≤ -11°C					0-6°C 0.5% HCl	0-6°C 0.5% HCl	0-6°C 0.4% HCl	0-6°C 0.4% HCl
Filtered:	NA	NA	NA	NA	NA	No	Yes (circled)	No	Yes (circled)
Holding Time:	7 Days	180 Days	5 Days	180 Days	180 Days	28 Days	28 Days	180 Days	180 Days

SAMPLE	DATE	TIME	Matrix	% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Arsenic Speciation (E1632)	Dissolved Arsenic Speciation (E1632)	Methyl Mercury (E1630)	Dissolved Methyl Mercury (E1630)			Number of Containers	COMMENTS
AMBSW_105_1118	111618	0918	SW						x	x	x	x			4	
AMBSW_06_1118	111618	1016	SW						x	x	x	x			4	
AMBSW_07_1118	111618	1107	SW						x	x	x	x			4	
AMBSW_08_1118	111618	1152	SW						x	x	x	x			4	
AMBSW_09_1118	111618	1230	SW						x	x	x	x			4	
AMBSW_10_1118	111618	1315	SW						x	x	x	x			4	
AMBSEB_1118a	111618	1400	Water						~~x~~	~~x~~	x	~~x~~			1	
AMBSEB_1118b	111618	1415	Water						~~x~~	~~x~~	x	~~x~~			1	
AMBSEB_1118c	111618	0840	Water						~~x~~	~~x~~	x	~~x~~			1	
AMBSEB_1118d	111618	1001	Water						~~x~~	~~x~~	x	~~x~~			1	

TOTAL NUMBER OF CONTAINERS

	Signatures	Date/Time
Approved by		
Sampled by	John D Fuerro	11/16/18 1700
Relinquished by	John D Fuerro	11/19/18 1100
Received by	[signature]	11/21/18 1030
Relinquished by		
Received by		

Shipping Details

Method of Shipment: Fed Ex
On Ice: yes (circled) / no
Airbill No: 7736 3982 6621
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone:

Special Instructions:

Report Copy to

eurofins | Eurofins Global Sciences

Sample Receipt Checklist

Client: E2 Date & Time Received: 11/13/18 0945 Date Labeled: 11-14-18 Labeled By: VR

Project: Received By: ZKA Label Verified By: BN

# of Coolers Received: 1 Samples Arrived By: ✓ Shipping Service ____ Courier ____ Hand ____ Other (Specify:____)

Coolant: ☐ None/Ambient ☒ Loose Ice ☐ Gel Ice ☐ Dry Ice Coolant Required: (Y)/ N Temp Blank Used: Y/(N) for Cooler(s):____

Notify Project Manager if packages/coolers are received without coolant or with thawed coolant and at a temperature in excess of 6°C. PM notified: Y/N

Cooler Information:	Y/N/NA	Comments
The coolers do not appear to be tampered with:	Y	
Custody Seals are present and intact:	NA	
Custody seals signed:	NA	

TID: 12240525 CF: +0.3 °C				Date/time: 11/13/18 0945 By: ZKH			
Cooler 1: 5.2 °C	w/ CF: 5.5 °C			Cooler 4:	°C	w/ CF:	°C
Cooler 2:	°C	w/ CF:	°C	Cooler 5:	°C	w/ CF:	°C
Cooler 3:	°C	w/ CF:	°C	Cooler 6:	°C	w/ CF:	°C

Chain of Custody:	Y/N/NA	Comments
Sample ID/Description:	Y	
Date and time of collection:	Y	
Sampled by:	N	
Preservation type:	NA	
Requested analyses:	Y	
Required signatures:	Y	
Internal COC required:	NA	

Sample Condition/Integrity:	Y/N/NA	Comments
Sample containers intact/present:	Y	
Sample labels are present and legible:	Y	
Sample ID on container/bag matches COC:	Y	
Correct sample containers used:	Y	
Samples received within holding times:	Y	
Sample volume sufficient for requested analyses:	Y	
Correct preservative used for requested analyses:	NA	

Anomalies/Non-conformances (attach additional pages if needed):

8K00475

8K00475

E2 Consulting Engineers, Inc.

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines	**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE							
Location	**Preservatives:**	≤ -11°C					0-6°C							
Project Manager														
QC Manager	**Filtered:**	NA	NA	NA	NA	NA	NA							
Project Number	**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days							
Project:		% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)							
Turnaround Time:														
Shipping Date:														
COC Number:														

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

SAMPLE	DATE	TIME	Matrix										Number of Containers	COMMENTS
PLNT02_05PT_1118S	11/8/18	1030	Plant	x	x	x	x	x					1	
PLNT02_05SS_1118	11/8/18	1030	Sed	x	x			x					1	
PLNT02_06PT_1118S	11/8/18	1120	Plant	x	x	x	x	x				MS/MSD	3	
PLNT02_06SS_1118	11/8/18	1120	Sed	x	x			x				MS/MSD	3	
PLNT02_07PT_1118			Plant	x	x	x	x	x					1	
PLNT02_07SS_1118			Sed	x	x			x					1	
PLNT02_08PT_1118			Plant	x	x	x	x	x					1	
PLNT02_08SS_1118			Sed	x	x			x					1	
PLNT02_09PT_1118			Plant	x	x	x	x	x					1	
PLNT02_09SS_1118			Sed	x	x			x					1	
PLNT02_10PT_1118			Plant	x	x	x	x	x					1	
PLNT02_10SS_1118			Sed	x	x			x					1	
PLNT02_11PT_1118			Plant	x	x	x	x	x					1	
PLNT02_11SS_1118			Sed	x	x			x					1	
PLNT02_12PT_1118			Plant	x	x	x	x	x					1	
PLNT02_12SS_1118			Sed	x	x			x					1	
												TOTAL NUMBER OF CONTAINERS		

	Signatures	Date/Time
Approved by		
Sampled by		11/8/18 1300
Relinquished by		11/8/18 1700
Received by		11/13/18 0945
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX
On Ice: (yes) / no
Airbill No: 773639810920
Lab Name: Eurofins Frontier Global Sciences LLC
Lab Phone:

Special Instructions:
Soil pH for all samples Bre

Report Copy to

8K60475

E 2 **E2 Consulting Engineers, Inc.** CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE			Ship To: Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	Number of Containers	COMMENTS
Location			**Preservatives:**	≤ -11°C					0-6°C					
Project Manager														
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA					
Project Number			**Holding Time:**	7 Days	180 Days	6 Days	180 Days	180 Days	180 Days					
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)					
Turnaround Time:														
Shipping Date:														
COC Number:														
SAMPLE	**DATE**	**TIME**	**Matrix**											
PLNT02_12PT_1118			Plant	x	x	x	x	x					1	
PLNT02_13SS_1118			Sed	x	x			x					1	
PLNT02_14PT_1118			Plant	x	x	x	x	x					1	
PLNT02_14SS_1118			Sed	x	x			x					1	
PLNT02_15PT_1118			Plant	x	x	x	x	x					1	
PLNT02_15SS_1118			Sed	x	x			x					1	
PLNT02_16PT_1118R	11/8/18	1030	Plant	x	x	x	x	x				ID PLNT02_05PT_1118R	1	
PLNT02_16SS_1118			Sed	x	x			x					1	
PLNT02_17PT_1118R	11/8/18	1120	Plant	x	x	x	x	x				MS/MSD ID PLNT02_06PT_1118R	1	
PLNT02_17SS_1118			Sed	x	x			x					1	
PLNT02_18PT_1118			Plant	x	x	x	x	x					1	
PLNT02_18SS_1118			Sed	x	x			x					1	
PLNT02_19PT_1118			Plant	x	x	x	x	x					1	
PLNT02_19SS_1118			Sed	x	x			x					1	
PLNT02_20PT_1118			Plant	x	x	x	x	x					1	
PLNT02_20SS_1118			Sed	x	x			x					1	
												TOTAL NUMBER OF CONTAINERS		

Signatures		**Date/Time**
Approved by		
Sampled by		11/8/18 1300
Relinquished by		11/8/18 1700
Received by		11/13/18 0945
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX

On Ice: (yes) / no

Airbill No: 773634810920

Lab Name: Eurofins Frontier Global Sciences, LLC

Lab Phone:

Special Instructions:

~~Soil pH for all samples~~ BMA

Report Copy to

Bar 11/19/18

8100475

E 2 **E2 Consulting Engineers, Inc.** CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE			Ship To: Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	Number of Containers	
Location			**Preservatives:**	≤ -11°C					0-6°C					
Project Manager														
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA					
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days					
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)					
Turnaround Time:														
Shipping Date:														
COC Number:														
SAMPLE	**DATE**	**TIME**	**Matrix**											**COMMENTS**
PLNT01_09PT_1118	11/9/18	1330	Plant	x	x	x	x	x					3	
PLNT01_09SS_1118	11/9/18	1330	Soil	x	x			x					3	
PLNT01_10PT_1118	11/9/18	1335	Plant	x	x	x	x	x					1	
~~PLNT01_10SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	BMG
PLNT01_11PT_1118	11/9/18	1340	Plant	x	x	x	x	x					1	
~~PLNT01_11SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	BMG
PLNT01_12PT_1118	11/9/18	1345	Plant	x	x	x	x	x					1	
~~PLNT01_12SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	BMG
PLNT01_13PT_1118	11/9/18	1350	Plant	x	x	x	x	x					1	
PLNT01_13SS_1118	11/9/18	1350	Soil	x	x			x					1	
PLNT01_14PT_1118	11/9/18	1355	Plant	x	x	x	x	x					1	
PLNT01_14SS_1118	11/9/18	1355	Soil	x	x			x					1	
PLNT01_15PT_1118	11/9/18	1400	Plant	x	x	x	x	x					1	
PLNT01_15SS_1118	11/9/18	1400	Soil	x	x			x					1	
PLNT01_16PT_1118	11/9/18	1405	Plant	x	x	x	x	x					1	
~~PLNT01_16SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	BMG
												TOTAL NUMBER OF CONTAINERS		

Signatures		**Date/Time**	**Shipping Details**		**Special Instructions:**
Approved by					
Sampled by		11/9/18 1800	Method of Shipment: FEDEX		
Relinquished by		11/9/18 1800	On Ice: (yes) / no		
Received by		11/13/18 0945	Airbill No: 773639810920		
Relinquished by			**Lab Name:** Eurofins Frontier Global Sciences, LLC		**Report Copy to**
Received by			Lab Phone:		

BMG 11/15/18

8K00475

E 2 **E2 Consulting Engineers, Inc.** CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines			**Container:**	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE						
Location			**Preservatives:**	≤ -11°C					0-6°C						
Project Manager															
QC Manager			**Filtered:**	NA	NA	NA	NA	NA	NA						
Project Number			**Holding Time:**	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days						
Project:				% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)						
Turnaround Time:															
Shipping Date:															
COC Number:															
SAMPLE	**DATE**	**TIME**	**Matrix**										**Ship To:** Eurofins Frontier Global Sciences, LLC 11720 North Creek Parkway N. Suite 400 Bothell, WA 98011 Attn: Amy Goodall	**Number of Containers**	**COMMENTS**
PLNT01_01PT_1118	11/9/18	1200	Plant	x	x	x	x	x						1	
PLNT01_01SS_1118	11/9/18	1200	Soil	x	x			x						1	
PLNT01_02PT_1118	11/9/18	1215	Plant	x	x	x	x	x						1	
PLNT01_02SS_1118	11/9/18	1215	Soil	x	x			x						1	
PLNT01_03PT_1118	11/9/18	1230	Plant	x	x	x	x	x						1	
PLNT01_03SS_1118	11/9/18	1230	Soil	x	x			x						1	
PLNT01_04PT_1118	11/9/18	1245	Plant	x	x	x	x	x						1	
~~PLNT01_04SS_1118~~			Soil	x	x			x						~~1~~ BMC	
PLNT01_05PT_1118	11/9/18	1250	Plant	x	x	x	x	x						1	
~~PLNT01_05SS_1118~~			Soil	x	x			x						~~1~~ BMC	
PLNT01_06PT_1118	11/9/18	1255	Plant	x	x	x	x	x						1	
~~PLNT01_06SS_1118~~			Soil	x	x			x						~~1~~ BMC	
PLNT01_07PT_1118	11/9/18	1300	Plant	x	x	x	x	x						1	
PLNT01_07SS_1118	11/9/18	1300	Soil	x	x			x						1	
PLNT01_08PT_1118	11/9/18	1315	Plant	x	x	x	x	x						1	
PLNT01_08SS_1118	11/9/18	1315	Soil	x	x			x						1	
													TOTAL NUMBER OF CONTAINERS		

Signatures		**Date/Time**
Approved by		
Sampled by		11/9/18 1800
Relinquished by		11/9/18 1800
Received by		11/13/18 0945
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX

On Ice: (yes) / no

Airbill No: ~~773639810461~~ BMC

Lab Name: Eurofins Frontier Global Sciences, LLC

Lab Phone: 7736398109 20

Special Instructions:

Report Copy to

8K00475

E2 Consulting Engineers, Inc.

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines
Location
Project Manager
QC Manager
Project Number
Project:
Turnaround Time:
Shipping Date:
COC Number:

Container: Plastic bag / 1 X 2 oz HDPE — 250 mL HDPE
Preservatives: ≤ -11°C — 0-6°C 0.42 HCL
Filtered: NA NA NA NA NA NA
Holding Time: 7 Days 180 Days 5 Days 180 Days 180 Days 180 Days

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

SAMPLE	DATE	TIME	Matrix	% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)				Number of Containers	COMMENTS
~~PLNT03_17PT_1118~~			~~Plant~~	x	x	x	x	x				BMG	1	
~~PLNT03_17SS_1118~~			~~Sed~~	x	x			x				BMG	1	
~~PLNT03_18PT_1118~~			~~Plant~~	x	x	x	x	x				BMG	3	
~~PLNT03_18SS_1118~~			~~Sed~~	x	x			x				BMG	3	
~~PLNT03_19PT_1118~~			~~Plant~~	x	x	x	x	x				BMG	1	
~~PLNT03_19SS_1118~~			~~Sed~~	x	x			x				BMG	1	
~~PLNT03_20PT_1118~~			~~Plant~~	x	x	x	x	x				BMG	1	
~~PLNT03_20SS_1118~~			~~Sed~~	x	x			x				BMG	1	
PTSSEB_1118a	11/9/18	1800	Water						x				1	
PTSSEB_1118b	11/9/18	1800	Water						x				1	
PTSSEB_1118c	11/9/18	1800	Water						x				1	
~~PTSSEB_1118d~~			~~Water~~						x			BMG	1	
~~PTSSEB_1118e~~			~~Water~~						x			BMG	1	
~~PTSSEB_1118f~~			~~Water~~						x			BMG	1	
~~PTSSEB_1118g~~			~~Water~~						x			BMG	1	
~~PTEB_1118a~~			~~Water~~						x			BMG	1	
												TOTAL NUMBER OF CONTAINERS	3	

	Signatures	Date/Time
Approved by		
Sampled by	[signature]	11/9/18 1800
Relinquished by	[signature]	11/9/18 1900
Received by	[signature]	11/13/18 0945
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX
On Ice: yes / no
Airbill No: 773634690407 BLL
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone: 7736398/0920

Special Instructions:

Report Copy to

SK00475

E 2 E2 Consulting Engineers, Inc.

CHAIN OF CUSTODY RECORD: SBMM-EFGSPLT2018 SBMM 2018 HHRA: Plants and Collocated Sed/Soil Samples

Project Name: Sulphur Bank Mercury Mines
Location
Project Manager
QC Manager
Project Number
Project:
Turnaround Time:
Shipping Date:
COC Number:

			Container:	Plastic bag / 1 X 2 oz HDPE					250 mL HDPE					
			Preservatives:	≤ -11°C					0-6°C					
			Filtered:	NA	NA	NA	NA	NA	NA					
			Holding Time:	7 Days	180 Days	5 Days	180 Days	180 Days	180 Days					
SAMPLE	DATE	TIME	Matrix	% Moisture (SOP5133)	Low-level Mercury (E1631B)	Arsenic Speciation (E1632)	Metals (E1638 Mod)	Methyl Mercury (E1630 Mod)	Methyl Mercury (E1630)				Number of Containers	COMMENTS
PLNT01_17PT_1118	11/9/18	1410	Plant	x	x	x	x	x					1	
~~PLNT01_17SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	
PLNT01_18PT_1118	11/9/18	1415	Plant	x	x	x	x	x					1	
~~PLNT01_18SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT01_19PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT01_19SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT01_20PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT01_20SS_1118~~			~~Soil~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT02_01PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT02_01SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT02_02PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT02_02SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT02_03PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT02_03SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
~~PLNT02_04PT_1118~~			~~Plant~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~					~~1~~	
~~PLNT02_04SS_1118~~			~~Sed~~	~~x~~	~~x~~			~~x~~					~~1~~	
												TOTAL NUMBER OF CONTAINERS		

Ship To:
Eurofins Frontier Global Sciences, LLC
11720 North Creek Parkway N.
Suite 400
Bothell, WA 98011
Attn: Amy Goodall

	Signatures	Date/Time
Approved by		
Sampled by	[signature]	11/9/18 1800
Relinquished by	[signature]	11/9/18 1800
Received by	[signature]	11/13/18 0945
Relinquished by		
Received by		

Shipping Details

Method of Shipment: FEDEX
On Ice: (yes) no
Airbill No: 7736 3981 0920
Lab Name: Eurofins Frontier Global Sciences, LLC
Lab Phone:

Special Instructions:

Report Copy to

BGW 11/...

eurofins | Frontier Global Sciences

5755 8th Street East
Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

PLNT02_11SS_1118

9B00908-01

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**6070**	487	1520	ng/g dry	5000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**351**	9 74	30 4	ng/g dry	50	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**63.2**	1 95	6 09	ng/g dry	10	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**2770**	487	1520	ng/g dry	2500	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**898**	9 74	30 4	ng/g dry	50	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**1990**	55 7	507	ng/g dry	5000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP5133 Solids Analysis											
% Solids	**46.1**	0 1	0 1	% by Weight	1	F903391	18-Mar-19		18-Mar-19	SM 2540B	O-04, O-09

Eurofins Frontier Global Sciences, LLC

Patrick Garcia Strickland, Business Unit Manager

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

This report was revisied for the following reason: See narrative for details

eurofins | Frontier Global Sciences

5755 8th Street East
Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

AMBSI_07_1118

9B00908-02

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**312000**	3520	11000	ng/g dry	5000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**3680**	70 5	220	ng/g dry	50	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**170**	14 1	44 0	ng/g dry	10	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**15700**	3520	11000	ng/g dry	2500	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**57300**	3520	11000	ng/g dry	2500	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**235000**	403	3670	ng/g dry	5000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP5133 Solids Analysis											
% Solids	**5.2**	0 1	0 1	% by Weight	1	F903391	18-Mar-19		18-Mar-19	SM 2540B	O-04, O-09

Eurofins Frontier Global Sciences, LLC

Patrick Garcia Strickland, Business Unit Manager

The results in this report only apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

This report was revisied for the following reason: See narrative for details

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Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

PLNT01_15SS_1118

9B00908-03

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**1080000**	2660	24200	ng/g dry	500000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**3630**	232	727	ng/g dry	2500	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**1020**	232	727	ng/g dry	2500	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**1580**	232	727	ng/g dry	2500	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**38600**	465	1450	ng/g dry	5000	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**1030000**	2660	24200	ng/g dry	500000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP5133 Solids Analysis											
% Solids	**89.3**	0 1	0 1	% by Weight	1	F903391	18-Mar-19		18-Mar-19	SM 2540B	O-04, O-09

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

PLNT01_01SS_1118

9B00908-04

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**1060000**	8490	77300	ng/g dry	1250000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**3460**	297	927	ng/g dry	2500	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**9260**	297	927	ng/g dry	2500	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**3820**	297	927	ng/g dry	2500	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**34300**	594	1850	ng/g dry	5000	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**1010000**	8490	77300	ng/g dry	1250000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP5133 Solids Analysis											
% Solids	**90.4**	0 1	0 1	% by Weight	1	F903391	18-Mar-19		18-Mar-19	SM 2540B	O-04, O-09

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

CRM HgO

9B00908-05

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**8710000**	87400	273000	ng/g wet	500000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**1840000**	43700	137000	ng/g wet	250000	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**6800000**	87400	273000	ng/g wet	500000	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**35000**	437	1370	ng/g wet	2500	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**23900**	437	1370	ng/g wet	2500	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**14700**	50 0	455	ng/g wet	5000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
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Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

CRM HgS

9B00908-06

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**895000**	139000	435000	ng/g wet	1000000	[CALC]	08-Dec-19		15-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**1810**	348	1090	ng/g wet	2500	F912165	04-Dec-19	0A16008	15-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**5610**	348	1090	ng/g wet	2500	F912177	05-Dec-19	0A16008	15-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**2250**	348	1090	ng/g wet	2500	F912178	06-Dec-19	0A16008	15-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**325000**	139000	435000	ng/g wet	1000000	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	J
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**561000**	3980	36200	ng/g wet	500000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

CRM HgCl2

9B00908-07

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Batch	Prepared	Sequence	Analyzed	Method	Notes
Sample Preparation: [CALC]											
Total Mercury	**2900000**	36900	115000	ng/g wet	250000	[CALC]	08-Dec-19		14-Jan-20	EFAFS-T-AFS-SOP2822	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-1											
Mercury F-1	**358000**	7380	23100	ng/g wet	50000	F912165	04-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-2											
Mercury F-2	**2490000**	36900	115000	ng/g wet	250000	F912177	05-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-3											
Mercury F-3	**11800**	738	2310	ng/g wet	5000	F912178	06-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-4											
Mercury F-4	**29800**	7380	23100	ng/g wet	50000	F912182	07-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	
Sample Preparation: EFGS SOP2813 Hg SSE Fraction F-5											
Mercury F-5	**4520**	422	3840	ng/g wet	50000	F912184	08-Dec-19	0A16006	14-Jan-20	EPA 1631 Mod	

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Cal Standard (0A16006-CAL1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 44	-		ng/L	0 50000		88 6				
Mercury F-2	0 44	-		ng/L	0 50000		88 6				
Mercury F-3	0 44	-		ng/L	0 50000		88 6				
Mercury F-4	0 44	-		ng/L	0 50000		88 6				
Mercury F-5	0 44	-		ng/L	0 50000		88 6				
Cal Standard (0A16006-CAL2)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 97	-		ng/L	1 0000		96 7				
Mercury F-2	0 97	-		ng/L	1 0000		96 7				
Mercury F-3	0 97	-		ng/L	1 0000		96 7				
Mercury F-4	0 97	-		ng/L	1 0000		96 7				
Mercury F-5	0 97	-		ng/L	1 0000		96 7				
Cal Standard (0A16006-CAL3)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 95	-		ng/L	5 0000		99 1				
Mercury F-2	4 95	-		ng/L	5 0000		99 1				
Mercury F-3	4 95	-		ng/L	5 0000		99 1				
Mercury F-4	4 95	-		ng/L	5 0000		99 1				
Mercury F-5	4 95	-		ng/L	5 0000		99 1				
Cal Standard (0A16006-CAL4)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	21 69	-		ng/L	20 000		108				
Mercury F-2	21 69	-		ng/L	20 000		108				
Mercury F-3	21 69	-		ng/L	20 000		108				
Mercury F-4	21 69	-		ng/L	20 000		108				
Mercury F-5	21 69	-		ng/L	20 000		108				
Cal Standard (0A16006-CAL5)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	42 89	-		ng/L	40 000		107				
Mercury F-2	42 89	-		ng/L	40 000		107				
Mercury F-3	42 89	-		ng/L	40 000		107				
Mercury F-4	42 89	-		ng/L	40 000		107				
Mercury F-5	42 89	-		ng/L	40 000		107				

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Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Calibration Blank (0A16006-CCB1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 08	-		ng/L							
Mercury F-2	0 08	-		ng/L							
Mercury F-3	0 08	-		ng/L							
Mercury F-4	0 08	-		ng/L							
Mercury F-5	0 08	-		ng/L							
Calibration Blank (0A16006-CCB2)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 04	-		ng/L							
Mercury F-2	0 04	-		ng/L							
Mercury F-3	0 04	-		ng/L							
Mercury F-4	0 04	-		ng/L							
Mercury F-5	0 04	-		ng/L							
Calibration Blank (0A16006-CCB3)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 07	-		ng/L							U
Mercury F-2	-0 07	-		ng/L							U
Mercury F-3	-0 07	-		ng/L							U
Mercury F-4	-0 07	-		ng/L							U
Mercury F-5	-0 07	-		ng/L							U
Calibration Blank (0A16006-CCB4)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 07	-		ng/L							U
Mercury F-2	-0 07	-		ng/L							U
Mercury F-3	-0 07	-		ng/L							U
Mercury F-4	-0 07	-		ng/L							U
Mercury F-5	-0 07	-		ng/L							U
Calibration Blank (0A16006-CCB5)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 18	-		ng/L							U
Mercury F-2	-0 18	-		ng/L							U
Mercury F-3	-0 18	-		ng/L							U
Mercury F-4	-0 18	-		ng/L							U
Mercury F-5	-0 18	-		ng/L							U

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Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Calibration Blank (0A16006-CCB6)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 27	-		ng/L							U
Mercury F-2	-0 27	-		ng/L							U
Mercury F-3	-0 27	-		ng/L							U
Mercury F-4	-0 27	-		ng/L							U
Mercury F-5	-0 27	-		ng/L							U
Calibration Blank (0A16006-CCB7)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 28	-		ng/L							U
Mercury F-2	-0 28	-		ng/L							U
Mercury F-3	-0 28	-		ng/L							U
Mercury F-4	-0 28	-		ng/L							U
Mercury F-5	-0 28	-		ng/L							U
Calibration Blank (0A16006-CCB8)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 17	-		ng/L							U
Mercury F-2	-0 17	-		ng/L							U
Mercury F-3	-0 17	-		ng/L							U
Mercury F-4	-0 17	-		ng/L							U
Mercury F-5	-0 17	-		ng/L							U
Calibration Blank (0A16006-CCB9)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 23	-		ng/L							U
Mercury F-2	-0 23	-		ng/L							U
Mercury F-3	-0 23	-		ng/L							U
Mercury F-4	-0 23	-		ng/L							U
Mercury F-5	-0 23	-		ng/L							U
Calibration Blank (0A16006-CCBA)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	-0 11	-		ng/L							U
Mercury F-2	-0 11	-		ng/L							U
Mercury F-3	-0 11	-		ng/L							U
Mercury F-4	-0 11	-		ng/L							U
Mercury F-5	-0 11	-		ng/L							U

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Calibration Blank (0A16006-CCBB)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 20	-		ng/L							
Mercury F-2	0 20	-		ng/L							
Mercury F-3	0 20	-		ng/L							
Mercury F-4	0 20	-		ng/L							
Mercury F-5	0 20	-		ng/L							
Calibration Blank (0A16006-CCBC)					Prepared & Analyzed: 14-Jan-20						
Mercury F-2	0 05	-		ng/L							
Mercury F-3	0 05	-		ng/L							
Mercury F-4	0 05	-		ng/L							
Mercury F-5	0 05	-		ng/L							
Calibration Check (0A16006-CCV1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	5 23	-		ng/L	5 0350		104	75-125			
Mercury F-2	5 23	-		ng/L	5 0350		104	75-125			
Mercury F-3	5 23	-		ng/L	5 0350		104	75-125			
Mercury F-4	5 23	-		ng/L	5 0350		104	75-125			
Mercury F-5	5 23	-		ng/L	5 0350		104	75-125			
Calibration Check (0A16006-CCV2)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	5 16	-		ng/L	5 0350		102	75-125			
Mercury F-2	5 16	-		ng/L	5 0350		102	75-125			
Mercury F-3	5 16	-		ng/L	5 0350		102	75-125			
Mercury F-4	5 16	-		ng/L	5 0350		102	75-125			
Mercury F-5	5 16	-		ng/L	5 0350		102	75-125			
Calibration Check (0A16006-CCV3)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-2	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-3	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-4	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-5	5 12	-		ng/L	5 0350		102	75-125			

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Calibration Check (0A16006-CCV4)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	5 01	-		ng/L	5 0350		99 5	75-125			
Mercury F-2	5 01	-		ng/L	5 0350		99 5	75-125			
Mercury F-3	5 01	-		ng/L	5 0350		99 5	75-125			
Mercury F-4	5 01	-		ng/L	5 0350		99 5	75-125			
Mercury F-5	5 01	-		ng/L	5 0350		99 5	75-125			
Calibration Check (0A16006-CCV5)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 48	-		ng/L	5 0350		88 9	75-125			
Mercury F-2	4 48	-		ng/L	5 0350		88 9	75-125			
Mercury F-3	4 48	-		ng/L	5 0350		88 9	75-125			
Mercury F-4	4 48	-		ng/L	5 0350		88 9	75-125			
Mercury F-5	4 48	-		ng/L	5 0350		88 9	75-125			
Calibration Check (0A16006-CCV6)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 30	-		ng/L	5 0350		85 3	75-125			
Mercury F-2	4 30	-		ng/L	5 0350		85 3	75-125			
Mercury F-3	4 30	-		ng/L	5 0350		85 3	75-125			
Mercury F-4	4 30	-		ng/L	5 0350		85 3	75-125			
Mercury F-5	4 30	-		ng/L	5 0350		85 3	75-125			
Calibration Check (0A16006-CCV7)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 57	-		ng/L	5 0350		90 7	75-125			
Mercury F-2	4 57	-		ng/L	5 0350		90 7	75-125			
Mercury F-3	4 57	-		ng/L	5 0350		90 7	75-125			
Mercury F-4	4 57	-		ng/L	5 0350		90 7	75-125			
Mercury F-5	4 57	-		ng/L	5 0350		90 7	75-125			
Calibration Check (0A16006-CCV8)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 60	-		ng/L	5 0350		91 3	75-125			
Mercury F-2	4 60	-		ng/L	5 0350		91 3	75-125			
Mercury F-3	4 60	-		ng/L	5 0350		91 3	75-125			
Mercury F-4	4 60	-		ng/L	5 0350		91 3	75-125			
Mercury F-5	4 60	-		ng/L	5 0350		91 3	75-125			

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Calibration Check (0A16006-CCV9)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 48	-		ng/L	5 0350		89 0	75-125			
Mercury F-2	4 48	-		ng/L	5 0350		89 0	75-125			
Mercury F-3	4 48	-		ng/L	5 0350		89 0	75-125			
Mercury F-4	4 48	-		ng/L	5 0350		89 0	75-125			
Mercury F-5	4 48	-		ng/L	5 0350		89 0	75-125			
Calibration Check (0A16006-CCVA)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 72	-		ng/L	5 0350		93 8	75-125			
Mercury F-2	4 72	-		ng/L	5 0350		93 8	75-125			
Mercury F-3	4 72	-		ng/L	5 0350		93 8	75-125			
Mercury F-4	4 72	-		ng/L	5 0350		93 8	75-125			
Mercury F-5	4 72	-		ng/L	5 0350		93 8	75-125			
Calibration Check (0A16006-CCVB)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	4 89	-		ng/L	5 0350		97 1	75-125			
Mercury F-2	4 89	-		ng/L	5 0350		97 1	75-125			
Mercury F-3	4 89	-		ng/L	5 0350		97 1	75-125			
Mercury F-4	4 89	-		ng/L	5 0350		97 1	75-125			
Mercury F-5	4 89	-		ng/L	5 0350		97 1	75-125			
Calibration Check (0A16006-CCVC)					Prepared & Analyzed: 14-Jan-20						
Mercury F-2	4 47	-		ng/L	5 0350		88 7	75-125			
Mercury F-3	4 47	-		ng/L	5 0350		88 7	75-125			
Mercury F-4	4 47	-		ng/L	5 0350		88 7	75-125			
Mercury F-5	4 47	-		ng/L	5 0350		88 7	75-125			
Instrument Blank (0A16006-IBL1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U
Mercury F-4	ND	0 10	0 31	ng/L							U
Mercury F-5	ND	0 005	0 05	ng/L							U

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1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16006 - F912177											
Instrument Blank (0A16006-IBL2)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U
Mercury F-4	ND	0 10	0 31	ng/L							U
Mercury F-5	ND	0 005	0 05	ng/L							U
Instrument Blank (0A16006-IBL3)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U
Mercury F-4	ND	0 10	0 31	ng/L							U
Mercury F-5	ND	0 005	0 05	ng/L							U
Initial Cal Blank (0A16006-ICB1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	0 34	-		ng/L							
Mercury F-2	0 34	-		ng/L							
Mercury F-3	0 34	-		ng/L							
Mercury F-4	0 34	-		ng/L							
Mercury F-5	0 34	-		ng/L							
Initial Cal Check (0A16006-ICV1)					Prepared & Analyzed: 14-Jan-20						
Mercury F-1	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-2	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-3	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-4	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-5	5 61	-		ng/L	5 0350		111	75-125			

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16008 - F912177											
Cal Standard (0A16008-CAL1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 47	-		ng/L	0 50000		93 7				
Mercury F-2	0 47	-		ng/L	0 50000		93 7				
Mercury F-3	0 47	-		ng/L	0 50000		93 7				
Cal Standard (0A16008-CAL2)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	1 03	-		ng/L	1 0000		103				
Mercury F-2	1 03	-		ng/L	1 0000		103				
Mercury F-3	1 03	-		ng/L	1 0000		103				
Cal Standard (0A16008-CAL3)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	4 86	-		ng/L	5 0000		97 2				
Mercury F-2	4 86	-		ng/L	5 0000		97 2				
Mercury F-3	4 86	-		ng/L	5 0000		97 2				
Cal Standard (0A16008-CAL4)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	19 91	-		ng/L	20 000		99 5				
Mercury F-2	19 91	-		ng/L	20 000		99 5				
Mercury F-3	19 91	-		ng/L	20 000		99 5				
Cal Standard (0A16008-CAL5)					Prepared & Analyzed 15 Jan 20						
Mercury F 1	42 69	-		ng/L	40 000		107				
Mercury F-2	42 69	-		ng/L	40 000		107				
Mercury F-3	42 69	-		ng/L	40 000		107				
Calibration Blank (0A16008-CCB1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	-0 01	-		ng/L							U
Mercury F-2	-0 01	-		ng/L							U
Mercury F-3	-0 01	-		ng/L							U

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16008 - F912177											
Calibration Blank (0A16008-CCB2)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 02	-		ng/L							
Mercury F-2	0 02	-		ng/L							
Mercury F-3	0 02	-		ng/L							
Calibration Blank (0A16008-CCB3)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	-0 03	-		ng/L							U
Mercury F-2	-0 03	-		ng/L							U
Mercury F-3	-0 03	-		ng/L							U
Calibration Blank (0A16008-CCB4)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 02	-		ng/L							
Mercury F-2	0 02	-		ng/L							
Mercury F-3	0 02	-		ng/L							
Calibration Blank (0A16008-CCB5)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 06	-		ng/L							
Mercury F-2	0 06	-		ng/L							
Mercury F-3	0 06	-		ng/L							
Calibration Blank (0A16008-CCB6)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 21	-		ng/L							
Mercury F-2	0 21	-		ng/L							
Mercury F-3	0 21	-		ng/L							
Calibration Blank (0A16008-CCB7)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 20	-		ng/L							
Mercury F-2	0 20	-		ng/L							
Mercury F-3	0 20	-		ng/L							

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16008 - F912177											
Calibration Blank (0A16008-CCB8)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 15	-		ng/L							
Mercury F-2	0 15	-		ng/L							
Mercury F-3	0 15	-		ng/L							
Calibration Blank (0A16008-CCB9)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 31	-		ng/L							
Mercury F-2	0 31	-		ng/L							
Mercury F-3	0 31	-		ng/L							
Calibration Check (0A16008-CCV1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	4 73	-		ng/L	5 0350		93 9	75-125			
Mercury F-2	4 73	-		ng/L	5 0350		93 9	75-125			
Mercury F-3	4 73	-		ng/L	5 0350		93 9	75-125			
Calibration Check (0A16008-CCV2)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	4 57	-		ng/L	5 0350		90 8	75-125			
Mercury F-2	4 57	-		ng/L	5 0350		90 8	75-125			
Mercury F-3	4 57	-		ng/L	5 0350		90 8	75-125			
Calibration Check (0A16008-CCV3)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	4 69	-		ng/L	5 0350		93 2	75-125			
Mercury F-2	4 69	-		ng/L	5 0350		93 2	75-125			
Mercury F-3	4 69	-		ng/L	5 0350		93 2	75-125			
Calibration Check (0A16008-CCV4)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 05	-		ng/L	5 0350		100	75-125			
Mercury F-2	5 05	-		ng/L	5 0350		100	75-125			
Mercury F-3	5 05	-		ng/L	5 0350		100	75-125			

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16008 - F912177											
Calibration Check (0A16008-CCV5)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-2	5 12	-		ng/L	5 0350		102	75-125			
Mercury F-3	5 12	-		ng/L	5 0350		102	75-125			
Calibration Check (0A16008-CCV6)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 33	-		ng/L	5 0350		106	75-125			
Mercury F-2	5 33	-		ng/L	5 0350		106	75-125			
Mercury F-3	5 33	-		ng/L	5 0350		106	75-125			
Calibration Check (0A16008-CCV7)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 66	-		ng/L	5 0350		112	75-125			
Mercury F-2	5 66	-		ng/L	5 0350		112	75-125			
Mercury F-3	5 66	-		ng/L	5 0350		112	75-125			
Calibration Check (0A16008-CCV8)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-2	5 61	-		ng/L	5 0350		111	75-125			
Mercury F-3	5 61	-		ng/L	5 0350		111	75-125			
Calibration Check (0A16008-CCV9)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	5 53	-		ng/L	5 0350		110	75-125			
Mercury F-2	5 53	-		ng/L	5 0350		110	75-125			
Mercury F-3	5 53	-		ng/L	5 0350		110	75-125			
Instrument Blank (0A16008-IBL1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0A16008 - F912177											
Instrument Blank (0A16008-IBL2)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U
Instrument Blank (0A16008-IBL3)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	ND	0 10	0 31	ng/L							U
Mercury F-2	ND	0 10	0 31	ng/L							U
Mercury F-3	ND	0 10	0 31	ng/L							U
Initial Cal Blank (0A16008-ICB1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	0 02	-		ng/L							
Mercury F-2	0 02	-		ng/L							
Mercury F-3	0 02	-		ng/L							
Initial Cal Check (0A16008-ICV1)					Prepared & Analyzed: 15-Jan-20						
Mercury F-1	4 97	-		ng/L	5 0350		98 7	75-125			
Mercury F-2	4 97	-		ng/L	5 0350		98 7	75-125			
Mercury F-3	4 97	-		ng/L	5 0350		98 7	75-125			
Batch 9C07005 - F903248											
Cal Standard (9C07005-CAL1)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	0 51	-		ng/L	0 50000		101				
Cal Standard (9C07005-CAL2)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	1 06	-		ng/L	1 0000		106				

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C07005 - F903248											
Cal Standard (9C07005-CAL3)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	4 95	-		ng/L	5 0000		99 0				
Cal Standard (9C07005-CAL4)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	19 24	-		ng/L	20 000		96 2				
Cal Standard (9C07005-CAL5)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	39 01	-		ng/L	40 000		97 5				
Calibration Blank (9C07005-CCB1)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	0 04	-		ng/L							
Calibration Blank (9C07005-CCB2)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	0 07	-		ng/L							
Calibration Blank (9C07005-CCB3)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	0 08	-		ng/L							
Calibration Blank (9C07005-CCB4)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	0 13	-		ng/L							
Calibration Check (9C07005-CCV1)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	5 03	-		ng/L	5 0300		100	75-125			
Calibration Check (9C07005-CCV2)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	4 93	-		ng/L	5 0300		98 1	75-125			
Calibration Check (9C07005-CCV3)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	4 95	-		ng/L	5 0300		98 3	75-125			

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C07005 - F903248											
Calibration Check (9C07005-CCV4)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	5 00	-		ng/L	5 0300		99 4	75-125			
Instrument Blank (9C07005-IBL1)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	ND	0 10	0 31	ng/L							U
Instrument Blank (9C07005-IBL2)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	ND	0 10	0 31	ng/L							U
Instrument Blank (9C07005-IBL3)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	ND	0 10	0 31	ng/L							U
Initial Cal Check (9C07005-ICV1)					Prepared & Analyzed: 06-Mar-19						
Mercury F-1	5 07	-		ng/L	5 0300		101	75-125			
Batch 9C07009 - F903276											
Cal Standard (9C07009-CAL1)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	0 50	-		ng/L	0 50000		99 8				
Cal Standard (9C07009-CAL2)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	1 01	-		ng/L	1 0000		101				
Cal Standard (9C07009-CAL3)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	4 96	-		ng/L	5 0000		99 2				
Cal Standard (9C07009-CAL4)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	20 16	-		ng/L	20 000		101				

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C07009 - F903276											
Cal Standard (9C07009-CAL5)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	39 79	-		ng/L	40 000		99 5				
Calibration Blank (9C07009-CCB1)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	-0 06	-		ng/L							U
Calibration Blank (9C07009-CCB2)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	-0 05	-		ng/L							U
Calibration Check (9C07009-CCV1)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	5 07	-		ng/L	5 0300		101	75-125			
Calibration Check (9C07009-CCV2)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	5 03	-		ng/L	5 0300		99 9	75-125			
Instrument Blank (9C07009-IBL1)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U
Instrument Blank (9C07009-IBL2)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U
Instrument Blank (9C07009-IBL3)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U
Initial Cal Check (9C07009-ICV1)					Prepared & Analyzed: 07-Mar-19						
Mercury F-2	5 11	-		ng/L	5 0300		102	75-125			
Batch 9C11010 - F903280											
Cal Standard (9C11010-CAL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	0 51	-		ng/L	0 50000		102				

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11010 - F903280											
Cal Standard (9C11010-CAL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	1 02	-		ng/L	1 0000		102				
Cal Standard (9C11010-CAL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	4 94	-		ng/L	5 0000		98 8				
Cal Standard (9C11010-CAL4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	19 76	-		ng/L	20 000		98 8				
Cal Standard (9C11010-CAL5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	39 44	-		ng/L	40 000		98 6				
Calibration Blank (9C11010-CCB1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	0 003	-		ng/L							
Calibration Blank (9C11010-CCB2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	-0 02	-		ng/L							U
Calibration Blank (9C11010-CCB3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	-0 03	-		ng/L							U
Calibration Blank (9C11010-CCB4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	-0 03	-		ng/L							U
Calibration Blank (9C11010-CCB5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	0 02	-		ng/L							
Calibration Blank (9C11010-CCB6)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	-0 006	-		ng/L							U

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11010 - F903280											
Calibration Blank (9C11010-CCB7)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	-0 01	-		ng/L							U
Calibration Check (9C11010-CCV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 17	-		ng/L	5 0300		103	75-125			
Calibration Check (9C11010-CCV2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 07	-		ng/L	5 0300		101	75-125			
Calibration Check (9C11010-CCV3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 06	-		ng/L	5 0300		101	75-125			
Calibration Check (9C11010-CCV4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 08	-		ng/L	5 0300		101	75-125			
Calibration Check (9C11010-CCV5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 14	-		ng/L	5 0300		102	75-125			
Calibration Check (9C11010-CCV6)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 14	-		ng/L	5 0300		102	75-125			
Calibration Check (9C11010-CCV7)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 12	-		ng/L	5 0300		102	75-125			
Instrument Blank (9C11010-IBL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	ND	0 10	0 31	ng/L							U
Instrument Blank (9C11010-IBL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	ND	0 10	0 31	ng/L							U

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11010 - F903280											
Instrument Blank (9C11010-IBL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	ND	0 10	0 31	ng/L							U
Initial Cal Check (9C11010-ICV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-3	5 15	-		ng/L	5 0300		102	75-125			
Batch 9C11012 - F903276											
Cal Standard (9C11012-CAL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 51	-		ng/L	0 50000		101				
Cal Standard (9C11012-CAL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	1 03	-		ng/L	1 0000		103				
Cal Standard (9C11012-CAL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	4 95	-		ng/L	5 0000		99 0				
Cal Standard (9C11012-CAL4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	19 49	-		ng/L	20 000		97 5				
Cal Standard (9C11012-CAL5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	39 84	-		ng/L	40 000		99 6				
Calibration Blank (9C11012-CCB1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 02	-		ng/L							
Calibration Blank (9C11012-CCB2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 03	-		ng/L							

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11012 - F903276											
Calibration Blank (9C11012-CCB3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 03	-		ng/L							
Calibration Blank (9C11012-CCB4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 05	-		ng/L							
Calibration Blank (9C11012-CCB5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	0 06	-		ng/L							
Calibration Check (9C11012-CCV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	5 17	-		ng/L	5 0300		103	75-125			
Calibration Check (9C11012-CCV2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	4 94	-		ng/L	5 0300		98 2	75-125			
Calibration Check (9C11012-CCV3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	5 09	-		ng/L	5 0300		101	75-125			
Calibration Check (9C11012-CCV4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	5 17	-		ng/L	5 0300		103	75-125			
Calibration Check (9C11012-CCV5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	5 22	-		ng/L	5 0300		104	75-125			
Instrument Blank (9C11012-IBL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U
Instrument Blank (9C11012-IBL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U

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Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11012 - F903276											
Instrument Blank (9C11012-IBL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	ND	0 10	0 31	ng/L							U
Initial Cal Check (9C11012-ICV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-2	5 11	-		ng/L	5 0300		102	75-125			
Batch 9C11013 - F903295											
Cal Standard (9C11013-CAL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 51	-		ng/L	0 50000		101				
Cal Standard (9C11013-CAL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	1 03	-		ng/L	1 0000		103				
Cal Standard (9C11013-CAL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	4 95	-		ng/L	5 0000		99 0				
Cal Standard (9C11013-CAL4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	19 49	-		ng/L	20 000		97 5				
Cal Standard (9C11013-CAL5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	39 84	-		ng/L	40 000		99 6				
Calibration Blank (9C11013-CCB1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 02	-		ng/L							
Calibration Blank (9C11013-CCB2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 03	-		ng/L							

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11013 - F903295											
Calibration Blank (9C11013-CCB3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 03	-		ng/L							
Calibration Blank (9C11013-CCB4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 05	-		ng/L							
Calibration Blank (9C11013-CCB5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 06	-		ng/L							
Calibration Blank (9C11013-CCB6)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 09	-		ng/L							
Calibration Blank (9C11013-CCB7)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	0 12	-		ng/L							
Calibration Check (9C11013-CCV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 17	-		ng/L	5 0300		103	75-125			
Calibration Check (9C11013-CCV2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	4 94	-		ng/L	5 0300		98 2	75-125			
Calibration Check (9C11013-CCV3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 09	-		ng/L	5 0300		101	75-125			
Calibration Check (9C11013-CCV4)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 17	-		ng/L	5 0300		103	75-125			
Calibration Check (9C11013-CCV5)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 22	-		ng/L	5 0300		104	75-125			

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C11013 - F903295											
Calibration Check (9C11013-CCV6)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 28	-		ng/L	5 0300		105	75-125			
Calibration Check (9C11013-CCV7)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 37	-		ng/L	5 0300		107	75-125			
Instrument Blank (9C11013-IBL1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	ND	0 10	0 31	ng/L							U
Instrument Blank (9C11013-IBL2)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	ND	0 10	0 31	ng/L							U
Instrument Blank (9C11013-IBL3)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	ND	0 10	0 31	ng/L							U
Initial Cal Check (9C11013-ICV1)					Prepared & Analyzed: 11-Mar-19						
Mercury F-4	5 11	-		ng/L	5 0300		102	75-125			
Batch 9C13016 - F903314											
Cal Standard (9C13016-CAL1)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	0 51	-		ng/L	0 50000		102				
Cal Standard (9C13016-CAL2)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	1 04	-		ng/L	1 0000		104				
Cal Standard (9C13016-CAL3)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	4 93	-		ng/L	5 0000		98 6				

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C13016 - F903314											
Cal Standard (9C13016-CAL4)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	19 59	-		ng/L	20 000		97 9				
Cal Standard (9C13016-CAL5)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	38 80	-		ng/L	40 000		97 0				
Calibration Blank (9C13016-CCB1)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	0 04	-		ng/L							
Calibration Blank (9C13016-CCB2)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	0 09	-		ng/L							
Calibration Blank (9C13016-CCB3)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	0 06	-		ng/L							
Calibration Check (9C13016-CCV1)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	4 95	-		ng/L	5 0300		98 4	75-125			
Calibration Check (9C13016-CCV2)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	4 94	-		ng/L	5 0300		98 3	75-125			
Calibration Check (9C13016-CCV3)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	4 89	-		ng/L	5 0300		97 2	75-125			
Instrument Blank (9C13016-IBL1)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	ND	0 005	0 05	ng/L							U
Instrument Blank (9C13016-IBL2)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	ND	0 005	0 05	ng/L							U

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9C13016 - F903314											
Instrument Blank (9C13016-IBL3)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	ND	0 005	0 05	ng/L							U
Initial Cal Check (9C13016-ICV1)					Prepared & Analyzed: 12-Mar-19						
Mercury F-5	5 03	-		ng/L	5 0300		99 9	75-125			
Batch F903248 - EFGS SOP2813 Hg SSE Fraction F-1											
Blank (F903248-BLK1)					Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	ND	1 00	3 12	ng/g wet							U
Blank (F903248-BLK2)					Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	ND	1 00	3 12	ng/g wet							U
Blank (F903248-BLK3)					Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	ND	1 00	3 12	ng/g wet							U
LCS (F903248-BS1)					Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	44 87	1 00	3 12	ng/g wet	45 900		97 8	77-123			
LCS Dup (F903248-BSD1)					Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	45 04	1 00	3 12	ng/g wet	45 900		98 1	77-123	0 378	25	
Duplicate (F903248-DUP1)		**Source: 9B00908-01RE1**			Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	566 2	9 53	29 8	ng/g dry		127 4			127	25	QR-07
Duplicate (F903248-DUP2)		**Source: 9B00908-01RE1**			Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	127 5	8 80	27 5	ng/g dry		127 4			0 0719	25	AD

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F903248 - EFGS SOP2813 Hg SSE Fraction F-1											
Matrix Spike (F903248-MS1)		**Source: 9B00908-02RE1**			Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	13450	171	533	ng/g dry	10660	2967	98 4	75-125			
Matrix Spike Dup (F903248-MSD1)		**Source: 9B00908-02RE1**			Prepared: 04-Mar-19 Analyzed: 06-Mar-19						
Mercury F-1	13180	171	533	ng/g dry	10660	2967	95 8	75-125	2 62	25	AS
Batch F903276 - EFGS SOP2813 Hg SSE Fraction F-2											
Blank (F903276-BLK1)					Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
Blank (F903276-BLK2)					Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
Blank (F903276-BLK3)					Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
Blank (F903276-BLK4)					Prepared: 05-Mar-19 Analyzed: 11-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
Blank (F903276-BLK5)					Prepared: 05-Mar-19 Analyzed: 11-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
Blank (F903276-BLK6)					Prepared: 05-Mar-19 Analyzed: 11-Mar-19						
Mercury F-2	ND	1 00	3 12	ng/g wet							U
LCS Dup (F903276-BSD1)					Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	46 55	1 00	3 12	ng/g wet	45 900		101	77-123		25	

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Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F903276 - EFGS SOP2813 Hg SSE Fraction F-2											
Duplicate (F903276-DUP2)		**Source: 9B00908-01RE1**			Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	71 27	1 76	5 50	ng/g dry		25 55				25	AD
Duplicate (F903276-DUP3)		**Source: 9B00908-01RE1**			Prepared: 05-Mar-19 Analyzed: 11-Mar-19						
Mercury F-2	253 0	9 53	29 8	ng/g dry		25 55				25	QR-07
Matrix Spike Dup (F903276-MSD1)		**Source: 9B00908-01RE1**			Prepared: 05-Mar-19 Analyzed: 07-Mar-19						
Mercury F-2	350 1	8 80	27 5	ng/g dry	275 00	25 55	118	75-125		25	AS
Matrix Spike Dup (F903276-MSD2)		**Source: 9B00908-01RE1**			Prepared: 05-Mar-19 Analyzed: 11-Mar-19						
Mercury F-2	352 2	8 80	27 5	ng/g dry	275 00	25 55	119	75-125		25	
Batch F903280 - EFGS SOP2813 Hg SSE Fraction F-3											
Blank (F903280-BLK1)					Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	ND	2 00	6 25	ng/g wet							U
Blank (F903280-BLK2)					Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	ND	2 00	6 25	ng/g wet							U
Blank (F903280-BLK3)					Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	ND	2 00	6 25	ng/g wet							U
LCS Dup (F903280-BSD1)					Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	95 16	2 00	6 25	ng/g wet	91 800		104	77-123		25	
Duplicate (F903280-DUP1)		**Source: 9B00908-01**			Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	12320	477	1490	ng/g dry		2776			126	25	E-01, QR-07

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This report was revisied for the following reason: See narrative for details

Patrick Garcia Strickland, Business Unit Manager

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5755 8th Street East
Tacoma, WA 98424
Phone: (253) 922-2310

E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F903280 - EFGS SOP2813 Hg SSE Fraction F-3											
Duplicate (F903280-DUP2)		**Source: 9B00908-01**			Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	12320	477	1490	ng/g dry		2776			126	25	QR-07
Duplicate (F903280-DUP3)		**Source: 9B00908-01**			Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	2775	440	1370	ng/g dry		2776			0 0524	25	AD
Matrix Spike Dup (F903280-MSD1)		**Source: 9B00908-01**			Prepared: 06-Mar-19 Analyzed: 11-Mar-19						
Mercury F-3	10060	440	1370	ng/g dry	6875 0	2776	106	75-125		25	AS
Batch F903295 - EFGS SOP2813 Hg SSE Fraction F-4											
Blank (F903295-BLK1)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	14 92	5 00	15 6	ng/g wet							J
Blank (F903295-BLK2)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	9 88	5 00	15 6	ng/g wet							J
Blank (F903295-BLK3)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	ND	5 00	15 6	ng/g wet							U
Blank (F903295-BLK4)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	6 12	5 00	15 6	ng/g wet							J
Blank (F903295-BLK5)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	ND	5 00	15 6	ng/g wet							U
LCS (F903295-BS1)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	246 6	5 00	15 6	ng/g wet	229 50		107	77-123			

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Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F903295 - EFGS SOP2813 Hg SSE Fraction F-4											
LCS Dup (F903295-BSD1)					Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	250 1	5 00	15 6	ng/g wet	229 50		109	77-123	1 37	25	
Duplicate (F903295-DUP1)		**Source: 9B00908-01RE1**			Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	1184	19 1	59 6	ng/g dry		346 0			110	25	QR-07
Duplicate (F903295-DUP2)		**Source: 9B00908-01RE1**			Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	346 8	8 80	27 5	ng/g dry		346 0			0 222	25	AD
Matrix Spike (F903295-MS1)		**Source: 9B00908-01RE1**			Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	1468	17 6	55 0	ng/g dry	1100 0	346 0	102	75-125			
Matrix Spike Dup (F903295-MSD1)		**Source: 9B00908-01RE1**			Prepared: 07-Mar-19 Analyzed: 11-Mar-19						
Mercury F-4	1465	17 6	55 0	ng/g dry	1100 0	346 0	102	75-125	0 287	25	AS
Batch F903314 - EFGS SOP2813 Hg SSE Fraction F-5											
Blank (F903314-BLK1)					Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	0 13	0 11	1 00	ng/g wet							J
Blank (F903314-BLK2)					Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	0 22	0 11	1 00	ng/g wet							J
Blank (F903314-BLK3)					Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	ND	0 11	1 00	ng/g wet							U
LCS Dup (F903314-BSD1)					Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	9 56	0 11	1 00	ng/g wet	10 000		95 6	77-123		25	

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Patrick Garcia Strickland, Business Unit Manager

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1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F903314 - EFGS SOP2813 Hg SSE Fraction F-5											
Duplicate (F903314-DUP1)		**Source: 9B00908-01**			Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	6879	52 4	477	ng/g dry		1814			117	25	QR-07
Duplicate (F903314-DUP2)		**Source: 9B00908-01**			Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	2079	24 2	220	ng/g dry		1814			13 6	25	AD
Matrix Spike Dup (F903314-MSD1)		**Source: 9B00908-01**			Prepared: 08-Mar-19 Analyzed: 12-Mar-19						
Mercury F-5	6239	24 2	220	ng/g dry	4400 0	1814	101	75-125		25	AS
Batch F912165 - EFGS SOP2813 Hg SSE Fraction F-1											
Blank (F912165-BLK1)					Prepared: 04-Dec-19 Analyzed: 14-Jan-20						
Mercury F-1	ND	0 96	3 00	ng/g wet							U
Blank (F912165-BLK2)					Prepared: 04-Dec-19 Analyzed: 14-Jan-20						
Mercury F-1	ND	0 96	3 00	ng/g wet							U
Blank (F912165-BLK3)					Prepared: 04-Dec-19 Analyzed: 14-Jan-20						
Mercury F-1	ND	0 96	3 00	ng/g wet							U
Duplicate (F912165-DUP1)		**Source: 9B00908-01RE2**			Prepared: 04-Dec-19 Analyzed: 14-Jan-20						
Mercury F-1	441 5	8 78	27 4	ng/g dry		351 4			22 7	25	
Batch F912177 - EFGS SOP2813 Hg SSE Fraction F-2											
Blank (F912177-BLK2)					Prepared: 05-Dec-19 Analyzed: 14-Jan-20						
Mercury F-2	ND	0 96	3 00	ng/g wet							U

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F912177 - EFGS SOP2813 Hg SSE Fraction F-2											
Blank (F912177-BLK3)					Prepared: 05-Dec-19 Analyzed: 14-Jan-20						
Mercury F-2	ND	0 96	3 00	ng/g wet							U
Blank (F912177-BLK4)					Prepared: 05-Dec-19 Analyzed: 14-Jan-20						
Mercury F-2	ND	0 96	3 00	ng/g wet							U
Duplicate (F912177-DUP1)		**Source: 9B00908-01RE2**			Prepared: 05-Dec-19 Analyzed: 14-Jan-20						
Mercury F-2	58 94	1 76	5 49	ng/g dry		63 23			7 04	25	
Batch F912178 - EFGS SOP2813 Hg SSE Fraction F-3											
Blank (F912178-BLK1)					Prepared: 06-Dec-19 Analyzed: 14-Jan-20						
Mercury F-3	ND	1 92	6 00	ng/g wet							U
Blank (F912178-BLK2)					Prepared: 06-Dec-19 Analyzed: 14-Jan-20						
Mercury F-3	ND	1 92	6 00	ng/g wet							U
Blank (F912178-BLK3)					Prepared: 06-Dec-19 Analyzed: 14-Jan-20						
Mercury F-3	ND	1 92	6 00	ng/g wet							U
Duplicate (F912178-DUP1)		**Source: 9B00908-01RE1**			Prepared: 06-Dec-19 Analyzed: 14-Jan-20						
Mercury F-3	3785	439	1370	ng/g dry		2766			31 1	25	QR-09
Batch F912182 - EFGS SOP2813 Hg SSE Fraction F-4											
Blank (F912182-BLK1)					Prepared: 07-Dec-19 Analyzed: 14-Jan-20						
Mercury F-4	4 64	1 92	6 00	ng/g wet							J

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E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Quality Control Data

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch F912182 - EFGS SOP2813 Hg SSE Fraction F-4											
Blank (F912182-BLK2)					Prepared: 07-Dec-19 Analyzed: 14-Jan-20						
Mercury F-4	3 17	1 92	6 00	ng/g wet							J
Blank (F912182-BLK3)					Prepared: 07-Dec-19 Analyzed: 14-Jan-20						
Mercury F-4	3 76	1 92	6 00	ng/g wet							J
Duplicate (F912182-DUP1)		**Source: 9B00908-01RE2**			Prepared: 07-Dec-19 Analyzed: 14-Jan-20						
Mercury F-4	822 6	8 78	27 4	ng/g dry		898 5			8 81	25	
Batch F912184 - EFGS SOP2813 Hg SSE Fraction F-5											
Blank (F912184-BLK1)					Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	ND	0 11	1 00	ng/g wet							U
Blank (F912184-BLK2)					Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	ND	0 11	1 00	ng/g wet							U
Blank (F912184-BLK3)					Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	ND	0 11	1 00	ng/g wet							U
LCS (F912184-BS1)					Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	10 74	0 11	1 00	ng/g wet	10 000		107	77-123			
LCS Dup (F912184-BSD1)					Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	10 43	0 11	1 00	ng/g wet	10 000		104	77-123	2 93	25	
Duplicate (F912184-DUP1)		**Source: 9B00908-01RE1**			Prepared: 08-Dec-19 Analyzed: 14-Jan-20						
Mercury F-5	2774	50 2	457	ng/g dry		1990			32 9	25	QR-09

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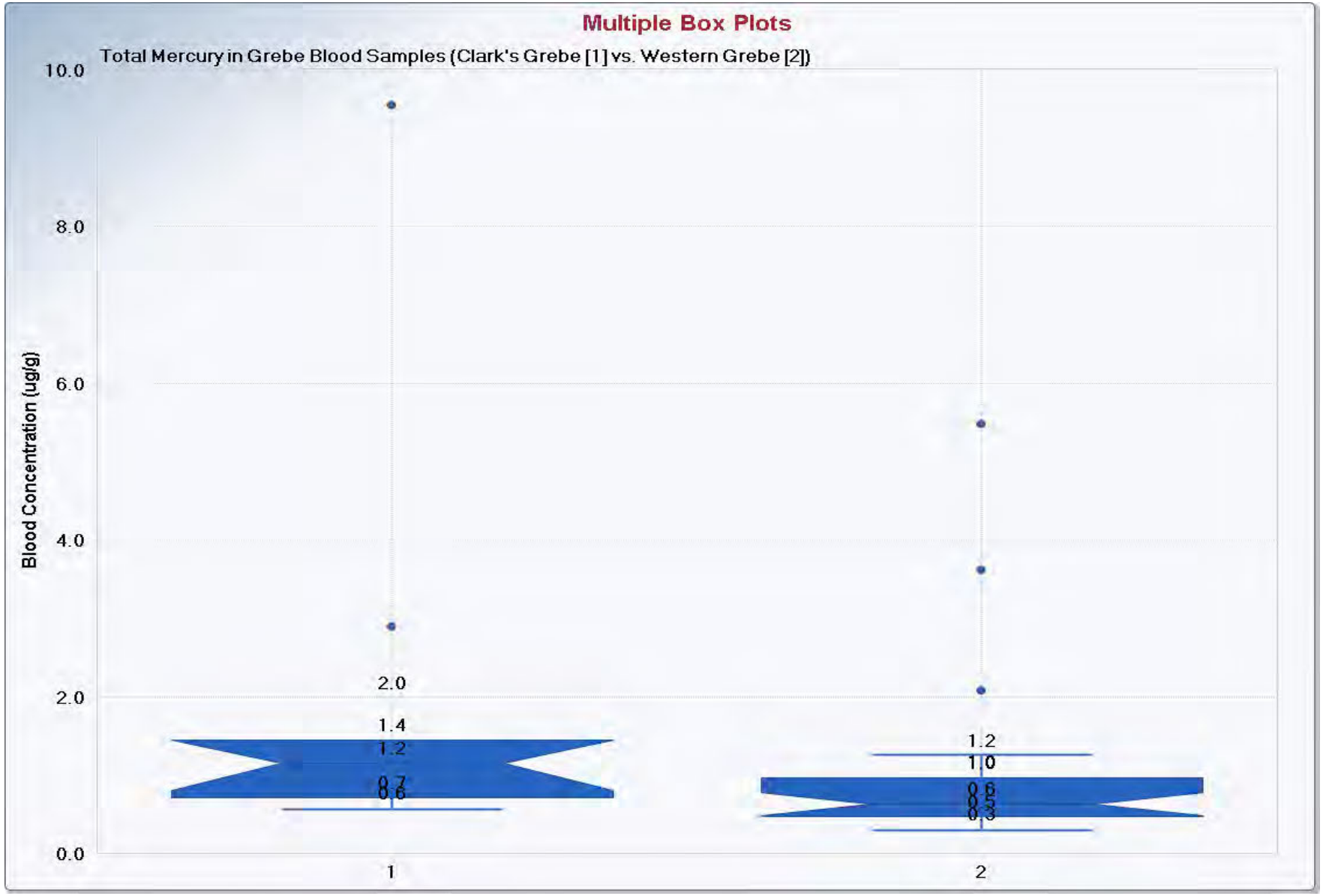
E2 Consulting Engineers, Inc.	Project: SBMM HHRA 2018	
1900 Powell St., Suite 250	Project Number: SBMM HHRA 2018	**Reported:**
Emeryville CALIFORNIA, 94608	Project Manager: Ruth Siegmund	17-Jan-20 17:48

Notes and Definitions

Z-01	CCB failure and not all over 10 times blank level. Sample -04 was reanalyzed for confirmation and confirms. Original run was reported as all are replicates standard checks
U	Analyte was not detected and is reported as less than the LOD or as defined by the client. The LOD has been adjusted for any dilution or concentration of the sample.
QR-09	MS/MSD and/or MD/MT RPD or RSD greater than the control limits due to a non-homogenous sample matrix. Batch QC acceptable based on LCS/LCSD RPD.
QR-07	The RPD/RSD value for the matrix duplicate/triplicate was outside of acceptance limits. Batch QC acceptable based on MS/MSD and/or LCS/LCSD RPD values within control limits.
QB-01	The method blank and/or initial/continuing calibration blank contains analyte at a concentration above the MRL. However, the blank concentration(s) are less than 10% of the sample result.
O-09	Total Solids are prepared at the same time as the preparation for the analyte(s) of interest in order to provide the most accurate dry mass correction.
O-04	This sample was analyzed outside of the recommended holding time.
J	The result is an estimated concentration.
E-01	Sample was preceded by a sample exceeding the calibration curve and was reanalyzed for confirmation.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate (CLP E-flag).
AS	This MS and/or MSD is an analytical spike and/or an analytical spike duplicate.
AD	This matrix duplicate is an analytical duplicate.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the method detection limit if reported to the MDL or above the reporting limit if reported to the MRL.
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Appendix G
Box Plot of Clark's grebe and Western grebe Blood THg Data

Appendix G


Multiple Box Plots
Total Mercury in Grebe Blood Samples (Clark's Grebe [1] vs. Western Grebe [2])
Blood Concentration (ug/g)
10.0
8.0
6.0
4.0
2.0
0.0
2.0
1.4
1.2
0.7
0.6
1.2
1.0
0.6
0.5
0.3
1
2

Appendix H
Laboratory Reports for the USGS Fish Tissue Data

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street Building 201
Richmond, CA 94804

Date: **10/30/2019**

Subject: **Analytical Testing Results - Project R20S06**
WorkOrder: 1910046

From: **Peter Husby, Director**
EPA Region 9 Laboratory
EMD-3-1

To: **Carter Jessop**
California Site Cleanup Section 2
SFD-7-2

Attached are the results from the analysis of samples from the **SBMM 2019 HHRA Fish Tissue Supplement** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Audrey Johnson at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Susan Sturges, the Lab Project Manager at (510)412 2300

Electronic CC: Radhika Sreenivasan, E2 Consulting Engineers Inc.

Analyses included in this report:

Mercury by EPA method 7473
Mercury by EPA method 7473
Percent Solids

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910046
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 45
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
CLEA_172	1910046-01	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_173	1910046-02	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_174	1910046-03	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_175	1910046-04	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_176	1910046-05	Tissue	06/27/19 00:00	10/18/19 09:05
CLEA_185	1910046-06	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_186	1910046-07	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_187	1910046-08	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_188	1910046-09	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_189	1910046-10	Tissue	06/19/19 00:00	10/18/19 09:05
CLEA_190	1910046-11	Tissue	06/19/19 00:00	10/18/19 09:05
CLEA_191	1910046-12	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_192	1910046-13	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_193	1910046-14	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_194	1910046-15	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_195	1910046-16	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_196	1910046-17	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_197	1910046-18	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_198	1910046-19	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_199	1910046-20	Tissue	06/25/19 00:00	10/18/19 09:05

Work Order 1910046

Mercury results for these tissue samples are reported on an "as received" basis, with no dry-weight correction. Percent solids values are provided for dry-weight correction at a future date, if required.

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910046
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 45
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910046-01**								**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA_172**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 13		0 022	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_172**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-02**								**Tissue Sampled 06/20/19 00 00**
Sample ID:	**CLEA_173**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 077		0 039	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_173**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		24		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-03**								**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA_174**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 24		0 023	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_174**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		24		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-04**								**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA 175**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 043		0 027	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_175**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-05**								**Tissue - Sampled: 06/27/19 00:00**
Sample ID:	**CLEA_176**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 16		0 022	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_176**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		24		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-06**								**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_185**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 11		0 071	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_185**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-07**								**Tissue - Sampled: 06/26/19 00:00**
Sample ID:	**CLEA_186**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 080		0 028	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_186**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-08**								**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_187**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 22		0 029	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID:	**CLEA_187**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID:	**1910046-09**								**Tissue - Sampled: 06/24/19 00:00**

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910046
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 45
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1910046-09									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: CLEA_188									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 30		0 033	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_188									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-10									**Tissue Sampled 06/19/19 00 00**
Sample ID: CLEA_189									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 091		0 022	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_189									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-11									**Tissue - Sampled: 06/19/19 00:00**
Sample ID: CLEA_190									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 10		0 021	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_190									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-12									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: CLEA 191									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 15		0 025	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_191									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-13									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: CLEA_192									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 15		0 024	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_192									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-14									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: CLEA_193									**Metals by EPA 6000/7000 Series Methods**
Mercury	RE1	0 12		0 051	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_193									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		19		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-15									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: CLEA_194									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 055		0 023	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_194									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-16									**Tissue - Sampled: 06/21/19 00:00**
Sample ID: CLEA_195									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 065		0 029	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: CLEA_195									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: 1910046-17									**Tissue - Sampled: 06/25/19 00:00**

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910046
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 45
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: **1910046-17**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID: **CLEA_196**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 038		0 025	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: **CLEA_196**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: **1910046-18**									**Tissue Sampled 06/21/19 00 00**
Sample ID: **CLEA_197**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 21		0 029	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: **CLEA_197**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: **1910046-19**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_198**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 15		0 030	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: **CLEA_198**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J101	10/24/19	10/28/19	3550C
Lab ID: **1910046-20**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID: **CLEA 199**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 064		0 039	mg/kg	B19J076	10/21/19	10/21/19	7473
Sample ID: **CLEA_199**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J101	10/24/19	10/28/19	3550C

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B19J076 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/21/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J076-BLK1)										
Mercury	ND	U	0 025	mg/kg						
Duplicate (B19J076-DUP2)		**Source: 1910046-01**								
Mercury	0 131		0 022	mg/kg		0 127			3	20
Reference (B19J076-SRM1)										
Mercury	0 44		0 028	mg/kg	0 433		102	80-120		
Batch B19J101 - Solids, Dry Weight (Prep) - Solids, Dry Weight										**Prepared: 10/24/19 Analyzed: 10/28/19**
										Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
Blank (B19J101-BLK1)										
% Solids	ND	U	1	%						
Duplicate (B19J101-DUP1)		**Source: 1910046-01**								
% Solids	21		1	%		22			4	20

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910046
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 45
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Qualifiers and Comments

U	Not Detected
NR	Not Reported
RE1, RE2, etc:	Result is from a sample re-analysis.

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street Building 201
Richmond, CA 94804

Date: **10/30/2019**

Subject: **Analytical Testing Results - Project R20S06**
WorkOrder: 1910048

From: **Peter Husby, Director**
EPA Region 9 Laboratory
EMD-3-1

To: **Carter Jessop**
California Site Cleanup Section 2
SFD-7-2

Attached are the results from the analysis of samples from the **SBMM 2019 HHRA Fish Tissue Supplement** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Audrey Johnson at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Susan Sturges, the Lab Project Manager at (510)412 2300

Electronic CC: Radhika Sreenivasan, E2 Consulting Engineers Inc.

Analyses included in this report:

Mercury by EPA method 7473
Mercury by EPA method 7473
Percent Solids

United States Environmental Protection Agency
Region 9 Laboratory

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910048
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
CLEA_200	1910048-01	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_201	1910048-02	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_202	1910048-03	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_203	1910048-04	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_204	1910048-05	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_205	1910048-06	Tissue	06/27/19 00:00	10/18/19 09:05
CLEA_206	1910048-07	Tissue	06/27/19 00:00	10/18/19 09:05
CLEA_208	1910048-08	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_209	1910048-09	Tissue	06/19/19 00:00	10/18/19 09:05
CLEA_210	1910048-10	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_212	1910048-11	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_213	1910048-12	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_214	1910048-13	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_215	1910048-14	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_216	1910048-15	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_217	1910048-16	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_218	1910048-17	Tissue	06/28/19 00:00	10/18/19 09:05
CLEA_219	1910048-18	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_220	1910048-19	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_221	1910048-20	Tissue	06/24/19 00:00	10/18/19 09:05

Work Order 1910048

Mercury results for these tissue samples are reported on an "as received" basis, with no dry-weight correction. Percent solids values are provided for dry-weight correction at a future date, if required.

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910048
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910048-01**								**Tissue - Sampled: 06/26/19 00:00**
Sample ID:	**CLEA_200**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 089		0 046	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_200**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		23		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-02**								**Tissue Sampled 06/26/19 00 00**
Sample ID:	**CLEA_201**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 10		0 033	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_201**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-03**								**Tissue - Sampled: 06/26/19 00:00**
Sample ID:	**CLEA_202**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 070		0 030	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_202**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-04**								**Tissue - Sampled: 06/26/19 00:00**
Sample ID:	**CLEA 203**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 059		0 038	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_203**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-05**								**Tissue - Sampled: 06/26/19 00:00**
Sample ID:	**CLEA_204**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 083		0 040	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_204**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-06**								**Tissue - Sampled: 06/27/19 00:00**
Sample ID:	**CLEA_205**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 10		0 032	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_205**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-07**								**Tissue - Sampled: 06/27/19 00:00**
Sample ID:	**CLEA_206**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 26		0 039	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_206**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-08**								**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_208**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 055		0 053	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID:	**CLEA_208**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-09**								**Tissue - Sampled: 06/19/19 00:00**

United States Environmental Protection Agency
Region 9 Laboratory

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910048
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1910048-09									**Tissue - Sampled: 06/19/19 00:00**
Sample ID: CLEA_209									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 19		0 034	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID: CLEA_209									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-10									**Tissue Sampled 06/21/19 00 00**
Sample ID: CLEA_210									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 074		0 035	mg/kg	B19J082	10/21/19	10/21/19	7473
Sample ID: CLEA_210									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-11									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA_212									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 11		0 035	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_212									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-12									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: CLEA 213									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 18		0 022	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_213									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-13									**Tissue - Sampled: 06/25/19 00:00**
Sample ID: CLEA_214									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 037		0 031	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_214									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		19		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-14									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: CLEA_215									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 16		0 028	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_215									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-15									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: CLEA_216									**Metals by EPA 6000/7000 Series Methods**
Mercury	RE1	0 11		0 048	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_216									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-16									**Tissue - Sampled: 06/25/19 00:00**
Sample ID: CLEA_217									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 036		0 022	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID: CLEA_217									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID: 1910048-17									**Tissue - Sampled: 06/28/19 00:00**

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910048
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte		Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910048-17**									**Tissue - Sampled: 06/28/19 00:00**
Sample ID:	**CLEA_218**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 059		0 025	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID:	**CLEA_218**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			19		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-18**									**Tissue Sampled 06/26/19 00 00**
Sample ID:	**CLEA_219**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 13		0 021	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID:	**CLEA_219**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-19**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_220**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 10		0 041	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID:	**CLEA_220**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			20		1	%	B19J102	10/24/19	10/28/19	3550C
Lab ID:	**1910048-20**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA 221**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 18		0 041	mg/kg	B19J083	10/22/19	10/22/19	7473
Sample ID:	**CLEA_221**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J102	10/24/19	10/28/19	3550C

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B19J082 - 7473 Hg Prep - Mercury by 7473									**Prepared & Analyzed: 10/21/19**	
									Metals by EPA 6000/7000 Series Methods - Quality Control	
Blank (B19J082-BLK1)										
Mercury	ND	U	0 031	mg/kg						
Duplicate (B19J082-DUP1)		**Source: 1910048-02**								
Mercury	0 0946		0 032	mg/kg		0 1			6	20
Reference (B19J082-SRM1)										
Mercury	0 444		0 025	mg/kg	0 433		103	80-120		
Batch B19J083 - 7473 Hg Prep - Mercury by 7473									**Prepared & Analyzed: 10/22/19**	
									Metals by EPA 6000/7000 Series Methods - Quality Control	
Blank (B19J083-BLK1)										
Mercury	ND	U	0 026	mg/kg						
Duplicate (B19J083-DUP1)		**Source: 1910048-11**								
Mercury	0 129		0 025	mg/kg		0 109			16	20
Reference (B19J083-SRM1)										
Mercury	0 446		0 026	mg/kg	0 433		103	80-120		
Batch B19J102 - Solids, Dry Weight (Prep) - Solids, Dry Weight									**Prepared: 10/24/19 Analyzed: 10/28/19**	
									Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control	
Blank (B19J102-BLK1)										
% Solids	ND	U	1	%						
Duplicate (B19J102-DUP1)		**Source: 1910048-01**								
% Solids	22		1	%		23			2	20

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:**	10/30/19 15 41
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**		

Qualifiers and Comments

U	Not Detected
NR	Not Reported
RE1, RE2, etc:	Result is from a sample re-analysis.

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street Building 201
Richmond, CA 94804

Date: **10/30/2019**

Subject: **Analytical Testing Results - Project R20S06**
WorkOrder: 1910049

From: **Peter Husby, Director**
EPA Region 9 Laboratory
EMD-3-1

To: **Carter Jessop**
California Site Cleanup Section 2
SFD-7-2

Attached are the results from the analysis of samples from the **SBMM 2019 HHRA Fish Tissue Supplement** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Audrey Johnson at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Susan Sturges, the Lab Project Manager at (510)412 2300

Electronic CC: Radhika Sreenivasan, E2 Consulting Engineers Inc.

Analyses included in this report:

Mercury by EPA method 7473
Mercury by EPA method 7473
Percent Solids

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910049
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
CLEA_222	1910049-01	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_224	1910049-02	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_225	1910049-03	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_228	1910049-04	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_229	1910049-05	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_230	1910049-06	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_233	1910049-07	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_234	1910049-08	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_235	1910049-09	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_236	1910049-10	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_237	1910049-11	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_238	1910049-12	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_239	1910049-13	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_240	1910049-14	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_241	1910049-15	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_242	1910049-16	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_243	1910049-17	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_244	1910049-18	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_245	1910049-19	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_246	1910049-20	Tissue	06/20/19 00:00	10/18/19 09:05

Work Order 1910049

Mercury results for these tissue samples are reported on an "as received" basis, with no dry-weight correction. Percent solids values are provided for dry-weight correction at a future date, if required.

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte		Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910049-01**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_222**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 12		0 038	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_222**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-02**									**Tissue Sampled 06/20/19 00 00**
Sample ID:	**CLEA_224**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 17		0 024	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_224**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-03**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_225**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 086		0 035	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_225**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-04**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA 228**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 21		0 030	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_228**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-05**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA_229**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 066		0 023	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_229**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-06**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_230**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 26		0 029	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_230**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-07**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_233**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 13		0 051	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_233**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-08**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_234**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 15		0 027	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_234**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			23		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-09**									**Tissue - Sampled: 06/25/19 00:00**

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910049
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte		Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910049-09**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_235**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 19		0 028	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_235**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-10**									**Tissue Sampled 06/20/19 00 00**
Sample ID:	**CLEA_236**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 19		0 036	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_236**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-11**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA_237**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 26		0 029	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_237**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			20		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-12**									**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA 238**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 13		0 023	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_238**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-13**									**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA_239**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 16		0 031	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_239**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			20		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-14**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_240**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 44		0 027	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_240**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-15**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_241**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 24		0 029	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_241**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-16**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_242**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 39		0 025	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_242**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-17**									**Tissue - Sampled: 06/25/19 00:00**

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte		Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910049-17**									**Tissue - Sampled: 06/25/19 00:00**
Sample ID:	**CLEA_243**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 35		0 028	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_243**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-18**									**Tissue Sampled 06/20/19 00 00**
Sample ID:	**CLEA_244**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 16		0 022	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID:	**CLEA_244**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			22		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-19**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA_245**									**Metals by EPA 6000/7000 Series Methods**
Mercury			0 083		0 027	mg/kg	B19J085	10/22/19	10/22/19	7473
Sample ID:	**CLEA_245**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			20		1	%	B19J107	10/25/19	10/28/19	3550C
Lab ID:	**1910049-20**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID:	**CLEA 246**									**Metals by EPA 6000/7000 Series Methods**
Mercury		RE1	0 087		0 036	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID:	**CLEA_246**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids			21		1	%	B19J107	10/25/19	10/28/19	3550C

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B19J085 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/22/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J085-BLK1)										
Mercury	ND	U	0 025	mg/kg						
Duplicate (B19J085-DUP1)		**Source: 1910049-03**								
Mercury	0 0854		0 033	mg/kg		0 0858			0 5	20
Reference (B19J085-SRM2)										
Mercury	0 449		0 029	mg/kg	0 433		104	80-120		
Batch B19J094 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/23/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J094-BLK1)										
Mercury	ND	U	0 027	mg/kg						
Reference (B19J094-SRM1)										
Mercury	0 481		0 025	mg/kg	0 433		111	80-120		
Batch B19J107 - Solids, Dry Weight (Prep) - Solids, Dry Weight										**Prepared: 10/25/19 Analyzed: 10/28/19**
										Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
Blank (B19J107-BLK1)										
% Solids	ND	U	1	%						
Duplicate (B19J107-DUP1)		**Source: 1910049-01**								
% Solids	21		1	%		21			1	20

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 42
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Qualifiers and Comments

U	Not Detected
NR	Not Reported
RE1, RE2, etc:	Result is from a sample re-analysis.

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street Building 201
Richmond, CA 94804

Date: **10/30/2019**

Subject: **Analytical Testing Results - Project R20S06**
WorkOrder: 1910050

From: **Peter Husby, Director**
EPA Region 9 Laboratory
EMD-3-1

To: **Carter Jessop**
California Site Cleanup Section 2
SFD-7-2

Attached are the results from the analysis of samples from the **SBMM 2019 HHRA Fish Tissue Supplement** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Audrey Johnson at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Susan Sturges, the Lab Project Manager at (510)412 2300

Electronic CC: Radhika Sreenivasan, E2 Consulting Engineers Inc.

Analyses included in this report:

Mercury by EPA method 7473
Mercury by EPA method 7473
Percent Solids

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Region 9 Laboratory

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910050
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 47
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
CLEA_247	1910050-01	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_248	1910050-02	Tissue	06/25/19 00:00	10/18/19 09:05
CLEA_249	1910050-03	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_250	1910050-04	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_251	1910050-05	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_252	1910050-06	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_253	1910050-07	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_254	1910050-08	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_255	1910050-09	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_256	1910050-10	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_257	1910050-11	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_258	1910050-12	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_259	1910050-13	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_260	1910050-14	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_261	1910050-15	Tissue	06/21/19 00:00	10/18/19 09:05
CLEA_262	1910050-16	Tissue	06/28/19 00:00	10/18/19 09:05
CLEA_263	1910050-17	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_264	1910050-18	Tissue	06/19/19 00:00	10/18/19 09:05
CLEA_265	1910050-19	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_266	1910050-20	Tissue	06/24/19 00:00	10/18/19 09:05

Work Order 1910050

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 47
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: 1910050-01									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA_247									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 091		0 030	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_247									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-02									**Tissue Sampled 06/25/19 00 00**
Sample ID: CLEA_248									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 54		0 034	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_248									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-03									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA_249									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 32		0 028	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_249									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-04									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA 250									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 030		0 028	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_250									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		27		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-05									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA_251									**Metals by EPA 6000/7000 Series Methods**
Mercury	RE1	0 039		0 025	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: CLEA_251									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-06									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: CLEA_252									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 074		0 031	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_252									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-07									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: CLEA_253									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 50		0 034	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_253									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-08									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: CLEA_254									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 081		0 028	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: CLEA_254									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: 1910050-09									**Tissue - Sampled: 06/24/19 00:00**

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910050
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 47
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID:	**1910050-09**								**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_255**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 15		0 023	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_255**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-10**								**Tissue Sampled 06/24/19 00 00**
Sample ID:	**CLEA_256**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 25		0 036	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_256**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-11**								**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA_257**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 20		0 022	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_257**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-12**								**Tissue - Sampled: 06/24/19 00:00**
Sample ID:	**CLEA 258**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 057		0 025	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_258**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-13**								**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA_259**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 13		0 027	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_259**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-14**								**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA_260**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 13		0 027	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_260**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-15**								**Tissue - Sampled: 06/21/19 00:00**
Sample ID:	**CLEA_261**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 14		0 027	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_261**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-16**								**Tissue - Sampled: 06/28/19 00:00**
Sample ID:	**CLEA_262**								**Metals by EPA 6000/7000 Series Methods**
Mercury		0 37		0 029	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID:	**CLEA_262**								**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID:	**1910050-17**								**Tissue - Sampled: 06/20/19 00:00**

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Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910050
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 47
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: **1910050-17**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA_263**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 23		0 032	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: **CLEA_263**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: **1910050-18**									**Tissue Sampled 06/19/19 00 00**
Sample ID: **CLEA_264**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 15		0 037	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: **CLEA_264**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		23		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: **1910050-19**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_265**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 067		0 042	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: **CLEA_265**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J109	10/25/19	10/28/19	3550C
Lab ID: **1910050-20**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: **CLEA 266**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 48		0 026	mg/kg	B19J091	10/23/19	10/23/19	7473
Sample ID: **CLEA_266**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J109	10/25/19	10/28/19	3550C

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Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B19J091 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/23/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J091-BLK1)										
Mercury	ND	U	0 03	mg/kg						
Duplicate (B19J091-DUP1)		**Source: 1910050-04**								
Mercury	0 0301		0 03	mg/kg		0 0296			2	20
Reference (B19J091-SRM1)										
Mercury	0 467		0 029	mg/kg	0 433		108	80-120		
Batch B19J096 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/24/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J096-BLK1)										
Mercury	ND	U	0 025	mg/kg						
Reference (B19J096-SRM1)										
Mercury	0 473		0 031	mg/kg	0 433		109	80-120		
Batch B19J109 - Solids, Dry Weight (Prep) - Solids, Dry Weight										**Prepared: 10/25/19 Analyzed: 10/28/19**
										Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
Blank (B19J109-BLK1)										
% Solids	ND	U	1	%						
Duplicate (B19J109-DUP1)		**Source: 1910050-02**								
% Solids	20		1	%		20			0 8	20

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Qualifiers and Comments

U	Not Detected
NR	Not Reported
RE1, RE2, etc:	Result is from a sample re-analysis.

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street Building 201
Richmond, CA 94804

Date: **10/30/2019**

Subject: **Analytical Testing Results - Project R20S06**
WorkOrder: 1910051

From: **Peter Husby, Director**
EPA Region 9 Laboratory
EMD-3-1

To: **Carter Jessop**
California Site Cleanup Section 2
SFD-7-2

Attached are the results from the analysis of samples from the **SBMM 2019 HHRA Fish Tissue Supplement** project. These data have been reviewed in accordance with EPA Region 9 Laboratory policy.

A full documentation package for these data, including raw data and sample custody documentation, is on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Audrey Johnson at the Region 9 Quality Assurance Office.

If you have any questions, please ask for Susan Sturges, the Lab Project Manager at (510)412 2300

Electronic CC: Radhika Sreenivasan, E2 Consulting Engineers Inc.

Analyses included in this report:

Mercury by EPA method 7473
Mercury by EPA method 7473
Percent Solids

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 48
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Collected	Date Received
CLEA_267	1910051-01	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_268	1910051-02	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_269	1910051-03	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_270	1910051-04	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_271	1910051-05	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_272	1910051-06	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_273	1910051-07	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_274	1910051-08	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_275	1910051-09	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_276	1910051-10	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_277	1910051-11	Tissue	06/27/19 00:00	10/18/19 09:05
CLEA_278	1910051-12	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_279	1910051-13	Tissue	06/24/19 00:00	10/18/19 09:05
CLEA_280	1910051-14	Tissue	06/19/19 00:00	10/18/19 09:05
CLEA_281	1910051-15	Tissue	06/26/19 00:00	10/18/19 09:05
CLEA_282	1910051-16	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_283	1910051-17	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_284	1910051-18	Tissue	06/20/19 00:00	10/18/19 09:05
CLEA_285	1910051-19	Tissue	06/24/19 00:00	10/18/19 09:05

Work Order 1910051

Mercury re ult for the e ti ue ample are reported on an "a received" ba i , with no dry weight correction Percent olid values are provided for dry-weight correction at a future date, if required.

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Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 48
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: **1910051-01**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: **CLEA_267**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 56		0 037	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_267**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-02**									**Tissue Sampled 06/24/19 00 00**
Sample ID: **CLEA_268**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 36		0 027	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_268**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-03**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA_269**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 14		0 025	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_269**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-04**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA 270**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 21		0 025	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_270**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-05**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA_271**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 27		0 030	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_271**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-06**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_272**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 085		0 037	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_272**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-07**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_273**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 11		0 025	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_273**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-08**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_274**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 17		0 032	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_274**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-09**									**Tissue - Sampled: 06/26/19 00:00**

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Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: **1910051-09**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_275**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 21		0 025	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_275**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		20		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-10**									**Tissue Sampled 06/26/19 00 00**
Sample ID: **CLEA_276**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 18		0 024	mg/kg	B19J094	10/23/19	10/23/19	7473
Sample ID: **CLEA_276**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-11**									**Tissue - Sampled: 06/27/19 00:00**
Sample ID: **CLEA_277**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 070		0 030	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_277**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-12**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: **CLEA 278**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 44		0 029	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_278**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-13**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: **CLEA_279**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 48		0 022	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_279**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		23		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-14**									**Tissue - Sampled: 06/19/19 00:00**
Sample ID: **CLEA_280**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 28		0 027	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_280**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-15**									**Tissue - Sampled: 06/26/19 00:00**
Sample ID: **CLEA_281**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 29		0 038	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_281**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-16**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA_282**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 071		0 036	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_282**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-17**									**Tissue - Sampled: 06/20/19 00:00**

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Sample Results

Analyte	Reanalysis / Extract	Result	Qualifiers / Comments	Quantitation Limit	Units	Batch	Prepared	Analyzed	Method
Lab ID: **1910051-17**									**Tissue - Sampled: 06/20/19 00:00**
Sample ID: **CLEA_283**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 066		0 027	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_283**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-18**									**Tissue Sampled 06/20/19 00 00**
Sample ID: **CLEA_284**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 066		0 033	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_284**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		22		1	%	B19J110	10/25/19	10/28/19	3550C
Lab ID: **1910051-19**									**Tissue - Sampled: 06/24/19 00:00**
Sample ID: **CLEA_285**									**Metals by EPA 6000/7000 Series Methods**
Mercury		0 041		0 029	mg/kg	B19J096	10/24/19	10/24/19	7473
Sample ID: **CLEA_285**									**Conventional Chemistry Parameters by APHA/EPA Methods**
% Solids		21		1	%	B19J110	10/25/19	10/28/19	3550C

Quality Control

Analyte	Result	Qualifiers / Comments	Quantitation Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch B19J094 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/23/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J094-BLK1)										
Mercury	ND	U	0 027	mg/kg						
Duplicate (B19J094-DUP1)		**Source: 1910051-06**								
Mercury	0 0793		0 025	mg/kg		0 0848			7	20
Reference (B19J094-SRM1)										
Mercury	0 481		0 025	mg/kg	0 433		111	80 120		
Batch B19J096 - 7473 Hg Prep - Mercury by 7473										**Prepared & Analyzed: 10/24/19**
										Metals by EPA 6000/7000 Series Methods - Quality Control
Blank (B19J096-BLK1)										
Mercury	ND	U	0 025	mg/kg						
Duplicate (B19J096-DUP1)		**Source: 1910051-11**								
Mercury	0 0705		0 031	mg/kg		0 0696			1	20
Reference (B19J096-SRM1)										
Mercury	0 473		0 031	mg/kg	0 433		109	80-120		
Batch B19J110 - Solids, Dry Weight (Prep) - Solids, Dry Weight										**Prepared: 10/25/19 Analyzed: 10/28/19**
										Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control
Blank (B19J110-BLK1)										
% Solids	ND	U	1	%						
Duplicate (B19J110-DUP1)		**Source: 1910051-03**								
% Solids	21		1	%		21			0 4	20

United States Environmental Protection Agency
Region 9 Laboratory

1337 S. 46th Street, Building 201, Richmond, CA 94804
Phone:(510) 412-2300 Fax:(510) 412-2302

Project Manager:	Carter Jessop	**California Site Cleanup Section 2**	**WorkOrder:** 1910051
Project Number:	R20S06	**75 Hawthorne Street**	**Reported:** 10/30/19 15 48
Project:	SBMM 2019 HHRA Fish Tissue Supplement	**San Francisco CA, 94105**	

Qualifiers and Comments

U	Not Detected
NR	Not Reported
RE1, RE2, etc:	Result is from a sample re-analysis.