FINAL
HUMAN HEALTH RISK ASSESSMENT FOR THE SMURFIT-STONE/FRENCHTOWN MILL OPERABLE UNIT 2 SITE LOCATED IN MISSOULA COUNTY, MONTANA

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Prepared by:
U.S. Environmental Protection Agency
Region 8
1595 Wynkoop Street
Denver, CO 80202

U.S. Environmental Protection Agency
Environmental Response Team
Washington D.C.

With technical assistance from:
SRC, Inc.
999 18th Street, Suite 1380
Denver, Colorado 80202

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LIST OF ACRONYMS AND ABBREVIATIONS

95UCL	95% Upper Confidence Limit
ABS_d	Dermal Absorption Fraction
ABS_{GI}	Fraction absorbed in gastrointestinal tract
ADAF	Age-Dependent Adjustment Factor
Ah	Aromatic Hydrocarbon
AOC	Administrative Order on Consent
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
BOD	Biological Oxygen Demand
BW	Body Weight
C	Concentration
C_{air}	Concentration in Air
C_{soil}	Concentration in Soil
CalEPA	California Environmental Protection Agency
CF	Conversion Factor
CF_s	Conversion Factor for Soil
CFR	Clark Fork River
COPC	Contaminant of Potential Concern
Cr(VI)	Hexavalent Chromium
Cr(III)	Trivalent Chromium
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
DAD	Dermal Absorbed Dose
DA_{event}	Absorbed dose per event
DAF	Dermal Adherence Factor
DI	Daily Intake
DI_L	Daily Intake, averaged over a lifetime
DL	Sample-specific Detection Limit
DRI	Daily Recommended Intake
EC	Exposure Concentration
ED	Exposure Duration
EF	Exposure Frequency
EPC	Exposure Point Concentration
EPD	Effective Predictive Domain
ET	Exposure Time
EU	Exposure Unit
EV	Event Frequency
FSP	Field Sampling Plan
HDPT	High Density Pulp Tank
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	Hazard Index
HIF	Human Intake Factor
HIF_{soil}	Human Intake Factor for Soil

HQ	Hazard Quotient
IR	Intake Rate
IRIS	Integrated Risk Information System
Kow	Octanol/water partition coefficient
LOAEL	Lowest Observed Adverse Effect Level
MCLG	Maximum Contaminant Level Goal
MDEQ	Montana Department of Environmental Quality
MDL	Method Detection Limit
MPDES	Montana Pollution Discharge Elimination System
MRL	Minimal Risk Level
MW	Molecular Weight
ND	Non-Detect
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
NPP	North Polishing Pond
OCC	Old Corrugated Container
OU	Operable Unit
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-*p*-dioxin
PCDF	Polychlorinated Dibenzo-*p*-furan
PEF	Particulate Emission Factor
PPRTV	Provisional Peer Reviewed Toxicity Value
p-RfC	Provisional Reference Concentration
p-RfD	Provisional Reference Dose
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RBA	Relative Bioavailability
RBC	Risk-Based Concentration
REL	Reference Exposure Level
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RfC	Reference Concentration
RfD	Reference Dose
RfD_{ABS}	Absorbed Reference Dose
RL	Reporting Limit
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SA	Surface Area
SAB	Science Advisory Board
SF	Slope Factor
SF_{ABS}	Absorbed Slope Factor
SI	Site Investigation
SL	Screening Level
STSC	Superfund Technical Support Center
SVOC	Semi-volatile Organic Compound

TCDD	2,3,7,8-Tetrachlorodibenzo-*p*-dioxin
TDS	Total Dissolved Solids
TEF	Toxicity Equivalence Factor
TEQ	Toxicity Equivalent
$TEQ_{(D/F)}$	Toxicity Equivalent for Dioxins and Furans
$TEQ_{(D/F/PCB)}$	Toxicity Equivalent for Dioxins, Furans and Coplanar Polychlorinated Biphenyls
$TEQ_{(PCB)}$	Toxicity Equivalent for Polychlorinated Biphenyls
TSB	Transformer Storage Building
TSS	Total Suspended Solids
TWA	Time Weighted Average
TWF	Time Weighting Factor
UR	Unit Risk
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WOE	Weight of Evidence
WMW	Wilcoxon-Mann-Whitney
kg/kg-day	Kilogram per kilogram per day
m^3/day	Cubic meter per day
m^3/kg	Cubic meter per kilogram
mg/kg	Milligram per kilogram
mg/kg-day	Milligram per kilogram per day
mg/m^3	Milligram per cubic meter
μg/m^3	Microgram per cubic meter

EXECUTIVE SUMMARY

ES-1 INTRODUCTION

This document is a baseline human health risk assessment (HHRA) for the Smurfit-Stone/Frenchtown Mill Site Operable Unit 2 (OU2). The purpose of this document is to characterize the potential risks to humans, both now and in the future, from site-related contaminants that are present at the Site, assuming that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

ES-2 SITE DESCRIPTION

The Site is located in Missoula County, Montana within the Clark Fork River (CFR) drainage. The historic pulp mill operated at the Site from 1957 to 2010. Most areas of the Site have been idle since industrial activities ceased in 2010. OU2 represents the core industrial footprint of the Mill site and covers about 260 acres. OU2 includes the former mill, recycling plant, wood chipping area, and hog fuel area as well as various equipment storage areas.

Mill operations (predominantly the pulping and bleaching processes) used or produced various hazardous chemicals on Site, including volatile and semi-volatile organic compounds (VOCs and SVOCs), and bleaching chemicals. The use of chlorine for the bleaching of pulp produces chlorinated organic compounds, including dioxins and furans. Pulping operations may have resulted in contamination of surface soils within OU2 and subsequent contamination of subsurface soils and groundwater via fate and transport mechanisms. Previous site investigations have identified contaminants of potential concern (COPCs) at the Site to include dioxins/furans, heavy metals, polychlorinated biphenyls (PCBs), SVOCs, and VOCs. Exposures to these types of COPCs may cause a range of non-cancer and cancer effects in humans, so humans who reside in, work at, and/or visit the OU2 Site now or in the future could be at risk of adverse health effects if excessive exposure to contaminated environmental media were to occur.

OU2 is fenced off with restricted access along Mullan Road. Based on information available to the United States Environmental Protection Agency (USEPA) USEPA at the time this HHRA was developed, remaining buildings in OU2 are unoccupied. Some of the equipment and machinery in OU2 were previously salvaged and sold. In addition, OU2 includes a 23-acre area that was used as a petroleum land farm that is permitted by the Montana Department of Environmental Quality (MDEQ). In 2018, a voluntary remedial action to remove soils from localized areas within OU2 was conducted.

ES-3 EXPOSURE ASSESSMENT

Exposure is the process by which human come into contact with chemicals in the environment. In general, humans can be exposed to chemicals in a variety of environmental media (e.g., soil, water), and these exposures can occur through several pathways (e.g., ingestion, dermal contact, inhalation).

This HHRA evaluates the potential for unrestricted future use of OU2. As such, the following receptors and exposure pathways were selected for evaluation:

Exposed Population	Exposure Pathways
Hypothetical future residents (adults and children age 0-6 years)	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Current/Hypothetical future commercial/industrial workers	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Hypothetical future construction workers	• Incidental ingestion of surface and subsurface soil • Dermal contact with surface and subsurface soil • Inhalation of soil particulates created by mechanical disturbances of surface soils

COPCs are contaminants which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from site-related sources. COPCs for OU2 soils and groundwater were selected using a conservative procedure that is expected to retain some contaminants that are actually of little or no concern, but which ensures that no contaminants of authentic concern will be overlooked. The COPCs identified for evaluation are summarized below:

COPC	Soil	Groundwater
Dioxins/furans evaluated as toxicity equivalent ($TEQ_{(D/F)}$)	X	X
Dioxins, furans and coplanar polychlorinated biphenyls (PCBs) evaluated as toxicity equivalent ($TEQ_{(D/F/PCB)}$)	X	
Total PCBs	X	
Aroclor-1254	X	
Aroclor-1260		X
Aluminum	X	
Arsenic	X	X
Barium		X
Chromium	X	X
Cobalt	X	X
Copper		X
Iron	X	X
Manganese	X	X
Thallium	X	
Vanadium		X

Human exposures to COPCs in environmental media at the Site were quantified using standard equations developed by the USEPA for use at Superfund sites. Exposure parameters that define the magnitude and frequency of exposure were selected from USEPA defaults or by application of professional judgment. Because there is normally a wide range of exposure levels that may occur in a population of exposed humans, parameters were selected to provide an estimate of exposures that are "average" or are near the upper end of the range. These two exposure estimates are referred to as Central Tendency Exposure (CTE) and Reasonable Maximum Exposure (RME), respectively. Exposure parameters selected for each exposure scenario are summarized in Section 3.5 (see Tables 3-9 to 3-11).

Exposure concentrations were estimated for defined exposure areas. An exposure area (also referred to as an exposure unit or exposure point) is an area where a receptor may be exposed to one or more environmental media. In general, receptors are assumed to move about at random within an exposure area. For this assessment, OU2 was evaluated based on randomized 20-acre grid exposure areas (see Figure 3-2). Groundwater wells were evaluated individually.
Since the true arithmetic mean concentration cannot be calculated with certainty from a limited number of measurements, the USEPA recommends that the 95 percent (%) upper confidence limit (95UCL) of the arithmetic mean at each exposure area be used as the exposure point concentration (EPC) when calculating exposure and risk at that location. EPCs were estimated differently for soil and groundwater based on the data available. For soils, UCLs could not be

calculated. Multiple soil sample types were collected from the various exposure grids including 5-point composites collected over a biased area of a 1- to 3-meter radius and 20-point composites comprised of random grab samples collected across an entire exposure grid. The larger the number of grab samples used to create the composite sample, the lower the variability around the mean estimate. Additionally, the larger the area within the exposure area that a composite sample is based, the more representative of the mean exposure across the exposure area. A 20-point composite comprised of 20 grab samples collected across the whole of the exposure area grid provides a representative estimate of the mean. Whereas, a mean concentration derived based on a localized 5-point composite is more uncertain, and the variability around the mean could be much greater. Therefore, soil EPCs were estimated as grid-specific weighted concentrations by assigning higher confidence in the concentration based on the 20-point composite than the 5-point composite (see Section 3.5.4). Particulate concentrations in air were estimated from soil concentrations and an assumed particulate emission factor (PEF) to account for soil disturbances at construction sites (inhalation of soil particulates was only quantified for a hypothetical future construction worker).

Groundwater EPCs were generated for each individual well. Data from all sampling years considered in the risk assessment were used in deriving well-specific EPCs. A 95UCL was calculated where at least four detected values were available, per USEPA guidance (USEPA 2015b). If this data requirement was not met, the EPC was set equal to the maximum detected value.

An accurate assessment of human exposure to ingested contaminants requires knowledge of the amount of contaminant absorbed from the gastrointestinal tract into the body from site media compared to the amount of absorption that occurred in the toxicity studies used to derive the toxicity factors. This ratio (amount absorbed from site media compared to the amount absorbed in toxicity tests) is referred to as Relative Bioavailability (RBA).

The oral RBA value for dioxins in soil is assumed to be 100% in accordance with USEPA (USEPA 2010b). This is considered to be a conservative assumption, because reports summarized by USEPA (2010b) indicate that absorption of dioxins from soils through the gastrointestinal tract is usually less than 50%.

In general, metals in soils exist in the form of mineral particles that are not completely solubilized in gastrointestinal fluids when ingested, while toxicity studies often utilize readily soluble forms of the test contaminant. Thus, oral RBA values for metals in soils are often less than 1.0. For arsenic, sufficient data are available to establish that oral RBA values in soil are generally less than 60% (USEPA 2012b). Thus, for the purposes of this HHRA, a RBA of 60% was applied for arsenic in OU2 soils. RBA data are much more limited or absent for other metals (except lead which was not identified as a COPC in this assessment). RBA values for all other metal COPCs were conservatively assumed to be 100%.

ES-4 TOXICITY ASSESSMENT

The objective of a toxicity assessment is to identify what adverse health effects a contaminant may cause, and how the emergence of these adverse effects depends on exposure level.

The toxicity assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the contaminant, while the second addresses the cancer effects of the contaminant. This two-part approach is employed because there are typically major differences in the time-course of action and the shape of the dose-response curve for cancer and non-cancer effects. The relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population forms the basis for a quantitative dose-response relationship. Toxicity values are derived based on such dose-response relationships (see tables 4-1 to 4-3). Furthermore, the MDEQ allowable cancer risk level is 1E-05, which will be considered as part of the risk management decisions associated with this Site.

ES-5 RISK CHARACTERIZATION

The potential for non-cancer effects is evaluated by comparing the estimated exposure concentration for a receptor over a specified time period to a reference threshold that represents the exposure below which it is unlikely for even sensitive populations to experience adverse health effects. This ratio of exposure to toxicity is called a Hazard Quotient (HQ). The sum of HQ values cross different exposure pathways is referred to as the hazard Index (HI). If the HQ or HI for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ or HI exceeds one, there is some possibility that non-cancer effects may occur, although an HQ or HI above one does not indicate an effect will occur. However, the larger the value, the more likely it is that an adverse effect may occur.

The excess risk of cancer from exposure to a chemical is described in terms of the probability that an exposed individual will develop cancer because of that exposure. Excess cancer risks are summed across all carcinogenic chemicals and all exposure pathways that contribute to exposure of an individual in a given population. The level of total cancer risk that is of concern is a matter of personal, community, and regulatory judgment. In general, the USEPA considers excess cancer risks that are below one in one million (1E-06) to be so small as to be negligible, and risks above one in ten thousand (1E-04) to be sufficiently large that some sort of remediation is desirable. Excess cancer risks that range between 1E-04 and 1E-06 are generally considered to be acceptable, although this is evaluated on a case by case basis.

Detailed calculations of exposure and risk from each COPC for each exposure scenario are presented in Appendix D and are summarized in Section 5.3. In brief, non-cancer hazards and cancer risks to potential human receptors from exposures to soils are below USEPA threshold criteria (HI ≤ 1E+00, cancer risk < 1E-04) with the exception of cancer risks to hypothetical future residents within grid 8 and grid 12. Cancer risk in grid 8 is estimated to be 2E-04 based on incidental ingestion of chromium in surface soils. Cancer risk in grid 12 is estimated at 1E-04, also primarily based on incidental ingestion of chromium in surface soils. This risk is based on evaluating chromium exposures as the more toxic hexavalent form (Cr(VI)) and applying adjustments for early-life exposures based on a mutagenic mode of action. Acceptable risks are predicted for hypothetical future commercial/industrial workers and hypothetical future construction workers exposed to OU2 soils. Non-cancer hazards to hypothetical future residents assumed to consume groundwater as drinking water exceed 1E+00 in groundwater wells NFWM13, NFMW15, NFMW6 and the log chipper water supply well. Similarly, non-cancer hazards to hypothetical future commercial/industrial workers assumed to consume groundwater as drinking water exceed 1E+00 in NFMW15 and the log chipper water supply well. Manganese is the primary risk driver in all wells, with additional contributions from arsenic in NFMW15 and from arsenic, cobalt and iron in the log chipper water supply well. Cancer risks to hypothetical future residents from consumption of groundwater as drinking water exceed 1E-04 in NFMW15 and the log chipper water supply well. Arsenic is the primary risk driver for cancer risks, with some contribution from chromium (evaluated as hexavalent chromium) as well. Cancer risks to hypothetical future commercial/industrial workers from consumption of groundwater as drinking water are at or below 1E-04 (cancer risk = 1E-04 in the log chipper supply well and cancer risk < 1E-04 in all other OU2 wells).

ES-6 UNCERTAINTY ASSESSMENT

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty regarding a number of key data items, including concentration levels in the environment, the true level of human contact with contaminated media, and the true dose-response curves for non-cancer and cancer effects in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on whatever limited data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

A significant source of uncertainty for this risk assessment is the form of chromium present in Site media. The non-cancer hazards and cancer risks estimated in this assessment evaluated chromium as the more toxic hexavalent form (Cr(VI)). This is a health-protective approach, but likely overestimates actual chromium risks. Chromium was only evaluated as total chromium in Site samples. There is no indication that historical Mill operations used or generated Cr(VI), and there is no information available to understand the ratio of Cr(VI) to trivalent chromium (Cr(III)) in Site soils or groundwater. Adding to this source of uncertainty, Cr(VI) is expected to readily reduce to Cr(III) in soil (USEPA 1998). On this basis, evaluating chromium risks as being attributed to 100% exposure to Cr(VI) suggests that the estimated cancer risks at or above 1E-04 in grid 8 for a hypothetical future residential scenario is overestimated.

1.0 INTRODUCTION

1.1 Purpose

This document is a human health risk assessment (HHRA) for the Smurfit-Stone/Frenchtown Mill Operable Unit 2 Site (hereafter referred to as “the OU2 Site”) located in Montana. The purpose of this document is to evaluate potential risks to humans, both now and in the future, from Site-related chemicals that are present at the OU2 Site, assuming that no steps are taken to remediate the environment or to reduce human contact with contaminated environmental media.

The results of this assessment are intended to help inform risk managers and the public about current and potential future health risks to humans that may occur as a result of exposure to Site-related contaminants, and to help determine if there is a need for action to protect public health at the OU2 Site. Although the Site is not listed on the National Priorities List (NPL), a Remedial Investigation (RI) is being conducted by the Potentially Responsible Parties (PRPs)[1] in accordance with the Administrative Order on Consent (AOC) entered into with the United States Environmental Protection Agency (USEPA) in November 2015 (USEPA 2015a). The RI serves as the mechanism for collecting data to characterize site conditions for the purposes of developing and evaluating remedial alternatives. The RI characterizes the nature and extent of contamination at a Site and estimates risks to human health and the environment posed by contaminants at the Site. The latter objective is achieved by conducting a baseline risk assessment during the RI process to characterize risks posed to human health or the environment by current environmental conditions at the Site. To meet this requirement and consistent with the Site-specific AOC, the USEPA has developed this HHRA to quantitatively describe the potential human health risks posed by the OU2 Site in the absence of remediation. The risk information generated by this evaluation based on USEPA’s current understanding of the Site will be used in the Remedial Investigation/Feasibility Study (RI/FS) at the Site. This baseline risk assessment represents only one part of the human health evaluation being conducted under the RI/FS.

The methods used to evaluate risks in this assessment are consistent with current guidelines for human health risk assessment provided by the U.S. Environmental Protection Agency (USEPA) for use at Superfund sites (USEPA 1989; 1991a; 1991b; 1991c; 1992; 2002a; 2014). The evaluation presented herein is based on the current understanding of the Site given the information and data available at the time of development. This HHRA represents a dynamic document that may need to be revised and/or updated to address new information.

[1] International Paper Company, WestRock CP, LLC, and M2Green LLC as defined in the Administrative Order on Consent (AOC).

1.2 Report Organization

In addition to this introduction, this report is organized into the following sections:

Section 2	This section provides a description of the Site and a review of data that have been collected to characterize the environmental contamination at the Site.
Section 3	This section identifies human exposure scenarios of potential concern at the OU2 Site and describes the approach for identifying chemicals of potential concern (COPCs) for each exposure medium.
Section 4	This section includes the toxicity assessment and identifies potential non-cancer and cancer effects and toxicity values for the COPCs identified at the OU2 Site.
Section 5	This section summarizes estimated exposure and risk to humans from COPCs at the OU2 Site.
Section 6	This section summarizes the uncertainty analysis.
Section 7	This section summarizes the main conclusions based on the risk characterization.
Section 8	This section provides full citations for USEPA guidance documents, Site-related documents, and scientific publications referenced in this report.

All tables, figures, and appendices cited in the text are provided at the end of the report.

2.0 SITE CHARACTERIZATION

A detailed description of the Smurfit-Stone/Frenchtown Mill Site and its history is provided in the Remedial Investigation Work Plan (RIWP) report for the Site (NewFields 2015). Site information is also provided on EPA's Superfund Page for the Site[2]. Pertinent information derived from these sources is summarized in the following subsections.

2.1 Site Overview

The Smurfit-Stone/Frenchtown Mill site encompasses approximately 3,150 acres of the northwestern portion of the Missoula Valley (herein referred to as "the Site") (Figure 2-1). The Site is located in the Clark Fork River (CFR) drainage. The CFR flows westward through the valley and north along the Site's western property boundary. The small tributaries O'Keefe Creek and Lavalle Creek flow through the southern end of the Site and drain into the CFR. A pulp mill operated at the Site from 1957 to 2010. Most areas of the Site have been idle since industrial activities at the Mill ceased in 2010. A detailed description of the Site and historical operation of the pulp mill is provided in the RIWP (NewFields 2015) and briefly summarized below.

The core industrial footprint of the Mill Site covers about 260 acres and includes the former mill, recycling plant, wood chipping area, and hog fuel area as well as various equipment storage areas. Over 900 acres of the Site consist of a series of unlined ponds used to store treated and untreated wastewater effluent from the Mill, as well as primary sludge recovered from untreated wastewater. Some ponds initially used to store wastewater were drained and used for the landfilling of solid wastes generated from the Mill. Most of the pulp was used to produce un-bleached linerboard, but about 6 percent of the total pulp produced from 1960-1999 was used to create white linerboard or sold as bleached pulp. Figure 2-2 (adapted from NewFields 2015) presents a schematic of the general wastewater treatment flow process that was followed during the last 13 years of plant operations (1997-2010). As shown, Smurfit Mill maintained four permitted outfalls to the CFR over the course of operations. The outlet at the North Polishing Pond (NPP) was the point of compliance for the wastewater treatment system. Prior to discharge to the CFR, treated effluent was stored in holding ponds to meet permit conditions including flow and ambient river temperatures. Treated wastewater was discharged to the CFR when river flow and temperature conditions were within permit limits. When holding ponds were at capacity, treated wastewater was moved to infiltration basins and infiltrated to groundwater.

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[2] Smurfit-Stone Mill Frenchtown, Missoula, MT webpage:
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850

There are two main levees and several berms that were constructed using on-Site materials.[3] The CFR levee located west of the treated water holding ponds provides flood protection, and the inner levee provides a physical barrier between wastewater solids and treated water holding ponds.

The USEPA conducted an initial site investigation (SI) in 2011 to support evaluation of the Smurfit-Stone/Frenchtown Mill Site for possible inclusion in the NPL (USEPA 2012a). This investigation was focused on the former wastewater treatment and storage area, O'Keefe Creek, and the CFR. The Smurfit-Stone/Frenchtown Mill Site was proposed to be added to the NPL on December 12, 2013. As noted above, the Site has not been added to the NPL. For assessment and management purposes, the USEPA has divided the Site into three operable units (OUs) based on historic use and the nature of the potential environmental concerns, as follows (Figure 2-3):

> **OU1** encompasses about 1,200 acres of the Site. This area has been and continues to be used largely for agricultural purposes, including grasslands for cattle grazing and cropland irrigated for alfalfa and grain crops.
>
> **OU2** encompasses approximately 255 acres of the Site and includes the former industrial area. This area includes the former buildings and process areas for the Mill.
>
> **OU3** encompasses approximately 1,700 acres of the Site and includes areas of the Site where solid and aqueous wastes were treated and stored. This area includes the former wastewater treatment system (settling ponds, aeration basins, polishing ponds, solid waste basins, spoils basins, holding ponds, and infiltration basins), the holding ponds areas within the 100-year floodplain, and parts of the CFR where hazardous substances from the Site may have come to be located.

This assessment focuses on OU2 (i.e., the study area). Human health risks within OU1 were previously evaluated in 2017 (USEPA 2017a). Human health risks within OU3 are being evaluated in a separate report. OU2 comprises the core industrial footprint of the Site. This includes the former pulp and paper mill building, the recycle plant (old corrugated container or OCC), a wood chip staging area, the hog fuel area, a chlorinated bleach plant, pulp tanks, multi-fuel and recovery boilers, lime kilns, a transformer storage building, an equipment repair building, offices, and various equipment storage areas.

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[3] This HHRA does not evaluate effects from hypothetical future flooding events. Berm stability has been evaluated in multiple investigations (NewFields 2018a, 2018b, 2019).

Within the AOC, OU3 is defined to include site-wide groundwater (USEPA 2015a). Groundwater beneath the Site is present in three primary hydrostatigraphic units (NewFields 2020a):

- Unit 1 – water table aquifer below the Site, generally present to a depth of approximately 35 feet below ground surface (ft bgs). Most onsite monitoring wells are completed within Unit 1.
- Unit 2 – semi-confining layer generally present from 35 to 130 ft bgs. No monitoring or water supply wells have been completed in Unit 2, as this unit transmits relatively minor quantities of water compared to Units 1 and 3.
- Unit 3 – regional water supply aquifer generally present from 130 to 160 ft bgs. Several monitoring wells and all the industrial and domestic water supply wells on the Site are completed in Unit 3.

Since the USEPA is evaluating human health risks separately for each individual OU, each HHRA includes evaluation of groundwater collected from wells within the boundary for the OU being assessed. For the purposes of this assessment, groundwater data collected from wells within the OU2 land boundary were evaluated as described in further detail below.

2.2 Basis for Potential Human Health Concern

Mill operations (predominantly the pulping and bleaching processes) used or produced various hazardous chemicals on Site, including volatile and semi-volatile organic compounds (VOCs and SVOCs), and bleaching chemicals. The use of chlorine for the bleaching of pulp produces chlorinated organic compounds, including dioxins and furans. Pulping operations may have resulted in contamination of surface soils within OU2 and subsequent contamination of subsurface soils and groundwater via fate and transport mechanisms discussed in further detail below. Previous site investigations have identified COPCs at the Site to include dioxins/furans, heavy metals, polychlorinated biphenyls (PCBs), SVOCs, and VOCs[4]. Exposures to these types of COPCs may cause a range of non-cancer and cancer effects in humans, so humans who reside in, work at, and/or visit the OU2 Site now or in the future could be at risk of adverse health effects if excessive exposure to contaminated environmental media were to occur.

2.3 Summary of Site Investigations

Numerous environmental studies and compliance monitoring events have been conducted at the Site in support of ongoing RI activities. In 2011, the USEPA conducted a SI to support

[4] USEPA has developed fact sheets on site-specific risks associated with dioxins/furans and PCBs at the Site (USEPA, 2021a,b).

evaluation of the Site for proposed NPL listing (USEPA 2012a)[5]. Following the 2011 SI, the PRPs for the Site commissioned the collection of environmental samples in April 2014 from areas that were not investigated by the USEPA in 2011. These data were evaluated within the RIWP (NewFields 2015) which also outlined sampling planned in 2015. Follow-up sampling was conducted in a series of sampling events in accordance with the USEPA approved RIWP and associated Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). Between 2014 and 2020, the following investigations were conducted[6]:

Sampling Date	Sample Type	Reference
April 2014	Soil and groundwater sampling	RIWP (NewFields 2015)
November/December 2015	Soil, groundwater, sediment and surface water sampling	RIWP (NewFields 2015)
May/June 2016	Groundwater sampling	RIWP Addendum 1 (NewFields 2016a)
August 2016	Soil sampling for PCBs at the HDPT foundation and TSB foundation areas	RIWP Addendum 2 (NewFields 2016b)
January and March 2017	Groundwater sampling	RIWP Addendum 3 (NewFields 2017a)
June, July, December 2017 and January 2018	Groundwater sampling	RIWP Addendum 4 (NewFields 2017b)
October 2017	Soil sampling	RIWP Addendum 7 (NewFields 2017c)
July 2018	Fish sampling	USEPA (2018)
June 2019 and September/October 2019	Groundwater sampling	RIWP Addendum 8 (NewFields 2018c)
June 2019	Fish sampling	USEPA (2019)
August 2019	Sediment, surface water, and biotic tissue sampling	RIWP Addendum 9 (NewFields 2018d)
June and September 2020	Groundwater sampling	RIWP Addendum 10 (NewFields 2020b)

[5] As noted in Appendix A, data collected in 2011 were not considered in the HHRA due to deviations from the Quality Assurance Project Plan that occurred during sampling and analysis of those samples. Instead, USEPA used those data to inform the RI sampling.
[6] RIWP reports are available on the Smurfit-Stone Mill Frenchtown, Missoula, MT webpage: https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.docdata&id=0802850

Site data used in this HHRA are included in USEPA's Scribe database for the Site. As described in further detail in Section 3, not all of these data are relevant to evaluating potential human health risks within OU2.

3.0 EXPOSURE ASSESSMENT

Exposure is the process by which humans come in to contact with chemicals in the environment. In general, humans can be exposed to chemicals in a variety of environmental media (e.g., soil, sediment, water, air, food), and these exposures can occur through several routes (e.g., ingestion, dermal contact, inhalation).

3.1 Site Conceptual Model

Figure 3-1 presents a Conceptual Site Model (CSM) for OU2 that summarizes USEPA's current understanding of how chemicals that have been released to the environment within OU2 might result in exposure of human receptors.[7] This CSM is based on the most current understanding of expected land use now and in the future. The main features of this CSM are discussed below.

3.1.1 Primary Sources of Contamination

As noted above and as described in further detail in the RIWP, historic Mill operations included the creation of pulp, wood chipping, recycling of OCC, burning of solid fuels in boilers, and paper making (NewFields 2015). Pulp and paper manufacturing involve a series of steps, each producing one or more characteristic wastes. NewFields (2020a) provides a detailed description of the pulp making process at the Mill and the associated waste streams generated during operation. In brief, the chemical pulping process used at the Mill (the "Kraft process") used a sodium-based alkaline solution (white liquor), consisting of sodium hydroxide and sodium sulfide, to digest wood chips and produce pulp. Smaller amounts of sulfuric acid and aluminum sulfate were also used during the process. No metals besides aluminum were used in the paper making process, although pulp is made from raw materials (i.e., wood) and the concentrations of metals in the trees used to produce the pulp is unknown. Site-wide use and storage of wood and wood fiber in OU2 provides a source of carbon and metals to Site soils and groundwater.

After producing the raw pulp, it was processed to remove impurities by chemically treating the pulp mixture to recover residual white liquor for reuse and remove heavy metals. Waste products such as excess sodium hydroxide and sodium sulfite were also removed. As noted above, a chlorine bleaching process was used to create white linerboard for about 6% of the pulp produced between 1960 and 1999 (NewFields 2020a). The combination of chlorine and carbon can result in the formation of dioxins and furans under particular temperature and pressure conditions.

[7] The risk assessment CSM is focused on exposure pathways for potential human receptors which differs from the other site wide CSMs. Refer to the groundwater CSM for detailed information on the geology, hydrogeology, contaminant sources, and transport pathways for the Site.

PCBs are not generally produced in the practice of wastewater chlorination in the paper industry (USEPA 1977). Generally speaking, potential sources of PCBs in the pulp and paper industry may include the use of printing inks containing PCBs, the recycling of carbonless copy paper (if manufactured from 1957 to 1971), use of PCB transformers and capacitors, and possible use of PCB-filled hydraulic or heat transfer systems, PCB-containing lubricants, paints, etc. (USEPA 1977). Specific to the Site, there is no available information to suggest significant use of process chemicals or inks containing PCBs. Initial investigation of PCB concentrations in OU2 soils was completed in 2015 (NewFields 2016b). A subsequent investigation in 2016 identified PCBs in soils in the vicinity of the High-Density Pulp Tank (HDPT) Foundation and the Transformer Storage Building (TSB) (NewFields 2017d).

Emissions from the recovery boilers, multi-fuel and power boilers, the lime kilns, and ambient air systems were controlled and monitored consistent with the Mill's Title V air quality operating permit issued by the Montana Department of Environmental Quality (MDEQ) (NewFields 2020a; Permit OP 2589). The Title V permit covered the sources of air emissions at the historic Mill including the: Pulp, Chip Dock and Recycled Fiber Department, the Power, Recovery, and Recausticizing Department, the Paper Mill Department, the Environmental and Technical Department, and the Engineering and Maintenance Department. Releases during such historic Mill operations, as well as releases associated with leaks and spills resulted in direct deposition of Site-related contaminants to OU2 surface soils.

As described in further detail in NewFields (2020a), the Mill also operated under a Montana Pollutant Discharge Elimination System (MPDES) permit that applied to the discharging of treated effluent to the CFR via permitted outfalls and infiltration to underlying groundwater. MPDES permits included limits based on biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), and nutrient reduction (nitrogen and phosphorus). Limits on toxic pollutants were based on Section 307(a) of the Montana Water Quality Act pursuant to established water quality standards. During mill operations, wastewater in the ponds infiltrated into Unit 1. The accumulation of wastewater in the ponds resulted in seasonal groundwater mounding in Unit 1 that was most pronounced in the winter and early spring. Groundwater mounding in Unit 1 likely contributed to downward vertical hydraulic gradients from Unit 1 to Unit 3.

3.1.2 Transport in the Environment

Contaminants generated and/or released from historic Mill operations in OU2 may migrate in the environment by several processes:

- Transport of chemicals emitted to the air from boiler emissions can result in direct deposition of chemicals in OU2 surface soils.[8]

- Fine-grained soil particulates may be released into air as a consequence either of wind erosion and/or human disturbances.

- Contaminants in soil may be dissolved by water (rain or snowmelt) and infiltrate into subsurface soils and downward into groundwater.

O'Keefe Creek runs along the southern edge of OU2 as shown in Figure 2-3. It is possible that runoff from surface soils may result in the transport of contamination from OU2 surface soils into O'Keefe Creek. However, this assessment for OU2 will not include evaluation of exposures along O'Keefe Creek outside of the OU2 boundary. Exposures associated with O'Keefe Creek were evaluated as part of the HHRAs for the other two operable units.

3.1.3 Land Use

OU2 is fenced off with restricted access along Mullan Road. Based on information available to USEPA at the time this HHRA was developed, remaining buildings in OU2 are unoccupied. Some of the equipment and machinery in OU2 were previously salvaged and sold. In addition, OU2 includes a 23-acre area that was used as a petroleum land farm that is permitted by the MDEQ. The PRPs have indicated that a restrictive covenant has been obtained for the property that restricts future development to industrial/commercial land use. The agencies have not approved the use of such restrictive covenant as an element of the final remedial action, nor does the restrictive covenant limit the agencies' analysis of risk or reasonably anticipated future use.

3.1.4 Potentially Exposed Populations

Potentially exposed populations represent people that could be exposed to Site-related chemicals, and include the following.

<u>Current and Hypothetical Future Residents</u>

No person currently resides within OU2. However, as there is potential for land development in the future, this assessment considers future residential use of OU2. On this basis, the CSM includes a hypothetical future residential receptor.

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[8] USEPA published a Smurfit Stone Mill Site Air Deposition Fact Sheet (USEPA 2021c) that describes how USEPA has investigated impacts of aerial deposition and addresses potential environmental concerns. https://semspub.epa.gov/work/08/100010222.pdf

Current and Hypothetical Future Commercial/Industrial Workers

As noted above, there are no current commercial or industrial operations conducted within OU2. However, expected future land use of OU2 is anticipated to include additional commercial/industrial development. On this basis, the CSM includes hypothetical future commercial/industrial workers who may be exposed to Site contamination while working at locations within OU2.

Hypothetical Future Construction Workers

With hypothetical future residential, commercial, or industrial development, future construction activities at the OU2 Site are anticipated. These activities would involve soil excavation and construction. On this basis, the CSM includes a hypothetical future construction worker receptor.

Current and Hypothetical Future Trespassers

While a person could potentially trespass within OU2 currently or in the future, evaluation of the residential and worker receptors is protective of the trespasser scenario given the larger degree of exposure assumed in those scenarios. As such, a trespasser is not quantitatively evaluated in this HHRA, but is discussed qualitatively within the uncertainty assessment.

3.2 Exposure Pathways of Chief Concern

Not all of the potential exposure routes to these populations of receptors are likely to be of equal concern. First, in order to be of concern, an exposure pathway must be "complete". That is, there must be contact between a human receptor and a contaminated environmental medium. Exposure pathways that are not complete are indicated in Figure 3-1 by open boxes. For pathways that are complete, the relative importance of one to another is related to the amount of chemical taken into the body by each pathway. Exposure scenarios that are likely to result in the highest level of exposure are shown in Figure 3-1 by boxes containing a solid circle (●). Greatest attention is focused on quantification of exposure from these pathways in order to determine if the pathway contributes significant risk. Pathways that are complete, but which are judged to contribute only minor exposures in comparison to other pathways, are shown by boxes with an open circle (❍). Because of their minor contribution, these pathways are not evaluated quantitatively. The following sections present a more detailed description of these pathways and an analysis of their relative importance for human exposure.

3.2.1 Exposures to Soil

<u>Exposures to Surface Soil</u>

Incidental Ingestion of Surface Soil

Even though few people intentionally ingest soil, anyone who has direct contact with contaminated surface soil may incidentally ingest small amounts that adhere to their hands during outdoor activities. Incidental ingestion of soil is often one of the most important routes of human exposure, so ingestion of surface soil (defined for this assessment as soils within the top six-inch depth below ground surface [0-6 inches]) is evaluated for all receptors.

Dermal Contact with Surface Soil

Humans who come into contact with contaminated soils may get some of the material on their skin. As such, dermal exposure to surface soil (0-6 inches) is considered a complete exposure pathway and is evaluated quantitatively for all receptors.

Inhalation of Airborne Soil Particulates

Whenever contaminated soils are exposed at the surface, fine-grained particles may become suspended in air by wind and/or human activity, and humans in the area could inhale those particles. In cases where the soil is disturbed only by wind or light human activity (e.g., walking/hiking), the amount of particulate material inhaled from air is generally quite small compared to the amount that is typically assumed for incidental ingestion. Therefore, inhalation of soil particulates generated by wind erosion or walking was considered a minor pathway for all potential human receptors. Appendix B presents screening level calculations to support this designation.

When soil is disturbed by mechanical forces such as construction equipment, dust levels in air may be significant and intake of soil from inhalation of airborne dusts may become similar to or even higher than the ingestion pathway. Thus, inhalation of soil particulates generated through the use of construction equipment was evaluated quantitatively for hypothetical future construction workers.

Inhalation of Vapors Emitted from Surface Soils

Whenever contaminated soils are exposed at the surface, volatile chemicals may volatilize into the air and humans in the area could inhale those vapors. OU2 data suggest that most VOCs are generally present at non-detectable levels within OU2 soils (<5% detection frequency). However, some VOCs were detected in both surface soil and subsurface soil. Volatilization of SVOCs in OU2 soils (including dioxins/furans and polyaromatic hydrocarbons [PAHs]) is generally not expected to be significant given the relatively low vapor pressures of these chemicals and the absence of a continuous source. Also, the amount of vapor inhaled from air is generally quite small compared to the amount that is typically assumed for incidental ingestion. Therefore, inhalation of vapors emitted from surface soils was considered a minor pathway for all potential human receptors. Appendix B presents screening level calculations to support this designation.

Exposures to Subsurface Soil

Due to the nature of the work, construction workers may be exposed via direct contact to soils down to a depth of 10 feet. Construction workers who have direct contact with contaminated soils may get soils on their skin and incidentally ingest small amounts that adhere to their hands during construction activities. On this basis, incidental ingestion and dermal contact with subsurface soils were considered complete exposure pathways for hypothetical future construction workers.

3.2.2 Exposures to Groundwater

Groundwater is not currently used as a drinking water source in OU2. A public water supply system is available in OU2 that extracts groundwater upgradient of all potential sources of contamination at the Site. Therefore, current exposures to groundwater are not evaluated quantitatively. However, it is possible that groundwater from OU2 could be used within future residences and/or commercial/industrial buildings. There are three primary pathways by which a hypothetical future resident or commercial worker may be exposed to groundwater as described below.

Ingestion of Drinking Water

Hypothetical future residents or commercial workers may ingest Site groundwater as drinking water.

Dermal Contact with Groundwater

If Site groundwater was used in residential homes in the future, dermal exposure by residents would primarily be the result of showering/bathing. If Site groundwater was used in commercial/industrial buildings in the future, dermal exposure by workers would primarily be the result of hand washing. Metals and dioxins/furans have been detected in OU2 groundwater samples. USEPA guidance recommends against quantifying exposure and risk based on dermal contact with 2,3,7,8-TCDD in water because the molecular weight (MW) and octanol/water partition coefficient (Kow) are outside of the effective predictive domain (EPD) (USEPA 2004). Uptake of metals across the skin from contact with water is usually a minor exposure pathway due to the relatively low tendency of metals to cross the skin even when contact does occur. Furthermore, risk associated with dermal contact to metals in water is expected to be relatively small compared to the amount that is typically assumed for ingestion of drinking water. On this basis, dermal exposure to groundwater by hypothetical future residents and workers is considered a minor pathway in the CSM. Appendix B presents screening level calculations to support this designation. Thus, dermal exposure to contaminants in groundwater by hypothetical future residents and workers was considered a minor pathway and was not evaluated quantitatively in this assessment.

<u>Inhalation of Vapors Released from Water</u>

Volatile chemicals in water can be released to indoor air by two pathways: 1) vaporization to indoor air through standard indoor water uses, and 2) vapor intrusion in which vapors rise from the groundwater through the soil underlying a building foundation and get into the building through cracks in the foundation. Although these pathways may be complete at future residences and/or commercial/industrial buildings within the OU2 Site, the chemicals detected at a high frequency in OU2 groundwater (dioxins/furans, metals) are not considered to be of sufficient volatility to expect significant exposures via these pathways. Therefore, these pathways were not evaluated quantitatively in this assessment.

3.2.3 Exposures to Food Items

<u>Ingestion of Homegrown Produce Items</u>

Hypothetical future residential use within OU2 could include residential gardens used to grow vegetables or fruit in Site-impacted soils. Under this scenario, area residents who ingest home-grown produce may be exposed to certain contaminants that may be taken up by the vegetables or fruit. No data are available on the levels of contaminants that may be present in vegetation within OU2. Thus, this pathway cannot be evaluated quantitatively in this risk assessment without modeling uptake from soils into plants. Dioxins/furans, Aroclors and metals have been detected in OU2 soils. USEPA (2017c) notes that most plants do not bioaccumulate PCBs from contaminated soil due to the presence of a waxy layer which binds the PCBs and prevents them from being absorbed into the plant. However, there are certain vegetables, such as squash and tomatoes that may accumulate PCBs from soil via their roots or leaves, respectively. As noted above, the OU2 soils associated with the TSB and HDPT where Aroclors were detected at high levels were excavated as part of the removal effort described in Addendum 5 of the RIWP (NewFields 2017e). Uptake of metals in plants varies for each metal and by metal form, and is strongly influenced by soil pH (USEPA 2013a). In general, the highest accumulation of metals in plants generally occurs in the roots whereby exposures to humans from most fruits and vegetables (except roots or green, leafy vegetables) are low (USEPA 2013a).

Exposure to contaminants from ingestion of washed garden produce is likely to be a minor source of exposure compared with direct ingestion of soil. On this basis, ingestion of home grown produce by a hypothetical future resident was not evaluated quantitatively in this risk assessment. A qualitative evaluation of excluding this pathway from the risk characterization is discussed in the uncertainty assessment.

3.2.4 Summary of Exposure Pathways for Quantitative Assessment

Table 3-1 summarizes the exposure pathways that were selected for quantitative evaluation in this risk assessment.

3.3 Data Used in this Assessment

Based on Figure 3-1, soil and groundwater data are needed to evaluate exposures to hypothetical future residents and workers within OU2. Table 3-2 summarizes the soil and groundwater data considered in this assessment. All of these data have been validated, were collected in accordance with the Site-specific QAPP, and are considered to be appropriate for use in risk assessment. Figures 3-2 and 3-3 present the sampling locations corresponding to the surface soil and subsurface soil samples collected within OU2, respectively. Consistent with the RI Work Plan Addendum 7, a randomized sampling grid design was used to collect 20-point composite surface soil samples in 2017 (NewFields 2017c). Older surface soil data correspond to 5-point grab samples collected under a biased sampling strategy that targeted areas of most concern (NewFields 2015, 2016b). Subsurface soil samples were collected as vertical composites from varying depths down to 18 feet. Only those samples collected down to 10 feet (the depth to which a construction worker may be exposed) were considered in this assessment. Table 3-3 presents the list of groundwater wells evaluated in this assessment and includes any well within OU2 that has been sampled as part of ongoing RI activities. Figure 3-4 presents the locations of these groundwater wells and denotes which hydrostratigraphic unit the well is within, the shallow Unit 1 or the deep Unit 3.

Appendix A summarizes the data reduction procedures and provides an Excel file containing the data used in this assessment in electronic format. Summary statistics are provided in Tables 3-4 to 3-6 and specific data considerations are outlined in brief below.

3.3.1 Polychlorinated Biphenyls (PCBs)

There are 209 distinct PCB congeners. PCBs generally occur as a mixture of congeners; the most common commercial mixtures are Aroclors. Soil samples collected in 2014, 2015 and 2016 were analyzed for PCBs as Aroclor mixtures. Soil samples collected in 2017 were analyzed for both Aroclors and PCB congeners. Congener-specific analyses generally offer lower detection limits and detection of concentrations biased by interference caused by chemicals that coelute, and account for changes in mixture composition related to weathering, metabolism, or degradation in the environment. The approach applied in this assessment of the OU2 soil dataset, including both Aroclor and PCB congener-specific concentrations, was to maintain separation between these analyses. This was achieved by calculating exposure estimates based on either Aroclor or PCB congeners separately. As described further in Section 5.0, risks were characterized separately based on Aroclor data and PCB congener data where both types of data were available.

Another consideration in using the available PCB congener data was to consider that twelve PCB congeners have a dioxin-like mode of action (herein referred to as coplanar PCBs; USEPA 1996). The coplanar PCB congeners were evaluated following the toxicity equivalent (TEQ) approach described below. However, dioxin equivalence explains only part of a PCB mixture's toxicity. As such, Total PCB concentrations for non-coplanar PCB congeners were also calculated as described in Appendix A.

3.3.2 Calculation of Toxicity Equivalents

For this assessment, data for dioxins/furans and coplanar PCB congeners were converted to a 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) TEQ value[9]. This was done because polychlorinated dibenzo-p-dioxin (PCDD) and furan (PCDF) congeners and coplanar PCB congeners all act by the same mechanism as TCDD. TEQ values were calculated by computing the sum across congeners of the product of congener-specific concentration and relative Toxicity Equivalence Factor (TEF):

$$TEQ = \Sigma (Ci \text{ x } TEFi)$$

TEFs were based on USEPA (2010a) as shown in the following table:

[9] https://www.epa.gov/superfund/risk-assessment-dioxin-superfund-sites

Compound	TEF
Polychlorinated dibenzo-p-dioxins (PCDDs)	
2,3,7,8-TCDD	1
1,2,3,7,8-PeCDD	1
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
OCDD	0.0003
Polychlorinated dibenzofurans (PCDFs)	
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.03
2,3,4,7,8-PeCDF	0.3
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
OCDF	0.0003
Polychlorinated biphenyls (PCBs)	
3,3',4,4'-TCB (77)	0.0001
3,4,4',5-TCB (81)	0.0003
3,3',4,4',5-PeCB (126)	0.1
3,3',4,4',5,5'-HxCB (169)	0.03
2,3,3',4,4'-PeCB (105)	0.00003
2,3,4,4',5-PeCB (114)	0.00003
2,3',4,4',5-PeCB (118)	0.00003
2',3,4,4',5-PeCB (123)	0.00003
2,3,3',4,4', 5 -HXCB (156)	0.00003
2,3,3',4,4',5'-HxCB (157)	0.00003
2,3',4,4',5,5'-HxCB (167)	0.00003
2,3,3',4,4',5,5'-HpCB (189)	0.00003

For this assessment, TEQ values in both soil and groundwater were calculated based on available data for dioxins/furans ($TEQ_{(D/F)}$). TEQ values for OU2 soils where PCB congener data were collected were also calculated based on available data for dioxins/furans and coplanar PCBs

($TEQ_{(D/F/PCB)}$) as well as based on coplanar PCBs only ($TEQ_{(PCB)}$). The USEPA Scribe database for the Smurfit-Stone/Frenchtown Mill Site includes three alternative $TEQ_{(D/F)}$ values that were computed based on evaluating ND concentrations as zero, at one-half the method detection limit (MDL) and at one-half the sample-specific detection limit (DL). Although summary statistics are provided in Tables 3-4 to 3-6 for each of these alternatives, risk calculations included in this risk assessment were based on evaluating NDs at ½ DL. Evaluation of NDs at ½ DL when calculating TEQ is consistent with evaluations conducted at other USEPA sites in the region.

3.3.3 Inorganics in Groundwater

Groundwater samples were analyzed for both total recoverable and dissolved concentrations of inorganics. In general, filtered water data may underestimate actual exposure to humans if contaminants of concern are primarily associated with particulate matter. For risk assessment purposes, USEPA Region 8 evaluates exposures to groundwater assuming that the water is consumed without filtration. Thus, total recoverable metal concentrations were used to quantify risks in this assessment.

3.4 Selection of Chemicals of Potential Concern

COPCs are chemicals which exist in the environment at concentration levels that might be of potential health concern to humans and which are or might be derived, at least in part, from Site-related sources.

3.4.1 COPC Selection Process

The procedure used to identify COPCs for the evaluation of risks to human receptors from contaminated environmental media (soil and groundwater) is shown in Figure 3-5. It is important to note that this COPC selection procedure is intended to be conservative. That is, it is expected that some chemicals may be identified as COPCs that are actually of little or no concern to human health based on current USEPA guidelines, but that no chemicals of authentic concern will be overlooked.

In brief, the COPC selection procedure classifies each chemical into one of three categories:

- COPC
- Not a COPC
- Source of Uncertainty

The process begins by determining if the contaminant has a risk-based screening level (SL) that can be used to evaluate potential risk. A risk-based SL is a concentration of a contaminant in a medium below which is believed to pose negligible health risk to a specified population of human receptors. For carcinogens, this is a concentration that corresponds to an added cancer risk of 1E-06. For non-carcinogens, this is a concentration that corresponds to a Hazard Quotient (HQ) of 0.1.

If a risk-based SL is available, the next step is to evaluate the detection frequency. If a contaminant was detected in 5% or more of the Site samples, the maximum detected concentration for each contaminant in each medium is compared to the risk-based SL. If the maximum detected concentration exceeds the risk-based SL, the contaminant is identified as a COPC. If the maximum detected concentration does not exceed the risk-based SL, it may be concluded that the contaminant does not pose a significant risk to humans and may be excluded as a COPC.

If the contaminant was detected in fewer than 5% of the Site samples, or if the contaminant was not detected, then the detection limit is evaluated. If the detection limit is lower than the risk-based SL, then it is very unlikely that the contaminant will pose a significant risk to human health and may be excluded as a COPC. However, if the detection limit is above the risk-based SL, the contaminant is identified as a source of uncertainty because the detection limit was inadequate for detecting concentrations at the risk-based SL.

If a contaminant does not have a risk-based SL, this is identified as a source of uncertainty unless the contaminant is a beneficial nutrient and the expected average intake from Site media is similar to the range that is considered healthful.

In summary, a contaminant is identified as a COPC if the maximum detected concentration in the medium being evaluated (soil or groundwater) exceeds an available risk-based SL.

3.4.2 Source of Risk-Based Screening Level Values

Risk-based SLs used in this assessment were selected based on the human receptor identified in the CSM (Figure 3-1) who is expected to receive the highest exposure. In general, this is the hypothetical future resident. Therefore, SL values for use in the COPC selection protocol were derived from USEPA's Regional Screening Level (RSL) Tables[10], using values that are protective of residents. USEPA's RSL Tables include generic SLs for a resident exposed to soil or drinking water calculated assuming default exposure parameters that represent Reasonable

[10] https://www.epa.gov/risk/regional-screening-levels-rsls (Tables last updated November 2021)

Maximum Exposure (RME) conditions for chronic exposures via the oral, dermal and inhalation pathways[11].

3.4.3 Evaluation of Beneficial Minerals

A number of metals are beneficial minerals, and a certain level of intake is required to maintain good health. This includes calcium, chromium (III), copper, iron, magnesium, manganese, molybdenum, potassium, selenium, sodium, and zinc. However, excess intake of these minerals may cause adverse effects. If a SL was available for such minerals in USEPA's RSL Tables, they were evaluated as described above. Because of their low toxicity (even at high doses), USEPA has not derived RSL values for some minerals, including calcium, magnesium, potassium, and sodium. These four essential nutrients were evaluated by calculating an effective SL as follows:

Effective SL (beneficial) = DRI / DI

Where:

DRI = Daily Reference Intake (mg/day), derived from the Food and Nutrition Board (FNB 2013)

DI = Daily intake of Site medium (kg/day of soil; L/day of water)

3.4.4 COPC Screening Results

Tables 3-7 and 3-8 present the application of this COPC selection process to the OU2 soil and groundwater data, respectively. As shown in the tables, maximum detected concentrations were below respective risk-based SLs in soil and groundwater for all contaminants except the following which were identified as OU2 COPCs for quantitative evaluation in this assessment:

- $TEQ_{(D/F)}$, $TEQ_{(D/F/PCB)}$, $TEQ_{(PCB)}$, Total PCBs, Aroclor-1254, aluminum, arsenic, chromium, cobalt, iron, manganese, and thallium in soil.

- $TEQ_{(D/F)}$, Aroclor-1260, arsenic, barium, chromium, cobalt, copper, iron, manganese, and vanadium in groundwater.

[11] Montana's DEQ-7 standards will be considered in the RI/FS.

3.5 Quantification of Exposure

3.5.1 Basic Equations

<u>Ingestion Exposures</u>

The amount of contaminant which is ingested by receptors exposed to Site media may be quantified using the following general equation:

$$DI = C \cdot (IR / BW) \cdot (EF \cdot ED / AT) \cdot RBA$$

where:

DI	=	Daily intake of contaminant (mg per kg of body weight per day).
C	=	Concentration of the contaminant in the contaminated environmental medium (soil, water) to which the person is exposed. The units are mg/kg for soil and µg/L for water.
IR	=	Intake rate of the contaminated environmental medium. The units are kg/day for soil and L/day for water.
BW	=	Body weight of the exposed person (kg).
EF	=	Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a typical year.
ED	=	Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.
AT	=	Averaging time (days). This term specifies the length of time over which the average dose is calculated. For a chemical which causes non-cancer effects, the averaging time is equal to the exposure duration. For a chemical that causes cancer effects, the averaging time is 70 years.
RBA	=	Relative bioavailability

Note that the factors EF, ED, and AT combine to yield a factor between zero and one. Values near 1.0 indicate that exposure is nearly continuous over the specified averaging period, while values near zero indicate that exposure occurs only rarely.

For mathematical convenience, the general equation for calculating dose can be written as:

$$DI = C \cdot HIF \cdot RBA$$

where:

HIF = Human Intake Factor. This term describes the average amount of an environmental medium contacted by the exposed person each day. The value of HIF is typically given by:

$$HIF = (IR / BW) \cdot (EF \cdot ED / AT)$$

The units of HIF are kg/kg-day for soil and L/kg-day for water.

When the same individual may be exposed beginning as a child and extending into adulthood, exposure was calculated as the time-weighted average (TWA) lifetime exposure for evaluating non-cancer hazards and cancer risks as recommended in USEPA Guidance (USEPA 1989).

Dermal Exposures

The amount of a contaminant which is absorbed across the skin is referred to as the dermally absorbed dose (DAD). Procedures for estimation of the DAD as outlined in USEPA (2004) are used in this assessment and described below. Exposure is quantified using an equation of the following general form:

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

where:

DAD = Dermal absorbed dose (mg of chemical per kg of body weight per day).

DA_{event} = Absorbed dose per event (mg of chemical per square centimeter of skin surface area per event). This is media-specific and is further described below.

EF = Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a typical year.

ED = Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.

EV = Event frequency (events/day). This describes the number of times per day a person comes in contact with a contaminant in soil.

SA = Surface area (cm^2). This describes the amount of skin exposed to the contaminated media.

BW = Body weight of the exposed person (kg).

AT = Averaging time (days). This term specifies the length of time over which the average dose is calculated.

For contaminants in soil, DA_{event} is estimated as follows:

$$DA_{event} = C_{soil} \cdot CF_s \cdot DAF \cdot ABS_d$$

where:

C_{soil} = Contaminant concentration in soil (mg of contaminant per kg of soil).

CF_s = Conversion factor for soil (10^{-6} kg/mg).

DAF = Dermal adherence factor (mg of soil per square centimeter of skin surface area per event). This describes the amount of soil that adheres to the skin per unit of surface area.

ABS_d = Dermal absorption fraction (unitless). This value is contaminant-specific and represents the contribution of absorption of a contaminant across a person’s skin from soil to the systemic dose.

For mathematical convenience, the general equation for calculating DAD can be written as:

Soil: $DAD = C_{soil} \cdot ABS_d \cdot HIF_{soil}$

where:

$$HIF_{soil} = (SA \cdot DAF \cdot EF \cdot ED \cdot EV \cdot CF_s) / (BW \cdot AT)$$

The units of HIF_{soil} are kg/kg-day.

Inhalation Exposures

Inhalation exposures are evaluated in accordance with the inhalation dosimetry methodology presented in USEPA (2009). In accordance with this guidance, the human intake equation does not include an inhalation rate (m^3/day) or body weight because the amount of the chemical that reaches the target site is not a simple function of these factors. Instead, the interaction of the inhaled contaminant with the respiratory tract is affected by factors such as species-specific relationships of exposure concentrations to deposited/delivered doses and physiochemical characteristics of the inhaled contaminant (USEPA 2009). Therefore, the inhaled exposure concentration (EC) for chronic exposures is calculated as:

$$EC = C \cdot (ET \cdot EF \cdot ED / AT)$$

where:

EC = Exposure Concentration ($\mu g/m^3$). This is the time-weighted concentration based on the characteristics of the exposure scenario being evaluated.

C = Concentration of the chemical in air ($\mu g/m^3$) to which the person is exposed.

ET = Exposure time (hours/day). This describes how long a person is likely to be exposed to the contaminated medium over the course of a day.

EF = Exposure frequency (days/year). This describes how often a person is likely to be exposed to the contaminated medium over the course of a year.

ED = Exposure duration (years). This describes how long a person is likely to be exposed to the contaminated medium during their lifetime.

AT = Averaging time (hours). This term specifies the length of time over which the time-weighted average concentration is calculated.

For mathematical convenience, the general equation for exposure concentration can be written as:

$$EC = C \cdot TWF$$

where:

TWF = Time-Weighting Factor (unitless). The value of TWF is given by:

$$TWF = (ET \cdot EF \cdot ED / AT)$$

As described above, when the same individual may be exposed beginning as a child and extending into adulthood, exposure was calculated as the TWA lifetime exposure for evaluating non-cancer and cancer risks.

3.5.2 Human Exposure Parameters

For every exposure pathway of potential concern, it is expected that there will be differences between different individuals in the level of exposure at a specific location due to differences in intake rates, body weights, exposure frequencies, and exposure durations. Thus, there is normally a wide range of average daily intakes between different members of an exposed population. Because of this, all daily intake calculations must specify what part of the range of doses is being estimated. Typically, attention is focused on intakes that are “average” or are otherwise near the central portion of the range, and on intakes that are near the upper end of the range (e.g., the 95th percentile). These two exposure estimates are referred to as Central Tendency Exposure (CTE) and RME, respectively.

Tables 3-9 to 3-11 list the CTE and RME exposure parameters and resultant HIF values used in this assessment for hypothetical future residential and worker populations. Most of the values are based on USEPA default guidelines. Other values were informed by Site information or professional judgment.

3.5.3 Exposure Areas

An exposure area (also referred to as an exposure unit) is an area throughout which a receptor moves about at random and encounters an environmental medium for the duration of the exposure (USEPA 2002a). Because the key attribute of an exposure point is the assumption of random exposure, exposure areas represent the entire area that a selected receptor may be exposed to over their entire exposure duration. Realistically, it is possible that any particular receptor does not move entirely at random within an exposure area but instead frequents certain locations more often than others. However, Superfund risk assessments do not seek to estimate risk to any one particular current receptor, but to a hypothetical population who may be exposed in any part of the exposure area. A receptor may be exposed to one or more environmental media within an exposure area.

Soil

For the purposes of this assessment, soil exposure units (EUs) were defined as geographic areas of an assumed size identified based on random grid assignment. OU2 was subdivided into 25 20-acre grids as shown in Figure 3-2. Each 20-acre area is assumed to represent the maximum area within which a hypothetical future resident or worker may be exposed at random over their entire exposure duration. In concept, this assumes that a receptor is expected to contact all locations within an individual grid equally over their exposure duration (i.e., 26 or 70 years). Thus, each 20-acre grid identified in Figure 3-2 represents an individual soil EU.

Groundwater

When groundwater is used for drinking water, exposure evaluation is often performed on a well-by-well basis. This is because wells in different areas and screened at different depths may draw water with differing levels of contamination. The wells located within OU2 that have been sampled as part of ongoing RI activities were evaluated individually.

3.5.4 Exposure Point Concentrations

Based on the assumption of random exposure over an exposure area, risk from a contaminant within an EU is related to the arithmetic mean concentration of that contaminant averaged over the entire EU. An exposure point concentration (EPC) is a COPC-specific and media-specific concentration value used in the dose equation for each receptor and exposure pathway. The EPCs used in this assessment reflect Site-specific conditions.

Soil

As described above, surface soil data have been collected at this Site over the course of four years during three separate sampling events (2014, 2015 and 2017). Soil sampling conducted in 2014 and 2015 involved the collection of 5-point composites collected over a 1-square meter area (2014 sampling event) or over an area of 1 to 3-meter radius (2015 sampling event) following a biased sampling approach (sampling locations selected based on Site knowledge to identify areas of highest environmental concern). During the most recent sampling event in 2017, one 20-point composite sample was collected from those EUs where fewer than two 5-pt composites had previously been collected. The 20-point composite sample was comprised of 20 grab samples collected across the entire EU. This sampling approach is recommended by the USEPA because it is designed to provide a representative sample of the average concentration in the exposure unit (ITRC 2012).

Table 3-12 summarizes the soil samples collected per 20-acre grid. The surface soil data available for each 20-acre grid falls into one of the following categories:

a) One 20-point composite sample only
b) One 20-point composite plus one 5-point composite
c) One or more 5-point composites

As described in USEPA (1992), the USEPA recommends that a 95% upper confidence limit (95UCL) of the arithmetic mean at each exposure area be used as the EPC when calculating exposure and risk at that location. This is because the true arithmetic mean concentration cannot be calculated with certainty from a limited number of measurements. However, OU2 soil data are available based on unequally weighted samples which limits characterization of the EPC using a 95UCL. The larger the number of grab samples used to create the composite sample, the lower the variability around the mean estimate. Additionally, the larger the area within the EU that a composite sample is based, the more representative of the mean exposure across the EU. A 20-point composite comprised of 20 grab samples collected across the whole of the EU provides a representative estimate of the mean. Whereas, a mean concentration derived based on a localized 5-point composite is more uncertain, and the variability around the mean could be much greater. Thus, for this assessment, the available data for each EU will be used to represent the best estimate of the mean for each of the data categories listed above, as described below.

Category a. For exposure areas where a single 20-point composite sample is available, this concentration will be used as the EPC, since this is the only data point available.

Category b. For exposure areas in Category b, the EPC will be based on weighting the data by the number of grab samples collected. For example, if for a given contaminant, the concentration in a 5-point composite sample collected from an exposure area was 5 mg/kg and the concentration in a 20-point composite sample was 3 mg/kg, the EPC would be calculated as follows:

(5 mg/kg * 5) + (3 mg/kg * 20) / (20 + 5) = 3.4 mg/kg

This approach effectively places more confidence in the value of the 20-point composite because this sample provides an unbiased estimate of the mean concentration over the entire exposure area, while the 5-point composite samples represent only a small area of the exposure unit and may tend to be biased high given that they were collected at locations assumed to be of greatest potential contamination.

Category c. For exposure areas where two or more 5-point composite samples are available and there is no 20-point composite, the average concentration will be used as the EPC. If the 5-point composites were unbiased, use of the maximum value would normally be preferred to help ensure that the EPC does not underestimate the true mean. However, since all of the 5-point composites are likely to be biased high, a simple average of the values is likely to be adequately conservative, and use of the maximum value would likely result in a substantial overestimate of the true mean.

Grab samples were also collected from boreholes at depth in the subsurface. For evaluating exposures to hypothetical future construction workers, data for both surface and subsurface data were combined into a single dataset to evaluate exposures via incidental ingestion of soil and dermal contact to soil. The same approach outlined above was followed for calculating grid-specific EPCs, except a grid-specific weighted concentration accounted for an additional sample result based on the average across subsurface samples if available.

Table 3-13 summarizes the soil EPCs used in the risk calculations for evaluation of exposures to surface soils by hypothetical future residents and commercial/industrial workers (Panel A) and of exposures to surface and subsurface soils by hypothetical future construction workers (Panel B). Table 3-14 summarizes the soil EPCs used in the risk calculations for evaluation of exposures to surface and subsurface soils by hypothetical future construction workers.

<u>Airborne Dust from Construction Activities</u>

No Site-specific data are available on particulate levels in air generated during mechanical disturbances with construction equipment. In the absence of measured values, the concentration of contaminants in air that would occur during hypothetical future construction activities was estimated using the following equation:

$$C(air) = C(soil) / PEF$$

where:

C(air) = concentration of contaminant in air (mg/m^3)
C(soil) = concentration of contaminant in soil (mg/kg)
PEF = particulate emission factor (m^3 of air per kg of soil) for a construction scenario

As noted in Section 3.2.1, inhalation of soil particulates is only quantified for the hypothetical future construction worker scenario in this assessment. The PEF assumed for evaluating exposures related to construction activities is assumed to be 4.4E+08 m^3/kg. This value is consistent with the recommendation in USEPA (2002a) that accounts for the mass of dust emitted by traffic on unpaved roads during construction activities and the mass of dust emitted by wind erosion. USEPA (2002a) notes that the most significant contribution to inhalation of fugitive dust exposure by construction workers comes from disturbance of surface soil by traffic on unpaved roads. Thus, evaluation of this pathway is based on surface soils only.

Because inhalation toxicity values are based on an assumed continuous exposure over a specified exposure duration, when exposure is less than continuous, the value of EC used to quantify risk is calculated from C_{air} as follows:

$$\text{EC (non-cancer effects)} = C_{air} \cdot ET/24 \cdot EF/365$$
$$\text{EC (cancer effects)} = C_{air} \cdot ET/24 \cdot EF/365 \cdot ED/70$$

where:

ET = exposure time (hrs/day)
EF = exposure frequency (days/yr)
ED = exposure duration (years)

<u>Groundwater</u>

The mathematical approach that is most appropriate for computing the 95UCL of a data set depends on a number of factors, including the number of data points available, the shape of the distribution of the values, and the degree of censoring (USEPA 2002b). Because of the complexity of this process, the USEPA Technical Support Center has developed a software application called ProUCL v5.0 (USEPA 2013b) to assist in the estimation of 95UCL values. ProUCL calculates 95UCLs for a data set using several different strategies and recommends which 95UCL is considered preferable based on the properties of the data set.

As shown in Table 3-3, not all groundwater samples were analyzed for dioxins/furans and total metals. Data from all years were considered in deriving well-specific EPCs. A 95UCL was calculated where at least four detected values were available, per USEPA guidance (2015b). If this data requirement was not met, the EPC was set equal to the maximum detected value. If the suggested 95UCL value from ProUCL exceeds the maximum detected concentration, the EPC was selected consistent with SRC (2021). ProUCL output is included in Appendix C. Table 3-14 summarizes the groundwater EPCs selected for use in the risk calculations.

3.5.5 Relative Bioavailability of Dioxins and Metals in Soil

An accurate assessment of human exposure to ingested contaminants requires knowledge of the amount of contaminant absorbed from the gastrointestinal tract into the body from site media compared to the amount of absorption that occurred in the toxicity studies used to derive the toxicity factors. This ratio (amount absorbed from site media compared to the amount absorbed in toxicity tests) is referred to as Relative Bioavailability (RBA).

The oral RBA value for dioxins in soil is assumed to be 100% in accordance with USEPA (USEPA 2010b). This is considered to be a conservative assumption, because reports summarized by USEPA (2010b) indicate that absorption of dioxins from soils through the gastrointestinal tract is usually less than 50%.

In general, metals in soils exist in the form of mineral particles that are not rapidly solubilized in gastrointestinal fluids when ingested, while toxicity studies often utilize readily soluble forms of the test contaminant. Thus, oral RBA values for metals in soils are often less than 1.0. For arsenic, sufficient data are available to establish that oral RBA values in soil are generally less than 60% (USEPA 2012b). Thus, for the purposes of this HHRA, an RBA of 60% was applied for arsenic in OU2 soils. RBA data are much more limited or absent for other metals (except lead which was not identified as a COPC in this assessment). RBA values for all other metal COPCs were conservatively assumed to be 100%.

4.0 TOXICITY ASSESSMENT

4.1 Toxicity Overview

The basic objective of a toxicity assessment is to identify what adverse health effects a chemical may cause, and how the appearance of these adverse effects depends on exposure level. In addition, the toxic effects of a chemical frequently depend on the route of exposure (oral, inhalation, dermal) and the duration of exposure (subchronic, chronic, or lifetime). Thus, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause, and how the occurrence of these effects depends upon dose, route, and duration of exposure.

The toxicity assessment process is usually divided into two parts: the first characterizes and quantifies the non-cancer effects of the chemical, while the second addresses the cancer effects of the chemical. This two-part approach is employed because there are typically major differences in the time-course of action and the shape of the dose-response curve for cancer and non-cancer effects. The relationship between the dose of the chemical administered or received and the incidence of adverse health effects in the exposed population forms the basis for a quantitative dose-response relationship. Toxicity values (e.g, reference doses and slope factors) are derived based on such dose-response relationships.

4.1.1 Non-cancer Effects

Essentially all chemicals can cause adverse health effects if given at a high enough dose. However, when the dose is sufficiently low, typically adverse non-cancer effects are not observed. Thus, in characterizing the non-cancer effects of a chemical, the key parameter is the threshold dose at which an adverse effect first becomes evident. Doses below the threshold are considered to be safe, while doses above the threshold are likely to cause an effect.

The threshold dose is typically estimated from toxicological data (derived from studies of humans and/or animals) by finding the highest dose that does not produce an observable adverse effect, and the lowest dose which does produce an effect. These are referred to as the "No-observed-adverse-effect-level" (NOAEL) and the "Lowest-observed-adverse-effect-level" (LOAEL), respectively. The threshold is presumed to lie in the interval between the NOAEL and the LOAEL. However, in order to be conservative (health protective), non-cancer risk evaluations are not based directly on the threshold exposure level, but on a value referred to as the Reference Dose (RfD) for oral exposures or Reference Concentration (RfC) for inhalation exposures. The RfD and RfC are estimates (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The RfD and RfC values are derived from a NOAEL (or a LOAEL if a reliable NOAEL is not available) by dividing by an "uncertainty factor". If the data are from studies in humans, and if the observations are considered to be very reliable, the uncertainty factor may be as small as 1.0. However, the uncertainty factor is normally at least 10, and can be much higher if the data are limited. The effect of dividing the NOAEL or the LOAEL by an uncertainty factor is to ensure that the RfD or RfC is not higher than the threshold level for adverse effects. Thus, there is always a "margin of safety" built into an RfD and RfC values, and doses equal to or less than the RfD or RfC are nearly certain to be without any risk of adverse effect. Doses higher than the RfD or RfC may carry some risk, but because of the margin of safety, a dose above the RfD or RfC does not mean that an effect will necessarily occur.

Chronic oral RfDs and chronic inhalation RfCs are specifically developed to be protective for long-term exposure to that particular contaminant. Chronic RfDs and RfCs are generally used to evaluate the potential noncarcinogenic effects associated with exposure periods greater than 7 years (approximately 10 percent of a human lifetime). Subchronic oral RfDs and inhalation RfCs are specifically developed to be protective for short-term exposure to that particular contaminant. As a guideline for Superfund risk assessments, subchronic RfDs and RfCs are generally used to evaluate potential noncarcinogenic effects of exposure periods between two weeks and seven years.

4.1.2 Cancer Effects

For cancer effects, the toxicity assessment process has two components. The first is a qualitative evaluation of the weight of evidence (WOE) that the chemical does or does not cause cancer in humans. Previously, this evaluation was performed by the USEPA using the system summarized below:

WOE	Meaning	Description
A	Known human carcinogen	Sufficient evidence of cancer in humans.
B1	Probable human carcinogen	Suggestive evidence of cancer incidence in humans.
B2	Probable human carcinogen	Sufficient evidence of cancer in animals, but lack of data or insufficient data in humans.
C	Possible human carcinogen	Suggestive evidence of carcinogenicity in animals
D	Cannot be evaluated	No evidence or inadequate evidence of cancer in animals or humans
E	Not carcinogenic to humans	Strong evidence that it does not cause cancer in humans

More recently, USEPA has developed a revised classification system for characterizing the weight of evidence for carcinogens (USEPA 2005). However, this system has not yet been implemented for a number of chemicals, so the older classification scheme is retained for use in this assessment.

For chemicals which are classified in Group A, B1, B2, or C, the second part of the toxicity assessment is to describe the carcinogenic potency of the chemical. This is done by quantifying how the number of cancers observed in exposed animals or humans increases as the dose increases. Typically, it is assumed that the dose response curve for cancer has no threshold, arising from the origin and increasing linearly until high doses are reached. Thus, the most convenient descriptor of cancer potency is the slope of the dose-response curve at low doses (where the slope is still linear). This is referred to as the Slope Factor (SF), which has dimensions of risk of cancer per unit dose.

Estimating the cancer SF is often complicated by the fact that observable increases in cancer incidence usually occur only at relatively high doses, frequently in the part of the dose-response curve that is no longer linear. Thus, it is necessary to use mathematical models to extrapolate from the observed high dose data to the desired (but un-measurable) slope at low dose. In order to account for the uncertainty in this extrapolation process, USEPA typically chooses to employ the upper 95th upper confidence limit of the slope as the SF. That is, there is a 95 percent probability that the true cancer potency is lower than the value chosen for the SF. This approach ensures that there is a margin of safety in cancer as well as non-cancer risk estimates.

For inhalation exposures, cancer risk is characterized by an inhalation Unit Risk (UR) value. This value represents the upper-bound excess lifetime cancer risk estimated to result from continuous lifetime exposure to a chemical at a concentration of 1 $\mu g/m^3$ in air.

4.2 Human Toxicity Values

In 2003, USEPA’s Superfund program revised its hierarchy of human health toxicity values into the following three-tiered approach (USEPA 2003a):

1. USEPA’s Integrated Risk Information System (IRIS)[12].

2. The Provisional Peer Reviewed Toxicity Values (PPRTVs) derived by USEPA’s Superfund Health Risk Technical Support Center (STSC)[13].

[12] https://www.epa.gov/iris
[13] https://hhpprtv.ornl.gov/

3. Other toxicity values including additional USEPA and non-USEPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.

Table 4-1 presents the toxicity values used for evaluating human health risks associated with chronic exposures to COPCs at the OU2 Site. Because construction workers are assumed to be exposed for one year or less, the subchronic noncancer toxicity values presented in Table 4-2 were used to evaluate risks to hypothetical future construction workers at the OU2 Site. As seen in Table 4-2, chronic RfDs and RfCs were used if a subchronic value was not available. The basis of these toxicity values is discussed in further detail below.

<u>Dioxin</u>

Toxicity values developed for TCDD are used to evaluate the exposure to the mixture of dioxins, furans, and coplanar PCBs. In February 2012, USEPA released an IRIS RfD for TCDD of 7E-10 mg/kg-day (USEPA 2021d). This value is based on two epidemiological studies reporting reproductive effects in populations exposed to TCDD from an industrial accident. This RfD was derived based on an adjusted LOAEL of 2.0E+01 pg/kg-day and an uncertainty factor of 30 (10 for extrapolation from a LOAEL to a NOAEL and 3 for human-to-human variability). The chronic RfD was used to evaluate non-cancer hazards for both chronic and subchronic exposures.

There is no IRIS RfC, oral SF, or inhalation UR for TCDD. However, Tier 3 toxicity values are available from the California EPA (CalEPA). CalEPA recommends a chronic inhalation reference exposure level (REL) of 4.0E-08 mg/m^3 based on route-to-route extrapolation from a dietary study conducted in rats (OEHHA 2008). In addition to route extrapolation, an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for intraspecies variability) was applied to the identified LOAEL of 0.01 μg/kg-day. The chronic RfC was used to evaluate non-cancer hazards for both chronic and subchronic exposures.

The oral SF and inhalation UR recommended by CalEPA for TCDD are 1.3E+05 $(mg/kg\text{-}day)^{-1}$ and 3.8E+01 $(\mu g/m^3)^{-1}$, respectively (OEHHA 2009). These values were derived based on an oncogenicity bioassay of TCDD in rats and mice conducted by the National Toxicology Program (NTP).

PCBs

In October 1994, USEPA published an IRIS RfD for Aroclor-1254 of 2E-5 mg/kg-day. This value is based on immune, dermal and ocular effects observed in a series of monkey studies (USEPA 2021e). This RfD was derived based on a LOAEL of 5.0E-03 mg/kg-day and an uncertainty factor of 300. PCBs are classified as probably human carcinogens under IRIS. The Agency for Toxic Substances and Disease Registry (ATSDR) derived an intermediate-duration oral minimal risk level (MRL) for Aroclor-1254 of 3.0E-05 mg/kg-day. This value is based on a LOAEL of 7.5E-03 mg/kg-day for neurobehavioral alterations in infant monkeys that were exposed to a PCB congener mixture from birth to 20 weeks of age (ATSDR 2000). This LOAEL was adjusted by an uncertainty factor of 300 (10 for extrapolation from a LOAEL to a NOAEL, 3 for extrapolation from monkeys to humans, and 10 for human variability). There is no RfC available for evaluating non-cancer effects from inhalation exposures to PCBs.

The IRIS WOE characterizes PCBs as probably human carcinogens (based on sufficient evidence of carcinogenicity in animals) (USEPA 2021f). The cancer potency of PCB mixtures is assessed using the IRIS SF of 2 $(mg/kg\text{-}day)^{-1}$ for high risk PCBs. This value was used to calculate a high-risk inhalation UR of 5.7E-04 $(\mu g/m^3)^{-1}$by dividing by body weight over inhalation rate (70 kg / 20 m^3), and applying a conversion factor of 1,000 µg/mg.

Aluminum

IRIS does not report toxicity values for aluminum. However, a PPRTV RfD (p-RfD) of 1E+00 mg/kg-day and PPRTV RfC (p-RfC) of 5.0E-03 mg/m^3 have been derived based on evaluation of available toxicity data (USEPA 2006). The p-RfD is based on a LOAEL of 100 mg/kg-day for minimal neurotoxicity in the offspring of mice adjusted by an uncertainty factor of 100 (3 for use of a minimal LOAEL, 10 for interspecies extrapolation, and 3 for human variability). The LOAEL was characterized as minimal because postweaning neurobehavioral test battery results indicated that performance deficits may be marginal. The same value of 1E+00 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2008). This MRL was derived based on a NOAEL of 26 mg/kg-day protective of neurological effects, neurodevelopmental effects, and delays in maturation. An uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability) was applied to this NOAEL.

The p-RfC is based on a LOAEL of 4.6E+00 mg/m^3 for psychomotor and cognitive impairment for an 8-hour occupational exposure (USEPA 2006a). This LOAEL was adjusted for continuous exposure to a value of 1.6E+00 mg/m^3 and an uncertainty factor of 300 (10 for human variability, 10 for use of a LOAEL, and 3 for an incomplete database) was applied.

USEPA (2006a) determined that there was inadequate information to assess the carcinogenic potential of aluminum.

Arsenic

Arsenic is a naturally occurring element that is found in combination with either inorganic or organics substances to form many different compounds (ATSDR 2009). Inorganic arsenic compounds are found in soils, sediments, and groundwater. These compounds occur either naturally or as a result of industrial use of arsenic. Organic arsenic compounds are found mainly in fish and shellfish. IRIS toxicity values for arsenic are based on the carcinogenic inorganic form.

The IRIS RfD of 3.0E-04 mg/kg-day for inorganic arsenic was derived based increased incidences of hyperpigmentation and keratosis in a Taiwanese population exposed to arsenic in drinking water (USEPA 2021g). This RfD is based on a LOAEL of 1.4E-02 mg/kg-day adjusted by an uncertainty factor of 3 (accounts for both the lack of data to preclude reproductive toxicity as a critical effect and to account for uncertainty in whether the NOAEL of the critical study accounts for all sensitive individuals). A subchronic RfD for inorganic arsenic is not available.

No IRIS RfC is available for inorganic arsenic, but a Tier 3 RfC is available from CalEPA. The CalEPA inhalation REL for inorganic arsenic of 1.5E-05 mg/m^3 is based on extrapolation from a chronic drinking water study in children (OEHHA 2008). The estimated LOAEL of 2.3E-04 mg/m^3 for decreased intellectual function and adverse effects on neurobehavioral development was adjusted by an uncertainty factor of 30 (3 for use of an estimated LOAEL and 10 for human variability). Due to the possibility of repeated exposure and the relatively slow clearance of arsenic compounds, CalEPA considers the 8-hour REL to be equivalent to the chronic REL.

The IRIS WOE characterizes inorganic arsenic as a known human carcinogen for both the oral and inhalation routes based on sufficient evidence from human data (USEPA 2021g). Increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also, increased incidence of skin cancer and increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) were observed in populations consuming drinking water high in inorganic arsenic. The oral SF for inorganic arsenic is 1.5E+00 (mg/kg-day)$^{-1}$. The inhalation unit risk for inorganic arsenic is 4.3E-03 (µg/m^3)$^{-1}$.

Barium

The IRIS RfD for barium of 2.0E-01 mg/kg-day is based on nephropathy observed in mice during a two-year drinking water study (USEPA 2021h). Dose response data from the critical study were modeled, and the lower benchmark dose for male mice associated with a benchmark response predicted to affect 5% of the population was used for derived the RfD. An uncertainty factor of 300 (10 for interspecies extrapolation, 10 for human variability, and 3 for database deficiencies) was applied. The same value of 2.0E-01 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2007). This MRL was derived based on a NOAEL of 65 mg/kg-day protective of kidney effects. An uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability) was applied to this NOAEL.

No IRIS RfC is available for barium. The Health Effects Assessment Summary Table (HEAST) RfC of 5E-04 mg/m^3 is used to evaluated risks from inhalation exposures to barium (USEPA 2000a). This value is based on a NOAEL of 8.0E-01 mg/m^3 derived from a 4-month inhalation study in rats. An uncertainty factor of 1000 was applied (10 for interspecies extrapolation, 10 for human variability, and 10 for extrapolation from subchronic to chronic exposure). Based on the duration of the critical study, a subchronic RfC was also derived by applying an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability).

There are no cancer toxicity values available for barium.

Chromium

Chromium can exist in the environment in several different forms, the most common being trivalent chromium (Cr(III)) and hexavalent chromium (Cr(VI)). Cr(III) is an essential nutrient and occurs naturally. Cr(VI) rarely occurs naturally, but is usually produced from anthropogenic sources (ATSDR 2012a). Cr(VI) has a higher toxic potency than Cr(III). For the purposes of this assessment, because data on chromium speciation at the Site are not available, a conservative, health-protective assumption that all of the chromium detected at the Site is in the hexavalent form was applied. Uncertainties associated with this assumption are described under the uncertainty assessment.

An IRIS RfD, RfC and inhalation UR are available for Cr(VI). The IRIS RfD for Cr(VI) is 3.0E-03 mg/kg-day (USEPA 2021i). This value is based on an adjusted NOAEL of 2.5 mg/kg-day derived from a one-year drinking water study in rats. An uncertainty factor of 300 was applied (10 for interspecies extrapolation, 10 for human variability, and 3 to compensate for the less-than-lifetime exposure in the critical study), along with a modifying factor of 3 to account for uncertainties related to reports of gastrointestinal effects following drinking water exposures in a residential population in China. A value of 5E-03 mg/kg-day is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2012a). This MRL was derived based on hematological effects in male rats and female mice after exposure to sodium dichromate dihydrate in drinking water for 22 days. An average benchmark modeled dose of 5.2E-01 mg/kg-day was adjusted by an uncertainty factor of 100 (10 for interspecies extrapolation and 10 for human variability).

The IRIS RfC for Cr(VI) is 1.0E-04 mg/m^3 (USEPA 2021i). This value is based on the RfC derived for Cr(VI) particulates and was derived from a benchmark modeled concentration of 3.4E-02 mg/m^3 for increased lactate dehydrogenase in bronchioalveolar lavage fluid in rats exposed for up to 90 days. An uncertainty factor of 300 (3 for pharmcodynamic differences, 3 for less-than-lifetime exposure, and 10 for human variability). A value of 3.0E-04 mg/m^3 is recommended for subchronic exposures based on the ATSDR intermediate duration oral MRL (ATSDR 2012a). This MRL was derived based on the same study identified as the critical study for the derivation of the IRIS chronic RfC. The subchronic RfC was based on adjusting a benchmark dose concentration of 1E-02 mg/m^3 by an uncertainty factor of 30 (3 for interspecies extrapolation and 10 for human variability).

The IRIS WOE characterizes Cr(VI) as a known human carcinogen by the inhalation route of exposure. The IRIS assessment determined that the carcinogenic potential of Cr(VI) by the oral route could not be determined. No IRIS oral SF is available, but a Tier 3 oral SF is available from CalEPA. The CalEPA oral SF for Cr(VI) is 5.0E-01 (mg/kg-day)$^{-1}$ derived based on a dose-related increase of tumors of the small intestine in male mice (OEHHA 2011). The IRIS inhalation UR is 1.2E-02 (µg/m^3)$^{-1}$ (USEPA 2021i). However, consistent with the USEPA RSLs, an assumption that the ratio of Cr(VI) to Cr(III) is 1:6 is applied to result in an inhalation UR of 8.4E-02 (µg/m^3)$^{-1}$ (USEPA 2021j).

As noted in CalEPA (2011), the carcinogenic effects of Cr(VI) have been shown to be associated with a mutagenic mode of action. Consistent with USEPA (2000), age-dependent adjustment factors (ADAFs) were applied to the non-age dependent oral slope factor to account for differences in potency that may occur from exposure during early life (up to age 16). This was only done for evaluation of risks to the hypothetical future resident which includes potential early life exposures during childhood. The ADAFs recommended in USEPA (2000) were applied to the different age intervals for a resident as:

Age Interval (years)	ADAF
0 - < 2	10
2 - < 16	3
16 - 18	1

USEPA (2000) further indicates that any grouping of ages in the exposure assessment will need to be integrated with the ADAF age groupings to derive age group-specific risk estimates. Table 4-3 presents the age group-specific exposure assumptions.

Cobalt

IRIS does not report toxicity values for cobalt. However, chronic and subchronic p-RfD values of 3E-04 mg/kg-day and 3E-03 mg/kg-day, respectively, were derived using a LOAEL of 1 mg/kg-day for decreased iodine uptake in the thryroid and polycythemia in humans following a two week exposure (USEPA 2008). An uncertainty factor of 3,000 (10 for subchronic to chronic extrapolation, 10 for LOAEL to NOAEL extrapolation, 10 for human variability, and 3 for database deficiencies) was applied to the LOAEL for derivation of the chronic p-RfD. An uncertainty factor of 300 (10 for LOAEL to NOAEL extrapolation, 10 for human variability, and 3 for database deficiencies) was applied to the LOAEL for derivation of the subchronic p-RfD.

Chronic and subchronic p-RfC values of 6E-06 mg/m^3 and 2E-05 mg/m^3, respectively, were derived using an adjusted NOAEL of 1.9 µg/m^3 based on an occupational exposure study that reported respiratory effects in workers exposed to cobalt dust (USEPA 2008). An uncertainty factor of 300 (3 for subchronic to chronic extrapolation, 10 for human variability, and 10 for database deficiencies) was applied to the NOAEL for derivation of the chronic p-RfC. An uncertainty factor of 100 (10 for human variability and 10 for database deficiencies) was applied to the NOAEL for derivation of the subchronic p-RfC.

The PPRTV WOE characterizes cobalt as likely to be carcinogenic to humans by the inhalation route. This characterization is based on both limited evidence of carcinogenicity in humans (respiratory tumors following occupational exposures), and sufficient evidence of carcinogenicity in animals (alveolar/bronchiolar tumors in rats and mice, pheochromocytomas in female rats, and hemangiosarcomas in male mice). No data were available to evaluate the carcinogenicity of cobalt by the oral route. The PPRTV inhalation UR is 9.0E-03 (µg/m^3)$^{-1}$.

Copper

IRIS does not report toxicity values for copper. USEPA's RSL tables include an RfD for copper of 4E-02 mg/kg-day attributed to the HEAST (USEPA 2000b). This value is based on the HEAST maximum contaminant level goal (MCLG) of 1.3 mg/L. No other toxicity values are available for copper.

Iron

IRIS does not report toxicity values for iron. However, a p-RfD of 7E-01 mg/kg-day for iron has been derived based on evaluation of available toxicity data (USEPA 2006b). This value is based on gastrointestinal toxicity, but is also protective against iron deficiency given that iron is an essential element for humans.

Manganese

Two oral RfD values are available for manganese, depending on exposure medium (food, nonfood). The IRIS RfD (1.4E-01 mg/kg-day) includes manganese from all sources, including diet (USEPA 2021k). This RfD is derived to be protective against central nervous system effects in humans following oral exposure, and is based on the upper range of total dietary intake (10 mg/day) as recommended in the 1989 Food and Nutrition Board National Research Council report. USEPA (2021k) notes that intakes above the RfD derived from the upper range of total dietary intake are not necessarily associated with toxicity. The USEPA RSL User's Guide recommends subtracting the dietary contribution when evaluating non-food exposures (e.g., drinking water or soil) to manganese, leading to an RfD of 7.1E-02 mg/kg-day for non-food media. IRIS recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties, leading to an RfD of 2.4E-02 mg/kg-day. This RfD is consistent with the RfD of 2.5E-02 mg/kg-day used in the recently derived MDEQ health-based guidance for manganese protective of the most sensitive population, formula-fed infants less than one year of age (MDEQ 2020). A subchronic RfD for manganese in non-food media is not available.

The IRIS RfC for manganese of 5.0E-05 mg/m^3 is based on a number of studies that indicated neurotoxicity associated with low-level occupational exposure to manganese (USEPA 2021k). This RfC was derived based on a LOAEL of 1.5E-01 mg/m^3 adjusted for continuous exposure. An uncertainty factor of 1,000 (10 for human variability, 10 for use of a LOAEL, and 10 for database limitations) was applied to derive the RfC. A separate subchronic RfC for manganese in non-food media is not available.

There are no cancer toxicity values for manganese.

Thallium

IRIS does not report toxicity values for thallium. However, IRIS does report a qualitative discussion on the limitations of deriving a RfD for thallium (USEPA 2021m). The available toxicity database for thallium contains oral studies that are generally of poor quality. For this same reason, a p-RfD has not been derived for thallium. However, recognizing the associated limitations, screening level PPRTV RfD values were derived for chronic and subchronic exposures (USEPA 2012c). These RfD values are based on an approximated NOAEL of 4E-02 mg/kg-day protective of hair follicle atrophy in female rats following a 90-day gavage exposure to soluble thallium. An uncertainty factor of 3,000 (10 for interspecies extrapolation, 10 for human variability, 10 for database deficiencies, and 3 for extrapolation from subchronic to chronic exposure) was applied to derive a chronic screening p-RfD of 1.0E-05 mg/kg-day. An uncertainty factor of 1,000 (10 for interspecies extrapolation, 10 for human variability, and 10 for database deficiencies) was applied to derive a subchronic screening p-RfD of 4.0E-05 mg/kg-day.

There is no RfC or cancer toxicity values available for thallium.

<u>Vanadium</u>

An IRIS RfD of 9.0E-03 mg/kg-day is available for vanadium pentoxide (USEPA 2021n). This RfD is based on decreased hair cysteine observed in rats exposed to vanadium pentoxide in their diet for 2.5 years. The NOAEL for the critical study of 0.89 mg/kg-day was adjusted by an uncertainty factor of 100 (10 interspecies extrapolation and 10 human variability) to derive the RfD value. Consistent with the USEPA RSL User's Guide (USEPA 2021j), the molecular weight of the oxide ion was factored out to estimate an RfD for vanadium compounds of 5.0E-03 mg/kg-day. A separate subchronic RfD for vanadium is not available.

An IRIS RfC for vanadium is not available. ATSDR has derived a chronic inhalation MRL of 1.0E-04 mg/m^3 (ATSDR 2012b). This MRL is based on a two-year inhalation study in rats and mice that observed lung, larynx, and nasal effects at the lowest dose tested. The MRL was derived based on the benchmark modeled concentration for degeneration of epiglottis respiratory epithelium adjusted by an uncertainty factor of 30 (3 for interspecies extrapolation with dosimetric adjustment and 10 for human variability).

5.0 RISK CHARACTERIZATION

Risk characterization integrates the exposure assessment and the toxicity assessment to estimate non-cancer hazards and cancer risks for the receptor populations of concern at the OU2 Site. Non-cancer health hazards and cancer risks are characterized separately. Non-cancer hazards are evaluated by comparing an estimated exposure level or dose with a reference dose that is without appreciable risk of adverse health effects. Cancer risk is expressed as the probability that an individual will develop cancer over a lifetime as a result of exposure to a potential carcinogen. Risk characterization results are presented below by receptor.

5.1 Risk Characterization of Non-cancer Effects

The potential for non-cancer effects is evaluated by comparing the estimated DI or EC for a receptor over a specified time period to a reference threshold that represents the exposure below which it is unlikely for even sensitive populations to experience adverse health effects (USEPA 1989). This ratio of exposure to toxicity is called a Hazard Quotient (HQ). When a receptor is exposed to a COPC by more than one route, or is exposed to more than one COPC, these values may be summed to yield a hazard Index (HI). The COPCs evaluated for non-cancer effects in this assessment are $TEQ_{(D/F)}$, $TEQ_{(D/F/PCB)}$, Total PCBs, Aroclor-1254, Aroclor-1260, aluminum, arsenic, chromium, cobalt, copper, iron, manganese, thallium, and vanadium. Because PCBs in OU2 soils were evaluated as concentrations of Aroclor mixtures in some samples and as PCB congeners in other samples, HI's were calculated separately based on inclusion of either $TEQ_{(D/F)}$ and Aroclor-1254 or $TEQ_{(D/F/PCB)}$ and total non-coplanar PCBs. This approach avoids double counting exposures to PCBs in OU2 soils. This is not an issue in groundwater because PCBs were only evaluated as Aroclor mixtures in groundwater samples.

If the HQ or HI value is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If an HQ or HI exceeds one, there is some possibility that non-cancer effects may occur, although an HQ or HI above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all toxicity values (see Section 4). However, the larger the HQ or HI value, the more likely it is that an adverse effect may occur. If the HI is greater than 1, then it may be appropriate to examine individual COPC HQs and only sum HQs for COPCs that affect the same target tissue or organ system (e.g., the liver). This approach is consistent with USEPA (1989).

5.1.1 Ingestion Exposures

For most contaminants, the potential for non-cancer effects is evaluated by comparing the estimated daily intake of the contaminant over a specific time period with the RfD for that contaminant derived for a similar exposure period, as follows (USEPA 1989):

$$HQ = DI / RfD$$

where:

DI	=	Daily Intake (mg/kg-day)
RfD	=	Reference Dose (mg/kg-day)

5.1.2 Dermal Exposures

For most contaminants, the potential for non-cancer effects following dermal exposure is evaluated by comparing the estimated absorbed dose of the contaminant over a specific time period with the absorbed RfD for that chemical derived for a similar exposure period, as follows (USEPA 1989):

$$HQ = DAD / RfD_{ABS}$$

where:

DAD	=	Dermal absorbed dose (mg/kg-day)
RfD_{ABS}	=	Absorbed Reference Dose (mg/kg-day)
		$RfD_{ABS} = RfD \cdot ABS_{GI}$

The ABS_{GI} term is unitless, contaminant-specific and is applied to the available oral toxicity value to account for the absorption efficiency of an administered dose across the gastrointestinal tract and into the bloodstream. Contaminant-specific ABS_{GI} values are presented in Table 4-1.

5.1.3 Inhalation Exposures

As per the CSM (Figure 3-1), inhalation exposures were only evaluated for hypothetical future construction workers exposed to soils down to a depth of 10 feet during construction activities. The potential for non-cancer effects from inhalation exposures is evaluated by comparing the estimated EC of the contaminant over a specific time period with the RfC for that contaminant, as follows (USEPA 2009):

$$HQ = EC / RfC$$

where:

EC	=	Exposure Concentration (mg/m^3)
RfC	=	Reference Concentration (mg/ m^3)

5.2 Risk Characterization of Cancer Effects

The excess risk of cancer from exposure to a contaminant is described in terms of the probability that an exposed individual will develop cancer because of that exposure. Excess cancer risks are summed across all carcinogenic chemicals and all exposure pathways that contribute to exposure of an individual in a given population. The level of total cancer risk that is of concern is a matter of personal, community, and regulatory judgment. In general, the USEPA considers excess cancer risks that are below 1E-06 to be so small as to be negligible, and risks above 1E-04 to be sufficiently large that some sort of remediation is desirable[14]. USEPA policy states that Superfund actions are generally warranted when the baseline risk assessment indicates that a cumulative site risk to an individual using RME assumptions for either current or future land use is greater than the 1E-04 lifetime excess cancer risk end of the cancer risk range of 1E-04 to 1E-06 (USEPA 1991b). Excess cancer risks that range between 1E-04 and 1E-06 are generally considered to be within USEPA health guidelines (USEPA 1991b), although this is evaluated on a case by case basis, and USEPA may determine that risks lower than 1E-04 are not sufficiently protective and warrant remedial action. Furthermore, the MDEQ allowable cancer risk level is 1E-05, which will be considered as part of the risk management decisions associated with this Site[15]. Cancer risks for each chemical are calculated as described below.

Similar to how non-cancer risks were summed across dioxins, furans and PCBs, to avoid double counting total excess cancer risks were also calculated separately based on inclusion of either $TEQ_{(D/F)}$ and Aroclor-1254 or $TEQ_{(D/F/PCB)}$ and total non-coplanar PCBs.

5.2.1 Ingestion Exposures

The excess risk of cancer from ingestion exposure to a contaminant is calculated as follows (USEPA 1989):

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[14] Note that excess cancer risk can be expressed in several formats. A cancer risk expressed in a scientific notation format as 1E-06 is equivalent to 1 in 1,000,000 or 10^{-6}. Similarly, a cancer risk of 1E-04 is equivalent to 1 in 10,000or 10^{-4}. For the purposes of this document, all cancer risks are presented in a scientific notation format (*i.e.*, 1E-06).

[15] Montana DEQ-7 standards (MDEQ 2019) will be considered separately in the RI/FS.

$$\text{Excess Cancer Risk} = 1 - \exp(-DI_L \cdot SF)$$

where:

DI_L = Daily Intake, averaged over a lifetime (mg/kg-day)
SF = Slope Factor $(\text{mg/kg-day})^{-1}$

In most cases (except when the product of $DI_L \cdot SF$ is larger than about 0.01), this equation may be approximated by the following:

$$\text{Excess Cancer Risk} = DI_L \cdot SF$$

5.2.2 Dermal Exposures

The excess risk of cancer from dermal exposure to a contaminant is calculated as follows (USEPA 2004):

$$\text{Excess Cancer Risk} = DAD_L \cdot SF_{ABS}$$

where:

DAD_L = Dermal Absorbed Dose, averaged over a lifetime (mg/kg-day)
SF_{ABS} = Absorbed Slope Factor $(\text{mg/kg-day})^{-1}$
$SF_{ABS} = SF / ABS_{GI}$

5.2.3 Inhalation Exposures

The excess risk of cancer from inhalation exposure is calculated based on inhalation UR values, as follows (USEPA 2009):

$$\text{Excess Cancer Risk} = EC \cdot UR$$

where:

EC = Exposure Concentration ($\mu g/m^3$)
UR = Unit Risk $(\mu g/m^3)^{-1}$

5.3 Risk Characterization Results

Detailed risk calculations are presented in Appendix D. Risk characterization results are presented in Section 5 tables as summarized below. Within the summary tables, non-cancer hazards that exceed the USEPA guidelines of non-cancer hazards ≤1E+00 and cancer risk < 1E-04 are bolded and shaded (orange). Cancer risk that exceeds MDEQs criteria of 1E-05 are also shaded (blue) for reference[16].

5.3.1 Risks from Exposures to COPCs in OU2 Soils

Risk estimates associated with exposures to COPCs in OU2 soils are summarized in Tables 5-1 to 5-3. Inspection of these tables reveals the following main conclusions.

5.3.1.1 Risks to Hypothetical Future Residents

Table 5-1 summarizes the non-cancer HIs and cancer risks for the hypothetical future residential scenario for each exposure area grid. As shown, non-cancer HI's for hypothetical future residents do not exceed 1E+00 in any exposure area. Estimated excess cancer risks for hypothetical future residents are below 1E-04 for all exposure areas (grids), except grids 8 and 12. The total cancer risk predicted for a hypothetical future resident exposed in grid 8 is 2E-04. As shown in Table 5-2, this risk is driven by early lifetime exposures to chromium via incidental ingestion of surface soils (evaluated as Cr(VI) accounting for a mutagenic mode of action). The total cancer risk predicted for a hypothetical future resident exposed in grid 12 is equal to 1E-04. Similar to grid 8, this risk is driven by early lifetime exposures to chromium via incidental ingestion of surface soils. However, unlike in grid 8, risk from chromium in grid 12 is estimated to be less than 1E-04 (risk = 8E-05).

5.3.1.2 Risks to Hypothetical Future Workers

Tables 5-3 and 5-4 summarize the non-cancer HIs and cancer risks for the hypothetical future worker scenarios for each exposure area grid. As shown, non-cancer HI's for hypothetical future commercial/industrial workers and hypothetical future construction workers do not exceed 1E+00 in any exposure area. Estimated excess cancer risks for hypothetical future commercial/industrial workers and hypothetical future construction workers are all below 1E-04 for all exposure areas.

[16] Montana DEQ's cancer risk criteria of 1E-05 will be considered within the Feasibility Study.

5.3.2 Risks from Exposures to COPCs in OU2 Groundwater Wells

Risk estimates associated with exposures to COPCs in groundwater wells within OU2 are summarized in Tables 5-5 through 5-8. Risk characterization results are also presented spatially in Figures 5-1 through 5-6. Inspection of these tables and figures reveals several main conclusions which are discussed in the sections below. Compliance of groundwater with DEQ-7 standards will be discussed separately in the RI.

5.3.2.1 Risks to Hypothetical Future Residents

Non-cancer hazards to the hypothetical future resident exceed 1E+00 as follows (Table 5-5 and Figure 5-1):

- RME Receptor: NFMW13 (HI = 3E+00), NFMW15 (HI = 6E+00), NFMW5 (HI = 2E+00), NFMW6 (HI = 4E+00), and the log chipper well (HI = 1E+01).

- CTE Receptor: NFMW15 (HI = 2E+00) and the log chipper well (HI = 5E+00).

As shown in Table 5-5, manganese is a risk driver in each of these wells (HQ values range from 2E+00 to 4E+00). Arsenic is also a risk driver in NFMW15 and the log chipper well (HQ values of 2E+00 and 3E+00, respectively). Figures 5-2 and 5-3 map the HQs for arsenic and manganese, respectively. Non-cancer HQ values also exceed 1E+00 for cobalt and iron in the log chipper well (HQ values of 3E+00 and 2E+00, respectively). Target organs differ for each of the risk drivers, so no further evaluation of target organ specific hazards was conducted.

Cancer risks to the hypothetical future resident were ≥ 1E-04 as follows (Table 5-6, Figure 5-4):

- RME receptor: NFMW15 (Risk = 3E-04), NFMW16 (Risk = 1E-04), cartage building well (Risk = 1E-04) and the log chipper well (Risk = 4E-04).

Arsenic is the primary cancer risk driver in all of these wells, and to a lesser extent chromium

The non-cancer hazards and cancer risk values for the cartage building well and the log chipper well (both Unit 3 wells) are based on a single groundwater sample each. Data in these samples are for metals only. Dioxins, furans, and PCBs have not been measured in these wells. Consistent with the RI Work Plan, wells NFMW-13 and NFMW-5 have consistently been sampled for these contaminants to evaluate the downgradient edge of the log yard (see Figure 5-4). The risk results for these wells should be interpreted within the context of the uncertainty associated with the assumed EPCs for these wells.

5.3.2.2 Risks to Hypothetical Future Workers

Non-cancer hazards to the hypothetical future commercial/industrial worker exceed 1E+00 as follows (Table 5-7, Figure 5-5):

- RME Receptor: NFMW15 (HI = 2E+00) and the log chipper well (HI = 4E+00).
- CTE Receptor: The log chipper well (HI = 2E+00).

As shown in Table 5-7, although the total HI exceeded 1E+00 for these wells, no contaminant-specific HQ exceeded 1E+00. Manganese is the primary risk driver in both NFMW15 and the log chipper well (HQ = 1E+00).

As shown in Table 5-8 and Figure 5-6, estimated cancer risk in the log chipper well is 1E-04 for the hypothetical future RME commercial/industrial worker. This risk is primarily attributed to arsenic (cancer risk = 1E-04). Cancer risks are estimated to be <1E-04 in all other wells for this receptor.

5.3.3 Summary of Risks from Exposures to Soil and Groundwater

As shown in the CSM, it is assumed that hypothetical future residents and commercial/industrial workers would be exposed to both surface soils and groundwater. Combined non-cancer hazards and cancer risks associated with combined exposures to COPCs in OU2 surface soil and groundwater wells within OU2 are summarized in Tables 5-9 and 5-10 and shown spatially in Figures 5-7 through 5-10. Consistent with the results described above, non-cancer hazards are driven by ingestion of groundwater as drinking water. For the hypothetical future residential scenario, the total HI exceeds 1E+00 but the individual media (groundwater or soil) HIs are ≤ 1E+00 in grids 11 (drinking water from well NFMW16) and 18 (drinking water from well NFMW18).

6.0 UNCERTAINTY ASSESSMENT

Quantitative evaluation of the risks to humans from environmental contamination is frequently limited by uncertainty regarding a number of key data items, including concentration levels in the environment, the true level of human contact with contaminated media, and the true dose-response curves for non-cancer and cancer effects in humans. This uncertainty is usually addressed by making assumptions or estimates for uncertain parameters based on whatever limited data are available. Because of these assumptions and estimates, the results of risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

6.1 Uncertainties in Exposure Assessment

6.1.1 Uncertainties in Exposure Pathways Not Evaluated

Omission of exposure pathways believed to be minor compared to one or more other pathways that were evaluated may result in a small underestimation of exposure and risk, but the magnitude of this underestimation is not expected to be significant.

As noted in Section 3.1.4, it is possible that someone (presumably and adolescent or adult) may trespass through the OU2 Site. A trespasser would be exposed to Site contamination via direct contact with surface soils (incidental ingestion of and dermal contact to surface soils). However, trespassing is expected to be limited by restricted access to the Site. It is not expected that a trespasser would visit the site more than 1 or 2 times per week, and such activity would primarily occur during the season roughly between May and October (2 visits/week for roughly 26 weeks equates to an exposure frequency of 52 days/year). Given that predicted risks from exposures to OU2 surface soils by a hypothetical future worker (who is assumed to be exposed 250 days/year) were below a level of concern (HI<1E+00, Cancer Risk< 1E-04), risks to a trespasser who will experience a lower exposure are not expected to be above a level of concern.

Consumption of cultivated garden fruits and vegetables by hypothetical future residents was also not evaluated quantitatively in this assessment. This was because OU2 soils were assessed assuming full-time residential exposure which is expected to be protective of gardening exposures. The residential risks associated with exposures to surface soils include assumed exposures as a young child who is assumed to represent the most sensitive receptor based on the highest potential soil exposure. A young child is not likely to be an avid gardener. Further, as shown in Tables 5-1 and 5-2, unacceptable risks to a hypothetical future resident were based on chromium. Data on plant uptake of chromium are limited, but ATSDR (2012a) noted that some data indicate that chromium has a low mobility for translocation from roots to above ground parts of plants.

6.1.2 Uncertainties from Chemicals Not Evaluated

As discussed above, quantitative risk estimates are derived only for COPCs. Contaminants that were measured in Site samples but excluded as a COPC may contribute a small amount of added risk, but the contribution is expected to be so small that this is not a source of significant uncertainty. The same is expected of contaminants that could not be evaluated as COPCs due to the lack of a risk-based screening level (no toxicity value), or contaminants qualified as not detected but whose DL is greater than the available risk-based SL. Although these contaminants are flagged as sources of uncertainty in the COPC screens, their relative contribution to the total risk is expected to be minor.

USEPA (2021b) discusses PCBs at the Site. As noted in USEPA (2021b), hundreds of samples have been collected from across OU1, OU2, and OU3 and analyzed for PCBs. PCBs have been evaluated in most soil samples and in groundwater as concentrations of Aroclor mixtures and not as PCB congeners. During the initial RI evaluation in 2015, Aroclor concentrations were measured in OU2 soils and groundwater (NewFields 2015). This initial investigation detected Aroclor-1254 and Aroclor-1260 in surface soils; no other Aroclor was detected in OU2 soils and no Aroclor was detected in groundwater sampled from OU2 wells. Concentrations of Aroclor-1260 in three OU2 surface soils collected near the HDPT foundation and the TSB area were greater than USEPA RSLs for a commercial/industrial scenario. On this basis, a subsequent soil investigation was conducted in 2016 to evaluate the extent of PCB soil impacts in the locations of the HDPT foundation and the TSB area (NewFields 2017c). Further similar investigation of other areas in OU2 was not conducted based on the lack of detections observed in the 2015 investigation. The 2016 PCB investigation defined the extent of PCBs in surface soils in the TSB area above the USEPA industrial RSLs for Aroclor-1254 and Aroclor-1260 (NewFields 2017d). In addition, this investigation confirmed concentrations of Aroclor-1260 at the HDPT foundation location above USEPA industrial RSLs in three of the fourteen samples collected, but was unable to fully define the extent of impacts in soils in this area (NewFields 2017d). Nonetheless, this study provided sufficient information for proceeding with a voluntary soil removal response action in the two identified areas. The response action was completed in 2018 and included additional sampling and analysis of PCBs in soil to further determine the full extent of contamination to support the removal action. As reported in NewFields (2018e), approximately 155 cubic yards of material was removed from the HDPT and TSB areas. Subsequent soil sampling conducted in OU2 in 2017 included analysis for PCB congeners and Aroclors. As described in this assessment, Aroclor-1254 was detected at concentrations above the residential RSL in the composite samples collected from grids 1 and 8 as part of this sampling effort.

Acceptable risks were estimated associated with exposures to Aroclor-1254 in these grids (HQ < 1E+00, cancer risk < 1E-04).

Regular groundwater monitoring conducted as part of ongoing RI activities included analyzing samples for Aroclor concentrations. Again, no additional evaluation of PCBs as PCB congeners in groundwater has been conducted based on the lack of detections for any Aroclor except Aroclor-1260. Aroclor-1260 has only been detected in one well (NFMW15), and only in five of the forty-one samples (12%) collected and analyzed for Aroclors. NFMW15 is located just northwest of the HDPT foundation, one of the two localized areas within OU2 where Aroclor-1260 was detected in soils. Estimated cancer risks for hypothetical future residents consuming Aroclor-1260 in groundwater from well NFMW15 are below 1E-04 (2E-06 and 4E-07 for the RME and CTE receptors, respectively).

There are three groundwater wells within OU2 with no data on total metals (MW4, MW7 and WFB1). Non-cancer hazards and cancer risks associated with exposures to hypothetical future residents and commercial/industrial workers from consuming groundwater from these wells were evaluated based on concentrations of $TEQ_{(D/F)}$ and Aroclor-1260 only. Only one sample was collected and analyzed from each of the three wells. Although PCB congeners were not analyzed in groundwater samples collected from these wells, no dioxin/furan congener, nor Aroclor-1260 were detected. Even though total metals were not analyzed in groundwater samples collected from these wells, the three samples were evaluated for dissolved metals. As shown in Appendix D, non-cancer HIs for wells MW4, MW7 and WFB1 did not exceed 1E+00 when including HQs for the metal COPCs derived based on the dissolved groundwater concentrations. Total cancer risks for these wells did not exceed 1E-04 when including risk estimates based on the dissolved concentrations of arsenic and chromium. Because dissolved concentrations are generally lower than total recoverable concentrations, exposures for these wells based on dissolved concentrations may be underestimated.

6.1.3 Uncertainties in Exposure Point Concentrations

In all exposure calculations, the desired input parameter is the true mean concentration of a contaminant within a medium, averaged over the area where random exposure occurs. However, because the true mean cannot be calculated based on a limited set of measurements, the USEPA (1989, 1992) recommends that the exposure estimate be based on the 95UCL. The groundwater EPCs were based on 95UCLs for the wells with enough data to support the development of the 95 UCLs. When data are plentiful and inter-sample variability is not large, the UCL may be only slightly higher than the mean of the data. However, when data are sparse and/or highly variable, the 95UCL may be substantially greater than the mean of the available data.

For OU2 soils, higher standard deviations were observed for some metals (see Tables 3-4 and 3-5) which suggests heterogeneity across OU2. 95UCL values were not calculated for soil due to the mix of sample types and limited sample sizes. The initial targeted soil sampling was conducted to assess areas identified as most likely to be contaminated by site operations. The follow-up composite sampling strategy was focused on collecting data to better define potential exposures within this risk assessment. The compositing schemes applied to the soil collection efforts were developed to be representative of hypothetical future residential or occupational (the receptors with the highest assumed exposures) exposure units. In cases where a 20-point composite was collected over the entire exposure area, variability around the mean is characterized better than within a 5-point composite. Surface soils collected in 2017 were composited on a grid-by-grid basis, resulting in a single sample result for some exposure units. Without additional data it is uncertain if the use of a single 20-point composite may overestimate or underestimate the true mean. In cases where additional data from localized samples (5-point composites collected over a small area, or grab samples) collected through biased sampling at areas identified as being of environmental concern, the weighted EPC is likely biased slightly high. If a soil grid was found to pose an unacceptable risk, additional samples within that grid may be warranted within the RI/FS. However, non-cancer HIs were below 1E+00 and cancer risks were below 1E-04 in all OU2 soil grids. Future changes in land use may result in higher density housing than was assumed for the soil sampling conducted on 20-acre grid areas. Although this increases uncertainty about future exposure, this is not considered a significant source of uncertainty for the specific scenarios evaluated within this assessment.

One area within OU2 formerly used as a borrow pit is currently ponded, fed by groundwater. This pond area is surrounded by wood chips. A surface water and a sediment sample were collected from this pond (CL-Pond) in 2018. It is not anticipated that a person will be exposed within this ponded area, so these data were not considered in this assessment. However, if this pond were dried out in the future (during land development), the sediment sample may represent contamination within the surface soil at this location. Because sedimentation may have resulted in an increased concentration within this specific area, the measured $TEQ_{(D/F)}$ concentration in the sediment sample was evaluated for this uncertainty assessment. $TEQ_{(D/F)}$ was detected in this sample at a concentration of 9.6E-06 mg/kg which equates to a non-cancer HQ < 1E+00 and a cancer risk < 1E-04.

Exposures to hypothetical future construction workers via direct contact with subsurface soils were calculated based on available concentration data in both surface and subsurface soil samples consistent with the CSM. However, the weighting approach applied to calculate the soil EPCs inherently weights the concentrations associated with the available 20-point composite surface soil samples heaviest and the single vertical composite subsurface samples the least. This would represent a significant source of uncertainty if concentrations at depth were significantly higher than concentrations at the surface. This is not anticipated at this Site given that the expected fate and transport systems would have resulted primarily in surface deposition. Nonetheless, to evaluate this source of uncertainty further, the maximum detected concentrations within the subsurface soil samples were used to estimate non-cancer hazards and excess cancer risks to hypothetical future construction workers for this uncertainty assessment. The non-cancer HI calculated following this approach is less than 1E+00 and the cancer risk is less than 1E-06.

Soil concentration data for the OU2 Site are based on evaluation of bulk or coarse soil particles. It is generally expected that small particles (<150 µm, "fine fraction") are more likely to adhere to the hands (or other objects that may be mouthed) than coarse particles (2mm) and be subsequently ingested (USEPA 2016). Studies of other sites have suggested enrichment of metal concentrations in the fine fraction (Beamer et al. 2012; Siciliano et al. 2009). This indicates that EPCs based on concentrations of COPCs in bulk samples collected at the Site may underestimate true exposure concentrations, but the magnitude of this underestimation is unknown.

When data are presented as summed values (i.e., TEQ and total PCBs), one-half the DL was used as a surrogate concentration for those specific congeners reported as non-detect. Use of one-half the DL assumes that there is equal probability that the actual concentration in the sample may be greater or less than the surrogate value. In general, the detection limits for non-detect results were low relative to detected concentrations. The uncertainty associated with the use of surrogate values for non-detect results was minimized by only including those contaminants that were determined to be present in a given medium.

There are eight wells where the groundwater EPC is based on a single sample, including the log chipper well where non-cancer hazards and total cancer risks were estimated to be above a level of concern. There is high uncertainty as to whether or not the EPC used to evaluate groundwater exposures for these wells underestimates or overestimates potential chronic exposures.

6.1.4 Uncertainties in Human Exposure Parameters

Accurate calculation of exposures requires accurate estimates of the level of human exposure that is occurring. However, many of the required exposure parameters are not known with certainty and must be estimated from limited data or knowledge. In general, when exposure data were limited or absent, the exposure parameters were chosen in a way that was intended to be conservative. Because of this, the values selected are thought to be more likely to overestimate than underestimate actual exposure and risk.

6.1.5 Uncertainties in Chemical Absorption (RBA)

The risk from an ingested chemical depends on how much of the ingested chemical is absorbed from the gastrointestinal tract into the body. Currently available information suggests that RBA of dioxin in soils can be expected to be less than 100%, but available estimates of soil dioxin RBA are not adequate to derive an alternative to assuming an RBA of 1.0. Similarly, data are not available to derive contaminant-specific RBA values for any of the metal COPCs except arsenic. Using an assumed RBA of 1.0 for these COPCs is likely to overestimate the true risk with the magnitude of the error depending on the true RBA value.

6.2 Uncertainties in Toxicity Assessment

Toxicity information for many chemicals is often limited. Consequently, there are varying degrees of uncertainty associated with toxicity values (i.e., oral SF, RfD, RfC, inhalation UR). For example, uncertainties can arise from the following sources:

- Extrapolation from animal studies to humans
- Extrapolation from high dose to low dose
- Extrapolation from continuous exposure to intermittent exposure
- Limited or inconsistent toxicity studies

In general, uncertainty in toxicity factors is one of the largest sources of uncertainty in risk estimates at a site. Because of the conservative methods USEPA uses in dealing with these uncertainties, it is much more likely that the uncertainty will result in an overestimation rather than an underestimation of risk (USEPA 2014b).

For TEQ, cancer risks were based on using the CalEPA toxicity criteria for TCDD. The CalEPA values assume that there is no level of exposure that is without risk. This assumes that TCDD induces cancer by way of a non-threshold linear dose-response relationship. The National Academy of Sciences (NRC 2006) discussed the primary uncertainties with the toxicity values for dioxin and dioxin-like compounds and reported that the estimation of cancer risks at doses below the range of existing reliable data may result in an overestimation of risk, and that the relative concentrations of the congener mixture in the environment may change over an exposure period. Further, NRC (2006) and members of USEPA's Science Advisory Board (SAB) that reviewed USEPA's 2000 dioxin reassessment suggested that the assumption that TCDD carcinogenicity is consistent with a non-threshold linear dose-response is inconsistent with what is known about the mode of action of TCDD and other dioxins. As noted in ATSDR (1998), available data suggest that TCDD acts as a cancer promoter and is not directly genotoxic. NRC

(2006) noted that the lack of evidence of cancer-initiating activity by TCDD in animal studies further supports this observation. TCDD has been reported to produce toxic effects by binding with a receptor, called the aromatic hydrocarbon (Ah) receptor. This binding, in addition to ligand-receptor interactions and subsequent molecular events, results in a complex, multi-step process to produce dioxin toxicity (NRC 2006). Chemicals that act via a receptor-mediated process produce sublinear responses at low doses. In previous evaluations of other receptor-mediated carcinogens, USEPA concluded that use of a nonlinear, low-dose model was appropriate for risk assessment. Although USEPA has not completed a cancer reassessment for dioxin, the Agency has established that the 2012 RfD for TCDD will be used to develop site-specific risk-based cleanup levels at Superfund sites. Dioxin cleanup levels based on the 2012 non-cancer RfD are expected to be within the cancer risk range currently used by USEPA's Superfund cleanup program (USEPA 2021n).

For chromium, non-cancer hazards and cancer risks were based on using toxicity values for the more potent form of chromium, Cr(VI). This is a health-protective approach, but likely overestimates actual chromium risks. Chromium was only evaluated as total chromium in Site samples. There is no indication that historical Mill operations used or generated Cr(VI), and there is no information available to understand the ratio of Cr(VI) to Cr(III) in Site soils or groundwater. Adding to this source of uncertainty, Cr(VI) is expected to readily reduce to Cr(III) in soil (USEPA 1998). On this basis, evaluating chromium risks as being attributed to 100% exposure to Cr(VI) is a significant source of uncertainty that suggests that the estimated cancer risk above 1E-04 in grid 8 for a hypothetical future residential scenario is overestimated.

For manganese, toxicity data in humans generally agree that occupational exposures to manganese dust in the air results in central nervous system pathology. However, data on the neurotoxicity of orally ingested manganese at relatively low doses are less consistent, albeit suggestive (USEPA 2021k). Additionally, many variables including environmental factors and biological factors can influence manganese absorption. The IRIS oral RfD for manganese in water is particularly uncertain as it is based on an upper dietary intake rate of 10 mg/day, instead of quantitative information to indicate toxic levels of manganese in the diet of humans. Because of the conservativeness of the oral RfD for manganese, it is likely that uncertainty associated with this toxicity value will result in an overestimation rather than an underestimation of risk for the general receptors of concern (USEPA 2021k). However, the RfD of 2.4E-02 mg/kg-day is consistent with the recently derived MDEQ public health goal for manganese in drinking water based on being protective of formula-fed infants (MDEQ 2020).

For thallium, the oral toxicity value is based on a screening level p-RfD. Screening level p-RfD values are considered of limited use in risk assessment and associated thallium risks calculated using this RfD should be interpreted with caution recognizing the associated uncertainties in this toxicity value. As discussed in USEPA (2012c), available toxicity data did not meet the criteria for the derivation of a PPRTV toxicity value for thallium. Although substantial data were available on human exposure to thallium, the majority of studies were limited by the lack of objective tests for toxicity, reliance on the incidence of symptoms obtained from questionnaires, and characterization of exposure levels based on measuring concentrations in urine and hair at a single point in time. There were also numerous animal studies on the effects of thallium, but only four of the repeated-dose studies included more than one dose level. The most comprehensive of the available thallium studies in animals was a 90-day study in rats which was used as the basis of the screening level p-RfD (USEPA 2012c). Critical study quality limitations of this study include high background incidence of alopecia, lack of histopathological examination of skin tissue in low- and mid-dose groups, and inadequate examination of objective measures of neurotoxicity. The screening level p-RfD is based on hair follicle atrophy as the critical effect. This critical effect is intended to serve as an indicator of alopecia in humans resulting from thallium exposure. The NOAEL in this study was not determined with certainty due to the lack of histopathology in the lower dose groups. For these reasons, an uncertainty factor of 3,000 was applied when deriving the screening chronic p-RfD.

6.3 Uncertainties in Risk Characterization

Because risk estimates for a chemical are derived by combining uncertain estimates of exposure and toxicity (see above), the risk estimates for each chemical are more uncertain than either the exposure estimate or the toxicity estimate alone. The hazards and risks presented in this assessment are based on numerous and often conservative assumptions in an effort to be protective of human health. In the absence of definitive information, assumptions are used to ensure that actual site risks are not underestimated. The cumulative effect of these assumptions can result in an evaluation with an overall conservativeness greater than the individual components. Thus, it is important to note that the risks presented in this assessment are more likely to be overestimated rather than underestimated.

In order to incorporate feedback from USEPA Headquarters, be consistent with guidance, and increase transparency, this risk assessment will no longer use background concentrations as criteria for screening COPCs for targeted risk evaluation as was performed in the previous draft. High background concentrations that are either naturally occurring or attributable to non-Site related sources, such as other industrialized areas, may nevertheless contribute to collective risk at the Site and are thus appropriately included in the risk assessment. Although evaluation of background is an important consideration for risk management decisions, the risk assessment does not make remedial decisions but only documents risks associated with the site as consistent with USEPA guidance. USEPA will narrow the list of COPCs, considering background information, as the remedial investigation process continues.

The USEPA has developed a preferred approach for the consideration of background constituent concentrations of hazardous substances, pollutants, and contaminants in certain steps of the remedy selection process. USEPA does not require remedial action or further investigation of contaminants that are below background (non-site related) levels (USEPA 2002c). Quantitative evaluation of background contributions to risk estimates may be necessary when making risk management decisions. The purpose of the HHRA is to quantify potential Site-related risks to receptors within the currently defined study area. On this basis, risk estimates were generated based on the assumption that 100% of the detected contamination in Site samples is attributed to historical Mill operations. However, some of the estimated risk may be associated with COPC concentrations attributable to natural and/or anthropogenic non-point sources. Naturally occurring constituents are present in the environment in forms that have not been influenced by human activity. MDEQ (2005) notes that arsenic may occur naturally in Montana soils at levels above risk-based concentrations. Conversely, contaminants may also be present in the environment as a result of human activities not specifically related to the Site. Some contaminants detected in Site media may have both natural and non-Site related anthropogenic sources, in addition to contributions from historic Site activities. For instance, dioxins have multiple anthropogenic and natural point and non-point sources, making it difficult to evaluate whether concentrations at the Site are due to the bleaching process conducted as part of historical Mill operations, or other sources (e.g., forest fires, barrel trash burning, etc.).

Sources of background information relevant to OU2 include the MDEQ soil background studies on dioxins/furans and metals (MDEQ 2011, 2013), as well as available groundwater data collected from monitoring wells located upgradient from any potential Site contamination[17]. Evaluation of these data as part of ongoing RI activities may provide risk managers with a better understanding of the predicted risks presented in this assessment. For example, concentrations of arsenic and chromium within OU2 groundwater generally fall within the range of arsenic and chromium concentrations measured in samples collected from wells located along the eastern edge of the current Site boundary[18]. Whereas manganese concentrations detected in OU2 groundwater appear much higher in OU2 wells by comparison to upgradient wells.

[17] These data are included in the Scribe database for the Site.
[18] Based on a qualitative comparison of data collected from monitoring wells located on the upgradient side of the Site that are included in the Site-specific Scribe database.

7.0 SUMMARY AND CONCLUSIONS

Multiple investigations performed at the Site have produced data for characterizing exposures to Site-related COPCs and associated risks to potential human receptors within OU2. This HHRA assesses potential risks to hypothetical future residents, commercial/industrial workers and construction workers based on current Site conditions. Risk characterization used exposure data for OU2 soils and groundwater from wells within the OU2 boundary. Predicted risks were calculated as non-cancer hazards (HIs and HQs) and excess cancer risk.

As described in this HHRA, risks to potential human receptors from exposures to OU2 soils are below USEPA's health guidelines (HI ≤ 1E+00, Cancer Risk <1E-04[19]) in all exposure areas for all potential receptors with the exception of a hypothetical future resident exposed to surface soils in grid 8 via incidental ingestion. Cancer risk in grid 8 for a hypothetical future resident is estimated as 2E-04 based primarily on incidental ingestion of chromium evaluated as Cr(VI). Cancer risk in grid 12 for a hypothetical future resident is estimated at 1E-04, also primarily based on incidental ingestion of chromium evaluated as Cr(VI). However, associated uncertainties stem from a lack of information on the ratio of the more toxic, hexavalent form of chromium that is present within Site soils. Based on these uncertainties, chromium risks are likely overestimated in this assessment, but the magnitude of overestimation is unknown.

Elevated levels of manganese, and to a lesser extent arsenic, in groundwater may contribute to risks above a level of concern for hypothetical future residents who consume Site groundwater as drinking water. Non-cancer hazards for these COPCs exceeded USEPA's health guideline (1E+00) for the RME hypothetical future resident in four wells (NFMW13, NFMW15, NFMW6, and the log chipper well) and for the CTE hypothetical future resident in NFMW15 and the log chipper well. Cobalt and iron also contribute to non-cancer hazards above 1E+00 in the log chipper well). The highest risks were associated with drinking groundwater from the log chipper well. Arsenic contributed to a cancer risk >1E-04 in this well. Additionally, the non-cancer hazards for the RME hypothetical future commercial/industrial worker consuming groundwater from NFMW15 and the log chipper well were also above a level of concern (HI >1E+00). However, for the worker, non-cancer hazards based on the individual COPCs were all below a level of concern (HQs ≤ 1E+00). Cancer risk is predicted at 1E-04 in the log chipper well for the RME hypothetical future commercial/industrial worker attributed to arsenic.

Total combined risks from exposure to soil and groundwater are primarily driven by exposures to groundwater; risks from exposures to OU2 soils do not contribute significantly to total combined

[19] Cancer risks to a hypothetical future resident exceed MDEQ's cancer risk threshold of 1E-05 in all grids.

risk with the exception of cancer risk associated with chromium in soil in Grids 8 and 12 for the hypothetical future resident.

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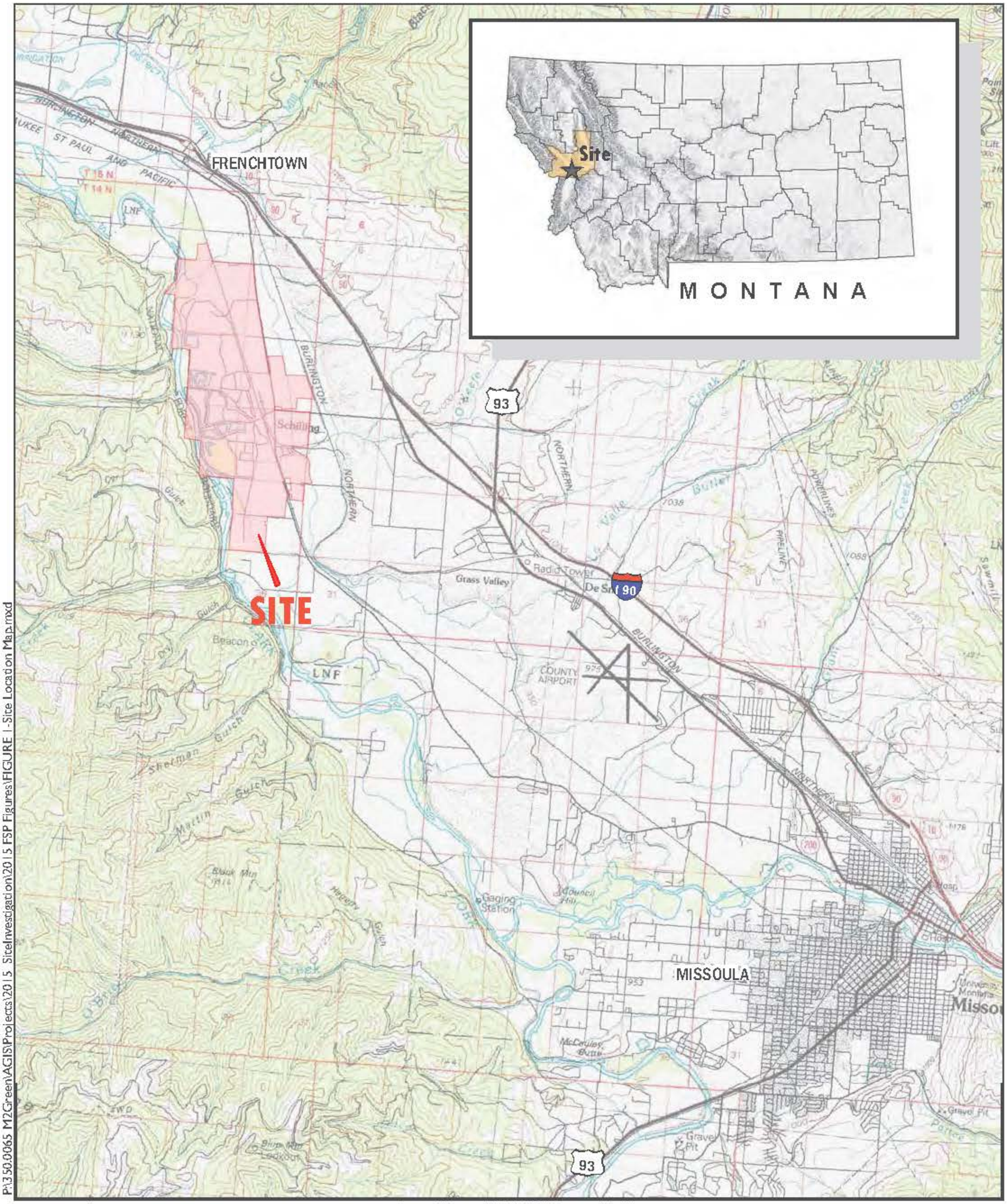
FIGURES

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment



Source: Montana USGS 100K Topographic Map

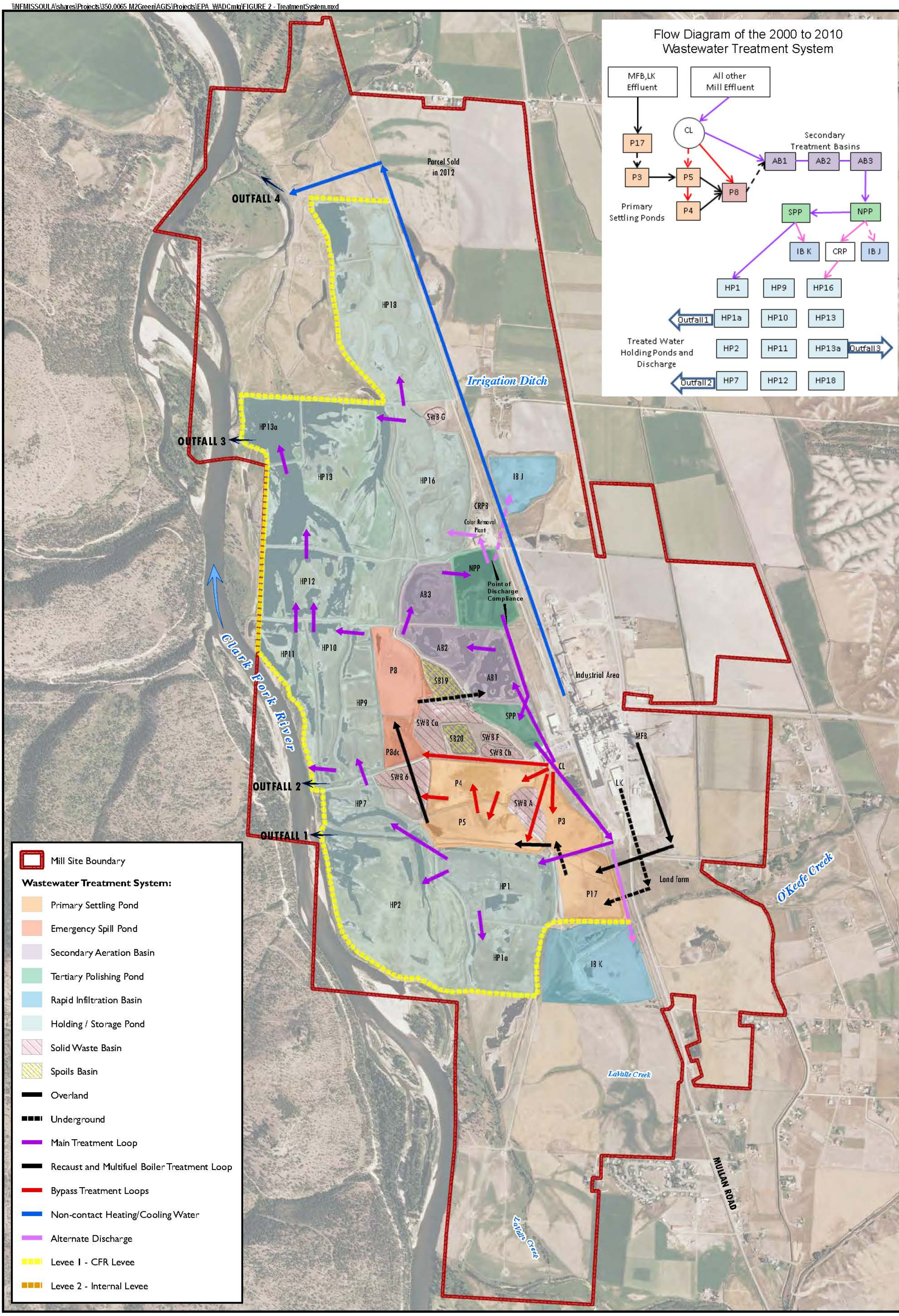
0 Feet 10,000

NewFields

Site Location Map
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2-1

P:\350.0065 M2Green\AGIS\Projects\2015 SiteInvestigation\2015 FSP Figures\FIGURE 1-Site Location Map.mxd

\\NFMISSOULA\shares\Projects\350.0065 M2Green\AGIS\Projects\EPA_WADCmtg\FIGURE 2 - TreatmentSystem.mxd



Aerial Photo Source: NAIP 2011

0 1,600 Feet

NewFields

Wastewater Treatment System Overview from 2000 through 2010.

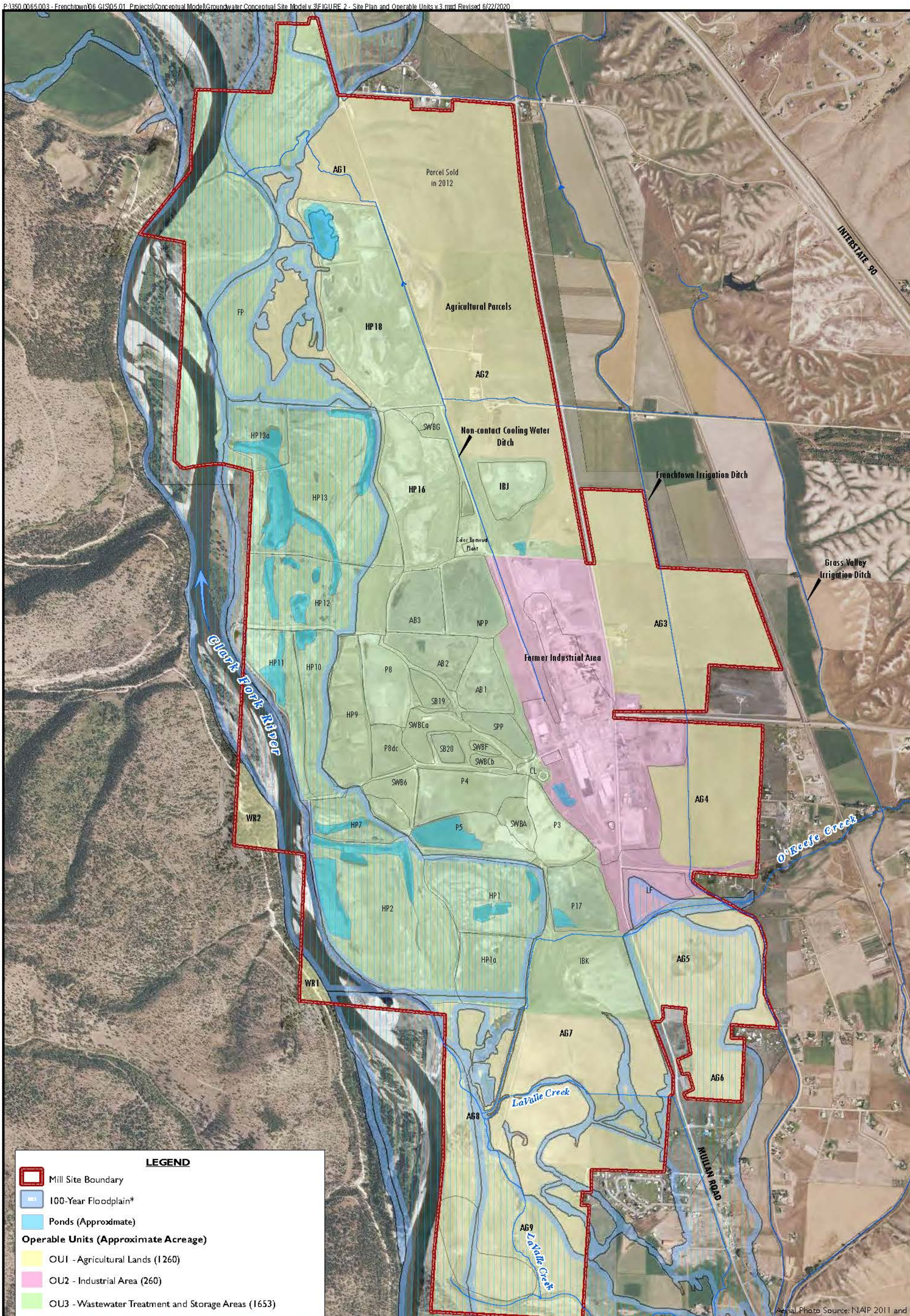
Notes

AB - Aeration Stabilization Basin
CL - Clarifier
CRPB - Color Removal Plant Basin
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LK - Lime Kiln
MFB - Multifuel Boiler
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin

Schematic of 2000 - 2010
Wastewater Treatment System
Former Frenchtown Mill Site
Missoula County, Montana

Figure 2-2

P:\350.0065.003 - Frenchtown\06 GIS\05.01 Projects\Conceptual Model\Groundwater Conceptual Site Model v.3\FIGURE 2 - Site Plan and Operable Units v.3.mxd Revised 6/22/2020



N

0 Feet 1,600

NewFields

***Floodplain Source:**

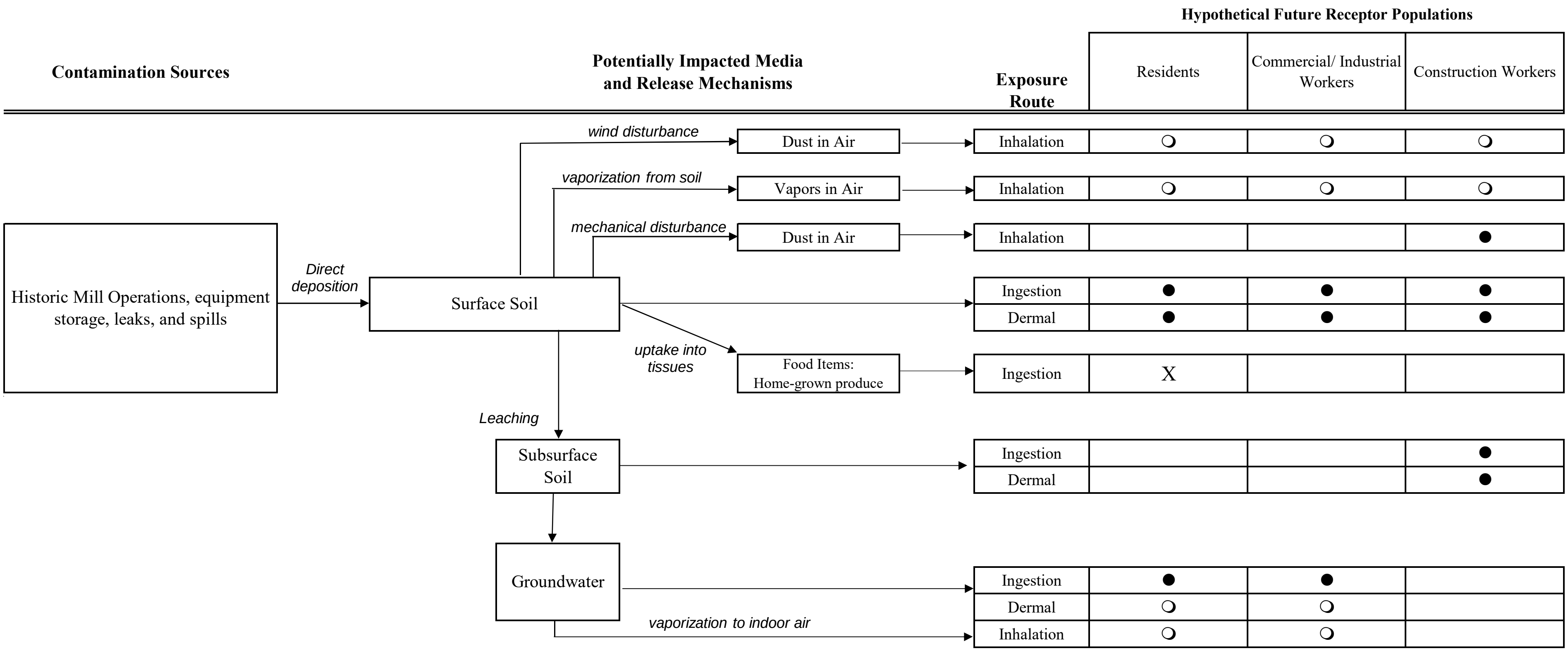
As defined by the Federal Emergency Management Agency (FEMA) 2013 Digital Flood Insurance Rate Map (DFIRM). (NFIP 2013)

Notes

AG - Agricultural Land
AB - Aeration Stabilization Basin
CFR - Clark Fork River
CL - Clarifier
FP - Floodplain
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
LF - Land Farm
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

ap of Operable Units
Smurfit-Stone/Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2-3
(Figure adapted from NewFields 2020)

Figure 3-1. Conceptual Site Model for Human Exposure at OU2



LEGEND

●	Pathway is complete and might be significant; quantitative evaluation.
❍	Pathway is complete, but is relatively minor; semi-quantitative evaluation.
	Pathway is not complete; no evaluation required.

Notes:

[1] Future land use is expected to be consistent with current and past use (i.e., commercial/industrial), but OU2 is evaluated for potential hypothetical residential development also.

Figure 3-2. Surface Soil Sampling Locations in OU2

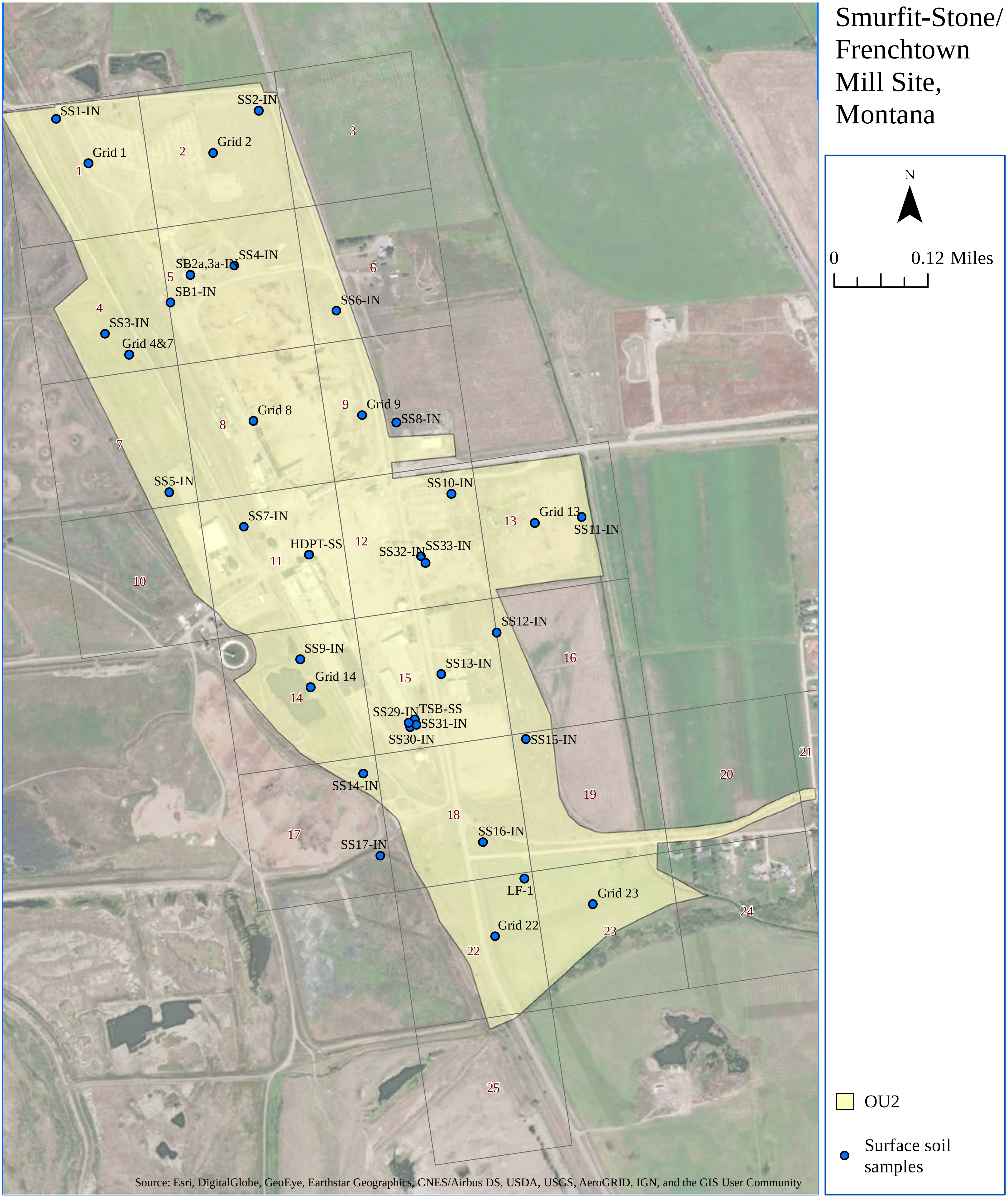
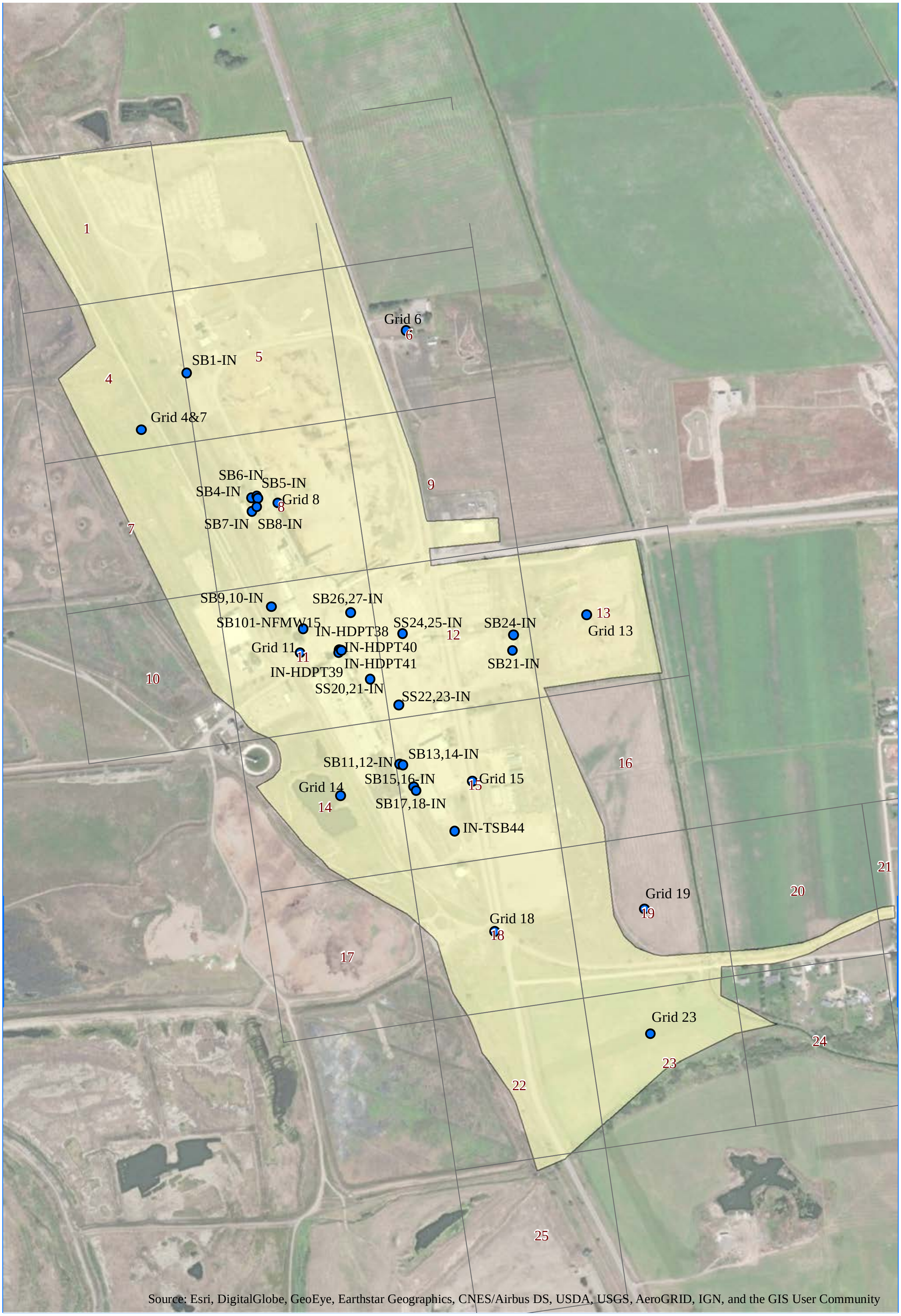


Figure 3-3. Subsurface Soil Sampling Locations in OU2



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.12 Miles

OU2

Subsurface soil samples

Figure 3-4. Groundwater Wells Evaluated in OU2

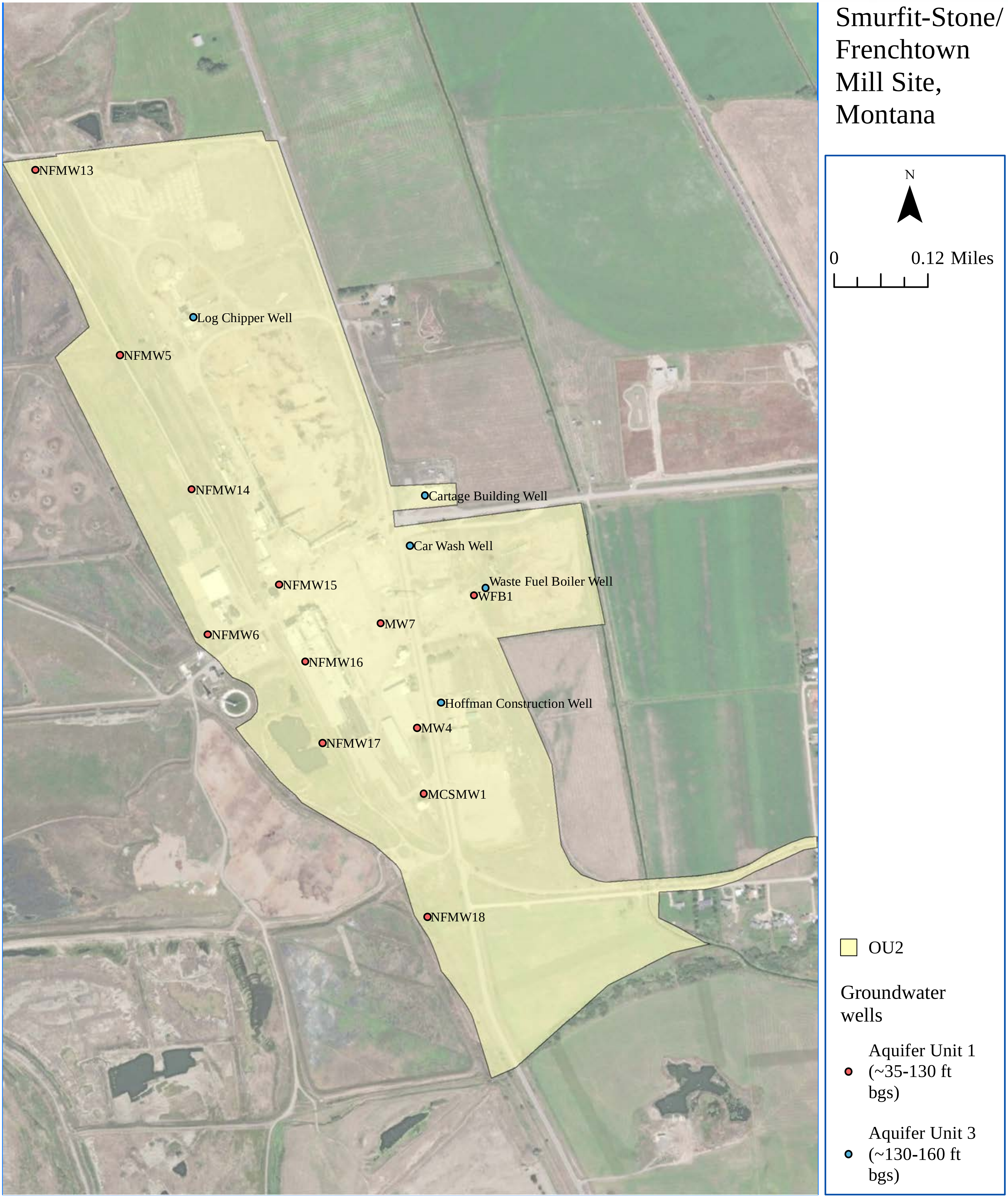
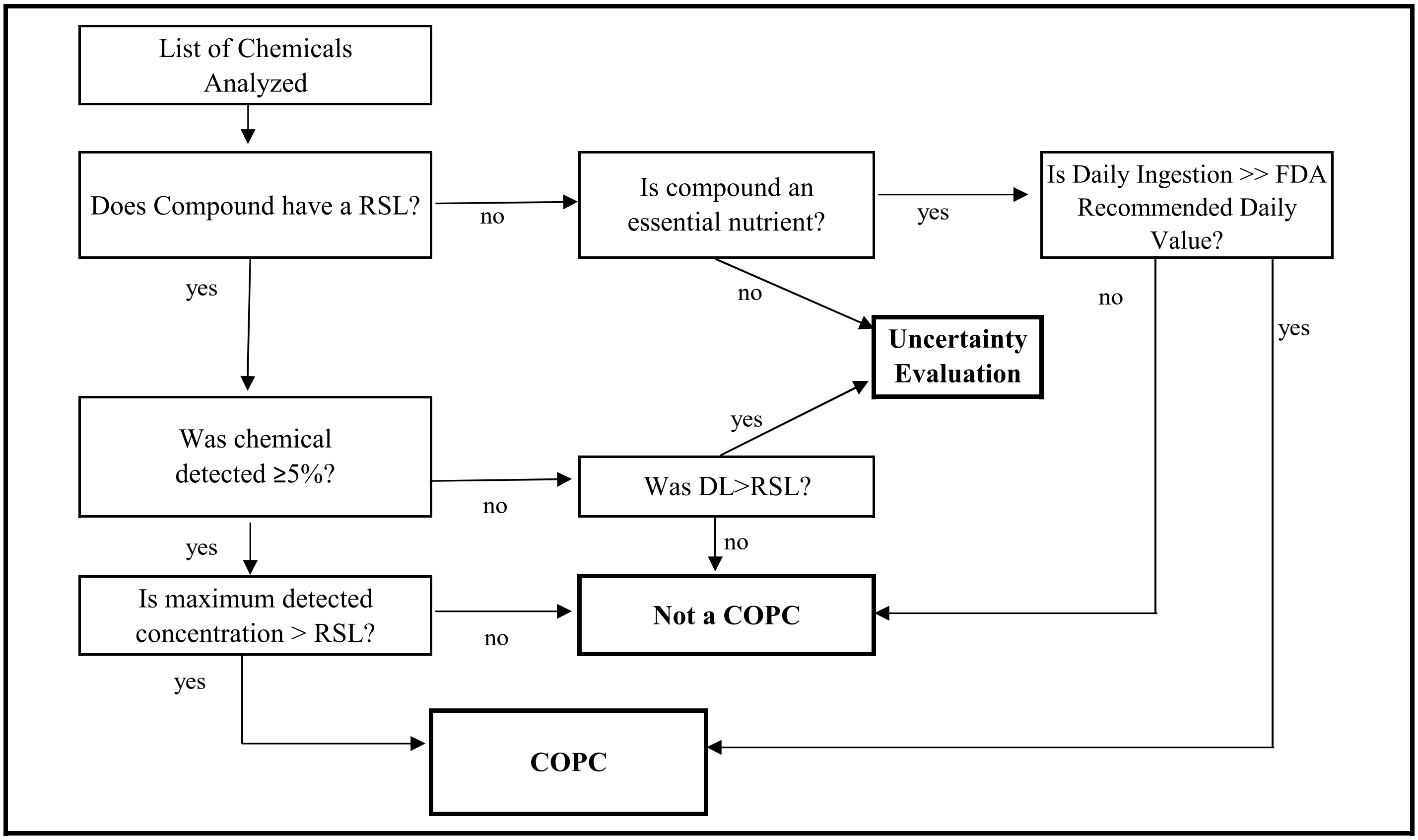


Figure 3-5. COPC Selection Procedure for Human Health



Notes:

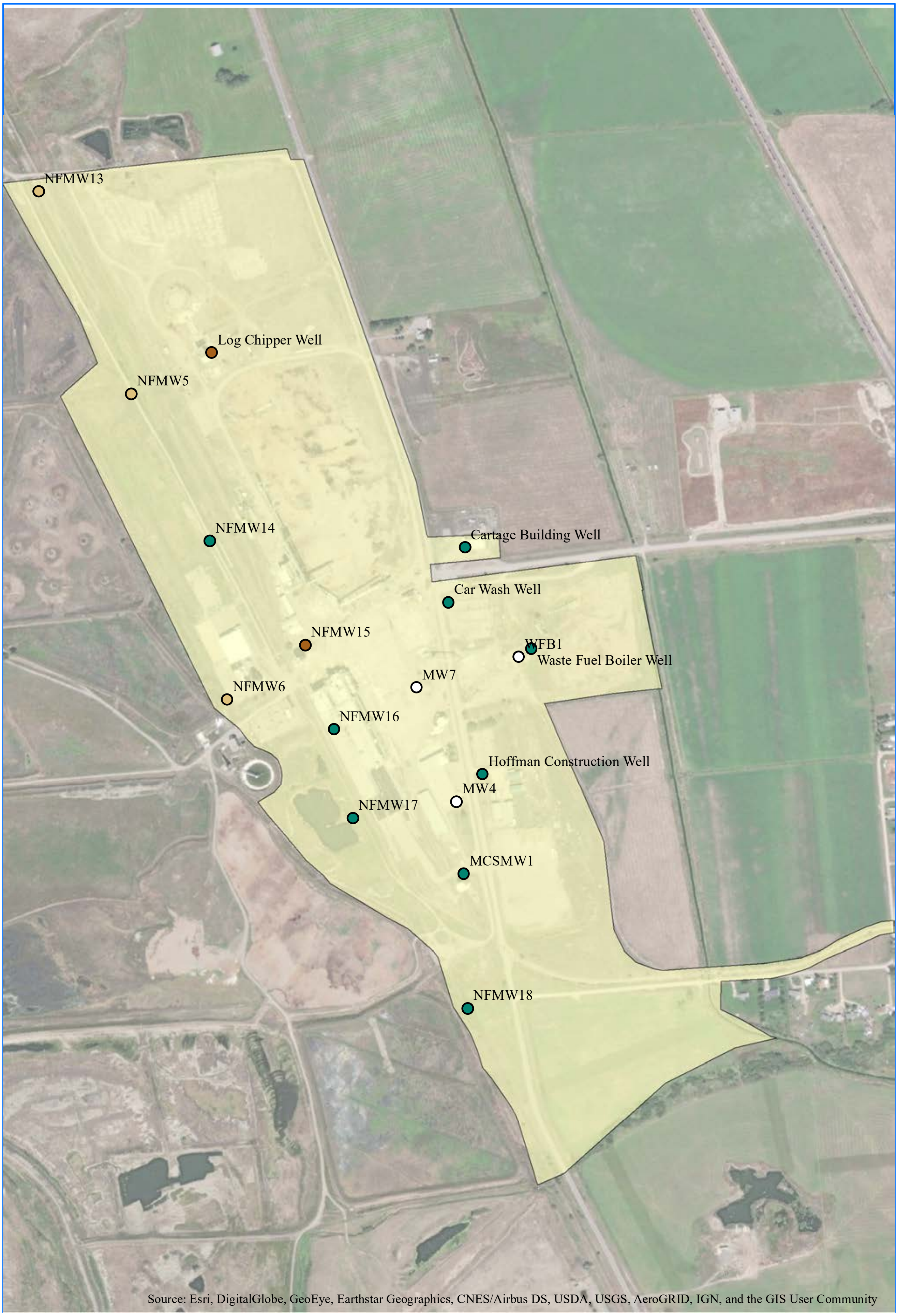
RSL = USEPA's risk-based Regional Screening Level (HQ = 0.1, Cancer risk = 1E-06)

COPC = chemical of potential concern

DL = detection limit

FDA = Food and Drug Administration

Figure 5-1. Total Non-Cancer Hazards to Hypothetical Future Residents from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.12 Miles

Total Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- *
- OU2

*These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

Note: This is reflective of the RME receptor.

Figure 5-2. Arsenic Hazard Quotients for the Hypothetical Future RME Resident from Exposure to Groundwater

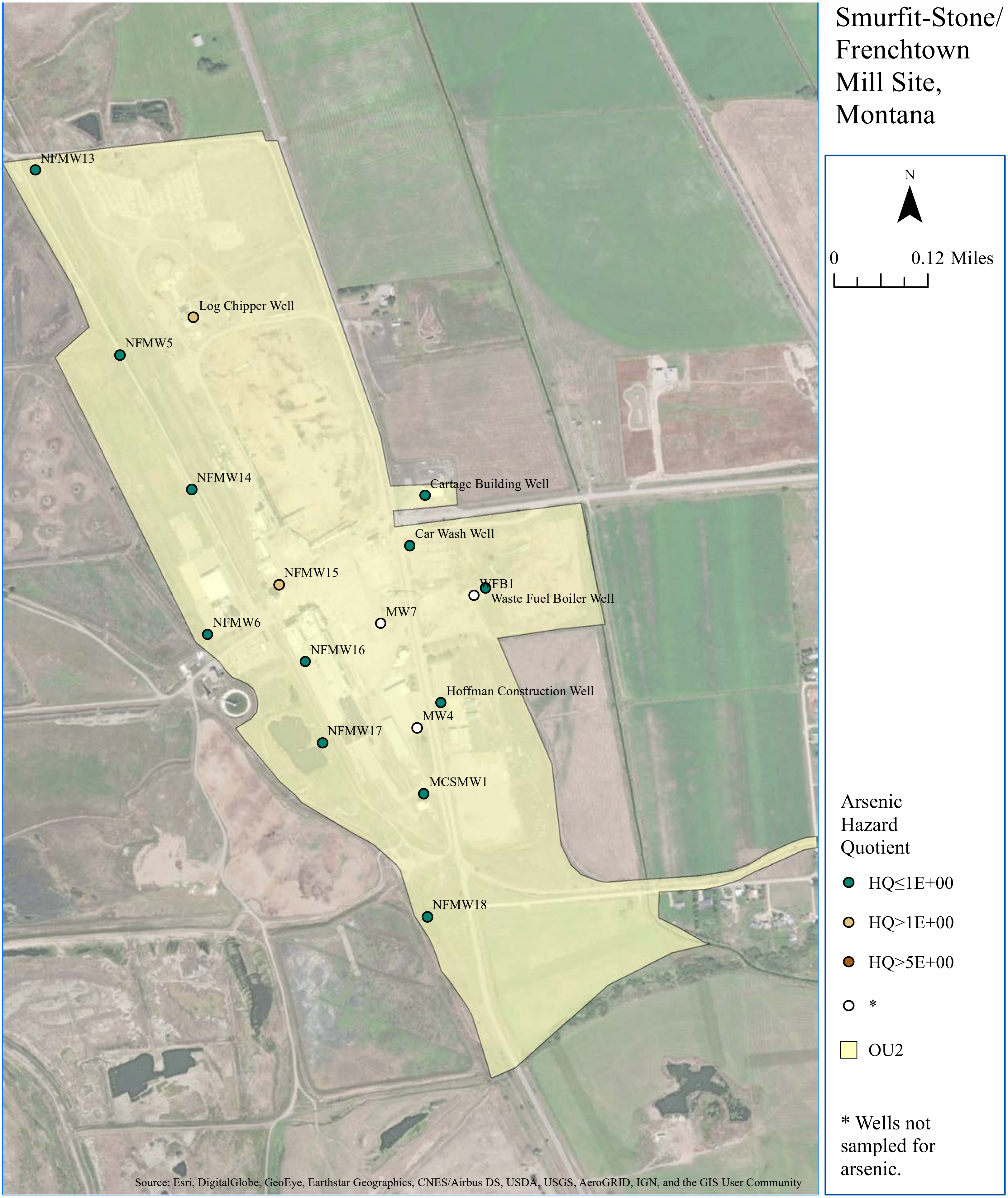


Figure 5-3. Manganese Hazard Quotients for the Hypothetical Future RME Resident from Exposure to Groundwater

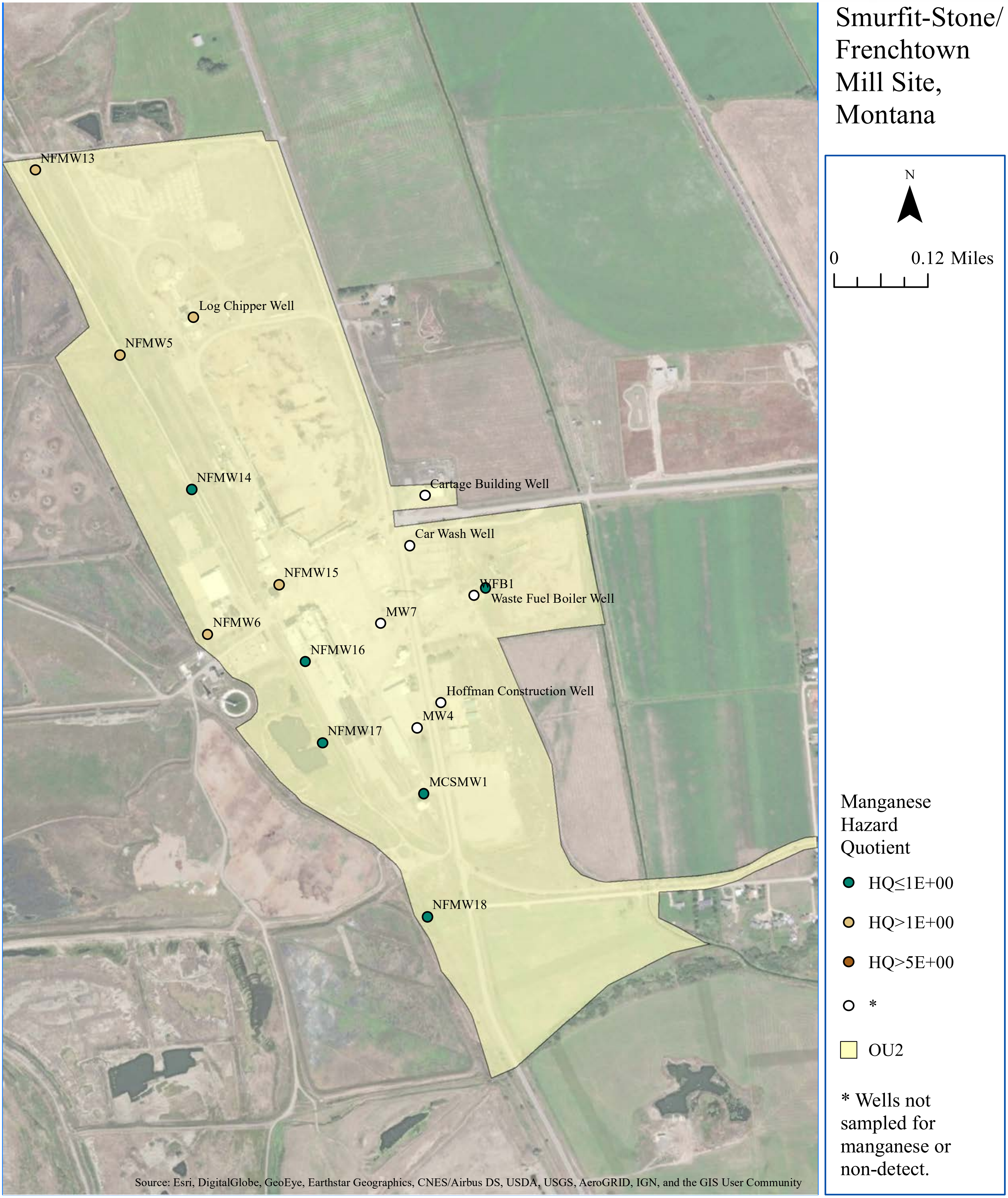
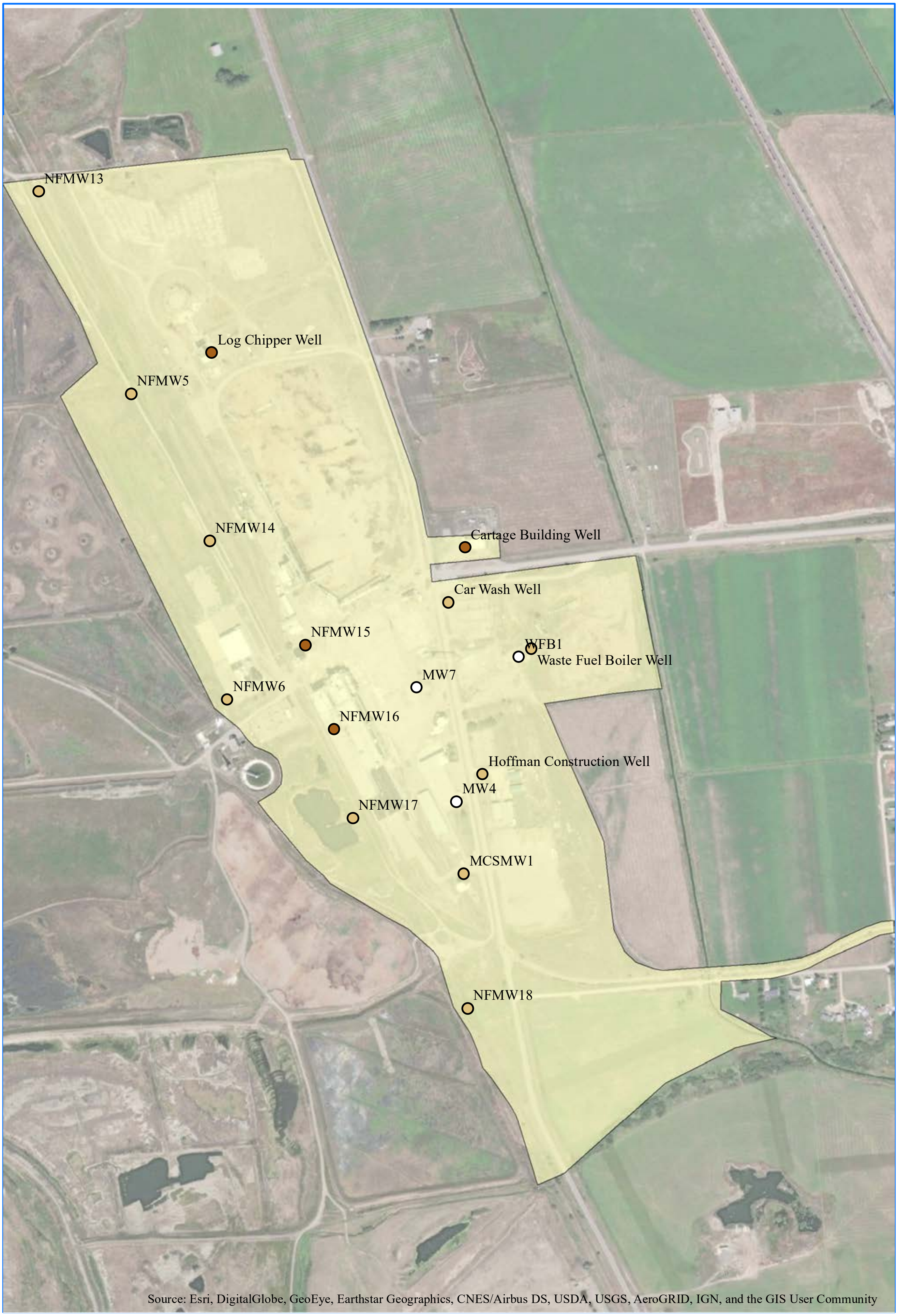


Figure 5-4. Total Cancer Risks to Hypothetical Future Residents from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.12 Miles

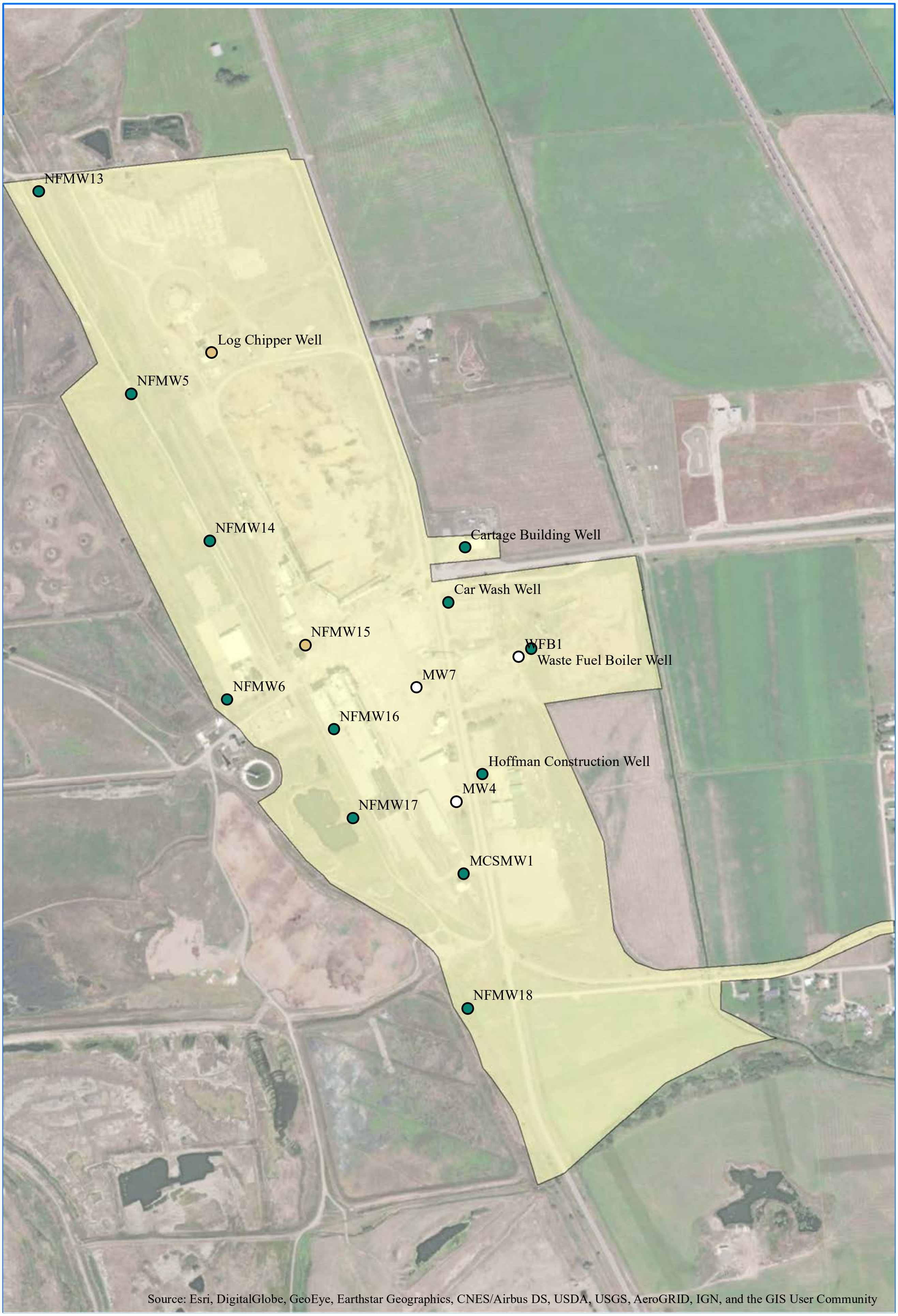
Total Cancer Risk

- Risk<1E-06
- Risk≥1E-06
- Risk≥1E-05
- Risk≥1E-04
- *
- OU2

* These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

Note: This is reflective of the RME receptor.

Figure 5-5. Total Non-Cancer Hazards to Hypothetical Future Workers from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.12 Miles

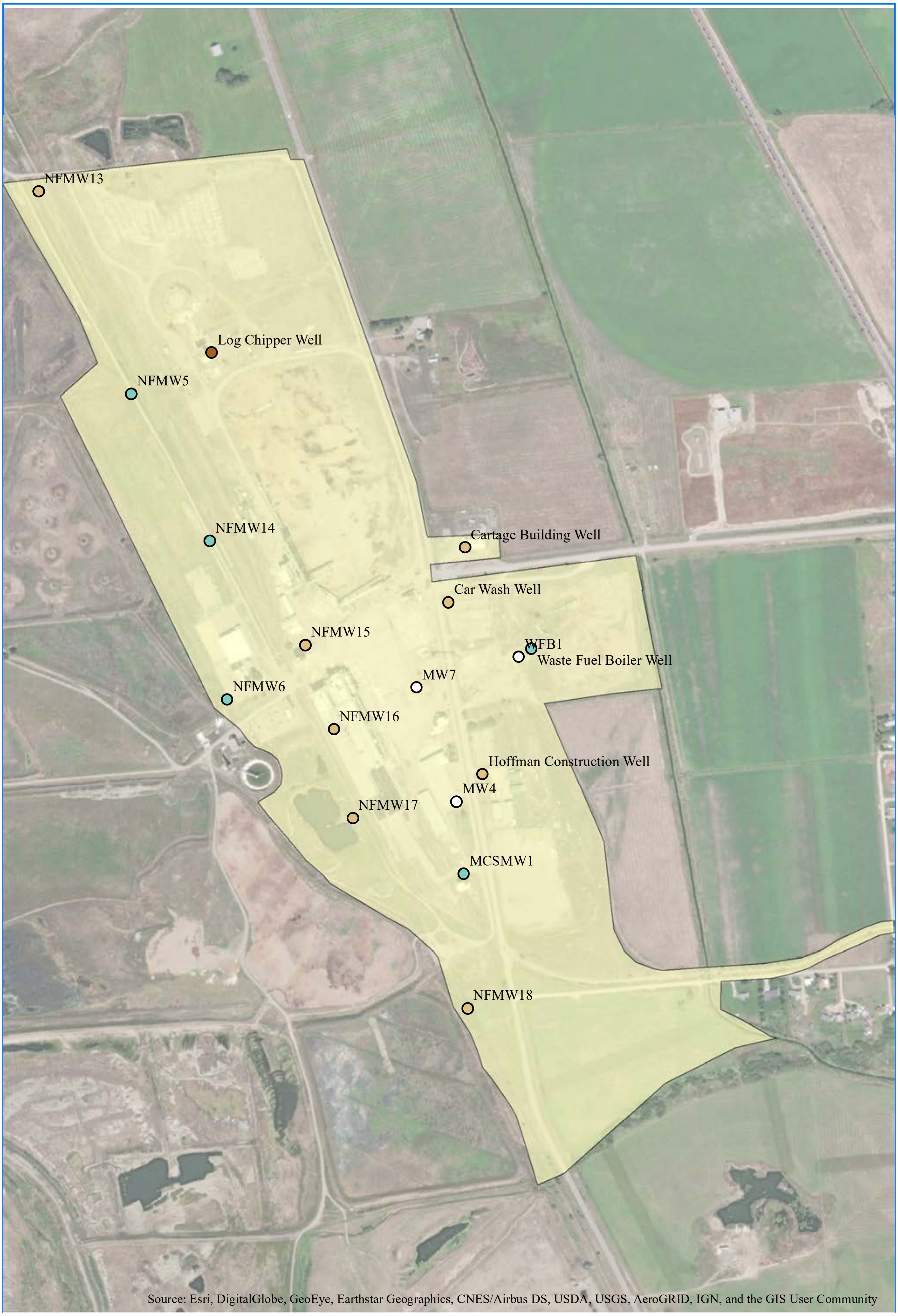
Total Non-Cancer Hazard Index

- HI≤1E+00
- HI>1E+00
- HI>5E+00
- *
- OU2

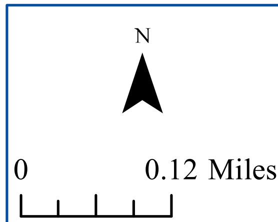
*These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

Note: This is reflective of the RME receptor.

Figure 5-6. Total Cancer Risks to Hypothetical Future Workers from Exposures to Groundwater



Smurfit-Stone/ Frenchtown Mill Site, Montana



Total Cancer Risk

- Risk<1E-06
- Risk≥1E-06
- Risk≥1E-05
- Risk≥1E-04
- *
- OU2

*These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

Note: This is reflective of the RME receptor.

Figure 5-7.Total Non-Cancer Hazards to Hypothetical Future Residents from Combined Exposures to Soil and Groundwater (Based on Grid-Specific Soil HI)

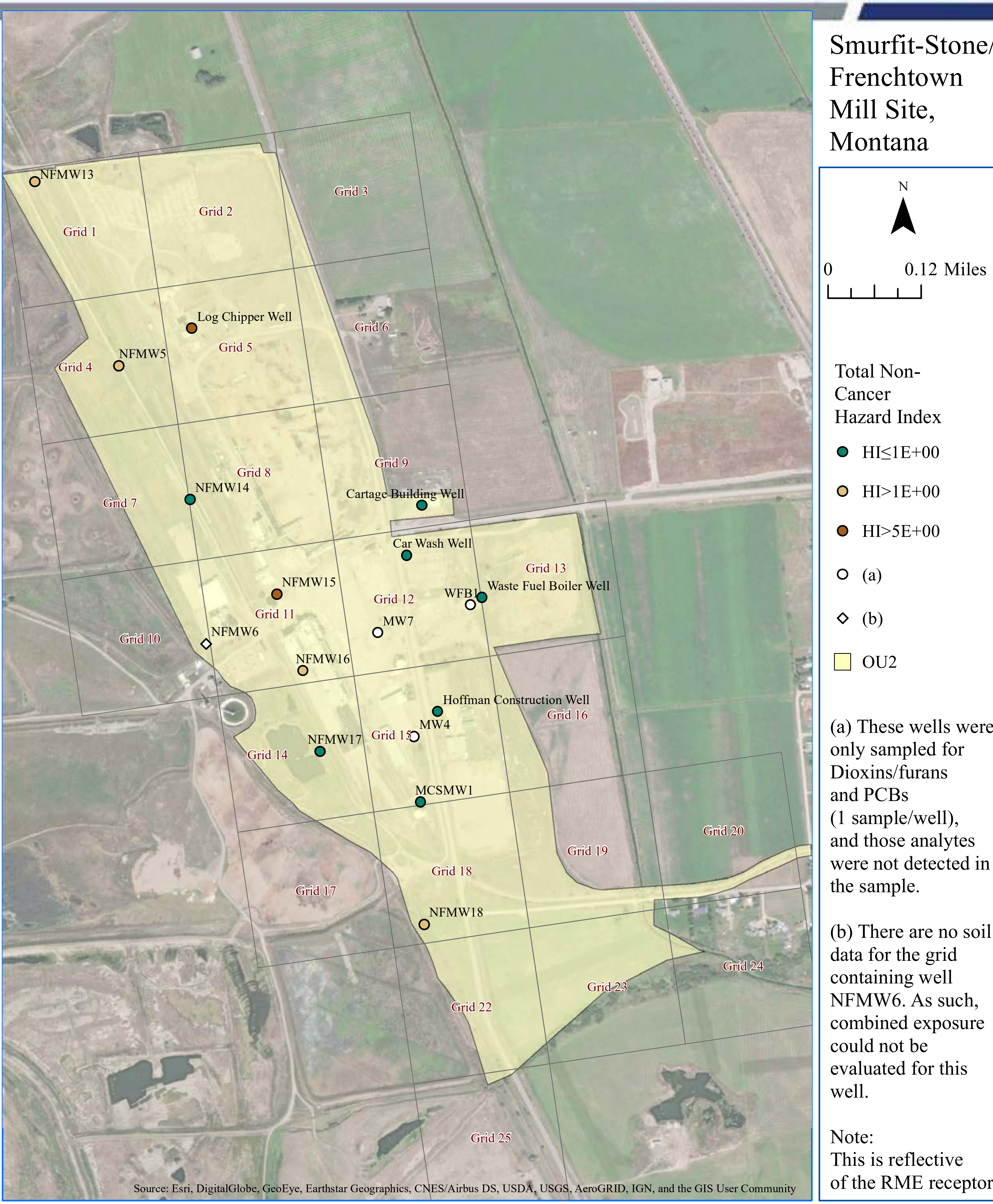
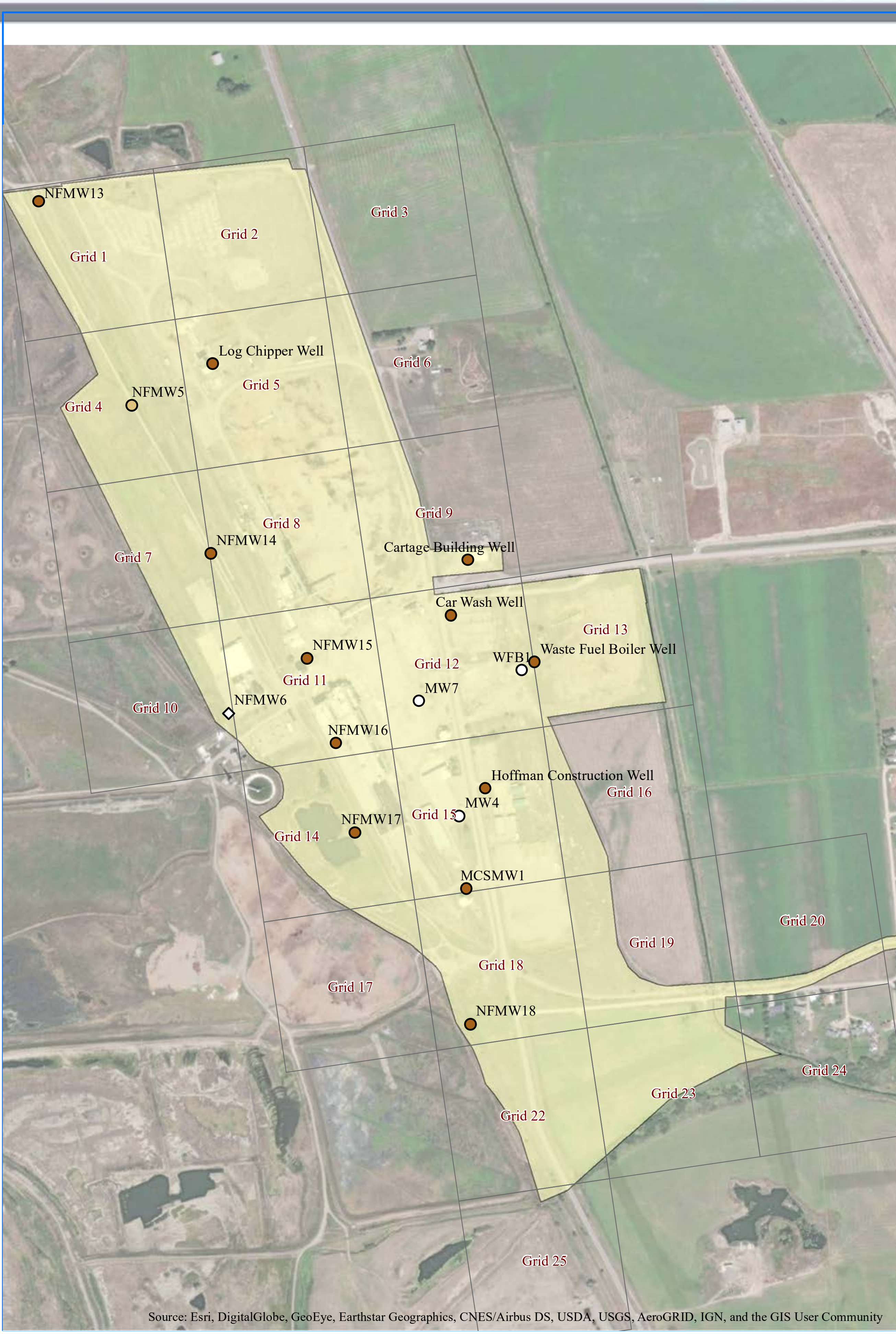


Figure 5-8.Total Cancer Risks to Hypothetical Future Residents from Combined Exposures to Soil and Groundwater (Based on Grid-Specific Soil Cancer Risk)

Smurfit-Stone/ Frenchtown Mill Site, Montana



N

0 0.12 Miles

Total Cancer Risk

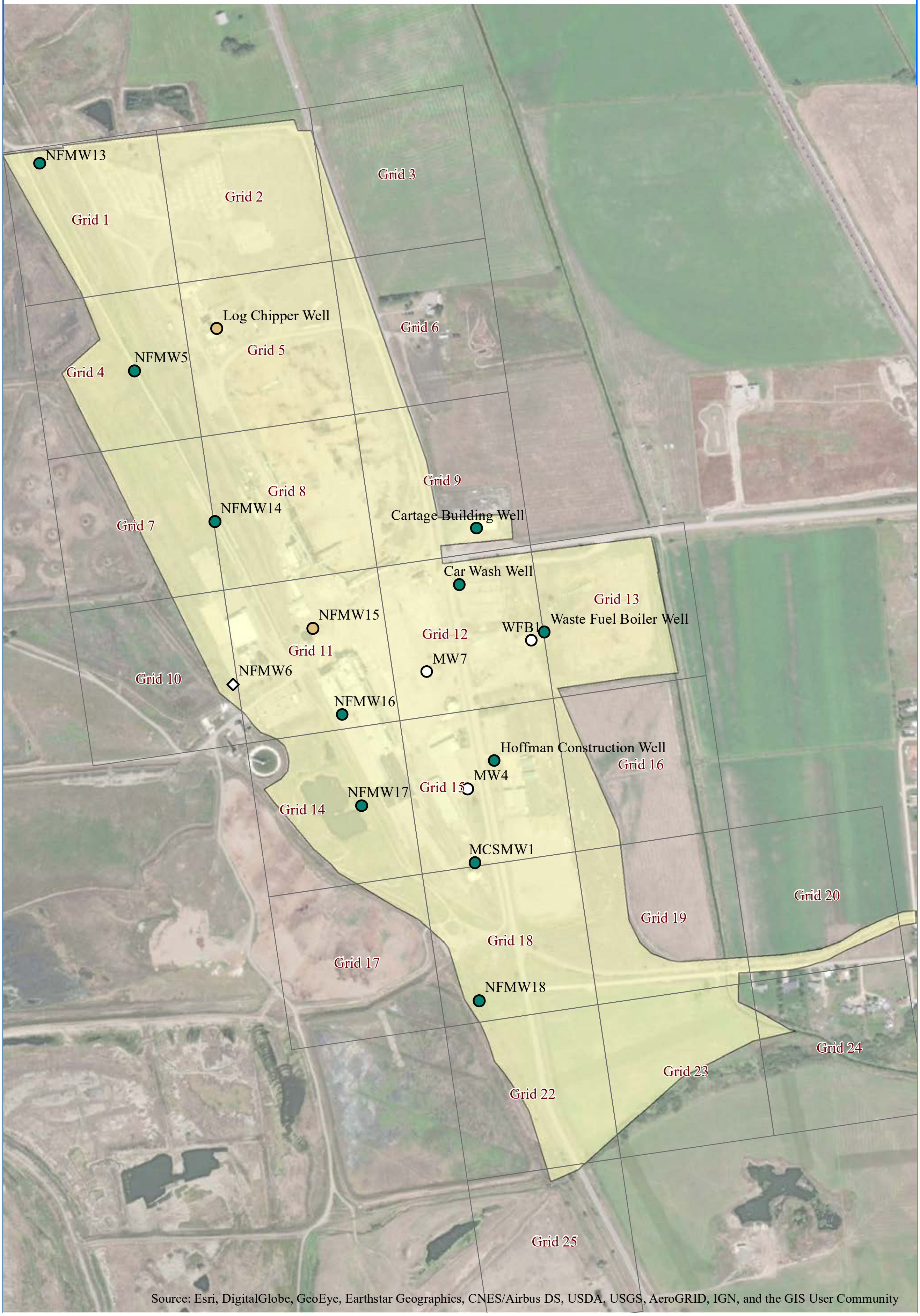
- Risk<1E-06
- Risk≥1E-06
- Risk≥1E-05
- Risk≥1E-04
- (a)
- (b)
- OU2

(a) These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

(b) There are no soil data for the grid containing well NFMW6. As such, combined exposure could not be evaluated for this well.

Notes:
This is reflective of the RME receptor.

Figure 5-9.Total Non-Cancer Hazards to Hypothetical Future Workers from Combined Exposures to Soil and Groundwater (Based on Grid-Specific Soil HI)



Smurfit-Stone/ Frenchtown Mill Site, Montana

N

0 0.12 Miles

Total Non-Cancer Hazard Index

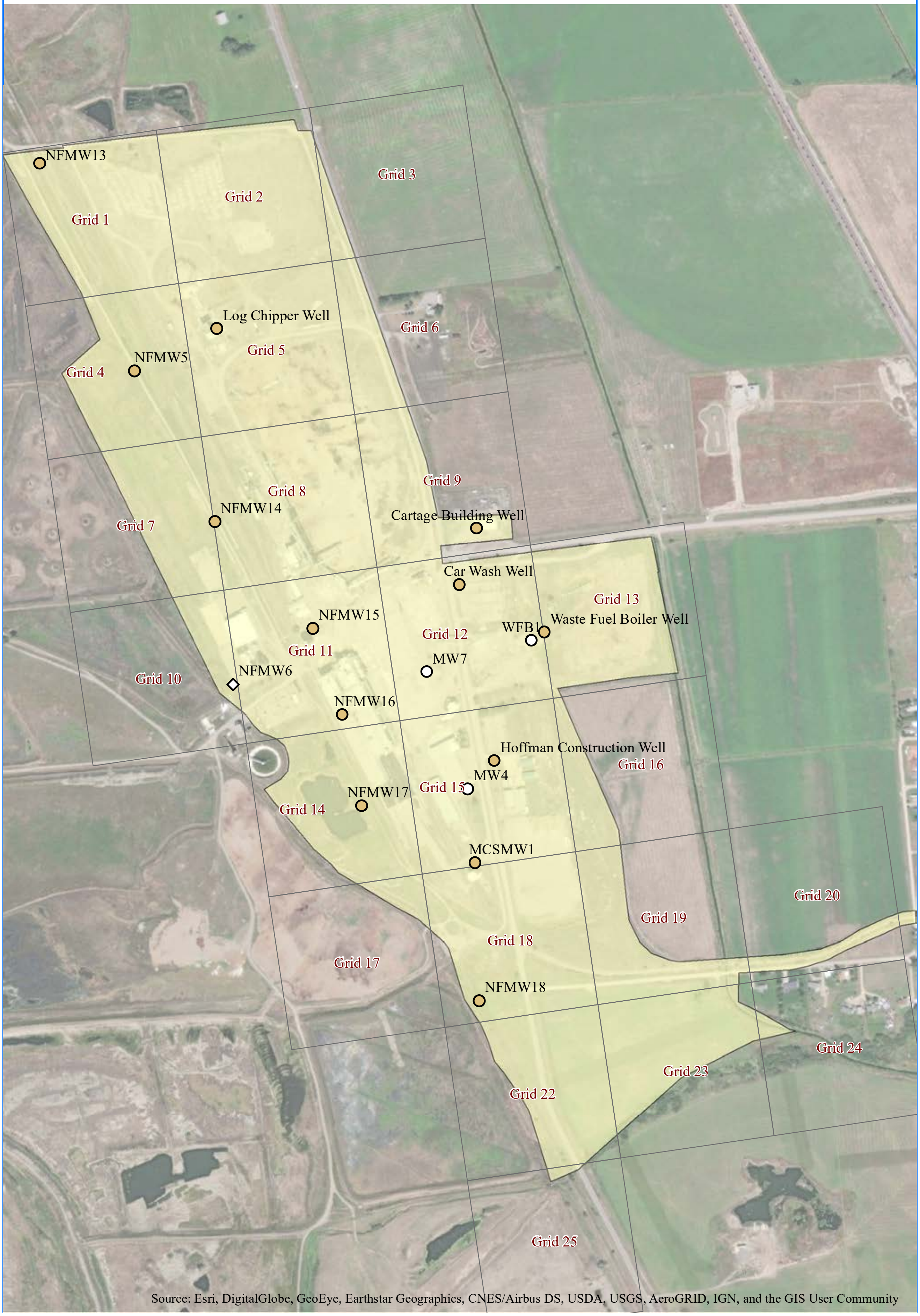
- HI≤1E+00
- HI>1E+00
- HI>5E+00
- (a)
- (b)
- OU2

(a) These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

(b) There are no soil data for the grid containing well NFMW6. As such, combined exposure could not be evaluated for this well.

Note:
This is reflective of the RME receptor.

Figure 5-10.Total Cancer Risks to Hypothetical Future Workers from Combined Exposures to Soil and Groundwater (Based on Grid-Specific Soil Cancer Risk)



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Smurfit-Stone/ Frenchtown Mill Site, Montana

(a) These wells were only sampled for Dioxins/furans and PCBs (1 sample/well), and those analytes were not detected in the sample.

(b) There are no soil data for the grid containing well NFMW6. As such, combined exposure could not be evaluated for this well.

Note:
This is reflective of the RME receptor.

TABLES

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

Table 3-1. Exposure Pathways Evaluated Quantitatively

Exposed Population	Exposure Pathways
Hypothetical future residents (adults and children age 0-6 years)	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Current/Hypothetical future commercial/industrial workers	• Incidental ingestion of surface soil • Dermal contact with surface soil • Ingestion of groundwater as drinking water
Hypothetical future construction workers	• Incidental ingestion of surface and subsurface soil • Dermal contact with surface and subsurface soil • Inhalation of soil particulates created by mechanical disturbances of surface soils

Table 3-2. Smurfit-Stone/Frenchtown Mill OU2 Data Summary

Media	Sample Date	Sample Description	Analysis
Surface Soil	April 2014	Surface (0-2.4 inches) soil sample (5-point composite) was collected from 1 location (n=1).	Aroclors, TAL metals, dioxins and furans.
	November/ December 2015	Surface soil samples (5-point composites) were collected from 0-2 inch and 1-2 inch depth intervals at 25 locations (n=25).	Aroclors (n=5), TAL metals (n=21), PAHs (n=19), VOCs (n=2), dioxins and furans (n=19).
	October 2017	20-point composite surface (0-6 inches) soil samples were collected from 9 grids (n=9).	Aroclors, PCB congeners, dioxins and furans, TAL metals, and TOC.
Subsurface Soil	November/ December 2015	Subsurface soil samples were collected from various depth intervals between 0 and 10 feet at 5 HDPT or TSB locations (n=40).	Aroclors (n=30), TAL metals (n=40), SVOCs (n=20), VOCs (n=40), dioxins and furans (n=11).
	August 2016	Subsurface (down to 10 feet) soil samples were collected from HDPT or TSB locations (n=19).	Aroclors
	October 2017	Subsurface (24-30 inches) soil samples were collected from 10 grids (n=10).	Aroclors, PCB congeners, dioxins and furans, TAL metals, and TOC.
Groundwater	April 2014	Three wells sampled (n=3).	Aroclors, total and dissolved TAL metals, dioxins and furans.
	December 2015	Eleven wells sampled (n=11). Two of the wells sampled in 2014 were also sampled during this event.	Aroclors, total and dissolved TAL metals, dioxins and furans, SVOCs, and VOCs.
	June 2016	Five wells sampled (n=5). All of the wells were previoulsy sampled in 2015.	Aroclors (n=4), dissolved TAL metals (n=5), dioxins and furans (n=4).
	July 2017	Eight wells sampled (n=8). All of the wells were previously sampled at least once before from 2014-2016.	Aroclors (n=4), total and dissolved TAL metals (n=8), dioxins and furans (n=7), SVOCs (n=4), and VOCs (n=4).
	June 2018	Eight wells sampled (n=8). Same wells that were previously sampled in 2017.	Aroclors (n=3), total and dissolved TAL metals (n=8), dioxins and furans (n=3), SVOCs (n=1), and VOCs (n=1).
	December 2018	Eight wells sampled (n=8). Same wells that were previously sampled in June 2018.	Aroclors (n=3), total and dissolved TAL metals (n=8), dioxins and furans (n=3), SVOCs (n=1), and VOCs (n=1).
	June 2019	Fourteen wells sampled (n=14). Same eight wells that were previously sampled in 2018 and six water supply wells that were sampled for the first time.	Total and dissolved TAL metals (n=14) and dioxins and furans (n=5).
	September 2019	Fourteen wells sampled (n=14). Same wells that were previously sampled in June 2019.	Total and dissolved TAL metals (n=14) and dioxins and furans (n=5).
	June 2019	Nine wells sampled (n=9). Same wells sampled in 2017 and 2018 as well as the waste fuel boiler well.	Total and dissolved TAL metals (n=9) and dioxins and furans (n=5).
	September 2019	Nine wells sampled (n=9). Same wells that were previously sampled in June.	Total and dissolved TAL metals (n=9) and dioxins and furans (n=5).
	June 2020	Nine wells sampled (n=9). Same wells sampled in 2019.	Total and dissolved TAL metals (n=9) and dioxins and furans (n=5).
	September 2020	Nine wells sampled (n=9). Same wells that were previously sampled in June.	Total and dissolved TAL metals (n=9) and dioxins and furans (n=5).

HDPT = High Density Pulp Tank; TSB = Transformer Storage Building; TAL = Total Analyte List; PAH = Polyaromatic Hydrocarbons; VOC = Volatile Organic Compounds; SVOC = Semi-volatile Organic Compounds; PCB = Polychlorinated Biphenyls

Table 3-3. Summary of OU2 Groundwater Data

Well ID	Sample Date	Sample Number	Analysis					
			Total Metals	Dissolved Metals	Dioxins/Furans	PCBs	SVOCs	VOCs
MCSMW1	4/15/2014	MCSMW-1_4/15/14_NM	X	X	X	X		
MW4	12/11/2015	MW4_20151211_NM		X	X	X	X	X
MW7	12/14/2015	MW7_20151214_NM		X	X	X	X	X
WFB1	12/21/2015	WFB1_20151221_NM		X	X	X	X	X
NFMW13	12/10/2015	NFMW13_20151210_NM		X	X	X	X	X
	6/2/2016	NFMW13_20160602_NM		X	X	X		
	7/5/2017	NFMW13_20170705_NM	X	X	X			
	12/15/2017	NFMW13_20171215_NM	X	X	X			
	6/19/2018	NFMW13_20180619_NM	X	X				
	12/15/2018	NFMW-13_20181215_NM	X	X				
	6/14/2019	NFMW13_20190614_NM	X	X				
	9/26/2019	NFMW13_20190926_NM	X	X				
	6/10/2020	NFMW13_20200610_NM	X	X				
	9/28/2020	NFMW13_20200928_NM	X	X				
NFMW14	12/10/2015	NFMW14_20151210_NM		X	X	X	X	X
	7/12/2017	NFMW14_20170712_NM	X	X	X			
	12/10/2017	NFMW14_20171210_NM	X	X	X			
	6/20/2018	NFMW14_20180620_NM	X	X				
	12/16/2018	NFMW-14_20181216_NM	X	X				
	6/23/2019	NFMW14_20190623_NM	X	X				
	9/26/2019	NFMW14_20190926_NM	X	X				
	6/10/2020	NFMW14_20200610_NM	X	X	X			
	9/24/2020	NFMW14_20200924_NM	X	X	X			
NFMW15	12/10/2015	NFMW15_20151210_NM		X	X	X	X	X
	6/3/2016	NFMW15_20160603_NM		X	X	X		
	7/12/2017	NFMW15_20170712_NM	X	X	X	X	X	X
	12/18/2017	NFMW15_20171218_NM	X	X	X	X		
	6/20/2018	NFMW15_20180620_NM	X	X	X	X		
	12/16/2018	NFMW-15_20181216_NM	X	X	X	X		
	6/23/2019	NFMW15_20190623_NM	X	X	X	X		
	9/27/2019	NFMW15_20190927_NM	X	X	X	X		
	6/10/2020	NFMW15_20200610_NM	X	X				
	9/24/2020	NFMW15_20200924_NM	X	X				
NFMW16	12/11/2015	NFMW16_20151211_NM		X	X	X	X	X
	6/3/2016	NFMW16_20160603_NM		X	X	X		
	7/13/2017	NFMW16_20170713_NM	X	X	X	X	X	X
	12/18/2017	NFMW16_20171218_NM	X	X	X	X		
	7/13/2017	NFMW16_2017713_NM	X	X	X	X	X	X
	6/20/2018	NFMW16_20180620_NM	X	X	X			
	12/16/2018	NFMW-16_20181216_NM	X	X	X			
	6/23/2019	NFMW16_20190623_NM	X	X	X			
	9/27/2019	NFMW16_20190927_NM	X	X	X			
	6/10/2020	NFMW16_20200610_NM	X	X	X			
	9/24/2020	NFMW16_20200924_NM	X	X	X			
NFMW17	12/11/2015	NFMW17_20151211_NM		X	X	X	X	X
	7/12/2017	NFMW17_20170712_NM	X	X	X	X	X	X
	12/18/2017	NFMW17_20171218_NM	X	X	X	X		
	6/20/2018	NFMW17_20180620_NM	X	X		X		
	12/16/2018	NFMW-17_20181216_NM	X	X		X		
	6/23/2019	NFMW17_20190623_NM	X	X		X		
	9/27/2019	NFMW17_20190927_NM	X	X		X		
	6/10/2020	NFMW17_20200610_NM	X	X	X			
	9/24/2020	NFMW17_20200924_NM	X	X	X			
NFMW18	12/21/2015	NFMW18_20151221_NM		X	X	X	X	X
	6/3/2016	NFMW18_20160603_NM		X				
	7/7/2017	NFMW18_20170707_NM	X	X				
	1/25/2018	NFMW18_20180125_NM	X	X				
	6/14/2018	NFMW18_20180614_NM	X	X			X	X
	12/5/2018	NFMW-18_20181205_NM	X	X			X	X
	6/21/2019	NFMW18_20190621_NM	X	X			X	X
	9/27/2019	NFMW18_20190927_NM	X	X				
	6/10/2020	NFMW18_20200609_NM	X	X	X			
	9/24/2020	NFMW18_20200924_NM	X	X	X			

Table 3-3. Summary of OU2 Groundwater Data

Well ID	Sample Date	Sample Number	Analysis					
			Total Metals	Dissolved Metals	Dioxins/Furans	PCBs	SVOCs	VOCs
NFMW5	4/15/2014	NFMW-5_4/15/14_NM	X	X	X	X		
	12/10/2015	NFMW5_20151210_NM		X	X	X	X	X
	6/2/2016	NFMW5_20160602_NM		X	X	X		
	7/11/2017	NFMW5_20170711_NM	X	X	X		X	X
	12/15/2017	NFMW5_20171215_NM	X	X	X			
	6/20/2018	NFMW5_20180620_NM	X	X				
	12/16/2018	NFMW-5_20181216_NM	X	X				
	6/23/2019	NFMW5_20190623_NM	X	X				
	9/25/2019	NFMW5_20190925_NM	X	X				
	6/10/2020	NFMW5_20200610_NM	X	X				
	9/28/2020	NFMW5_20200928_NM	X	X				
NFMW6	4/15/2014	NFMW-6_4/15/14_NM	X	X	X	X		
	12/18/2015	NFMW6_20151218_NM		X	X			
	7/12/2017	NFMW6_20170712_NM	X	X	X	X		
	12/20/2017	NFMW6_20171220_NM	X	X	X	X		
	6/14/2018	NFMW6_20180614_NM	X	X	X	X		
	12/10/2018	NFMW-6_20181210_NM	X	X	X	X		
	6/23/2019	NFMW6_20190623_NM	X	X	X	X		
	9/26/2019	NFMW6_20190926_NM	X	X	X	X		
	6/11/2020	NFMW6_20200611_NM	X	X				
	9/30/2020	NFMW6_20200930_NM	X	X				
Car Wash Well	6/25/2019	CAR WASH WELL_20190625_NM	X	X				
Cartridge Building Well	6/25/2019	CARTAGE BUILDING WELL_20190625_NM	X	X				
Hoffman Construction Well	6/25/2019	HOFFCONWELL_20190625_NM	X	X				
Log Chipper Well	6/26/2019	LOG CHIPPER WELL_20190626_NM	X	X				
Waste Fuel Boiler Well	6/25/2019	WFBW_20190625_NM	X	X	X			
	6/16/2020	WFBW_20200616_NM	X	X	X			
	9/28/2020	WFBW_20200928_NM	X	X	X			

PCBs = polychlorinated biphenyls; SVOCs = semi-volatile organic compounds; VOCs = volatile organic compounds.

Table 3-4. OU2 Surface Soil Summary Statistics[a]

Analysis	Contaminant	N Samples	N Detect	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{(D/F)}$ (ND=0)	31	31	100	5.11E-06	6.39E-06	2.53E-05	--
	$TEQ_{(D/F)}$ (ND=1/2DL)	31	31	100	5.31E-06	6.27E-06	2.53E-05	--
	$TEQ_{(D/F/PCB)}$ (ND=0)	9	9	100	1.74E-05	1.41E-05	4.20E-05	--
	$TEQ_{(D/F/PCB)}$(ND=1/2DL)	9	9	100	1.74E-05	1.41E-05	4.20E-05	--
	$TEQ_{(PCB)}$ (ND=0)	9	9	100	7.05E-06	1.03E-05	3.33E-05	--
	$TEQ_{(PCB)}$ (ND=1/2DL)	9	9	100	7.06E-06	1.03E-05	3.33E-05	--
PCBs	Total PCBs (ND=1/2DL)	9	9	100	1.93E-01	3.56E-01	1.13E+00	--
	Aroclor-1016	16	0	0	4.58E-03	1.56E-03	--	9.15E-03
	Aroclor-1221	16	0	0	5.46E-03	1.36E-03	--	1.09E-02
	Aroclor-1232	16	0	0	5.49E-03	1.31E-03	--	1.10E-02
	Aroclor-1242	16	0	0	6.19E-03	1.56E-03	--	1.24E-02
	Aroclor-1248	16	0	0	5.39E-03	3.32E-04	--	1.08E-02
	Aroclor-1254	16	7	44	4.96E-02	1.05E-01	4.13E-01	8.51E-03
	Aroclor-1260	16	3	19	2.11E-02	4.21E-02	1.54E-01	7.32E-03
	Aroclor-1262	16	0	0	5.08E-03	1.43E-03	0.00E+00	1.02E-02
	Aroclor-1268	16	0	0	3.21E-03	7.59E-04	0.00E+00	6.42E-03
Total Metals	Aluminum	33	33	100	1.12E+04	6.11E+03	2.84E+04	5.47E+00
	Antimony	12	8	67	2.13E-01	1.21E-01	3.60E-01	1.67E-01
	Arsenic	33	33	100	4.21E+00	1.78E+00	1.14E+01	1.69E-01
	Barium	33	33	100	2.43E+02	1.75E+02	1.08E+03	1.23E-01
	Beryllium	12	12	100	5.58E-01	2.96E-01	1.20E+00	7.77E-02
	Cadmium	33	33	100	3.96E-01	5.95E-01	3.50E+00	3.24E-02
	Calcium	12	12	100	7.69E+03	5.35E+03	2.17E+04	2.39E+01
	Chromium	33	33	100	1.30E+01	6.61E+00	3.95E+01	1.88E-01
	Cobalt	33	33	100	4.94E+00	1.47E+00	8.00E+00	2.30E-01
	Copper	33	33	100	2.92E+01	2.32E+01	1.13E+02	3.31E-01
	Iron	33	33	100	1.37E+04	5.87E+03	3.73E+04	2.78E+01
	Lead	33	33	100	1.27E+01	7.44E+00	3.88E+01	4.46E-02
	Magnesium	12	12	100	5.27E+03	1.38E+03	8.13E+03	6.02E+00
	Manganese	33	33	100	4.79E+02	5.11E+02	3.04E+03	2.59E-01
	Mercury	33	31	94	3.42E-02	5.36E-02	3.10E-01	8.75E-03
	Nickel	33	33	100	1.10E+01	6.61E+00	4.25E+01	1.73E-01
	Potassium	12	12	100	2.37E+03	1.01E+03	4.14E+03	2.58E+01
	Selenium	12	12	100	1.26E+00	5.77E-01	2.10E+00	2.81E-01
	Silver	33	6	18	1.20E-01	1.27E-01	7.40E-01	1.54E-01
	Sodium	12	12	100	1.72E+02	1.53E+02	5.59E+02	1.97E+01
	Thallium	33	33	100	1.25E-01	8.55E-02	5.50E-01	4.39E-02
	Vanadium	33	33	100	1.32E+01	4.26E+00	2.62E+01	3.45E-01
	Zinc	33	33	100	1.10E+02	1.03E+02	4.46E+02	1.47E+00
Semivolatiles	Acenaphthene	21	1	5	4.64E-04	9.63E-04	6.30E-04	8.89E-04
	Acenaphthylene	21	1	5	4.96E-04	9.65E-04	2.00E-03	8.34E-04
	Anthracene	21	4	19	9.61E-04	1.96E-03	8.00E-03	7.56E-04
	Benzo(a)anthracene	21	4	19	1.43E-03	3.65E-03	1.56E-02	4.51E-04
	Benzo(a)pyrene	21	6	29	3.07E-03	7.94E-03	3.60E-02	4.88E-04
	Benzo(b)fluoranthene	21	9	43	6.09E-03	9.20E-03	3.38E-02	8.60E-04
	Benzo(g,h,i)perylene	21	5	24	2.30E-03	4.68E-03	1.93E-02	8.71E-04
	Benzo(k)fluoranthene	21	6	29	1.89E-03	3.20E-03	1.20E-02	9.87E-04
	Chrysene	21	7	33	5.12E-03	7.97E-03	2.42E-02	6.04E-04
	Dibenzo(a,h)anthracene	21	2	10	1.11E-03	2.22E-03	8.70E-03	1.05E-03
	Fluoranthene	21	9	43	5.20E-03	7.75E-03	3.07E-02	5.38E-04
	Fluorene	21	0	0	3.79E-04	8.19E-04	--	7.59E-04
	Indeno(1,2,3-cd)pyrene	21	5	24	1.82E-03	2.90E-03	1.04E-02	9.47E-04
	Naphthalene	21	2	10	7.96E-04	1.50E-03	5.40E-03	9.10E-04
	Phenanthrene	21	2	10	8.96E-04	1.94E-03	7.00E-03	6.11E-04
	Pyrene	21	9	43	4.18E-03	6.34E-03	2.59E-02	5.92E-04
Volatile Organics	1,1,1,2-Tetrachloroethane	3	0	0	3.38E-04	4.47E-05	--	6.77E-04
	1,1,1-Trichloroethane	3	0	0	9.17E-04	1.15E-04	--	1.83E-03
	1,1,2,2-Tetrachloroethane	3	0	0	3.08E-04	4.04E-05	--	6.17E-04
	1,1,2-Trichloroethane	3	0	0	3.60E-04	4.76E-05	--	7.20E-04
	1,1-Dichloroethane	3	0	0	4.38E-04	5.34E-05	--	8.77E-04
	1,1-Dichloroethene	3	0	0	8.33E-04	1.01E-04	--	1.67E-03
	1,1-Dichloropropene	3	0	0	8.17E-04	1.15E-04	--	1.63E-03
	1,2,3-Trichlorobenzene	3	0	0	2.77E-04	3.75E-05	--	5.53E-04
	1,2,3-Trichloropropane	3	0	0	8.17E-04	1.15E-04	--	1.63E-03
	1,2,4-Trichlorobenzene	3	0	0	2.90E-04	3.90E-05	--	5.80E-04
	1,2,4-Trimethylbenzene	3	2	67	2.99E-02	2.56E-02	4.47E-02	5.30E-04
	1,2-Dibromo-3-chloropropane	3	0	0	1.30E-03	1.73E-04	--	2.60E-03
	1,2-Dibromoethane	3	0	0	4.08E-04	5.34E-05	--	8.17E-04
	1,2-Dichlorobenzene	3	0	0	2.63E-04	3.61E-05	--	5.27E-04
	1,2-Dichloroethane	3	0	0	3.17E-04	4.19E-05	--	6.33E-04
	1,2-Dichloropropane	3	0	0	4.78E-04	6.21E-05	--	9.57E-04
	1,3,5-Trimethylbenzene	3	2	67	1.64E-02	1.39E-02	2.44E-02	7.40E-04
	1,3-Dichlorobenzene	3	0	0	2.95E-04	3.90E-05	--	5.90E-04
	1,3-Dichloropropane	3	0	0	2.90E-04	3.90E-05	--	5.80E-04
	1,4-Dichlorobenzene	3	0	0	2.55E-04	3.46E-05	--	5.10E-04
	2,2-Dichloropropane	3	0	0	8.67E-04	1.15E-04	--	1.73E-03
	Acetone	3	1	33	4.82E-01	8.30E-01	1.44E+00	8.78E-02

Table 3-4. OU2 Surface Soil Summary Statistics[a]

Analysis	Contaminant	N Samples	N Detect	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Volatile Organics	Allyl chloride	3	0	0	5.15E-04	7.36E-05	--	1.03E-03
	Benzene	3	0	0	6.00E-04	8.66E-05	--	1.20E-03
	Bromobenzene	3	0	0	5.50E-04	8.66E-05	--	1.10E-03
	Bromochloromethane	3	0	0	2.43E-04	3.18E-05	--	4.87E-04
	Bromoform	3	0	0	2.73E-04	3.61E-05	--	5.47E-04
	Bromomethane	3	0	0	9.50E-04	1.30E-04	--	1.90E-03
	Carbon tetrachloride	3	0	0	1.35E-04	1.73E-05	--	2.70E-04
	Chlorobenzene	3	0	0	3.38E-04	4.47E-05	--	6.77E-04
	Chloroethane	3	0	0	6.50E-04	8.66E-05	--	1.30E-03
	Chloroform	3	0	0	3.65E-04	4.76E-05	--	7.30E-04
	Chloromethane	3	0	0	6.50E-04	8.66E-05	--	1.30E-03
	cis-1,2-Dichloroethylene	3	0	0	4.10E-04	5.63E-05	--	8.20E-04
	cis-1,3-Dichloropropylene	3	0	0	9.83E-05	1.44E-05	--	1.97E-04
	Cumene	3	0	0	4.20E-04	5.63E-05	--	8.40E-04
	Dibromochloromethane	3	0	0	4.15E-04	5.63E-05	--	8.30E-04
	Dichlorobromomethane	3	0	0	3.92E-04	5.05E-05	--	7.83E-04
	Dichlorodifluoromethane	3	0	0	9.00E-04	1.30E-04	--	1.80E-03
	Dichlorofluoromethane	3	0	0	6.00E-04	8.66E-05	--	1.20E-03
	Ethyl ether	3	0	0	3.93E-04	5.34E-05	--	7.87E-04
	Ethylbenzene	3	0	0	3.82E-04	5.05E-05	--	7.63E-04
	Hexachlorobutadiene	3	0	0	9.00E-04	1.30E-04	--	1.80E-03
	Hexachloroethane	2	0	0	1.10E-02	0.00E+00	--	2.21E-02
	Methyl ethyl ketone	3	0	0	2.20E-03	3.03E-04	--	4.40E-03
	Methyl isobutyl ketone	3	0	0	1.38E-03	1.88E-04	--	2.77E-03
	Methylene bromide	3	0	0	2.63E-04	3.61E-05	--	5.27E-04
	Methylene chloride	3	1	33	1.10E-01	1.88E-01	3.27E-01	7.07E-03
	MTBE (Methyl tert-butyl ether)	3	0	0	2.68E-04	3.61E-05	--	5.37E-04
	Naphthalene	3	0	0	1.85E-03	1.34E-03	--	3.70E-03
	n-Butyl benzene	3	0	0	4.42E-04	5.05E-05	--	8.83E-04
	n-Propyl benzene	3	0	0	4.68E-04	7.07E-05	--	9.37E-04
	o-Chlorotoluene	3	0	0	3.38E-04	4.47E-05	--	6.77E-04
	p-Chlorotoluene	3	0	0	1.40E-04	1.73E-05	--	2.80E-04
	p-Isopropyltoluene	3	1	33	1.15E-03	1.34E-03	2.70E-03	8.17E-04
	sec-Butyl benzene	3	0	0	5.15E-04	7.36E-05	--	1.03E-03
	Styrene	3	0	0	2.38E-04	3.18E-05	--	4.77E-04
	tert-Butyl benzene	3	0	0	4.42E-04	5.05E-05	--	8.83E-04
	Tetrachloroethylene	3	0	0	6.50E-04	8.66E-05	--	1.30E-03
	Tetrahydrofuran	3	2	67	8.54E-02	5.21E-02	1.16E-01	5.05E-02
	Toluene	3	3	100	5.90E-04	1.13E-04	7.20E-04	6.10E-04
	trans-1,2-Dichloroethylene	3	0	0	6.50E-04	8.66E-05	--	1.30E-03
	trans-1,3-Dichloropropylene	3	0	0	7.67E-05	1.15E-05	--	1.53E-04
	Trichloroethylene	3	0	0	5.50E-04	8.66E-05	--	1.10E-03
	Trichlorofluoromethane	3	2	67	1.62E-01	1.38E-01	2.42E-01	3.80E-03
	Trichlorotrifluoroethane	3	0	0	2.33E-04	3.18E-05	--	4.67E-04
	Vinyl chloride	3	0	0	2.13E-04	2.74E-05	--	4.27E-04
	Xylenes (total)	3	0	0	7.17E-04	1.15E-04	--	1.43E-03

TEQ = toxicity equivalent; PCB = polychlorinated biphenyl; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; $TEQ_{(D/F/PCB)}$ = toxicity equivalent for dioxins, furans and coplanar PCBs; $TEQ_{(PCB)}$ = toxicity equivalen for coplanar PCBs; ND = non-detect; DL = sample-specific detection limit; MDL = method detection imit

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-5. OU2 Subsurface Soil (10 feet) Summary Statistics[a]

Analysis	Contaminant	N Samples	N Detect	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
TEQ	$TEQ_{(D/F)}$ (ND=0)	21	21	100	8.42E-07	1.40E-06	5.52E-06	--
	$TEQ_{(D/F)}$ (ND=1/2DL)	21	21	100	1.17E-06	1.38E-06	5.84E-06	--
	$TEQ_{(D/F/PCB)}$ (ND=0)	9	9	100	1.08E-06	2.21E-06	6.37E-06	--
	$TEQ_{(D/F/PCB)}$(ND=1/2DL)	9	9	100	1.45E-06	2.18E-06	6.67E-06	--
	$TEQ_{(PCB)}$ (ND=0)	9	9	100	6.77E-07	1.43E-06	3.97E-06	--
	$TEQ_{(PCB)}$ (ND=1/2DL)	9	9	100	6.90E-07	1.42E-06	3.97E-06	--
PCBs	Total PCBs - (ND=1/2DL)	10	10	100	2.30E-02	4.78E-02	1.23E-01	--
	Aroclor-1016	35	0	0	3.86E-03	8.01E-04	--	7.72E-03
	Aroclor-1221	35	0	0	6.64E-03	1.38E-03	--	1.33E-02
	Aroclor-1232	35	0	0	4.73E-03	1.79E-03	--	9.46E-03
	Aroclor-1242	35	0	0	7.31E-03	1.95E-03	--	1.46E-02
	Aroclor-1248	35	0	0	5.44E-03	7.22E-04	--	1.09E-02
	Aroclor-1254	35	7	20	2.82E-02	7.01E-02	3.74E-01	6.75E-03
	Aroclor-1260	35	4	11	1.24E-02	3.21E-02	1.72E-01	5.51E-03
	Aroclor-1262	35	0	0	4.20E-03	1.68E-03	--	8.39E-03
	Aroclor-1268	35	0	0	2.67E-03	8.96E-04	--	5.34E-03
Total Metals	Aluminum	35	35	100	9.38E+03	6.37E+03	2.41E+04	4.34E+00
	Antimony	12	2	17	1.13E-01	6.24E-02	2.60E-01	1.80E-01
	Arsenic	35	35	100	3.02E+00	1.15E+00	6.40E+00	1.57E-01
	Barium	35	35	100	1.55E+02	1.15E+02	5.64E+02	9.94E-02
	Beryllium	12	12	100	6.78E-01	3.74E-01	1.20E+00	7.92E-02
	Cadmium	35	33	94	9.00E-02	5.81E-02	2.60E-01	2.90E-02
	Calcium	12	12	100	8.25E+03	1.36E+04	5.10E+04	3.17E+01
	Chromium	35	35	100	9.68E+00	3.95E+00	1.87E+01	1.80E-01
	Cobalt	35	35	100	4.26E+00	2.02E+00	9.60E+00	1.96E-01
	Copper	35	35	100	1.62E+01	7.78E+00	3.22E+01	2.84E-01
	Iron	35	35	100	1.14E+04	5.18E+03	2.24E+04	2.42E+01
	Lead	35	35	100	7.49E+00	3.33E+00	1.53E+01	4.04E-02
	Magnesium	12	12	100	6.03E+03	3.05E+03	1.40E+04	5.26E+00
	Manganese	35	35	100	2.37E+02	1.28E+02	5.58E+02	2.07E-01
	Mercury	35	21	60	1.57E-02	1.92E-02	1.00E-01	8.09E-03
	Nickel	35	35	100	8.42E+00	3.57E+00	1.74E+01	1.55E-01
	Potassium	12	12	100	2.15E+03	9.05E+02	3.66E+03	2.05E+01
	Selenium	12	3	25	1.79E-01	6.65E-02	3.20E-01	2.86E-01
	Silver	35	1	3	7.12E-02	2.61E-02	1.50E-01	1.37E-01
	Sodium	12	12	100	2.38E+02	1.70E+02	5.04E+02	1.95E+01
	Thallium	35	32	91	1.08E-01	6.67E-02	2.40E-01	4.00E-02
	Vanadium	35	35	100	1.11E+01	5.35E+00	2.19E+01	3.59E-01
	Zinc	35	35	100	5.34E+01	6.85E+01	4.16E+02	1.32E+00
Semivolatiles	1,2,4-Trichlorobenzene	1	0	0	2.84E-02	--	--	5.67E-02
	1,2-Dichlorobenzene	1	0	0	1.11E-02	--	--	2.22E-02
	1,2-Diphenylhydrazine	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	1,3-Dichlorobenzene	1	0	0	1.09E-02	--	--	2.17E-02
	1,4-Dichlorobenzene	1	0	0	1.15E-02	--	--	2.29E-02
	1-Methylnaphthalene	12	0	0	3.04E-02	1.35E-03	--	6.09E-02
	2,4,5-Trichlorophenol	12	0	0	2.11E-02	9.45E-04	--	4.22E-02
	2,4,6-Trichlorophenol	12	0	0	2.27E-02	1.01E-03	--	4.55E-02
	2,4-Dichlorophenol	12	0	0	3.32E-02	1.49E-03	--	6.65E-02
	2,4-Dimethylphenol	12	0	0	3.31E-02	1.48E-03	--	6.61E-02
	2,4-Dinitrophenol	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	2,4-Dinitrotoluene	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	2,6-Dinitrotoluene	12	0	0	1.51E-02	6.71E-04	--	3.02E-02
	2-Chloronaphthalene	12	0	0	2.77E-02	1.23E-03	--	5.53E-02
	2-Chlorophenol	12	0	0	4.12E-02	1.84E-03	--	8.24E-02
	2-Methylnaphthalene	12	0	0	3.16E-02	1.41E-03	--	6.31E-02
	2-Nitroaniline	12	0	0	1.92E-02	8.51E-04	--	3.83E-02
	2-Nitrophenol	12	0	0	3.02E-02	1.36E-03	--	6.04E-02
	3,3`-Dichlorobenzidine	12	0	0	2.46E-02	1.10E-03	--	4.92E-02
	3-Nitroaniline	12	0	0	1.80E-02	8.03E-04	--	3.61E-02
	4,6-Dinitro-o-cresol	12	0	0	3.51E-02	1.57E-03	--	7.02E-02
	4-Bromophenyl phenyl ether	12	0	0	1.88E-02	8.40E-04	--	3.76E-02
	4-Chloro-3-methylphenol	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	4-Chlorophenyl phenyl ether	12	0	0	2.03E-02	9.06E-04	--	4.07E-02
	4-Nitroaniline	12	0	0	1.55E-02	6.96E-04	--	3.09E-02
	4-Nitrophenol	12	0	0	1.85E-02	8.36E-04	--	3.70E-02
	Acenaphthene	14	0	0	1.75E-02	7.38E-03	--	3.50E-02
	Acenaphthylene	14	0	0	1.98E-02	8.38E-03	--	3.97E-02
	Anthracene	14	0	0	7.58E-02	3.22E-02	--	1.52E-01
	Benzo(a)anthracene	14	0	0	7.58E-02	3.23E-02	--	1.52E-01
	Benzo(a)pyrene	14	0	0	7.58E-02	3.23E-02	--	1.52E-01
	Benzo(b)fluoranthene	14	0	0	1.92E-02	8.10E-03	--	3.84E-02
	Benzo(g,h,i)perylene	14	0	0	1.84E-02	7.77E-03	--	3.68E-02
	Benzo(k)fluoranthene	14	0	0	1.94E-02	8.17E-03	--	3.88E-02
	bis(2-chloroethoxy)methane	12	0	0	3.45E-02	1.54E-03	--	6.90E-02
	bis(2-chloroethyl)ether	12	0	0	1.23E-02	5.50E-04	--	2.46E-02
	Bis(2-chloroisopropyl)ether	12	0	0	4.08E-02	1.83E-03	--	8.16E-02
	Bis(2-ethylhexyl)phthalate	12	2	17	6.09E-02	9.10E-02	3.46E-01	6.04E-02

Table 3-5. OU2 Subsurface Soil (10 feet) Summary Statistics[a]

Analysis	Contaminant	N Samples	N Detect	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Semivolatiles	Butyl benzyl phthalate	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Carbazole	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Chrysene	14	0	0	2.03E-02	8.61E-03	--	4.07E-02
	Dibenzo(a,h)anthracene	14	0	0	7.58E-02	3.22E-02	--	1.52E-01
	Dibenzofuran	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Dibutyl phthalate	12	1	8	2.70E-02	8.49E-03	5.37E-02	4.90E-02
	Diethyl phthalate	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Dimethyl phthalate	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Di-n-octyl phthalate	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Fluoranthene	14	0	0	7.58E-02	3.23E-02	--	1.52E-01
	Fluorene	14	0	0	7.58E-02	3.22E-02	--	1.52E-01
	Hexachlorobenzene	12	0	0	2.32E-02	1.05E-03	--	4.64E-02
	Indeno(1,2,3-cd)pyrene	14	0	0	7.58E-02	3.22E-02	--	1.52E-01
	Isophorone	12	0	0	2.82E-02	1.25E-03	--	5.64E-02
	m & p-cresols	12	0	0	3.53E-02	1.58E-03	--	7.06E-02
	Naphthalene	3	0	0	1.09E-02	1.85E-02	--	2.17E-02
	Nitrobenzene	12	0	0	3.57E-02	1.59E-03	--	7.14E-02
	N-Nitrosodimethylamine	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	N-Nitrosodi-n-propylamine	12	0	0	2.40E-02	1.07E-03	--	4.81E-02
	N-Nitrosodiphenylamine	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	o-Cresol	12	0	0	3.82E-02	1.70E-03	--	7.64E-02
	p-Chloroaniline	12	0	0	2.71E-02	1.21E-03	--	5.42E-02
	Pentachlorophenol	12	0	0	8.84E-02	3.97E-03	--	1.77E-01
	Phenanthrene	14	0	0	2.17E-02	9.18E-03	--	4.33E-02
	Phenol	12	0	0	3.86E-02	1.73E-03	--	7.72E-02
	Pyrene	14	1	7	2.08E-02	1.08E-02	4.59E-02	3.82E-02
Volatile Organics	1,1,1,2-Tetrachloroethane	16	0	0	3.84E-04	1.76E-04	--	7.69E-04
	1,1,1-Trichloroethane	16	0	0	1.05E-03	4.97E-04	--	2.11E-03
	1,1,2,2-Tetrachloroethane	16	1	6	3.95E-04	2.22E-04	9.40E-04	7.06E-04
	1,1,2-Trichloroethane	16	0	0	4.11E-04	1.96E-04	--	8.22E-04
	1,1-Dichloroethane	16	0	0	5.02E-04	2.40E-04	--	1.00E-03
	1,1-Dichloroethene	16	0	0	9.56E-04	4.53E-04	--	1.91E-03
	1,1-Dichloropropene	16	0	0	9.40E-04	4.46E-04	--	1.88E-03
	1,2,3-Trichlorobenzene	16	0	0	3.15E-04	1.52E-04	--	6.30E-04
	1,2,3-Trichloropropane	16	0	0	9.40E-04	4.46E-04	--	1.88E-03
	1,2,4-Trichlorobenzene	16	0	0	3.32E-04	1.61E-04	--	6.64E-04
	1,2,4-Trimethylbenzene	16	4	25	1.23E-02	2.55E-02	8.91E-02	3.19E-03
	1,2-Dibromo-3-chloropropane	16	0	0	1.48E-03	6.91E-04	--	2.97E-03
	1,2-Dibromoethane	16	0	0	4.65E-04	2.23E-04	--	9.31E-04
	1,2-Dichlorobenzene	16	0	0	2.99E-04	1.42E-04	--	5.99E-04
	1,2-Dichloroethane	16	0	0	3.58E-04	1.69E-04	--	7.16E-04
	1,2-Dichloropropane	16	0	0	5.47E-04	2.58E-04	--	1.09E-03
	1,3,5-Trimethylbenzene	16	3	19	6.39E-03	1.39E-02	4.85E-02	2.33E-03
	1,3-Dichlorobenzene	16	0	0	3.37E-04	1.60E-04	--	6.73E-04
	1,3-Dichloropropane	16	0	0	3.32E-04	1.61E-04	--	6.64E-04
	1,4-Dichlorobenzene	16	0	0	2.88E-04	1.32E-04	--	5.77E-04
	2,2-Dichloropropane	16	0	0	9.78E-04	4.63E-04	--	1.96E-03
	Acetone	16	2	13	7.45E-03	9.77E-03	3.49E-02	7.83E-03
	Allyl chloride	16	0	0	5.79E-04	2.76E-04	--	1.16E-03
	Benzene	16	1	6	1.36E-03	2.75E-03	1.16E-02	1.90E-03
	Bromobenzene	16	0	0	6.30E-04	3.05E-04	--	1.26E-03
	Bromochloromethane	16	0	0	2.78E-04	1.34E-04	--	5.56E-04
	Bromoform	16	0	0	3.09E-04	1.41E-04	--	6.18E-04
	Bromomethane	16	0	0	1.08E-03	5.05E-04	--	2.16E-03
	Carbon tetrachloride	16	0	0	1.53E-04	7.20E-05	--	3.07E-04
	Chlorobenzene	16	0	0	3.84E-04	1.76E-04	--	7.69E-04
	Chloroethane	16	0	0	7.21E-04	3.35E-04	--	1.44E-03
	Chloroform	16	0	0	4.16E-04	1.95E-04	--	8.31E-04
	Chloromethane	16	0	0	7.34E-04	3.48E-04	--	1.47E-03
	cis-1,2-Dichloroethylene	16	0	0	4.66E-04	2.23E-04	--	9.32E-04
	cis-1,3-Dichloropropylene	16	0	0	1.12E-04	5.36E-05	--	2.24E-04
	Cumene	16	0	0	4.77E-04	2.22E-04	--	9.54E-04
	Dibromochloromethane	16	0	0	4.70E-04	2.21E-04	--	9.39E-04
	Dichlorobromomethane	16	0	0	4.47E-04	2.15E-04	--	8.94E-04
	Dichlorodifluoromethane	16	0	0	1.01E-03	4.80E-04	--	2.03E-03
	Dichlorofluoromethane	16	0	0	6.79E-04	3.19E-04	--	1.36E-03
	Ethyl ether	16	0	0	4.47E-04	2.15E-04	--	8.94E-04
	Ethylbenzene	16	1	6	2.57E-03	8.52E-03	3.45E-02	1.50E-03
	Hexachlorobutadiene	16	0	0	1.75E-03	3.40E-03	--	3.50E-03
	Hexachloroethane	14	0	0	1.12E-02	4.62E-04	--	2.24E-02
	Methyl ethyl ketone	16	0	0	2.50E-03	1.18E-03	--	5.00E-03
	Methyl isobutyl ketone	16	0	0	1.57E-03	7.35E-04	--	3.14E-03
	Methylene bromide	16	0	0	2.99E-04	1.42E-04	--	5.99E-04
	Methylene chloride	16	4	25	2.80E-02	5.73E-02	1.88E-01	1.13E-02
	MTBE (Methyl tert-butyl ether)	16	0	0	3.05E-04	1.42E-04	--	6.10E-04
	Naphthalene	16	1	6	3.27E-02	1.20E-01	4.84E-01	1.70E-02
	n-Butyl benzene	16	0	0	5.08E-04	2.40E-04	--	1.02E-03
	n-Propyl benzene	16	0	0	5.27E-04	2.49E-04	--	1.05E-03
	o-Chlorotoluene	16	0	0	3.84E-04	1.76E-04	--	7.68E-04

Table 3-5. OU2 Subsurface Soil (10 feet) Summary Statistics[a]

Analysis	Contaminant	N Samples	N Detect	Detection Frequency (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average DL
Volatile Organics	p-Chlorotoluene	16	0	0	1.60E-04	7.56E-05	--	3.19E-04
	p-Isopropyltoluene	16	2	13	2.04E-01	6.52E-01	2.56E+00	3.80E-03
	sec-Butyl benzene	16	0	0	5.79E-04	2.76E-04	--	1.16E-03
	Styrene	16	0	0	2.70E-04	1.23E-04	--	5.40E-04
	tert-Butyl benzene	16	0	0	5.08E-04	2.40E-04	--	1.02E-03
	Tetrachloroethylene	16	0	0	7.47E-04	3.58E-04	--	1.49E-03
	Tetrahydrofuran	16	3	19	4.13E-02	5.70E-02	2.11E-01	4.44E-02
	Toluene	16	11	69	4.70E-03	1.67E-02	6.74E-02	1.58E-03
	trans-1,2-Dichloroethylene	16	0	0	7.43E-04	3.58E-04	--	1.49E-03
	trans-1,3-Dichloropropylene	16	0	0	8.63E-05	4.09E-05	--	1.73E-04
	Trichloroethylene	16	0	0	6.31E-04	3.04E-04	--	1.26E-03
	Trichlorofluoromethane	16	4	25	6.19E-02	1.07E-01	2.61E-01	1.42E-02
	Trichlorotrifluoroethane	16	0	0	2.64E-04	1.24E-04	--	5.28E-04
	Vinyl chloride	16	0	0	2.43E-04	1.16E-04	--	4.85E-04
	Xylenes (total)	16	0	0	8.24E-04	3.93E-04	--	1.65E-03

TEQ = toxicity equivalent; PCB = polychlorinated biphenyl; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; $TEQ_{(D/F/PCB)}$ = toxicity equivalent for dioxins, furans and coplanar PCBs; $TEQ_{(PCB)}$ = toxicity equivalen for coplanar PCBs; ND = non-detect; DL = sample-specific detection limit; MDL = method detection imit

[a]All concentrations reported in units of mg/kg.

[b]Non-detects evaluated at 1/2 the DL when calculating average and standard deviation.

Table 3-6. OU2 Groundwater Summary Statistics[a]

Analysis	Contaminant	N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
TEQ	$TEQ_{(D/F)}$ (ND = 0)	62	33	53	1.48E-07	5.37E-07	3.49E-06	--
	$TEQ_{(D/F)}$ (ND = 1/2 DL)	62	33	53	1.55E-06	6.55E-07	5.09E-06	--
PCBs	Aroclor-1016	41	0	0	2.11E-02	3.19E-03	--	4.22E-02
	Aroclor-1221	41	0	0	1.84E-02	4.94E-03	--	3.68E-02
	Aroclor-1232	41	0	0	1.85E-02	2.43E-03	--	3.70E-02
	Aroclor-1242	41	0	0	2.10E-02	4.62E-03	--	4.20E-02
	Aroclor-1248	41	0	0	1.67E-02	6.21E-03	--	3.34E-02
	Aroclor-1254	41	0	0	1.86E-02	6.18E-03	--	3.73E-02
	Aroclor-1260	41	5	12.2	2.41E-02	2.52E-02	1.20E-01	3.11E-02
	Aroclor-1262	41	0	0	1.99E-02	3.28E-03	--	3.98E-02
	Aroclor-1268	41	0	0	1.95E-02	5.77E-03	--	3.91E-02
Total Metals	Aluminum	80	50	63	3.55E+01	5.53E+01	3.56E+02	3.36E+01
	Antimony	80	32	40	1.99E-01	1.88E-01	7.10E-01	3.17E-01
	Arsenic	80	74	93	3.30E+00	3.97E+00	2.19E+01	1.71E+00
	Barium	80	80	100	2.13E+02	9.06E+01	5.19E+02	--
	Beryllium	70	3	4	7.21E-02	1.24E-01	9.20E-02	1.44E-01
	Cadmium	80	21	26	6.43E-02	1.12E-01	3.30E-01	9.68E-02
	Calcium	80	80	100	5.28E+04	1.92E+04	1.02E+05	--
	Chromium	80	36	45	5.91E-01	7.11E-01	3.80E+00	1.10E+00
	Cobalt	80	24	30	6.43E-01	2.89E+00	2.60E+01	3.39E-01
	Copper	80	66	83	4.29E+00	1.10E+01	9.30E+01	1.23E+00
	Iron	80	61	76	1.23E+03	4.71E+03	4.11E+04	4.27E+01
	Lead	80	43	54	4.41E-01	1.58E+00	1.36E+01	1.41E-01
	Magnesium	80	80	100	1.96E+04	6.33E+03	3.28E+04	--
	Manganese	80	70	88	8.11E+02	9.92E+02	3.34E+03	2.23E+01
	Mercury	80	3	4	4.18E-02	2.25E-02	2.00E-01	7.58E-02
	Nickel	80	51	64	8.39E-01	1.62E+00	1.31E+01	7.30E-01
	Potassium	80	80	100	5.47E+03	4.08E+03	1.82E+04	--
	Selenium	80	16	20	1.97E-01	2.83E-01	3.50E-01	3.79E-01
	Silver	80	3	4	1.65E-01	3.36E-01	2.60E-01	3.31E-01
	Sodium	80	80	100	5.49E+04	4.68E+04	2.13E+05	--
	Thallium	80	2	3	4.14E-02	6.69E-02	3.80E-01	7.36E-02
	Vanadium	80	66	83	2.90E+00	7.03E+00	5.54E+01	2.05E+00
	Zinc	80	32	40	1.40E+01	3.95E+01	2.93E+02	5.88E+00
Dissolved Metals	Aluminum	97	47	48	4.11E+01	1.63E+02	1.41E+03	2.12E+01
	Antimony	81	26	32	2.01E-01	1.37E-01	7.00E-01	3.17E-01
	Arsenic	97	94	97	3.12E+00	3.42E+00	1.75E+01	1.15E+00
	Barium	97	97	100	2.08E+02	9.32E+01	5.22E+02	--
	Beryllium	70	2	3	6.56E-02	1.10E-01	9.70E-02	1.30E-01
	Cadmium	97	24	25	4.17E-02	6.12E-02	3.60E-01	5.74E-02
	Calcium	97	97	100	5.07E+04	1.97E+04	1.03E+05	--
	Chromium	97	58	60	4.77E-01	6.31E-01	5.50E+00	6.37E-01
	Cobalt	97	61	63	5.04E-01	6.46E-01	4.10E+00	2.83E-01
	Copper	97	73	75	3.19E+00	8.52E+00	8.04E+01	1.22E+00
	Iron	97	67	69	3.79E+02	5.17E+02	2.07E+03	1.91E+01
	Lead	97	41	42	1.76E-01	3.66E-01	2.90E+00	9.05E-02
	Magnesium	97	97	100	1.85E+04	6.59E+03	3.37E+04	--
	Manganese	97	90	93	7.61E+02	9.83E+02	3.62E+03	1.08E+01
	Mercury	97	0	0	3.37E-02	1.20E-02	--	6.75E-02
	Nickel	97	69	71	7.06E-01	9.40E-01	5.10E+00	8.83E-01
	Potassium	97	93	96	5.14E+03	3.97E+03	1.82E+04	1.99E+03
	Selenium	81	15	19	1.69E-01	2.14E-01	3.30E-01	3.11E-01
	Silver	97	4	4	1.20E-01	2.33E-01	1.70E-01	2.44E-01
	Sodium	97	97	100	5.36E+04	4.72E+04	1.94E+05	--
	Thallium	97	7	7	2.87E-02	4.01E-02	1.60E-01	5.56E-02
	Vanadium	97	77	79	2.42E+00	6.03E+00	5.23E+01	2.07E+00
	Zinc	97	46	47	7.44E+00	1.54E+01	6.26E+01	4.11E+00
Miscellaneous Parameters	Chloride	94	94	100	2.08E+04	1.84E+04	1.17E+05	--
	Fluoride	94	94	100	1.83E+02	5.65E+01	3.70E+02	--
	Nitrogen, NO2 plus NO3	94	74	79	5.06E+02	6.55E+02	2.60E+03	4.17E+01
	Phosphorus (as P)	94	87	93	1.34E+02	1.28E+02	5.50E+02	6.43E+01
	Sulfate	94	94	100	4.51E+04	2.70E+04	1.66E+05	--

Table 3-6. OU2 Groundwater Summary Statistics[a]

Analysis	Contaminant	N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
Semivolatiles	1,2,4-Trichlorobenzene	20	0	0	2.33E+00	4.89E+00	--	4.66E+00
	1,2-Dichlorobenzene	20	0	0	2.09E+00	4.06E+00	--	4.19E+00
	1,2-Diphenylhydrazine	20	0	0	1.36E+00	1.35E+00	--	2.71E+00
	1,3-Dichlorobenzene	20	0	0	2.25E+00	4.83E+00	--	4.51E+00
	1,4-Dichlorobenzene	20	0	0	2.03E+00	3.93E+00	--	4.06E+00
	1-Methylnaphthalene	20	0	0	1.55E+00	2.33E+00	--	3.09E+00
	2,4,5-Trichlorophenol	20	0	0	1.17E+00	1.17E+00	--	2.34E+00
	2,4,6-Trichlorophenol	20	0	0	1.19E+00	1.16E+00	--	2.38E+00
	2,4-Dichlorophenol	20	0	0	1.40E+00	1.69E+00	--	2.79E+00
	2,4-Dimethylphenol	20	0	0	3.74E+00	3.67E+00	--	7.47E+00
	2,4-Dinitrophenol	20	0	0	1.96E+00	2.68E+00	--	3.93E+00
	2,4-Dinitrotoluene	20	0	0	1.24E+00	1.45E+00	--	2.48E+00
	2,6-Dinitrotoluene	20	0	0	1.01E+00	7.00E-01	--	2.02E+00
	2-Chloronaphthalene	20	0	0	1.63E+00	2.48E+00	--	3.27E+00
	2-Chlorophenol	20	0	0	1.21E+00	1.19E+00	--	2.41E+00
	2-Methylnaphthalene	20	0	0	1.72E+00	2.82E+00	--	3.43E+00
	2-Nitroaniline	20	0	0	1.54E+00	1.62E+00	--	3.08E+00
	2-Nitrophenol	20	0	0	1.46E+00	1.82E+00	--	2.92E+00
	3&4-Methylphenol	2	0	0	9.50E-01	0.00E+00	--	1.90E+00
	3,3'-Dichlorobenzidine	19	0	0	2.09E+00	1.41E+00	--	4.17E+00
	3-Nitroaniline	20	0	0	2.18E+00	1.35E+00	--	4.36E+00
	4,6-Dinitro-o-cresol	20	0	0	1.82E+00	1.59E+00	--	3.64E+00
	4-Bromophenyl phenyl ether	20	0	0	1.72E+00	2.56E+00	--	3.43E+00
	4-Chloro-3-methylphenol	20	0	0	1.19E+00	1.63E+00	--	2.37E+00
	4-Chlorophenyl phenyl ether	20	0	0	1.11E+00	1.70E+00	--	2.23E+00
	4-Nitroaniline	20	0	0	2.21E+00	2.19E+00	--	4.42E+00
	4-Nitrophenol	20	0	0	2.34E+00	2.76E+00	--	4.67E+00
	Acenaphthene	20	0	0	1.36E+00	2.08E+00	--	2.73E+00
	Acenaphthylene	20	0	0	1.45E+00	1.84E+00	--	2.91E+00
	Anthracene	20	0	0	1.36E+00	1.36E+00	--	2.71E+00
	Benzo(a)anthracene	20	0	0	1.96E+00	1.55E+00	--	3.92E+00
	Benzo(a)pyrene	20	0	0	1.45E+00	1.88E+00	--	2.90E+00
	Benzo(b)fluoranthene	20	0	0	1.47E+00	1.89E+00	--	2.95E+00
	Benzo(g,h,i)perylene	20	0	0	1.65E+00	2.31E+00	--	3.30E+00
	Benzo(k)fluoranthene	20	0	0	1.60E+00	1.90E+00	--	3.21E+00
	bis(2-Chloroethoxy)methane	20	0	0	1.13E+00	1.47E+00	--	2.26E+00
	bis(2-Chloroethyl)ether	20	0	0	1.25E+00	1.18E+00	--	2.51E+00
	bis(2-Chloroisopropyl)ether	20	0	0	1.36E+00	1.43E+00	--	2.72E+00
	bis(2-Ethylhexyl)phthalate	20	0	0	2.87E+00	5.23E+00	--	5.74E+00
	Butyl benzyl phthalate	20	0	0	1.41E+00	1.94E+00	--	2.81E+00
	Carbazole	20	0	0	1.31E+00	1.16E+00	--	2.63E+00
	Chrysene	20	0	0	1.44E+00	1.92E+00	--	2.88E+00
	Dibenzo(a,h)anthracene	20	0	0	1.50E+00	2.42E+00	--	2.99E+00
	Dibenzofuran	20	0	0	1.43E+00	1.74E+00	--	2.85E+00
	Dibutyl phthalate	20	0	0	1.49E+00	1.41E+00	--	2.98E+00
	Diethyl phthalate	20	0	0	1.40E+00	1.49E+00	--	2.79E+00
	Dimethyl phthalate	20	0	0	1.29E+00	1.33E+00	--	2.58E+00
	Di-n-octyl phthalate	20	0	0	1.50E+00	2.27E+00	--	3.01E+00
	Fluoranthene	20	0	0	1.45E+00	1.57E+00	--	2.91E+00
	Fluorene	20	0	0	1.36E+00	1.55E+00	--	2.72E+00
	Hexachlorobenzene	20	0	0	1.71E+00	2.38E+00	--	3.41E+00
	Hexachlorobutadiene	20	0	0	1.85E+00	3.68E+00	--	3.70E+00
	Hexachloroethane	20	0	0	2.00E+00	3.95E+00	--	4.00E+00
	Indeno(1,2,3-cd)pyrene	20	0	0	1.41E+00	2.26E+00	--	2.82E+00
	Isophorone	20	0	0	1.07E+00	1.24E+00	--	2.14E+00
	m & p-Cresols	18	0	0	1.28E+00	1.13E+00	--	2.56E+00
	Naphthalene	20	0	0	1.65E+00	2.67E+00	--	3.30E+00
	Nitrobenzene	20	0	0	1.37E+00	1.35E+00	--	2.73E+00
	n-Nitrosodimethylamine	20	0	0	1.17E+00	1.09E+00	--	2.35E+00
	n-Nitrosodi-n-propylamine	20	0	0	1.20E+00	1.06E+00	--	2.40E+00
	n-Nitrosodiphenylamine	20	0	0	1.72E+00	1.19E+00	--	3.43E+00
	o-Cresol	20	0	0	1.54E+00	2.09E+00	--	3.09E+00
	p-Chloroaniline	20	0	0	2.07E+00	2.07E+00	--	4.13E+00
	Pentachlorophenol	20	0	0	1.91E+00	2.92E+00	--	3.82E+00
	Phenanthrene	20	0	0	1.23E+00	1.03E+00	--	2.45E+00
	Phenol	20	0	0	1.21E+00	1.23E+00	--	2.42E+00
	Pyrene	20	0	0	1.37E+00	1.61E+00	--	2.75E+00

Table 3-6. OU2 Groundwater Summary Statistics[a]

Analysis	Contaminant	N	N Detect	DF (%)	Average Concentration[b]	Standard Deviation[b]	Maximum Detected Concentration	Average Detection Limit
Volatile Organics	1,1,1,2-Tetrachloroethane	20	0	0	7.62E-02	3.33E-02	--	1.52E-01
	1,1,1-Trichloroethane	20	0	0	7.05E-02	3.33E-02	--	1.41E-01
	1,1,2,2-Tetrachloroethane	20	0	0	7.74E-02	3.85E-02	--	1.55E-01
	1,1,2-Trichloroethane	20	0	0	8.47E-02	4.10E-02	--	1.69E-01
	1,1-Dichloroethane	20	0	0	7.74E-02	3.85E-02	--	1.55E-01
	1,1-Dichloroethene	20	0	0	7.91E-02	3.51E-02	--	1.58E-01
	1,1-Dichloropropene	20	0	0	6.94E-02	2.25E-02	--	1.39E-01
	1,2,3-Trichlorobenzene	20	0	0	1.03E-01	1.40E-02	--	2.06E-01
	1,2,3-Trichloropropane	20	0	0	1.78E-01	7.50E-02	--	3.56E-01
	1,2,4-Trichlorobenzene	20	0	0	9.45E-02	1.88E-02	--	1.89E-01
	1,2,4-Trimethylbenzene	20	1	5	1.01E-01	1.57E-01	7.60E-01	1.32E-01
	1,2-Dibromo-3-chloropropane	20	0	0	4.08E-01	1.92E-01	--	8.15E-01
	1,2-Dibromoethane	20	0	0	9.16E-02	3.44E-02	--	1.83E-01
	1,2-Dichlorobenzene	20	0	0	7.92E-02	3.33E-02	--	1.58E-01
	1,2-Dichloroethane	20	0	0	7.16E-02	2.82E-02	--	1.43E-01
	1,2-Dichloropropane	20	0	0	1.29E-01	8.50E-02	--	2.57E-01
	1,3,5-Trimethylbenzene	20	0	0	6.64E-02	3.69E-02	--	1.33E-01
	1,3-Dichlorobenzene	20	0	0	7.94E-02	2.91E-02	--	1.59E-01
	1,3-Dichloropropane	20	0	0	7.56E-02	4.56E-02	--	1.51E-01
	1,4-Dichlorobenzene	20	1	5	6.96E-02	1.98E-02	9.40E-02	1.37E-01
	2,2-Dichloropropane	20	0	0	1.20E-01	6.32E-02	--	2.39E-01
	Acetone	20	6	30	4.87E+00	2.55E+00	1.03E+01	7.09E+00
	Allyl chloride	20	0	0	2.11E-01	8.18E-02	--	4.21E-01
	Benzene	20	0	0	6.74E-02	3.98E-02	--	1.35E-01
	Bromobenzene	20	0	0	9.35E-02	3.83E-02	--	1.87E-01
	Bromochloromethane	20	0	0	1.20E-01	6.04E-02	--	2.39E-01
	Bromoform	20	0	0	1.82E-01	1.17E-01	--	3.64E-01
	Bromomethane	20	0	0	2.60E-01	2.78E-01	--	5.20E-01
	Carbon tetrachloride	20	0	0	1.16E-01	6.37E-02	--	2.31E-01
	Chlorobenzene	20	1	5	8.82E-02	4.02E-02	1.60E-01	1.69E-01
	Chloroethane	20	0	0	1.43E-01	6.76E-02	--	2.86E-01
	Chloroform	20	0	0	1.38E-01	4.00E-02	--	2.76E-01
	Chloromethane	20	0	0	1.86E-01	1.38E-01	--	3.72E-01
	cis-1,2-Dichloroethylene	20	0	0	9.48E-02	3.14E-02	--	1.90E-01
	cis-1,3-Dichloropropylene	20	0	0	7.96E-02	3.40E-02	--	1.59E-01
	Cumene	20	0	0	6.72E-02	2.66E-02	--	1.34E-01
	Dibromochloromethane	20	0	0	5.74E-02	2.61E-02	--	1.15E-01
	Dichlorobromomethane	20	0	0	7.34E-02	3.05E-02	--	1.47E-01
	Dichlorodifluoromethane	20	0	0	1.53E-01	9.80E-02	--	3.06E-01
	Dichlorofluoromethane	20	0	0	7.50E-02	3.87E-02	--	1.50E-01
	Ethyl ether	20	0	0	1.18E-01	7.39E-02	--	2.36E-01
	Ethylbenzene	20	0	0	8.11E-02	3.64E-02	--	1.62E-01
	Hexachlorobutadiene	20	0	0	1.66E-01	8.16E-02	--	3.32E-01
	m & p-Xylenes	20	0	0	1.45E-01	7.00E-02	--	2.90E-01
	Methyl ethyl ketone	20	0	0	8.92E-01	3.68E-01	--	1.78E+00
	Methyl isobutyl ketone	20	0	0	7.72E-01	4.44E-01	--	1.54E+00
	Methylene bromide	20	0	0	1.14E-01	4.22E-02	--	2.28E-01
	Methylene chloride	20	0	0	3.06E-01	4.24E-01	--	6.12E-01
	MTBE (Methyl tert-butyl ether)	20	0	0	7.02E-02	3.59E-02	--	1.40E-01
	Naphthalene	20	0	0	8.22E-02	7.03E-02	--	1.64E-01
	n-Butyl benzene	20	0	0	6.68E-02	2.91E-02	--	1.34E-01
	n-Propyl benzene	20	0	0	6.86E-02	3.83E-02	--	1.37E-01
	o-Chlorotoluene	20	0	0	8.17E-02	3.17E-02	--	1.63E-01
	o-Xylene	20	0	0	6.72E-02	3.44E-02	--	1.34E-01
	p-Chlorotoluene	20	0	0	7.82E-02	4.50E-02	--	1.56E-01
	p-Isopropyltoluene	20	0	0	6.25E-02	2.30E-02	--	1.25E-01
	sec-Butyl benzene	20	0	0	6.77E-02	1.57E-02	--	1.35E-01
	Styrene	20	0	0	5.16E-02	2.26E-02	--	1.03E-01
	tert-Butyl benzene	20	0	0	6.52E-02	3.03E-02	--	1.30E-01
	Tetrachloroethylene	20	0	0	8.30E-02	1.40E-02	--	1.66E-01
	Tetrahydrofuran	20	0	0	1.43E+00	5.99E-01	--	2.86E+00
	Toluene	20	1	5	5.27E-02	2.63E-02	1.40E-01	9.63E-02
	trans-1,2-Dichloroethylene	20	0	0	8.78E-02	1.84E-02	--	1.76E-01
	trans-1,3-Dichloropropylene	20	0	0	7.62E-02	4.14E-02	--	1.52E-01
	Trichloroethylene	20	0	0	5.40E-02	2.41E-02	--	1.08E-01
	Trichlorofluoromethane	20	0	0	7.19E-02	3.45E-02	--	1.44E-01
	Trichlorotrifluoroethane	20	0	0	1.44E-01	6.91E-02	--	2.89E-01
	Vinyl chloride	20	0	0	4.43E-02	4.01E-03	--	8.85E-02
	Xylenes (Total)	20	0	0	2.00E-01	1.06E-01	--	3.99E-01

DF = detection frequency; TEQ = toxicity equivalent; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; PCBs = Polychlorinated Biphenyls; ND = non-detect; DL = detection limit

[a]Concentrations reported in units of µg/L

[b]Non-detects evaluated at 1/2 the DL

Table 3-7. OU2 Soil COPC Screen[a]

Analysis	Contaminant	N	N Detect	Detection Frequency (%)	Maximum Detected Concentration	Average DL	SL[b]	COPC SELECTION STEPS				OU2 SOIL COPCs		
								Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > SL?	Detection Limit[c] Is DL > SL?	COPC	Not a COPC	Source of Uncertainty
TEQ	**TEQ$_{(D/F)}$ (ND=1/2DL)**	52	52	100	2.53E-05	--	4.8E-06 C	yes	yes	yes		X		
	TEQ$_{(D/F/PCB)}$ (ND=1/2DL)	19	19	100	4.21E-05	--	4.8E-06 C	yes	yes	yes		X		
	TEQ$_{(PCB)}$ (ND=1/2DL)	19	19	100	3.33E-05	--	4.8E-06 C	yes	yes	yes		X		
PCBs	**Total PCBs (ND=1/2DL)**	19	19	100	1.13E+00	--	2.3E-01 C	yes	yes	yes		X		
	Aroclor-1016	51	0	0	--	8.17E-03	4.1E-01 NC	yes	no		no		X	
	Aroclor-1221	51	0	0	--	1.25E-02	2.0E-01 C	yes	no		no		X	
	Aroclor-1232	51	0	0	--	9.94E-03	1.7E-01 C	yes	no		no		X	
	Aroclor-1242	51	0	0	--	1.39E-02	2.3E-01 C	yes	no		no		X	
	Aroclor-1248	51	0	0	--	1.09E-02	2.3E-01 C	yes	no		no		X	
	Aroclor-1254	51	14	27	4.13E-01	7.30E-03	1.2E-01 NC	yes	yes	yes		X		
	Aroclor-1260	51	7	14	1.72E-01	6.08E-03	2.4E-01 C	yes	yes	no			X	
	Aroclor-1262	51	0	0	--	8.95E-03		no						X
	Aroclor-1268	51	0	0	--	5.68E-03		no						X
Total Metals	**Aluminum**	68	68	100	2.84E+04	4.78E+00	7.7E+03 NC	yes	yes	yes		X		
	Antimony	24	10	42	3.60E-01	1.73E-01	3.1E+00 NC	yes	yes	no			X	
	Arsenic	68	68	100	1.14E+01	1.60E-01	6.8E-01 C	yes	yes	yes		X		
	Barium	68	68	100	1.08E+03	1.10E-01	1.5E+03 NC	yes	yes	no			X	
	Beryllium	24	24	100	1.20E+00	7.75E-02	1.6E+01 NC	yes	yes	no			X	
	Cadmium	68	66	97	3.50E+00	3.06E-02	7.1E+00 NC	yes	yes	no			X	
	Calcium	24	24	100	5.10E+04	2.88E+01	3.6E+06 EN	yes	yes	no			X	
	Chromium	68	68	100	3.95E+01	1.83E-01	3.0E-01 C	yes	yes	yes		X		
	Cobalt	68	68	100	9.60E+00	2.14E-01	2.3E+00 NC	yes	yes	yes		X		
	Copper	68	68	100	1.13E+02	3.11E-01	3.1E+02 NC	yes	yes	no			X	
	Iron	68	68	100	3.73E+04	2.58E+01	5.5E+03 NC	yes	yes	yes		X		
	Lead	68	68	100	3.88E+01	4.19E-02	4.0E+02 NC	yes	yes	no			X	
	Magnesium	24	24	100	1.40E+04	6.68E+00	4.6E+05 EN	yes	yes	no			X	
	Manganese	68	68	100	3.04E+03	2.25E-01	1.8E+02 NC	yes	yes	yes		X		
	Mercury	68	52	76	3.10E-01	8.33E-03	2.3E+00 NC	yes	yes	no			X	
	Nickel	68	68	100	4.25E+01	1.62E-01	1.5E+02 NC	yes	yes	no			X	
	Potassium	24	24	100	4.14E+03	3.03E+01	1.4E+07 EN	yes	yes	no			X	
	Selenium	24	15	63	2.10E+00	2.80E-01	3.9E+01 NC	yes	yes	no			X	
	Silver	68	7	10	7.40E-01	1.45E-01	3.9E+01 NC	yes	yes	no			X	
	Sodium	24	24	100	5.59E+02	2.02E+01	4.7E+06 EN	yes	yes	no			X	
	Thallium	68	65	96	5.50E-01	4.12E-02	7.8E-02 NC	yes	yes	yes		X		
	Vanadium	68	68	100	2.62E+01	3.42E-01	3.9E+01 NC	yes	yes	no			X	
	Zinc	68	68	100	4.46E+02	1.39E+00	2.3E+03 NC	yes	yes	no			X	
Semivolatiles	1,2,4-Trichlorobenzene	12	0	0	--	5.82E-02	5.8E+00 NC	yes	no		no		X	
	1,2-Dichlorobenzene	12	0	0	--	2.28E-02	1.8E+02 NC	yes	no		no		X	
	1,2-Diphenylhydrazine	12	0	0	--	1.77E-01	6.8E-01 C	yes	no		no		X	
	1,3-Dichlorobenzene	12	0	0	--	2.23E-02		no						X
	1,4-Dichlorobenzene	12	0	0	--	2.35E-02	2.6E+00 C	yes	no		no		X	
	1-Methylnaphthalene	12	0	0	--	6.09E-02	1.8E+01 C	yes	no		no		X	
	2,4,5-Trichlorophenol	12	0	0	--	4.22E-02	6.3E+02 NC	yes	no		no		X	
	2,4,6-Trichlorophenol	12	0	0	--	4.55E-02	6.3E+00 NC	yes	no		no		X	
	2,4-Dichlorophenol	12	0	0	--	6.65E-02	1.9E+01 NC	yes	no		no		X	
	2,4-Dimethylphenol	12	0	0	--	6.61E-02	1.3E+02 NC	yes	no		no		X	
	2,4-Dinitrophenol	12	0	0	--	1.77E-01	1.3E+01 NC	yes	no		no		X	
	2,4-Dinitrotoluene	12	0	0	--	1.77E-01	1.7E+00 C	yes	no		no		X	
	2,6-Dinitrotoluene	12	0	0	--	3.02E-02	3.6E-01 C	yes	no		no		X	
	2-Chloronaphthalene	12	0	0	--	5.53E-02	4.8E+02 NC	yes	no		no		X	
	2-Chlorophenol	12	0	0	--	8.24E-02	3.9E+01 NC	yes	no		no		X	
	2-Methylnaphthalene	12	0	0	--	6.31E-02	2.4E+01 NC	yes	no		no		X	
	2-Nitroaniline	12	0	0	--	3.83E-02	6.3E+01 NC	yes	no		no		X	
	2-Nitrophenol	12	0	0	--	6.04E-02		no						X
	3,3`-Dichlorobenzidine	12	0	0	--	4.92E-02	1.2E+00 C	yes	no		no		X	
	3-Nitroaniline	12	0	0	--	3.61E-02		no						X
	4,6-Dinitro-o-cresol	12	0	0	--	7.02E-02	5.1E-01 NC	yes	no		no		X	
	4-Bromophenyl phenyl ether	12	0	0	--	3.76E-02		no						X
	4-Chloro-3-methylphenol	12	0	0	--	1.77E-01	6.3E+02 NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	12	0	0	--	4.07E-02		no						X
	4-Nitroaniline	12	0	0	--	3.09E-02	2.5E+01 NC	yes	no		no		X	
	4-Nitrophenol	12	0	0	--	3.70E-02		no						X
	Acenaphthene	35	1	3	6.30E-04	1.45E-02	3.6E+02 NC	yes	no		no		X	
	Acenaphthylene	35	1	3	2.00E-03	1.64E-02		no						X
	Anthracene	35	4	11	8.00E-03	6.11E-02	1.8E+03 NC	yes	yes	no			X	
	Benzo(a)anthracene	35	4	11	1.56E-02	6.09E-02	1.1E+00 C	yes	yes	no			X	
	Benzo(a)pyrene	35	6	17	3.60E-02	6.09E-02	1.1E-01 C	yes	yes	no			X	
	Benzo(b)fluoranthene	35	9	26	3.38E-02	1.59E-02	1.1E+00 C	yes	yes	no			X	
	Benzo(g,h,i)perylene	35	5	14	1.93E-02	1.53E-02		no						X
	Benzo(k)fluoranthene	35	6	17	1.20E-02	1.61E-02	1.1E+01 C	yes	yes	no			X	
	bis(2-chloroethoxy)methane	12	0	0	--	6.90E-02	1.9E+01 NC	yes	no		no		X	
	bis(2-chloroethyl)ether	12	0	0	--	2.46E-02	2.3E-01 C	yes	no		no		X	
	Bis(2-chloroisopropyl)ether	12	0	0	--	8.16E-02	3.1E+02 NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	12	2	17	3.46E-01	6.04E-02	3.9E+01 C	yes	yes	no			X	
	Butyl benzyl phthalate	12	0	0	--	1.77E-01	2.9E+02 C	yes	no		no		X	
	Carbazole	12	0	0	--	1.77E-01		no						X
	Chrysene	35	7	20	2.42E-02	1.66E-02	1.1E+02 C	yes	yes	no			X	
	Dibenzo(a,h)anthracene	35	2	6	8.70E-03	6.13E-02	1.1E-01 C	yes	yes	no			X	
	Dibenzofuran	12	0	0	--	1.77E-01	7.8E+00 NC	yes	no		no		X	
	Dibutyl phthalate	12	1	8	5.37E-02	4.90E-02	6.3E+02 NC	yes	yes	no			X	
	Diethyl phthalate	12	0	0	--	1.77E-01	5.1E+03 NC	yes	no		no		X	
	Dimethyl phthalate	12	0	0	--	1.77E-01		no						X
	Di-n-octyl phthalate	12	0	0	--	1.77E-01	6.3E+01 NC	yes	no		no		X	
	Fluoranthene	35	9	26	3.07E-02	6.09E-02	2.4E+02 NC	yes	yes	no			X	
	Fluorene	35	0	0	--	6.11E-02	2.4E+02 NC	yes	no		no		X	
	Hexachlorobenzene	12	0	0	--	4.64E-02	2.1E-01 C	yes	no		no		X	
	Hexachlorobutadiene	12	0	0	--	2.98E-02	1.2E+00 C	yes	no		no		X	
	Hexachloroethane	12	0	0	--	2.25E-02	1.8E+00 C	yes	no		no		X	
	Indeno(1,2,3-cd)pyrene	35	5	14	1.04E-02	6.12E-02	1.1E+00 C	yes	yes	no			X	
	Isophorone	12	0	0	--	5.64E-02	5.7E+02 C	yes	no		no		X	
	m & p-cresols	12	0	0	--	7.06E-02	3.2E+02 NC	yes	no		no		X	
	Naphthalene	35	2	6	5.40E-03	4.12E-02	2.0E+00 C	yes	yes	no			X	
	Nitrobenzene	12	0	0	--	7.14E-02	5.1E+00 C	yes	no		no		X	
	N-Nitrosodimethylamine	12	0	0	--	1.77E-01	2.0E-03 C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	12	0	0	--	4.81E-02	7.8E-02 C	yes	no		no		X	
	N-Nitrosodiphenylamine	12	0	0	--	1.77E-01	1.1E+02 C	yes	no		no		X	
	o-Cresol	12	0	0	--	7.64E-02	3.2E+02 NC	yes	no		no		X	
	p-Chloroaniline	12	0	0	--	5.42E-02	2.7E+00 C	yes	no		no		X	

Table 3-7. OU2 Soil COPC Screen[a]

Analysis	Contaminant	N	N Detect	Detection Frequency (%)	Maximum Detected Concentration	Average DL	SL[b]	COPC SELECTION STEPS				OU2 SOIL COPCs		
								Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > SL?	Detection Limit[c]: Is DL > SL?	COPC	Not a COPC	Source of Uncertainty
	Pentachlorophenol	12	0	0	--	1.77E-01	1.0E+00 C	yes	no		no		X	
Semivolatiles	Phenanthrene	35	2	6	7.00E-03	1.77E-02		no						X
	Phenol	12	0	0	--	7.72E-02	1.9E+03 NC	yes	no		no		X	
	Pyrene	35	10	29	4.59E-02	1.56E-02	1.8E+02 NC	yes	yes	no			X	
	1,1,1,2-Tetrachloroethane	19	0	0	--	7.54E-04	2.0E+00 C	yes	no		no		X	
	1,1,1-Trichloroethane	19	0	0	--	2.06E-03	8.1E+02 NC	yes	no		no		X	
	1,1,2,2-Tetrachloroethane	19	1	5	9.40E-04	6.92E-04	6.0E-01 C	yes	yes	no			X	
	1,1,2-Trichloroethane	19	0	0	--	8.06E-04	1.5E-01 NC	yes	no		no		X	
	1,1-Dichloroethane	19	0	0	--	9.84E-04	3.6E+00 C	yes	no		no		X	
	1,1-Dichloroethene	19	0	0	--	1.87E-03	2.3E+01 NC	yes	no		no		X	
	1,1-Dichloropropene	19	0	0	--	1.84E-03		no						X
	1,2,3-Trichlorobenzene	19	0	0	--	6.18E-04	6.3E+00 NC	yes	no		no		X	
	1,2,3-Trichloropropane	19	0	0	--	1.84E-03	5.1E-03 C	yes	no		no		X	
	1,2,4-Trichlorobenzene	19	0	0	--	6.51E-04	5.8E+00 NC	yes	no		no		X	
	1,2,4-Trimethylbenzene	19	6	32	8.91E-02	3.01E-03	3.0E+01 NC	yes	yes	no			X	
	1,2-Dibromo-3-chloropropane	19	0	0	--	2.91E-03	5.3E-03 C	yes	no		no		X	
	1,2-Dibromoethane	19	0	0	--	9.13E-04	3.6E-02 C	yes	no		no		X	
	1,2-Dichlorobenzene	19	0	0	--	5.87E-04	1.8E+02 NC	yes	no		no		X	
	1,2-Dichloroethane	19	0	0	--	7.03E-04	4.6E-01 C	yes	no		no		X	
	1,2-Dichloropropane	19	0	0	--	1.07E-03	1.6E+00 NC	yes	no		no		X	
	1,3,5-Trimethylbenzene	19	5	26	4.85E-02	2.22E-03	2.7E+01 NC	yes	yes	no			X	
	1,3-Dichlorobenzene	19	0	0	--	6.60E-04		no						X
	1,3-Dichloropropane	19	0	0	--	6.51E-04	1.6E+02 NC	yes	no		no		X	
	1,4-Dichlorobenzene	19	0	0	--	5.66E-04	2.6E+00 C	yes	no		no		X	
	2,2-Dichloropropane	19	0	0	--	1.92E-03		no						X
	Acetone	19	3	16	1.44E+00	2.04E-02	6.1E+03 NC	yes	yes	no			X	
	Allyl chloride	19	0	0	--	1.14E-03	1.7E-01 NC	yes	no		no		X	
	Benzene	19	1	5	1.16E-02	1.79E-03	1.2E+00 C	yes	yes	no			X	
	Bromobenzene	19	0	0	--	1.23E-03	2.9E+01 NC	yes	no		no		X	
	Bromochloromethane	19	0	0	--	5.45E-04	1.5E+01 NC	yes	no		no		X	
	Bromoform	19	0	0	--	6.07E-04	1.9E+01 C	yes	no		no		X	
	Bromomethane	19	0	0	--	2.12E-03	6.8E-01 NC	yes	no		no		X	
Volatile Organics	Carbon tetrachloride	19	0	0	--	3.01E-04	6.5E-01 C	yes	no		no		X	
	Chlorobenzene	19	0	0	--	7.54E-04	2.8E+01 NC	yes	no		no		X	
	Chloroethane	19	0	0	--	1.42E-03	1.4E+03 NC	yes	no		no		X	
	Chloroform	19	0	0	--	8.15E-04	3.2E-01 C	yes	no		no		X	
	Chloromethane	19	0	0	--	1.44E-03	1.1E+01 NC	yes	no		no		X	
	cis-1,2-Dichloroethylene	19	0	0	--	9.14E-04	1.6E+01 NC	yes	no		no		X	
	cis-1,3-Dichloropropylene	19	0	0	--	2.20E-04		no						X
	Cumene	19	0	0	--	9.36E-04	1.9E+02 NC	yes	no		no		X	
	Dibromochloromethane	19	0	0	--	9.22E-04	8.3E+00 C	yes	no		no		X	
	Dichlorobromomethane	19	0	0	--	8.77E-04	2.9E-01 C	yes	no		no		X	
	Dichlorodifluoromethane	19	0	0	--	1.99E-03	8.7E+00 NC	yes	no		no		X	
	Dichlorofluoromethane	19	0	0	--	1.33E-03		no						X
	Ethyl ether	19	0	0	--	8.77E-04	1.6E+03 NC	yes	no		no		X	
	Ethylbenzene	19	1	5	3.45E-02	1.39E-03	5.8E+00 C	yes	yes	no			X	
	Hexachlorobutadiene	19	0	0	--	3.23E-03	1.2E+00 C	yes	no		no		X	
	Hexachloroethane	16	0	0	--	2.24E-02	1.8E+00 C							
	Methyl ethyl ketone	19	0	0	--	4.91E-03	2.7E+03 NC	yes	no		no		X	
	Methyl isobutyl ketone	19	0	0	--	3.08E-03	3.3E+03 NC	yes	no		no		X	
	Methylene bromide	19	0	0	--	5.87E-04	2.4E+00 NC	yes	no		no		X	
	Methylene chloride	19	5	26	3.27E-01	1.06E-02	3.5E+01 NC	yes	yes	no			X	
	MTBE (Methyl tert-butyl ether)	19	0	0	--	5.98E-04	4.7E+01 C	yes	no		no		X	
	Naphthalene	19	1	5	4.84E-01	1.49E-02	2.0E+00 C	yes	yes	no			X	
	n-Butyl benzene	19	0	0	--	9.95E-04	3.9E+02 NC	yes	no		no		X	
	n-Propyl benzene	19	0	0	--	1.04E-03	3.8E+02 NC	yes	no		no		X	
	o-Chlorotoluene	19	0	0	--	7.54E-04	1.6E+02 NC	yes	no		no		X	
	p-Chlorotoluene	19	0	0	--	3.13E-04	1.6E+02 NC	yes	no		no		X	
	p-Isopropyltoluene	19	3	16	2.56E+00	3.33E-03		no						X
	sec-Butyl benzene	19	0	0	--	1.14E-03	7.8E+02 NC	yes	no		no		X	
	Styrene	19	0	0	--	5.30E-04	6.0E+02 NC	yes	no		no		X	
	tert-Butyl benzene	19	0	0	--	9.95E-04	7.8E+02 NC	yes	no		no		X	
	Tetrachloroethylene	19	0	0	--	1.46E-03	8.1E+00 NC	yes	no		no		X	
	Tetrahydrofuran	19	5	26	2.11E-01	4.48E-02	1.8E+03 NC	yes	yes	no			X	
	Toluene	19	14	74	6.74E-02	1.52E-03	4.9E+02 NC	yes	yes	no			X	
	trans-1,2-Dichloroethylene	19	0	0	--	1.46E-03	7.0E+00 NC	yes	no		no		X	
Volatile Organics	trans-1,3-Dichloropropylene	19	0	0	--	1.69E-04		no						X
	Trichloroethylene	19	0	0	--	1.24E-03	4.1E-01 NC	yes	no		no		X	
	Trichlorofluoromethane	19	6	32	2.61E-01	1.35E-02	2.3E+03 NC	yes	yes	no			X	
	Trichlorotrifluoroethane	19	0	0	--	5.18E-04	6.7E+02 NC	yes	no		no		X	
	Vinyl chloride	19	0	0	--	4.76E-04	5.9E-02 C	yes	no		no		X	
	Xylenes (total)	19	0	0	--	1.61E-03	5.8E+01 NC	yes	no		no		X	

TEQ = Toxicity Equivalence; PCBs = Polychlorinated Biphenyls; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; $TEQ_{(D/F/PCB)}$ = toxicity equivalent for dioxins, furans and PCBs; $TEQ_{(PCB)}$ = toxicity equivalent for PCBs; SL = screening level; ND = non-detect; DL = sample-specific detection limit; EN = essential nutrient; C = cancer; NC = non-cancer.

Bolded contaminants are those where the maximum detected concentration exceeds the respective risk-based SL.

[a]Concentrations are in units of mg/kg.

[b]Risk-based screening levels are based on generic residential soil RSL values using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value).

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

Table 3-8. OU2 Groundwater COPC Screen[a]

Analysis	Contaminant	N	N Detect	Detection Frequency (%)	Maximum Detected Concentration	Average DL	SL[b]		COPC SELECTION STEPS: Does chemical have an RBC?	COPC SELECTION STEPS: Is chemical detected ≥5%?	COPC SELECTION STEPS: Is Max Detect > SL?	COPC SELECTION STEPS: Detection Limit[c]: Is DL > SL?	OU2 GROUNDWATER COPCs: COPC	OU2 GROUNDWATER COPCs: Not a COPC	OU2 GROUNDWATER COPCs: Source of Uncertainty
TEQ	**$TEQ_{(D/F)}$ (ND = 1/2 DL)**	62	33	53	5.1E-06	--	1.2E-07	C	yes	yes	yes		X		
PCBs	Aroclor-1016	41	0	0	--	4.2E-02	1.4E-01	NC	yes	no		no		X	
	Aroclor-1221	41	0	0	--	3.7E-02	4.7E-03	C	yes	no		yes			X
	Aroclor-1232	41	0	0	--	3.7E-02	4.7E-03	C	yes	no		yes			X
	Aroclor-1242	41	0	0	--	4.2E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1248	41	0	0	--	3.3E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1254	41	0	0	--	3.7E-02	7.8E-03	C	yes	no		yes			X
	Aroclor-1260	41	5	12	1.2E-01	3.1E-02	7.8E-03	C	yes	yes	yes		X		
	Aroclor-1262	41	0	0	--	4.0E-02			no						X
	Aroclor-1268	41	0	0	--	3.9E-02			no						X
Total Metals	Aluminum	80	50	63	3.6E+02	3.4E+01	2.0E+03	NC	yes	yes	no			X	
	Antimony	80	32	40	7.1E-01	3.2E-01	7.8E-01	NC	yes	yes	no			X	
	Arsenic	80	74	93	2.2E+01	1.7E+00	5.2E-02	C	yes	yes	yes		X		
	Barium	80	80	100	5.2E+02	--	3.8E+02	NC	yes	yes	yes		X		
	Beryllium	70	3	4	9.2E-02	1.4E-01	2.5E+00	NC	yes	no		no		X	
	Cadmium	80	21	26	3.3E-01	9.7E-02	9.2E-01	NC	yes	yes	no			X	
	Calcium	80	80	100	1.0E+05	--	4.4E+05	EN	yes	yes	no			X	
	Chromium	80	36	45	3.8E+00	1.1E+00	3.5E-02	C	yes	yes	yes		X		
	Cobalt	80	24	30	2.6E+01	3.4E-01	6.0E-01	NC	yes	yes	yes		X		
	Copper	80	66	83	9.3E+01	1.2E+00	8.0E+01	NC	yes	yes	yes		X		
	Iron	80	61	76	4.1E+04	4.3E+01	1.4E+03	NC	yes	yes	yes		X		
	Lead	80	43	54	1.4E+01	1.4E-01	1.5E+01	NC	yes	yes	no			X	
	Magnesium	80	80	100	3.3E+04	--	1.3E+05	EN	yes	yes	no			X	
	Manganese	80	70	88	3.3E+03	2.2E+01	4.3E+01	NC	yes	yes	yes		X		
	Mercury	80	3	4	2.0E-01	7.6E-02	5.7E-01	NC	yes	no		no		X	
	Nickel	80	51	64	1.3E+01	7.3E-01	3.9E+01	NC	yes	yes	no			X	
	Potassium	80	80	100	1.8E+04	--	1.9E+06	EN	yes	yes	no			X	
	Selenium	80	16	20	3.5E-01	3.8E-01	1.0E+01	NC	yes	yes	no			X	
	Silver	80	3	4	2.6E-01	3.3E-01	9.4E+00	NC	yes	no		no		X	
	Sodium	80	80	100	2.1E+05	--	5.6E+05	EN	yes	yes	no			X	
	Thallium	80	2	3	3.8E-01	7.4E-02	2.0E-02	NC	yes	no		yes			X
	Vanadium	80	66	83	5.5E+01	2.1E+00	8.6E+00	NC	yes	yes	yes		X		
	Zinc	80	32	40	2.9E+02	5.9E+00	6.0E+02	NC	yes	yes	no			X	
Miscellaneous Parameters	Chloride	94	94	100	1.2E+05	--	3.1E+05	EN	yes	yes	no			X	
	Fluoride	94	94	100	3.7E+02	--	3.5E+05	EN	yes	yes	no			X	
	Nitrogen, NO2 plus NO3	94	74	79	2.6E+03	4.2E+01	1.0E+04	MCL	yes	yes	no			X	
	Phosphorus (as P)	94	87	93	5.5E+02	6.4E+01	1.3E+08	EN	yes	yes	no			X	
	Sulfate	94	94	100	1.7E+05	--			no						X
Semivolatiles	1,2,4-Trichlorobenzene	20	0	0	--	4.7E+00	4.0E-01	NC	yes	no		yes			X
	1,2-Dichlorobenzene	20	0	0	--	4.2E+00	3.0E+01	NC	yes	no		no		X	
	1,2-Diphenylhydrazine	20	0	0	--	2.7E+00	7.8E-02	C	yes	no		yes			X
	1,3-Dichlorobenzene	20	0	0	--	4.5E+00			no						X
	1,4-Dichlorobenzene	20	0	0	--	4.1E+00	4.8E-01	C	yes	no		yes			X
	1-Methylnaphthalene	20	0	0	--	3.1E+00	1.1E+00	C	yes	no		yes			X
	2,4,5-Trichlorophenol	20	0	0	--	2.3E+00	1.2E+02	NC	yes	no		no		X	
	2,4,6-Trichlorophenol	20	0	0	--	2.4E+00	1.2E+00	NC	yes	no		yes			X
	2,4-Dichlorophenol	20	0	0	--	2.8E+00	4.6E+00	NC	yes	no		no		X	
	2,4-Dimethylphenol	20	0	0	--	7.5E+00	3.6E+01	NC	yes	no		no		X	
	2,4-Dinitrophenol	20	0	0	--	3.9E+00	3.9E+00	NC	yes	no		yes			X
	2,4-Dinitrotoluene	20	0	0	--	2.5E+00	2.4E-01	C	yes	no		yes			X
	2,6-Dinitrotoluene	20	0	0	--	2.0E+00	4.9E-02	C	yes	no		yes			X
	2-Chloronaphthalene	20	0	0	--	3.3E+00	7.5E+01	NC	yes	no		no		X	
	2-Chlorophenol	20	0	0	--	2.4E+00	9.1E+00	NC	yes	no		no		X	
	2-Methylnaphthalene	20	0	0	--	3.4E+00	3.6E+00	NC	yes	no		no		X	
	2-Nitroaniline	20	0	0	--	3.1E+00	1.9E+01	NC	yes	no		no		X	
	2-Nitrophenol	20	0	0	--	2.9E+00			no						X
	3&4-Methylphenol	2	0	0	--	1.9E+00			no						X
	3,3`-Dichlorobenzidine	19	0	0	--	4.2E+00	1.3E-01	C	yes	no		yes			X
	3-Nitroaniline	20	0	0	--	4.4E+00			no						X
	4,6-Dinitro-o-cresol	20	0	0	--	3.6E+00	1.5E-01	NC	yes	no		yes			X
	4-Bromophenyl phenyl ether	20	0	0	--	3.4E+00			no						X
	4-Chloro-3-methylphenol	20	0	0	--	2.4E+00	1.4E+02	NC	yes	no		no		X	
	4-Chlorophenyl phenyl ether	20	0	0	--	2.2E+00			no						X
	4-Nitroaniline	20	0	0	--	4.4E+00	3.8E+00	C	yes	no		yes			X
	4-Nitrophenol	20	0	0	--	4.7E+00			no						X
	Acenaphthene	20	0	0	--	2.7E+00	5.3E+01	NC	yes	no		no		X	
	Acenaphthylene	20	0	0	--	2.9E+00			no						X
	Anthracene	20	0	0	--	2.7E+00	1.8E+02	NC	yes	no		no		X	
	Benzo(a)anthracene	20	0	0	--	3.9E+00	3.0E-02	C	yes	no		yes			X
	Benzo(a)pyrene	20	0	0	--	2.9E+00	2.5E-02	C	yes	no		yes			X
	Benzo(b)fluoranthene	20	0	0	--	2.9E+00	2.5E-01	C	yes	no		yes			X
	Benzo(g,h,i)perylene	20	0	0	--	3.3E+00			no						X
	Benzo(k)fluoranthene	20	0	0	--	3.2E+00	2.5E+00	C	yes	no		yes			X
	bis(2-chloroethoxy)methane	20	0	0	--	2.3E+00	5.9E+00	NC	yes	no		no		X	
	bis(2-chloroethyl)ether	20	0	0	--	2.5E+00	1.4E-02	C	yes	no		yes			X
	Bis(2-chloroisopropyl)ether	20	0	0	--	2.7E+00	7.1E+01	NC	yes	no		no		X	
	Bis(2-ethylhexyl)phthalate	20	0	0	--	5.7E+00	5.6E+00	C	yes	no		yes			X
	Butyl benzyl phthalate	20	0	0	--	2.8E+00	1.6E+01	C	yes	no		no		X	
	Carbazole	20	0	0	--	2.6E+00			no						X
	Chrysene	20	0	0	--	2.9E+00	2.5E+01	C	yes	no		no		X	
	Dibenzo(a,h)anthracene	20	0	0	--	3.0E+00	2.5E-02	C	yes	no		yes			X
	Dibenzofuran	20	0	0	--	2.9E+00	7.9E-01	NC	yes	no		yes			X
	Dibutyl phthalate	20	0	0	--	3.0E+00	9.0E+01	NC	yes	no		no		X	
	Diethyl phthalate	20	0	0	--	2.8E+00	1.5E+03	NC	yes	no		no		X	

Table 3-8. OU2 Groundwater COPC Screen[a]

Analysis	Contaminant	N	N Detect	Detection Frequency (%)	Maximum Detected Concentration	Average DL	SL[b]	COPC SELECTION STEPS: Does chemical have an RBC?	COPC SELECTION STEPS: Is chemical detected ≥5%?	COPC SELECTION STEPS: Is Max Detect > SL?	COPC SELECTION STEPS: Detection Limit[c]: Is DL > SL?	OU2 GROUNDWATER COPCs: COPC	OU2 GROUNDWATER COPCs: Not a COPC	OU2 GROUNDWATER COPCs: Source of Uncertainty
Semivolatiles	Dimethyl phthalate	20	0	0	--	2.6E+00		no						X
	Di-n-octyl phthalate	20	0	0	--	3.0E+00	2.0E+01 NC	yes	no		no		X	
	Fluoranthene	20	0	0	--	2.9E+00	8.0E+01 NC	yes	no		no		X	
	Fluorene	20	0	0	--	2.7E+00	2.9E+01 NC	yes	no		no		X	
	Hexachlorobenzene	20	0	0	--	3.4E+00	9.8E-03 C	yes	no		yes			X
	Hexachlorobutadiene	20	0	0	--	3.7E+00	1.4E-01 C	yes	no		yes			X
	Hexachloroethane	20	0	0	--	4.0E+00	3.3E-01 C	yes	no		yes			X
	Indeno(1,2,3-cd)pyrene	20	0	0	--	2.8E+00	2.5E-01 C	yes	no		yes			X
	Isophorone	20	0	0	--	2.1E+00	7.8E+01 C	yes	no		no		X	
	m & p-cresols	18	0	0	--	2.6E+00	9.3E+01 NC	yes	no		no		X	
	Naphthalene	20	0	0	--	3.3E+00	1.2E-01 C	yes	no		yes			X
	Nitrobenzene	20	0	0	--	2.7E+00	1.4E-01 C	yes	no		yes			X
	N-Nitrosodimethylamine	20	0	0	--	2.3E+00	1.1E-04 C	yes	no		yes			X
	N-Nitrosodi-n-propylamine	20	0	0	--	2.4E+00	1.1E-02 C	yes	no		yes			X
	N-Nitrosodiphenylamine	20	0	0	--	3.4E+00	1.2E+01 C	yes	no		no		X	
	o-Cresol	20	0	0	--	3.1E+00	9.3E+01 NC	yes	no		no		X	
	p-Chloroaniline	20	0	0	--	4.1E+00	3.7E-01 C	yes	no		yes			X
	Pentachlorophenol	20	0	0	--	3.8E+00	4.1E-02 C	yes	no		yes			X
	Phenanthrene	20	0	0	--	2.5E+00		no						X
	Phenol	20	0	0	--	2.4E+00	5.8E+02 NC	yes	no		no		X	
	Pyrene	20	0	0	--	2.7E+00	1.2E+01 NC	yes	no		no		X	
Volatile Organics	1,1,1,2-Tetrachloroethane	20	0	0	--	1.5E-01	5.7E-01 C	yes	no		no		X	
	1,1,1-Trichloroethane	20	0	0	--	1.4E-01	8.0E+02 NC	yes	no		no		X	
	1,1,2,2-Tetrachloroethane	20	0	0	--	1.5E-01	7.6E-02 C	yes	no		yes			X
	1,1,2-Trichloroethane	20	0	0	--	1.7E-01	4.1E-02 NC	yes	no		yes			X
	1,1-Dichloroethane	20	0	0	--	1.5E-01	2.8E+00 C	yes	no		no		X	
	1,1-Dichloroethene	20	0	0	--	1.6E-01	2.8E+01 NC	yes	no		no		X	
	1,1-Dichloropropene	20	0	0	--	1.4E-01		no						X
	1,2,3-Trichlorobenzene	20	0	0	--	2.1E-01	7.0E-01 NC	yes	no		no		X	
	1,2,3-Trichloropropane	20	0	0	--	3.6E-01	7.5E-04 C	yes	no		yes			X
	1,2,4-Trichlorobenzene	20	0	0	--	1.9E-01	4.0E-01 NC	yes	no		no		X	
	1,2,4-Trimethylbenzene	20	1	5	7.6E-01	1.3E-01	5.6E+00 NC	yes	yes	no			X	
	1,2-Dibromo-3-chloropropane	20	0	0	--	8.2E-01	3.3E-04 C	yes	no		yes			X
	1,2-Dibromoethane	20	0	0	--	1.8E-01	7.5E-03 C	yes	no		yes			X
	1,2-Dichlorobenzene	20	0	0	--	1.6E-01	3.0E+01 NC	yes	no		no		X	
	1,2-Dichloroethane	20	0	0	--	1.4E-01	1.7E-01 C	yes	no		no		X	
	1,2-Dichloropropane	20	0	0	--	2.6E-01	8.2E-01 NC	yes	no		no		X	
	1,3,5-Trimethylbenzene	20	0	0	--	1.3E-01	6.0E+00 NC	yes	no		no		X	
	1,3-Dichlorobenzene	20	0	0	--	1.6E-01		no						X
	1,3-Dichloropropane	20	0	0	--	1.5E-01	3.7E+01 NC	yes	no		no		X	
	1,4-Dichlorobenzene	20	1	5	9.4E-02	1.4E-01	4.8E-01 C	yes	yes	no			X	
	2,2-Dichloropropane	20	0	0	--	2.4E-01		no						X
	Acetone	20	6	30	1.0E+01	7.1E+00	1.4E+03 NC	yes	yes	no			X	
	Allyl chloride	20	0	0	--	4.2E-01	2.1E-01 NC	yes	no		yes			X
	Benzene	20	0	0	--	1.3E-01	4.6E-01 C	yes	no		no		X	
	Bromobenzene	20	0	0	--	1.9E-01	6.2E+00 NC	yes	no		no		X	
	Bromochloromethane	20	0	0	--	2.4E-01	8.3E+00 NC	yes	no		no		X	
	Bromoform	20	0	0	--	3.6E-01	3.3E+00 C	yes	no		no		X	
	Bromomethane	20	0	0	--	5.2E-01	7.5E-01 NC	yes	no		no		X	
	Carbon tetrachloride	20	0	0	--	2.3E-01	4.6E-01 C	yes	no		no		X	
	Chlorobenzene	20	1	5	1.6E-01	1.7E-01	7.8E+00 NC	yes	yes	no			X	
	Chloroethane	20	0	0	--	2.9E-01	2.1E+03 NC	yes	no		no		X	
	Chloroform	20	0	0	--	2.8E-01	2.2E-01 C	yes	no		yes			X
	Chloromethane	20	0	0	--	3.7E-01	1.9E+01 NC	yes	no		no		X	
	cis-1,2-Dichloroethylene	20	0	0	--	1.9E-01	3.6E+00 NC	yes	no		no		X	
	cis-1,3-Dichloropropylene	20	0	0	--	1.6E-01		no						X
	Cumene	20	0	0	--	1.3E-01	4.5E+01 NC	yes	no		no		X	
	Dibromochloromethane	20	0	0	--	1.1E-01	8.7E-01 C	yes	no		no		X	
	Dichlorobromomethane	20	0	0	--	1.5E-01	1.3E-01 C	yes	no		yes			X
	Dichlorodifluoromethane	20	0	0	--	3.1E-01	2.0E+01 NC	yes	no		no		X	
	Dichlorofluoromethane	20	0	0	--	1.5E-01		no						X
	Ethyl ether	20	0	0	--	2.4E-01	3.9E+02 NC	yes	no		no		X	
	Ethylbenzene	20	0	0	--	1.6E-01	1.5E+00 C	yes	no		no		X	
	Hexachlorobutadiene	20	0	0	--	3.3E-01	1.4E-01 C	yes	no		yes			X
	m & p-Xylenes	20	0	0	--	2.9E-01		no						X
	Methyl ethyl ketone	20	0	0	--	1.8E+00	5.6E+02 NC	yes	no		no		X	
	Methyl isobutyl ketone	20	0	0	--	1.5E+00	6.3E+02 NC	yes	no		no		X	
	Methylene bromide	20	0	0	--	2.3E-01	8.3E-01 NC	yes	no		no		X	
	Methylene chloride	20	0	0	--	6.1E-01	1.1E+01 NC	yes	no		no		X	
	MTBE (Methyl tert-butyl ether)	20	0	0	--	1.4E-01	1.4E+01 C	yes	no		no		X	
	Naphthalene	20	0	0	--	1.6E-01	1.2E-01 C	yes	no		yes			X
	n-Butyl benzene	20	0	0	--	1.3E-01	1.0E+02 NC	yes	no		no		X	
	n-Propyl benzene	20	0	0	--	1.4E-01	6.6E+01 NC	yes	no		no		X	
	o-Chlorotoluene	20	0	0	--	1.6E-01	2.4E+01 NC	yes	no		no		X	
	o-Xylene	20	0	0	--	1.3E-01	1.9E+01 NC	yes	no		no		X	
	p-Chlorotoluene	20	0	0	--	1.6E-01	2.5E+01 NC	yes	no		no		X	
	p-Isopropyltoluene	20	0	0	--	1.2E-01		no						X
	sec-Butyl benzene	20	0	0	--	1.4E-01	2.0E+02 NC	yes	no		no		X	
	Styrene	20	0	0	--	1.0E-01	1.2E+02 NC	yes	no		no		X	
	tert-Butyl benzene	20	0	0	--	1.3E-01	6.9E+01 NC	yes	no		no		X	
	Tetrachloroethylene	20	0	0	--	1.7E-01	4.1E+00 NC	yes	no		no		X	
	Tetrahydrofuran	20	0	0	--	2.9E+00	3.4E+02 NC	yes	no		no		X	
	Toluene	20	1	5	1.4E-01	9.6E-02	1.1E+02 NC	yes	yes	no			X	

Table 3-8. OU2 Groundwater COPC Screen[a]

Analysis	Contaminant	N	N Detect	Detection Frequency (%)	Maximum Detected Concentration	Average DL	SL[b]	COPC SELECTION STEPS				OU2 GROUNDWATER COPCs		
								Does chemical have an RBC?	Is chemical detected ≥5%?	Is Max Detect > SL?	Detection Limit[c] Is DL > SL?	COPC	Not a COPC	Source of Uncertainty
Volatile Organics	trans-1,2-Dichloroethylene	20	0	0	--	1.8E-01	6.8E+00 NC	yes	no		no		X	
	trans-1,3-Dichloropropylene	20	0	0	--	1.5E-01		no						X
	Trichloroethylene	20	0	0	--	1.1E-01	2.8E-01 NC	yes	no		no		X	
	Trichlorofluoromethane	20	0	0	--	1.4E-01	5.2E+02 NC	yes	no		no		X	
	Trichlorotrifluoroethane	20	0	0	--	2.9E-01	1.0E+03 NC	yes	no		no		X	
	Vinyl chloride	20	0	0	--	8.9E-02	1.9E-02 C	yes	no		yes			X
	Xylenes (total)	20	0	0	--	4.0E-01	1.9E+01 NC	yes	no		no		X	

DF = Detection Frequency; TEQ = Toxicity Equivalence; $TEQ_{(D/F)}$ = Toxicity Equivalent for dioxins and furans; PCBs = Polychlorinated Biphenyls; SL = screening level; ND = non-detect; DL = detection limit; EN = essential nutrient; MCL = maximum contaminant level

Bolded contaminants are those where the maximum detected concentration exceeds the respective risk-based SL.

[a]Concentrations in units of µg/L. Data from wells in Units 1 and 3 were used to generate these summary statistics.

[b]Risk-based RSLs are based on generic residential tapwater RSL values using a target cancer risk of 1E-06 ("C" = cancer based value) or a target HQ of 0.1 ("NC" = non-cancer based value). For essential nutrients, tolerable Upper Intake levels derived by the Food and Nutrition Information Center (FNIC) were used to derive a RBC assuming a water intake rate of 0.78 L/day for a child receptor (there is no Tolerable Upper Intake Level for Potassium, so a Dietary Reference Intake was used instead).

[c]Detection limts were evaluated for those chemicals with a detection frequency <5%.

Table 3-9. Exposure Parameters for Hypothetical Future Residents

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight - adult	kg	80	[1]	80	[1]
	Body Weight - child	kg	15	[1]	15	[1]
	Exposure frequency	days/yr	256	[4, a]	350	[1]
	Exposure duration - adult	yr	9	[4, b]	20	[1]
	Exposure duration - child	yr	3	[4, b]	6	[1]
	Exposure duration (total)	yr	12	[4, b]	26	[1]
	Averaging Time, Cancer	yr	70	[2]	70	[2]
Incidental Ingestion of Soil	Ingestion rate - adult	mg/day	50	[3, c]	100	[1]
	Ingestion rate - child	mg/day	100	[3, c]	200	[1]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**1.50E-06**		**3.87E-06**	
	HIF (cancer)	**kg/kg-day**	**2.57E-07**		**1.44E-06**	
Ingestion of Water	Ingestion rate - adult	L/day	1.2	[4, d]	2.5	[1]
	Ingestion rate - child	L/day	0.45	[4, d]	0.78	[1]
	HIF (noncancer)	**L/kg-d**	**1.32E-02**		**3.46E-02**	
	HIF (cancer)	**L/kg-d**	**2.25E-03**		**1.28E-02**	
Dermal Exposure to Soil	Exposed Surface Area - adult	cm^2/event	6,032	[1]	6,032	[1]
	Exposed Surface Area - child	cm^2/event	2,373	[1]	2,373	[1]
	Adherence Factor - adult	mg/cm^2	0.01	[5]	0.07	[1]
	Adherence Factor - child	mg/cm^2	0.04	[5]	0.2	[1]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency	events/day	1	[5]	1	[5]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**1.51E-06**		**1.09E-05**	
	HIF (cancer)	**kg/kg-day**	**2.58E-07**		**4.05E-06**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

[4] USEPA 2011. Exposure Factors Handbook.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] MDEQ 2016. Development of Montana-Specific Default Soil Exposure Frequencies. June.

[7] Professional judgment.

Notes:

[a] Estimated frequency based on the average percent of time spent at home (70%, see Table 16-16) and multiplying by 365 days/year.

[b] Average residential occupancy period =12 years (Table 16-5); delegation of years between adult and child based on professional judgment and consistent with other Regional risk assessments.

[c] CTE ingestion rate assumed to be half that of the RME receptor.

[d] Weighted mean of consumer-only ingestion of drinking water (Table 3-1).

Table 3-10. Exposure Parameters for Hypothetical Future Commercial/Industrial Workers

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight	kg	80	[1]	80	[1]
	Exposure frequency	days/yr	219	[3]	250	[1]
	Exposure duration	yr	9	[3]	25	[1]
	Averaging Time, Noncancer	days	3,285	[2]	9,125	[2]
	Averaging Time, Cancer	days	25,550	[2]	25,550	[2]
Incidental Ingestion of Soil	Ingestion rate	mg/day	50	[5, c]	100	[1]
	Conversion factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**3.75E-07**		**8.56E-07**	
	HIF (cancer)	**kg/kg-day**	**4.82E-08**		**3.06E-07**	
Ingestion of Water	Ingestion rate	L/day	0.63	[5, c]	1.25	[4, a]
	HIF (noncancer)	**L/kg-d**	**4.69E-03**		**1.07E-02**	
	HIF (cancer)	**L/kg-d**	**6.03E-04**		**3.82E-03**	
Dermal Exposure to Soil	Exposed Surface Area (SA)	cm^2/event	3,527	[1]	3,527	[1]
	Adherence Factor (AF)	mg/cm^2	0.07	[1,3 b]	0.12	[1]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[3]	CS	[3]
	Event Frequency (EV)	events/day	1	[3]	1	[3]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**1.85E-06**		**3.62E-06**	
	HIF (cancer)	**kg/kg-day**	**2.38E-07**		**1.29E-06**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[4] USEPA 1991. OSWER Directive 9285.6-03.

[5] Professional judgment.

Notes:

[a] USEPA 1991 states that half of an individual's daily water intake is assumed to occur at work. Thus, the RME value is based on half of the default daily water intake is 2.5 L/day. This is consistent with the FAQs for OSWER Directive 9200.1-120.

[b] The CTE adherence factor is based on adherence factor for an RME adult resident (derived using the 50th percentile weighted AF for a high-end activity [gardening]).

[c] CTE ingestion rate assumed to be half that of the RME receptor.

Table 3-11. Exposure Parameters for Hypothetical Future Construction Workers

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight	kg	80	[1]	80	[1]
	Exposure frequency	days/yr	62	[6, a]	124	[5]
	Exposure duration	yr	0.5	[6, a]	1	[4]
	Averaging Time, Noncancer	days	183	[2]	365	[2]
	Averaging Time, Cancer	days	25,550	[2]	25,550	[2]
Ingestion of Soil	Ingestion rate	mg/day	165	[6, a]	330	[4, b]
	Conversion factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**3.50E-07**		**1.40E-06**	
	HIF (cancer)	**kg/kg-day**	**2.50E-09**		**2.00E-08**	
Inhalation of Particulates	Exposure time	hr/day	8	[4, c]	8	[4, c]
	Particulate Emission Factor (PEF)	m^3/kg	4.40E+08	[4, d]	4.40E+08	[4, d]
	TWF (noncancer)	**unitless**	**5.66E-02**		**1.13E-01**	
	TWF (cancer)	**unitless**	**4.04E-04**		**1.62E-03**	
Dermal Exposure to Soil	Exposed Surface Area (SA)	cm^2/event	3,527	[1, e]	3,527	[1, e]
	Adherence Factor (AF)	mg/cm^2	0.1	[3, f]	0.3	[3, f]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[3]	CS	[3]
	Event Frequency (EV)	events/day	1	[3]	1	[3]
	Conversion Factor	kg/mg	1.00E-06		1.00E-06	
	HIF (noncancer)	**kg/kg-day**	**7.49E-07**		**4.49E-06**	
	HIF (cancer)	**kg/kg-day**	**5.35E-09**		**6.42E-08**	

RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure; CS = chemical-specific

Sources:

[1] USEPA 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February.

[2] USEPA 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D.C. EPA/540/1-89/002. December.

[3] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[4] USEPA 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.

[5] MDEQ 2016. Development of Montana-Specific Default Soil Exposure Frequencies. June.

[6] Professional judgment.

Notes:

[a] CTE value assumed to be half that of the RME receptor.

[b] RME value is based on the default value for construction scenario (Exhibit 5-1) is based on the 95th percentile value for adult soil intake rates reported in a soil ingestion mass-balance study.

[c] Assumes the entire 8-hour workday is outdoors.

[d] Particle emission factor is based on the value recommended for off-site residents of a construction site. This value normalizese the mass of fugitive dust over 30 years but accounts for the mass of dust emited by traffic on unpaved roads during construction and the mass of dust emitted by wind erosion.

[e] Construction workers are assumed to wear a short-sleeved shirt, long pants, and shoes. Assumes that the exposed surface area is equal to the USEPA default for a worker based on assumed exposure to the head, hands and forearms.

[f] Exhibit 3-3; based on the 95th percentile value (0.3) AF for the RME receptor and the geometric mean value (0.1) AF for the CTE receptor.

Table 3-12. Summary of OU2 Soil COPC Data

Grid Number	SampleDate	Sample Number	Sample Type		Analysis Group		
					Dioxins/Furans	Aroclors	PCB Congeners
1	10/16/2017	Grid 1-SSComp-01_20171016_NM	SS	20-point composite	X	X	X
	11/23/2015	SS1-IN-(0-2)c	SS	5-point composite	X		
2	10/16/2017	Grid 2-SSComp-01_20171016_NM	SS	20-point composite	X	X	X
	11/23/2015	SS2-IN-(0-2)c	SS	5-point composite	X		
4	10/17/2017	Grid 4&7-SSComp-01_20171017_NM	SS	20-point composite	X	X	X
	11/23/2015	SS3-IN-(0-2)c	SS	5-point composite	X		
	10/17/2017	Grid 4&7-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
5	11/23/2015	SS4-IN-(0-2)c	SS	5-point composite	X		
	12/14/2015	SB1A-IN-(1-2)	SS	5-point composite		X	
	12/14/2015	SB1-IN-(6-7)	SB	grab		X	
6	11/23/2015	SS6-IN-(0-2)c	SS	5-point composite	X		
	10/17/2017	Grid 6-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
7	10/17/2017	Grid 4&7-SSComp-01_20171017_NM	SS	20-point composite	X	X	X
	11/23/2015	SS5-IN-(0-2)c	SS	5-point composite	X		
	10/17/2017	Grid 4&7-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
8	10/18/2017	Grid 8-SSComp-01_20171018_NM	SS	20-point composite	X	X	X
	10/17/2017	Grid 8-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
	12/14/2015	SB4-IN-(2-3)	SB	grab		X	
	12/14/2015	SB5-IN-(8-9)	SB	grab		X	
	12/14/2015	SB6-IN-(2.5-3)	SB	grab		X	
	12/11/2015	SB7-IN-(6-8)	SB	grab		X	
	12/14/2015	SB8-IN-(2-3)	SB	grab		X	
9	10/18/2017	Grid 9-SSComp-01_20171018_NM	SS	20-point composite	X	X	X
	11/23/2015	SS8-IN-(0-2)c	SS	5-point composite	X		
11	12/6/2017	BACKFILL-HDPT-SS	SS	5-point composite	X	X	
	11/23/2015	SS7-IN-(0-2)c	SS	5-point composite	X		
	12/15/2015	SS20-IN-(12)	SB	grab	X	X	
	12/15/2015	SS21-IN-(24)	SB	grab	X	X	
	12/15/2015	SS26-IN-(12)	SB	grab	X	X	
	12/15/2015	SS27-IN-(24)	SB	grab	X	X	
	10/17/2017	Grid 11-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
	12/6/2017	BACKFILL-HDPT-SB	SB	grab	X	X	
	12/1/2015	SB101-NFMW15-(5.5-7.5)	SB	grab	X	X	
	8/23/2016	IN-HDPT41-SB1	SB	grab		X	
	8/23/2016	IN-HDPT41-SB5	SB	grab		X	
12	11/24/2015	SS10-IN-(0-2)c	SS	5-point composite	X		
	12/3/2015	SS32-IN-(0-2)c	SS	5-point composite	X		
	12/4/2015	SS33-IN-(0-2)c	SS	5-point composite	X		
	12/15/2015	SS22-IN-(12)	SB	grab	X	X	
	12/15/2015	SS23-IN-(24)	SB	grab	X	X	
	12/15/2015	SS24-IN-(12)	SB	grab	X	X	
	12/15/2015	SS25-IN-(24)	SB	grab	X	X	
	12/14/2015	SB21-IN-(8-9)	SB	grab		X	
	12/14/2015	SB24-IN-(9-10)	SB	grab		X	
13	10/19/2017	Grid 13-SSComp-01_20171019_NM	SS	20-point composite	X	X	X
	11/24/2015	SS11-IN-(0-2)c	SS	5-point composite	X		
	10/16/2017	Grid 13-SB-(24-30in)_20171016_NM	SB	grab	X	X	X
14	10/17/2017	Grid 14-SSComp-01_20171017_NM	SS	20-point composite	X	X	X
	11/23/2015	SS9-IN-(0-2)c	SS	5-point composite	X		
	10/17/2017	Grid 14-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
15	11/24/2015	SS13-IN-(0-2)c	SS	5-point composite	X		
	12/6/2017	BACKFILL-TSB-SS	SS	5-point composite	X	X	
	12/4/2015	SS29-IN-(0-2)c	SS	5-point composite		X	
	12/4/2015	SS30-IN-(0-2)c	SS	5-point composite		X	
	12/4/2015	SS31-IN-(0-2)c	SS	5-point composite		X	
	10/16/2017	Grid 15-SB-(24-30in)_20171016_NM	SB	grab	X	X	X
	12/6/2017	BACKFILL-TSB-SB	SB	grab	X	X	
	12/9/2015	SB11-IN-(8-10)	SB	grab		X	
	12/10/2015	SB13-IN-(2-4)	SB	grab		X	
	12/10/2015	SB15-IN-(8-10)	SB	grab		X	
	12/10/2015	SB17-IN-(8-10)	SB	grab		X	
16	11/24/2015	SS12-IN-(0-2)c	SS	5-point composite	X		
17	11/23/2015	SS14-IN-(0-2)c	SS	5-point composite	X		
	11/23/2015	SS17-IN-(0-2)c	SS	5-point composite	X		
18	11/24/2015	SS16-IN-(0-2)c	SS	5-point composite	X		
	10/17/2017	Grid 18-SB-(24-30in)_20171017_NM	SB	grab	X	X	X
19	11/24/2015	SS15-IN-(0-2)c	SS	5-point composite	X		
	10/16/2017	Grid 19-SB-(24-30in)_20171016_NM	SB	grab	X	X	X
22	10/18/2017	Grid 22-SSComp-01_20171018_NM	SS	20-point composite	X	X	X
	4/18/2014	LF-1-SS_4/18/14_NM	SS	5-point composite	X	X	
23	10/18/2017	Grid 23-SSComp-01_20171018_NM	SS	20-point composite	X	X	X
	10/16/2017	Grid 23-SB-(24-30in)_20171016_NM	SB	grab	X	X	X

SS = surface soil; SB = subsurface soil; TEQ = toxicity equivalent; PCB = polychlorinated biphenyl

Table 3-13. Soil Exposure Point Concentrations

Panel A: Surface Soil EPCs

Grid	Aluminum	Arsenic	Chromium	Cobalt	Iron	Manganese	Thallium	Aroclor-1254	$TEQ_{(D/F)}$	$TEQ_{(D/F/PCB)}$	Total PCBs	Non-coplanar PCBs
1	7,378	4.8	13.1	5.6	14,800	635	0.083	0.141	5.4E-06	1.4E-05	0.215	0.195
2	6,574	3.5	9.9	3.6	9,518	293	0.099	0.025	3.5E-06	5.3E-06	0.032	0.029
3	no data											
4	11,460	3.9	10.2	4.8	12,300	321	0.122	0.032	1.6E-06	6.5E-06	0.125	0.111
5	6,230	3.3	7.1	3.4	7,847	366	0.231	0.002	1.5E-06	no data	no data	no data
6	8,860	3.2	12.4	4.0	10,600	353	0.090	no data	2.2E-05	no data	no data	no data
7	18,800	2.8	12.5	6.0	16,700	386	0.150	0.032	6.0E-07	6.5E-06	0.125	0.111
8	12,800	4.7	39.5	6.9	37,300	460	0.150	0.413	8.8E-06	4.2E-05	1.125	1.008
9	10,738	4.1	10.4	4.8	12,450	287	0.115	0.016	9.0E-06	1.0E-05	0.036	0.033
10	no data											
11	8,300	2.6	11.5	4.2	11,217	253	0.098	0.0048	3.1E-06	no data	no data	no data
12	14,390	7.7	17.8	5.2	14,867	1,622	0.090	no data	3.4E-06	no data	no data	no data
13	14,502	5.2	11.5	6.3	15,348	487	0.132	0.0057	4.0E-06	3.8E-06	0.016	0.015
14	10,208	4.1	15.9	5.1	15,460	322	0.114	0.104	2.1E-05	3.0E-05	0.074	0.067
15	5,100	2.3	11.4	3.0	8,717	196	0.066	0.0028	1.6E-06	no data	no data	no data
16	8,010	3.3	9.2	4.4	10,800	306	0.100	no data	5.3E-06	no data	no data	no data
17	9,920	4.0	12.0	5.0	12,700	319	0.103	no data	2.2E-06	no data	no data	no data
18	15,000	4.4	13.0	5.7	14,800	525	0.140	no data	6.8E-06	no data	no data	no data
19	22,500	4.3	14.3	6.7	18,500	429	0.190	no data	2.9E-06	no data	no data	no data
20	no data											
21	no data											
22	15,600	5.4	14.1	6.3	16,620	437	0.146	0.025	1.5E-05	2.6E-05	0.109	0.103
23	16,500	5.3	12.9	7.1	16,300	403	0.150	0.005	6.9E-07	1.0E-06	0.008	0.007

Panel B: Surface+Subsurface Soil EPCs

Grid	Aluminum	Arsenic	Chromium	Cobalt	Iron	Manganese	Thallium	Aroclor-1254	$TEQ_{(D/F)}$	$TEQ_{(D/F/PCB)}$	Total PCBs	Non-coplanar PCBs
1	7,378	4.8	13.1	5.6	14,800	635	0.083	0.141	5.4E-06	1.4E-05	0.215	0.195
2	6,574	3.5	9.9	3.6	9,518	293	0.099	0.025	3.5E-06	5.3E-06	0.032	0.029
3	no data											
4	11,850	3.9	10.2	4.8	12,427	317	0.124	0.031	1.6E-06	6.2E-06	0.119	0.106
5	7,392	3.6	7.8	3.8	8,939	345	0.223	0.002	1.5E-06	no data	no data	no data
6	9,783	3.2	12.0	4.3	11,050	364	0.105	0.0046	1.9E-05	5.7E-07	0.001	4.8E-04
7	18,800	2.8	12.5	6.0	16,700	386	0.150	no data	6.0E-07	6.2E-06	0.119	0.106
8	12,751	4.7	38.2	6.8	36,186	452	0.150	0.394	8.5E-06	4.0E-05	1.077	0.965
9	10,738	4.1	10.4	4.8	12,450	287	0.115	0.016	9.0E-06	1.0E-05	0.036	0.033
10	no data											
11	8,041	2.6	11.0	4.2	11,004	255	0.097	0.013	2.7E-06	4.2E-06	0.103	0.100
12	12,661	6.8	15.9	4.8	13,766	1,389	0.081	0.062	3.3E-06	no data	no data	no data
13	14,871	5.1	11.6	6.3	15,488	481	0.134	0.006	3.8E-06	3.7E-06	0.015	0.014
14	10,427	4.1	15.9	5.1	15,588	324	0.117	0.099	2.0E-05	2.9E-05	0.070	0.063
15	5,279	2.2	10.8	3.0	8,530	184	0.067	0.0028	1.4E-06	6.8E-07	0.001	0.001
16	8,010	3.3	9.2	4.4	10,800	306	0.100	no data	5.3E-06	no data	no data	no data
17	9,920	4.0	12.0	5.0	12,700	319	0.103	no data	2.2E-06	no data	no data	no data
18	13,875	4.1	12.3	5.4	14,033	468	0.133	0.0056	5.7E-06	3.7E-07	2.7E-04	2.6E-04
19	21,833	4.3	15.0	6.6	19,150	384	0.195	0.0050	2.5E-06	4.3E-07	5.4E-05	4.8E-05
20	no data											
21	no data											
22	15,600	5.4	14.1	6.3	16,620	437	0.146	0.025	1.5E-05	2.6E-05	0.109	0.103
23	16,657	5.2	13.0	7.1	16,424	395	0.151	0.005	6.8E-07	9.8E-07	0.007	0.007

EPC = exposure point concentration; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; $TEQ_{(D/F/PCB)}$ = toxicity equivalent for dioxins, furans, and PCBs; PCBs = polychlorinated biphenyls.

Table 3-14. OU2 Groundwater Exposure Point Concentrations

Well ID	N Samples	COPC	Maximum Detected Concentration (µg/L)	95UCL Concentration Value (µg/L)	Exposure Point Concentration (µg/L)	Basis for Exposure Point Concentration[a]
MCSMW1	1	$TEQ_{(D/F)}$	1.0E-06	NC	1.0E-06	Max detect; too few samples to calculate a 95UCL
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Arsenic	1.6	NC	1.6	Max detect; too few samples to calculate a 95UCL
	1	Barium	150	NC	150	Max detect; too few samples to calculate a 95UCL
	1	Chromium	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Copper	1.9	NC	1.9	Max detect; too few samples to calculate a 95UCL
	1	Iron	142	NC	142	Max detect; too few samples to calculate a 95UCL
	1	Manganese	83	NC	83	Max detect; too few samples to calculate a 95UCL
	1	Vanadium	2.1	NC	2.1	Max detect; too few samples to calculate a 95UCL
MW4	1	$TEQ_{(D/F)}$	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	0	Arsenic	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Barium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chromium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Cobalt	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Copper	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Iron	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Manganese	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Vanadium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
MW7	1	$TEQ_{(D/F)}$	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	0	Arsenic	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Barium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chromium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Cobalt	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Copper	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Iron	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Manganese	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Vanadium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
WFB1	1	$TEQ_{(D/F)}$	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	0	Arsenic	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Barium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Chromium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Cobalt	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Copper	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Iron	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Manganese	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Vanadium	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
NFMW13	4	$TEQ_{(D/F)}$	ND	NC	ND	COPC not detected; not evaluated quantitatively
	2	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	4.9	4.0	4.0	95% KM (t) UCL
	8	Barium	283	253	253	95% Student's-t UCL
	8	Chromium	0.31	0.27	0.27	95% KM (t) UCL
	8	Cobalt	1.2	0.98	0.98	95% KM (t) UCL
	8	Copper	2.7	2.4	2.4	95% KM (t) UCL
	8	Iron	2,040	1,497	1,497	95% KM (t) UCL
	8	Manganese	1,650	1,473	1,473	95% Student's-t UCL
	8	Vanadium	2.1	1.7	1.7	95% KM Adjusted Gamma UCL
NFMW14	5	$TEQ_{(D/F)}$	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	1.3	1.1	1.1	95% Student's-t UCL
	8	Barium	519	418	418	95% Modified-t UCL
	8	Chromium	0.54	0.45	0.45	95% KM (t) UCL
	8	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Copper	3.8	2.7	2.7	95% Student's-t UCL
	8	Iron	13	NC	13	Max detect; only one distinct detect, no 95UCL calculated.
	8	Manganese	84	66	66	95% Adjusted Gamma UCL
	8	Vanadium	0.93	0.82	0.82	95% KM (t) UCL

Table 3-14. OU2 Groundwater Exposure Point Concentrations

Well ID	N Samples	COPC	Maximum Detected Concentration (µg/L)	95UCL Concentration Value (µg/L)	Exposure Point Concentration (µg/L)	Basis for Exposure Point Concentration[a]
NFMW15	8	$TEQ_{(D/F)}$	2.6E-06	2.3E-06	2.3E-06	95% Student's-t UCL
	8	Aroclor-1260	0.12	0.088	0.088	95% KM (t) UCL
	8	Arsenic	17	14	14	95% Student's-t UCL
	8	Barium	240	211	211	95% Student's-t UCL
	8	Chromium	2.8	1.8	1.8	95% KM (t) UCL
	8	Cobalt	1.4	1.1	1.1	95% Student's-t UCL
	8	Copper	93	67	67	95% Chebyshev (Mean, Sd) UCL
	8	Iron	2,080	1,690	1,690	95% Student's-t UCL
	8	Manganese	3,340	2,807	2,807	95% Student's-t UCL
	8	Vanadium	55	44	44	95% Chebyshev (Mean, Sd) UCL
NFMW16	11	$TEQ_{(D/F)}$	5.1E-06	2.5E-06	2.5E-06	KM H-UCL
	5	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Arsenic	7.0	6.3	6.3	95% Adjusted Gamma UCL
	9	Barium	269	239	239	95% Student's-t UCL
	9	Chromium	0.29	0.28	0.28	95% KM (t) UCL
	9	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Copper	2.0	1.4	1.4	95% KM (t) UCL
	9	Iron	61	42	42	95% KM (t) UCL
	9	Manganese	254	230	230	95% Adjusted Gamma UCL
	9	Vanadium	1.5	1.2	1.2	95% KM (t) UCL
NFMW17	5	$TEQ_{(D/F)}$	1.0E-06	NC	1.0E-06	Max detect; only one distinct detect, no 95UCL calculated.
	7	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	3.4	3.1	3.1	95% Student's-t UCL
	8	Barium	213	157	157	95% Modified-t UCL
	8	Chromium	0.62	0.53	0.53	95% KM (t) UCL
	8	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Copper	1.4	0.95	0.95	95% KM (t) UCL
	8	Iron	16	NC	16	Max detect; only one distinct detect, no 95UCL calculated.
	8	Manganese	1.3	0.71	0.71	95% KM (t) UCL
	8	Vanadium	3.3	2.8	2.8	95% Student's-t UCL
NFMW18	3	$TEQ_{(D/F)}$	1.6E-06	1.7E-06	1.7E-06	95% Student's-t UCL; suggested 95UCL > max detect and sample size<n
	1	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	3.9	3.5	3.5	95% KM (t) UCL
	8	Barium	134	122	122	95% Student's-t UCL
	8	Chromium	0.68	0.65	0.65	95% KM (t) UCL
	8	Cobalt	0.88	0.72	0.72	95% KM (t) UCL
	8	Copper	6.9	6.1	6.1	95% Student's-t UCL
	8	Iron	278	216	216	95% Student's-t UCL
	8	Manganese	384	316	316	95% Student's-t UCL
	8	Vanadium	4.2	3.6	3.6	95% KM (t) UCL
NFMW5	5	$TEQ_{(D/F)}$	1.7E-06	1.6E-06	1.6E-06	95% KM (t) UCL
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Arsenic	2.4	1.5	1.5	95% Student's-t UCL
	9	Barium	306	285	285	95% Student's-t UCL
	9	Chromium	0.18	NC	0.18	Max detect; only one distinct detect, no 95UCL calculated.
	9	Cobalt	0.41	NC	0.41	Max detect; only one distinct detect, no 95UCL calculated.
	9	Copper	1.8	1.0	1.0	95% KM (t) UCL
	9	Iron	1,160	838	838	95% Student's-t UCL
	9	Manganese	1,230	1,100	1,100	95% Student's-t UCL
	9	Vanadium	1.3	0.64	0.64	95% KM (t) UCL
NFMW6	8	$TEQ_{(D/F)}$	2.0E-06	1.5E-06	1.5E-06	95% KM (t) UCL
	7	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Arsenic	0.54	0.41	0.41	95% KM (t) UCL
	9	Barium	391	328	328	95% Student's-t UCL
	9	Chromium	0.42	0.36	0.36	95% KM (t) UCL
	9	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	9	Copper	1.6	0.88	0.88	95% KM (t) UCL
	9	Iron	1,410	1,179	1,179	95% Student's-t UCL
	9	Manganese	2,820	2,533	2,533	95% Student's-t UCL
	9	Vanadium	1.5	1.0	1.0	95% KM (t) UCL

Table 3-14. OU2 Groundwater Exposure Point Concentrations

Well ID	N Samples	COPC	Maximum Detected Concentration (µg/L)	95UCL Concentration Value (µg/L)	Exposure Point Concentration (µg/L)	Basis for Exposure Point Concentration[a]
Car Wash Well	0	$TEQ_{(D/F)}$	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	1	Arsenic	2.1	NC	2.1	Max detect; too few samples to calculate a 95UCL
	1	Barium	340	NC	340	Max detect; too few samples to calculate a 95UCL
	1	Chromium	0.26	NC	0.26	Max detect; too few samples to calculate a 95UCL
	1	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Copper	1.8	NC	1.8	Max detect; too few samples to calculate a 95UCL
	1	Iron	479	NC	479	Max detect; too few samples to calculate a 95UCL
	1	Manganese	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Vanadium	0.91	NC	0.91	Max detect; too few samples to calculate a 95UCL
Cartage Building Well	0	$TEQ_{(D/F)}$	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	1	Arsenic	6.1	NC	6.1	Max detect; too few samples to calculate a 95UCL
	1	Barium	136	NC	136	Max detect; too few samples to calculate a 95UCL
	1	Chromium	0.60	NC	0.60	Max detect; too few samples to calculate a 95UCL
	1	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Copper	14	NC	14	Max detect; too few samples to calculate a 95UCL
	1	Iron	2,120	NC	2,120	Max detect; too few samples to calculate a 95UCL
	1	Manganese	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Vanadium	7.1	NC	7.1	Max detect; too few samples to calculate a 95UCL
Hoffman Construction Well	0	$TEQ_{(D/F)}$	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	1	Arsenic	2.1	NC	2.1	Max detect; too few samples to calculate a 95UCL
	1	Barium	173	NC	173	Max detect; too few samples to calculate a 95UCL
	1	Chromium	0.86	NC	0.86	Max detect; too few samples to calculate a 95UCL
	1	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Copper	1.3	NC	1.3	Max detect; too few samples to calculate a 95UCL
	1	Iron	7,000	NC	7,000	Max detect; too few samples to calculate a 95UCL
	1	Manganese	ND	NC	ND	COPC not detected; not evaluated quantitatively
	1	Vanadium	2.3	NC	2.3	Max detect; too few samples to calculate a 95UCL
Log Chipper Well	0	$TEQ_{(D/F)}$	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	0	Aroclor-1260	NA	NC	NA	No data for this COPC in this well; not evaluated quantitatively
	1	Arsenic	22	NC	22	Max detect; too few samples to calculate a 95UCL
	1	Barium	146	NC	146	Max detect; too few samples to calculate a 95UCL
	1	Chromium	3.8	NC	3.8	Max detect; too few samples to calculate a 95UCL
	1	Cobalt	26	NC	26	Max detect; too few samples to calculate a 95UCL
	1	Copper	21	NC	21	Max detect; too few samples to calculate a 95UCL
	1	Iron	41,100	NC	41,100	Max detect; too few samples to calculate a 95UCL
	1	Manganese	3,020	NC	3,020	Max detect; too few samples to calculate a 95UCL
	1	Vanadium	8.8	NC	8.8	Max detect; too few samples to calculate a 95UCL
Waste Fuel Boiler Well	9	$TEQ_{(D/F)}$	8.9E-07	NC	8.9E-07	Max detect; only one distinct detect, no 95UCL calculated.
	3	Aroclor-1260	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Arsenic	1.3	0.83	0.83	95% KM (t) UCL
	8	Barium	235	190	190	95% Modified-t UCL
	8	Chromium	1.1	0.88	0.88	95% KM Adjusted Gamma UCL
	8	Cobalt	ND	NC	ND	COPC not detected; not evaluated quantitatively
	8	Copper	12	7.4	7.4	95% Student's-t UCL
	8	Iron	9,380	8,753	8,753	97.5% KM (Chebyshev) UCL
	8	Manganese	37	30	30	95% KM (Chebyshev) UCL
	8	Vanadium	1.6	0.97	0.97	95% KM (t) UCL

$TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; NA = not analyzed; NC = not calculated; ND = not detected; COPC = contaminant of potential concern; 95UCL = 95% upper confidence level.

[a]Rationale provided in SRC (2021) was used to select the EPC.

Table 4-1. Chronic Human Health Toxicity Values for OU2 COPCs

Contaminant	CAS No.	Oral				Note	Dermal			Oral/Dermal Target Organ/System	Inhalation				Note
		RfD (mg/kg-day)	Source	CSF (mg/kg-day)$^{-1}$	Source		Absorption Fraction (ABS_{GI})	RfD_{ABS} (mg/kg-day) [1]	CSF_{ABS} (mg/kg-day)$^{-1}$ [2]		RfC (mg/m^3)	Source	UR (µg/m^3)$^{-1}$	Source	
2,3,7,8-TCDD	1746-01-6	7.0E-10	I	1.3E+05	C		1	7.0E-10	1.3E+05	Reproductive	4.0E-08	C	3.8E+01	C	[3]
Aroclor-1254	11097-69-1	2.0E-05	I	2.0E+00	G		1	2.0E-05	2.0E+00	Immune			5.7E-04	G	
Aroclor-1260	11096-82-5			2.0E+00	G		1		2.0E+00				5.7E-04	G	
Aluminum	7429-90-5	1.0E+00	P				1	1.0E+00		Nervous	5.0E-03	P			
Arsenic	7440-38-2	3.0E-04	I	1.5E+00	I		1	3.0E-04	1.5E+00	Dermal	1.5E-05	C	4.3E-03	I	
Barium	7440-39-3	2.0E-01	I				0.07	1.4E-02		Kidney	5.0E-04	H			
Chromium	18540-29-9	3.0E-03	I	5.0E-01	C	[4]	0.025	7.5E-05	2.0E+01	None	1.0E-04	I	8.4E-02	G	[4]
Cobalt	7440-48-4	3.0E-04	P				1	3.0E-04		Thyroid	6.0E-06	P	9.0E-03	P	
Copper	7440-50-8	4.0E-02	H			[5]	1	4.0E-02		--					
Iron	7439-89-6	7.0E-01	P				1	7.0E-01		Gastrointestinal					
Manganese (non-food)	7439-96-5	2.4E-02	G			[6]	0.04	9.6E-04		Nervous	5.0E-05	I			
Thallium	7440-28-0	1.0E-05	S				1	1.0E-05		Dermal					
Total PCBs (high risk)	1336-36-3			2.0E+00	I		1		2.0E+00				5.7E-04	I	
Vanadium	7440-62-2	5.0E-03	G			[7]	0.026	1.3E-04		Dermal	1.0E-04	A			

COPC = contaminant of potential concern; CSF = cancer slope factor; PCB = polychlorinated biphenyl; RfD = reference dose; RfC = Reference Concentration; TCDD = tetrachlorodibenzo-p-dioxin; UR = unit risk

Key: I = IRIS; P = PPRTV; S = PPRTV Screening Level; G = USEPA RSL User's Guide; H = HEAST; C = CalEPA; A = ATSDR.

Notes:

[1] Absorbed Reference Doses for Dermal were derived using the Oral Reference Dose as follows: $RFD_{ABS} = RfD_o * ABS_{GI}$ (Equation 4.3 from USEPA 2004).

[2] Absorbed Cancer Slope Factors for Dermal were derived using the Oral Cancer Slope Factors as follows: $SF_{ABS} = SF_o / ABS_{GI}$ (Equation 4.2 from USEPA 2004).

[3] USEPA (2013) noted that the contribution of the inhalation pathway to total risk is well below 1%.

[4] Toxicity values are for hexavalent chromium [Cr(VI)].

[5] The oral RfD is based on the maximum contaminant level goal of 1.3 mg/L.

[6] The IRIS RfD (0.14 mg/kg-day) is adjusted by subtracting the dietary exposure (default assumption of 5 mg) and applying a modifying factor of 3.

[7] Based on factoring out the molecular weight of the oxide ion from the RfD for vanadium pentoxide.

Table 4-2. Sub-Chronic Human Health Toxicity Values for OU2 COPCs

Contaminant	CAS No.	Oral					Dermal				Inhalation					
		RfD (mg/kg-day)	Source	CSF $(mg/kg\text{-}day)^{-1}$	Source	Note	Absorption Fraction	RfD_{ABS} (mg/kg-day) [1]	CSF_{ABS} $(mg/kg\text{-}day)^{-1}$ [2]	Oral/Dermal Target Organ/System	RfC (mg/m^3)	Source	UR $(\mu g/m^3)^{-1}$	Source	Note	Inhalation Target Organ/System
2,3,7,8-TCDD	1746-01-6	2.0E-08	A	1.3E+05	C		1	2.0E-08	1.3E+05	Reproductive	4.0E-08	C	3.8E+01	C	[3] [8]	Systemic, Hematologic, Biochemical, Liver, Respiratory
Aroclor-1254	11097-69-1	3.0E-05	A	2.0E+00	G		1	3.0E-05	2.0E+00	Immune			5.7E-04	G		
Aroclor-1260	11096-82-5			2.0E+00	G		1		2.0E+00				5.7E-04	G		
Aluminum	7429-90-5	1.0E+00	A				1	1.0E+00		Nervous	5.0E-03	P			[8]	Nervous
Antimony	7440-36-0	4.0E-04	P				0.15	6.0E-05		Systemic	1.0E-03	A				Respiratory
Arsenic	7440-38-2	3.0E-04	I	1.5E+00	I	[8]	1	3.0E-04	1.5E+00	Dermal	1.5E-05	C	4.3E-03	I	[8]	Nervous
Barium	7440-39-3	2.0E-01	A				0.07	1.4E-02		Kidney	5.0E-03	H				Developmental
Chromium	18540-29-9	5.0E-03	A	5.0E-01	C	[4]	0.025	1.3E-04	2.0E+01	None	3.0E-04	A	8.4E-02	G	[4]	Respiratory
Cobalt	7440-48-4	3.0E-03	P				1	3.0E-03		Thyroid	2.0E-05	P	9.0E-03	P		Respiratory
Copper	7440-50-8	1.0E-02	A			[5]	1	1.0E-02		--						--
Iron	7439-89-6	7.0E-01	P				1	7.0E-01		Gastrointestinal						--
Manganese (non-food)	7439-96-5	2.4E-02	G			[6]	0.04	9.6E-04		Nervous	5.0E-05	I			[8]	Nervous
Thallium	7440-28-0	4.0E-05	S				1	4.0E-05		Dermal						
Total PCBs (high risk)	1336-36-3			2.0E+00	I		1		2.0E+00				5.7E-04	I		
Vanadium	7440-62-2	1.0E-02	A			[7]	0.026	2.6E-04		Dermal	1.0E-04	A			[8]	Respiratory

COPC = contaminant of potential concern; CSF = cancer slope factor; PCB = polychlorinated biphenyl; RfD = reference dose; RfC = Reference Concentration; TCDD = tetrachlorodibenzo-p-dioxin; UR = unit risk

Key: A = ATSDR; C = CalEPA; I = IRIS; P = PPRTV; G = USEPA RSL User's Guide; H = HEAST; S = PPRTV Screening Value.

Notes:

[1] Absorbed Reference Doses for Dermal were derived using the Oral Reference Dose as follows: $RFD_{ABS} = RfD_o * ABS_{GI}$ (Equation 4.3 from USEPA 2004).

[2] Absorbed Cancer Slope Factors for Dermal were derived using the Oral Cancer Slope Factors as follows: $SF_{ABS} = SF_o / ABS_{GI}$ (Equation 4.2 from USEPA 2004).

[3] USEPA (2013) noted that the contribution of the inhalation pathway to total risk is well below 1%.

[4] Toxicity values are for hexavalent chromium [Cr(VI)].

[5] The oral RfD is based on the secondary MCL which is based on aesthetic effects and not based on health effects.

[6] The IRIS RfD (0.14 mg/kg-day) is adjusted by subtracting the dietary exposure (default assumption of 5 mg) and applying a modifying factor of 3.

[7] Based on factoring out the molecular weight of the oxide ion from the RfD for vanadium pentoxide.

[8] Sub-chronic RfD is not available. Chronic RfD is used in its place.

Table 4-3. Exposure Parameters for Hypothetical Future Residents
Exposed to Carcinogenic Contaminants with a Mutagenic Mode of Action

Exposure Pathway	Exposure Input Parameter	Units	CTE		RME	
			Value	Source	Value	Source
General	Body Weight$_{0-<2}$	kg	10	[2, 3, a]	10	[2, 3, a]
	Body Weight$_{2-<6}$	kg	17	[2, 3, a]	17	[2, 3, a]
	Body Weight$_{6-<16}$	kg	43	[2, 3, a]	43	[2, 3, a]
	Body Weight$_{>16}$	kg	79	[2, 3, a]	79	[2, 3, a]
	Exposure frequency	days/yr	256	[3, b]	350	[6]
	Exposure duration$_{0-<2}$	yr	2	[2]	2	[2]
	Exposure duration$_{2-<6}$	yr	4	[2]	4	[2]
	Exposure duration$_{6-<16}$	yr	10	[2]	10	[2]
	Exposure duration$_{>16}$	yr	54	[2]	54	[2]
	Averaging Time, Cancer	days	25,550	[1, c]	25,550	[1, c]
	ADAF$_{0-<2}$	unitless	10	[2]	10	[2]
	ADAF$_{2-<6}$	unitless	3	[2]	3	[2]
	ADAF$_{6-<16}$	unitless	3	[2]	3	[2]
	ADAF$_{>16}$	unitless	1	[2]	1	[2]
Ingestion of Soil	Ingestion rate$_{0-<2}$	mg/day	100	[7, d]	200	[6]
	Ingestion rate$_{2-<6}$	mg/day	100	[7, d]	200	[6]
	Ingestion rate$_{6-<16}$	mg/day	50	[7, d]	100	[6]
	Ingestion rate$_{>16}$	mg/day	50	[7, d]	100	[6]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**2.08E-06**		**5.69E-06**	
	HIF$_{2-<6}$	**kg/kg-d**	**6.91E-07**		**1.89E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**3.50E-07**		**9.58E-07**	
	HIF$_{<16}$	**kg/kg-d**	**3.41E-07**		**9.34E-07**	
	HIF$_{Total}$	**kg/kg-d**	**3.46E-06**		**9.47E-06**	
Ingestion of Water	Ingestion rate$_{0-<2}$	L/day	0.45	[3, e]	0.78	[6]
	Ingestion rate$_{2-<6}$	L/day	0.45	[3, e]	0.78	[6]
	Ingestion rate$_{6-<16}$	L/day	1.2	[3, e]	2.5	[6]
	Ingestion rate$_{>16}$	L/day	1.2	[3, e]	2.5	[6]
	HIF$_{0-<2}$	**kg/kg-d**	**9.36E-03**		**2.22E-02**	
	HIF$_{2-<6}$	**kg/kg-d**	**3.11E-03**		**7.37E-03**	
	HIF$_{6-<16}$	**kg/kg-d**	**8.41E-03**		**2.39E-02**	
	HIF$_{<16}$	**kg/kg-d**	**8.20E-03**		**2.33E-02**	
	HIF$_{Total}$	**kg/kg-d**	**2.91E-02**		**7.68E-02**	
Dermal Exposure to Soil	Exposed Surface Area (SA)$_{0-<2}$	cm^2/event	2,989	[2, 3, 4, f]	2,989	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{2-<6}$	cm^2/event	4,258	[2, 3, 4, f]	4,258	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{6-<16}$	cm^2/event	8,060	[2, 3, 4, f]	8,060	[2, 3, 4, f]
	Exposed Surface Area (SA)$_{>16}$	cm^2/event	12,508	[2, 3, 4, f]	12,508	[2, 3, 4, f]
	Adherence Factor (AF)	mg/cm^2	0.04	[4, 5, g]	0.2	[4, 5, g]
	Dermal Absorption Fraction (ABSd)	unitless	CS	[5]	CS	[5]
	Event Frequency (EV)	events/day	1	[5]	1	[5]
	Conversion factor	kg/mg	1E-06	--	1E-06	--
	HIF$_{0-<2}$	**kg/kg-d**	**2.49E-06**		**1.70E-05**	
	HIF$_{2-<6}$	**kg/kg-d**	**1.18E-06**		**8.05E-06**	
	HIF$_{6-<16}$	**kg/kg-d**	**2.26E-06**		**1.54E-05**	
	HIF$_{<16}$	**kg/kg-d**	**3.42E-06**		**2.34E-05**	
	HIF$_{Total}$	**kg/kg-d**	**9.34E-06**		**6.38E-05**	

CTE = Central Tendency Exposure; RME = Reasonable Maximum Exposure; CS = chemical-specific; kg = kilograms; yr = year; mg = milligrams; mL = millilters; L=liters; g=grams; m=meters; cm=centimeters; hr=hours

Sources:

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

[2] USEPA 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. March.

[3] USEPA 2011. Exposure Factors Handbook. EPA/600/R-090/052F. September.

[4] Professional judgment.

[5] USEPA 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response. July.

[6] USEPA 2014a. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120.

[7] USEPA 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

Notes:

[a] Table 8-1. Age-weighted average for the following age ranges: 0 to <2 years old, 2 to <6 years old, 6 to <16 years old, and ≥16 years old.

[b] Exposure frequencies assumed for a resident.

[c] Averaging time expressed as days. Noncancer averaging time calculated by multiplying the exposure duration by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.

[d] Assumes CTE value is half of the RME value.

[e] Weighted mean of consumer-only ingestion of drinking water (USEPA 2011, Table 3-1).

[f] Assumes exposure to head, arms, hands, legs, and feet. Calculated as time-weighted average surface area based on age (USEPA 2011, Table 7-2).

[g] Assumes adherence factor equal to the soil adherence factor for a resident (USEPA 2004, Exhibit 3-3).

Table 5-1. Risk Estimates for Hypothetical Future Residents Exposed to OU2 Surface Soils[a,b]

Exposure Unit	Exposure Route	Non-cancer HI		Excess cancer Risk	
		CTE	RME	CTE	RME
Grid 1	Incidental Ingestion	2E-01	4E-01	2E-05	7E-05
	Dermal Contact	3E-03	2E-02	8E-08	1E-06
	Total	2E-01	5E-01	2E-05	7E-05
Grid 2	Incidental Ingestion	1E-01	3E-01	2E-05	5E-05
	Dermal Contact	1E-03	7E-03	5E-08	7E-07
	Total	1E-01	3E-01	2E-05	5E-05
Grid 4	Incidental Ingestion	1E-01	4E-01	2E-05	5E-05
	Dermal Contact	1E-03	7E-03	6E-08	9E-07
	Total	1E-01	4E-01	2E-05	6E-05
Grid 5	Incidental Ingestion	1E-01	3E-01	1E-05	4E-05
	Dermal Contact	6E-04	4E-03	4E-08	6E-07
	Total	1E-01	3E-01	1E-05	4E-05
Grid 6	Incidental Ingestion	2E-01	4E-01	2E-05	7E-05
	Dermal Contact	2E-03	1E-02	6E-08	9E-07
	Total	2E-01	4E-01	2E-05	7E-05
Grid 7	Incidental Ingestion	2E-01	4E-01	2E-05	6E-05
	Dermal Contact	8E-04	6E-03	5E-08	7E-07
	Total	2E-01	4E-01	2E-05	7E-05
Grid 8	Incidental Ingestion	3E-01	8E-01	7E-05	**2E-04**
	Dermal Contact	6E-03	4E-02	2E-07	3E-06
	Total	3E-01	8E-01	7E-05	**2E-04**
Grid 9	Incidental Ingestion	1E-01	4E-01	2E-05	6E-05
	Dermal Contact	1E-03	1E-02	6E-08	9E-07
	Total	1E-01	4E-01	2E-05	6E-05
Grid 11	Incidental Ingestion	1E-01	3E-01	2E-05	6E-05
	Dermal Contact	6E-04	5E-03	3E-08	5E-07
	Total	1E-01	3E-01	2E-05	6E-05
Grid 12	Incidental Ingestion	2E-01	6E-01	3E-05	9E-05
	Dermal Contact	1E-03	1E-02	9E-08	1E-06
	Total	2E-01	6E-01	3E-05	**1E-04**
Grid 13	Incidental Ingestion	2E-01	4E-01	2E-05	6E-05
	Dermal Contact	1E-03	8E-03	6E-08	1E-06
	Total	2E-01	4E-01	2E-05	6E-05
Grid 14	Incidental Ingestion	2E-01	5E-01	3E-05	9E-05
	Dermal Contact	3E-03	2E-02	8E-08	1E-06
	Total	2E-01	5E-01	3E-05	9E-05
Grid 15	Incidental Ingestion	8E-02	2E-01	2E-05	6E-05
	Dermal Contact	5E-04	3E-03	3E-08	4E-07
	Total	8E-02	2E-01	2E-05	6E-05
Grid 16	Incidental Ingestion	1E-01	3E-01	2E-05	5E-05
	Dermal Contact	8E-04	6E-03	4E-08	7E-07
	Total	1E-01	3E-01	2E-05	5E-05
Grid 17	Incidental Ingestion	1E-01	3E-01	2E-05	6E-05
	Dermal Contact	7E-04	5E-03	5E-08	8E-07
	Total	1E-01	3E-01	2E-05	6E-05
Grid 18	Incidental Ingestion	2E-01	4E-01	2E-05	7E-05
	Dermal Contact	1E-03	8E-03	6E-08	9E-07
	Total	2E-01	4E-01	2E-05	7E-05
Grid 19	Incidental Ingestion	2E-01	5E-01	3E-05	7E-05
	Dermal Contact	8E-04	6E-03	5E-08	8E-07
	Total	2E-01	5E-01	3E-05	7E-05
Grid 22	Incidental Ingestion	2E-01	6E-01	3E-05	8E-05
	Dermal Contact	3E-03	2E-02	1E-07	2E-06
	Total	2E-01	6E-01	3E-05	8E-05
Grid 23	Incidental Ingestion	2E-01	4E-01	2E-05	7E-05
	Dermal Contact	9E-04	6E-03	6E-08	1E-06
	Total	2E-01	4E-01	2E-05	7E-05

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Non-cancer hazards and cancer risks from dioxins, furans and PCBs were calculated two ways as either $TEQ_{D/F}$ and Aroclor-1254 or as $TEQ_{D/F/P}$ and Total non-co-planar PCBs. Total Non-cancer HIs and cancer risks shown in the table reflect the maximum estimates from the two separate approaches.

[b]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks ≥ 1E-04. Blue highlight flags cancer risks > 1E-05.

Table 5-2. Summary of Non-Cancer Hazards and Cancer Risks in Grids 8 & 12 for Hypothetical Future Residents Exposed to OU2 Surface Soils

Exposure Unit	Exposure Route	Non-cancer HI		Excess cancer Risk	
		CTE	RME	CTE	RME
Grid 8	Incidental Ingestion	3E-01	8E-01	7E-05	**2E-04**
	Dermal Contact	6E-03	4E-02	2E-07	3E-06
	Total	3E-01	8E-01	7E-05	**2E-04**
Grid 12	Incidental Ingestion	2E-01	6E-01	3E-05	9E-05
	Dermal Contact	1E-03	1E-02	9E-08	1E-06
	Total	2E-01	6E-01	3E-05	**1E-04**
COPC-Specific Hazard Quotients (HQs) Based on Incidental Ingestion of Soil					
Grid 8	$TEQ_{(D/F/PCB)}$	9E-02	2E-01	1E-06	8E-06
	Total non-coplanar PCBs	--	--	6E-07	3E-06
	Aluminum	2E-02	5E-02	--	--
	Arsenic	1E-02	4E-02	1E-06	6E-06
	Chromium	2E-02	5E-02	7E-05	**2E-04**
	Cobalt	3E-02	9E-02	--	--
	Iron	8E-02	2E-01	--	--
	Manganese	3E-02	7E-02	--	--
	Thallium	2E-02	6E-02	--	--
Grid 12	$TEQ_{(D/F)}$	7E-03	2E-02	1E-07	6E-07
	Aroclor-1254	--	--	--	--
	Aluminum	2E-02	6E-02		
	Arsenic	2E-02	6E-02	2E-06	1E-05
	Chromium	9E-03	2E-02	3E-05	8E-05
	Cobalt	3E-02	7E-02		
	Iron	3E-02	8E-02		
	Manganese	1E-01	3E-01		
	Thallium	1E-02	3E-02		

HI = hazard index; CTE = central tendence estimate; RME = reasonable maximum exposure;
$TEQ_{D/F/P}$ = toxicity equivalence for dioxins, furans and co-planar polychlorinated biphenyls;
PCB = polychlorinated biphenyl; -- = not calculated.

Orange highlight flags non-cancer hazards > 1E+00 and cancer risks ≥ 1E-04.
Blue highlight flags cancer risks > 1E-05.

Table 5-3. Risk Estimates for Hypothetical Future Commercial/Industrial Workers Exposed to OU2 Surface Soils[a,b]

Exposure Unit	Exposure Route	Non-cancer HI		Excess cancer Risk	
		CTE	RME	CTE	RME
Grid 1	Incidental Ingestion	4E-02	1E-01	6E-07	4E-06
	Dermal Contact	3E-03	6E-03	8E-08	4E-07
	Total	5E-02	1E-01	7E-07	4E-06
Grid 2	Incidental Ingestion	3E-02	6E-02	4E-07	3E-06
	Dermal Contact	1E-03	2E-03	4E-08	2E-07
	Total	3E-02	6E-02	5E-07	3E-06
Grid 4	Incidental Ingestion	3E-02	8E-02	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	6E-08	3E-07
	Total	4E-02	8E-02	5E-07	3E-06
Grid 5	Incidental Ingestion	3E-02	7E-02	3E-07	2E-06
	Dermal Contact	8E-04	1E-03	4E-08	2E-07
	Total	3E-02	7E-02	4E-07	2E-06
Grid 6	Incidental Ingestion	4E-02	9E-02	6E-07	4E-06
	Dermal Contact	2E-03	5E-03	5E-08	3E-07
	Total	4E-02	9E-02	6E-07	4E-06
Grid 7	Incidental Ingestion	4E-02	1E-01	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	4E-08	2E-07
	Total	4E-02	1E-01	5E-07	3E-06
Grid 8	Incidental Ingestion	8E-02	2E-01	2E-06	1E-05
	Dermal Contact	7E-03	1E-02	2E-07	9E-07
	Total	8E-02	2E-01	2E-06	1E-05
Grid 9	Incidental Ingestion	4E-02	8E-02	5E-07	3E-06
	Dermal Contact	2E-03	3E-03	6E-08	3E-07
	Total	4E-02	8E-02	6E-07	3E-06
Grid 11	Incidental Ingestion	3E-02	6E-02	4E-07	3E-06
	Dermal Contact	8E-04	2E-03	3E-08	2E-07
	Total	3E-02	6E-02	4E-07	3E-06
Grid 12	Incidental Ingestion	6E-02	1E-01	8E-07	5E-06
	Dermal Contact	2E-03	3E-03	9E-08	5E-07
	Total	6E-02	1E-01	9E-07	5E-06
Grid 13	Incidental Ingestion	4E-02	1E-01	5E-07	3E-06
	Dermal Contact	1E-03	3E-03	6E-08	3E-07
	Total	4E-02	1E-01	6E-07	4E-06
Grid 14	Incidental Ingestion	5E-02	1E-01	8E-07	5E-06
	Dermal Contact	4E-03	7E-03	8E-08	4E-07
	Total	5E-02	1E-01	8E-07	5E-06
Grid 15	Incidental Ingestion	2E-02	5E-02	4E-07	2E-06
	Dermal Contact	6E-04	1E-03	3E-08	1E-07
	Total	2E-02	5E-02	4E-07	3E-06
Grid 16	Incidental Ingestion	3E-02	7E-02	4E-07	3E-06
	Dermal Contact	1E-03	2E-03	4E-08	2E-07
	Total	3E-02	7E-02	4E-07	3E-06
Grid 17	Incidental Ingestion	3E-02	7E-02	5E-07	3E-06
	Dermal Contact	9E-04	2E-03	4E-08	2E-07
	Total	3E-02	7E-02	5E-07	3E-06
Grid 18	Incidental Ingestion	4E-02	1E-01	5E-07	3E-06
	Dermal Contact	1E-03	3E-03	5E-08	3E-07
	Total	4E-02	1E-01	6E-07	4E-06
Grid 19	Incidental Ingestion	5E-02	1E-01	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	5E-08	3E-07
	Total	5E-02	1E-01	6E-07	4E-06
Grid 22	Incidental Ingestion	5E-02	1E-01	8E-07	5E-06
	Dermal Contact	3E-03	6E-03	9E-08	5E-07
	Total	6E-02	1E-01	8E-07	5E-06
Grid 23	Incidental Ingestion	4E-02	1E-01	5E-07	3E-06
	Dermal Contact	1E-03	2E-03	6E-08	3E-07
	Total	4E-02	1E-01	6E-07	4E-06

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Non-cancer hazards and cancer risks from dioxins, furans and PCBs were calculated two ways as either $TEQ_{D/F}$ and Aroclor-1254 or as $TEQ_{D/F/P}$ and Total non-co-planar PCBs. Total Non-cancer HIs and cancer risks shown in the table reflect the maximum estimates from the two separate approaches.

[b]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks ≥ 1E-04. Blue highlight flags cancer risks > 1E-05.

Table 5-4. Risk Estimates for Hypothetical Future Construction Workers Exposed to OU2 Surface and Subsurface Soils [a,b]

Exposure Unit	Exposure Route	Non-cancer HI		Excess cancer Risk	
		CTE	RME	CTE	RME
Grid 1	Incidental Ingestion	3E-02	1E-01	3E-08	3E-07
	Dermal Contact	9E-04	5E-03	2E-09	2E-08
	Inhalation (particulates)	2E-03	4E-03	1E-12	4E-12
	Total	3E-02	1E-01	3E-08	3E-07
Grid 2	Incidental Ingestion	2E-02	6E-02	2E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	1E-03	2E-03	8E-13	3E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 4	Incidental Ingestion	2E-02	8E-02	2E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	1E-03	2E-03	8E-13	3E-12
	Total	2E-02	9E-02	3E-08	2E-07
Grid 5	Incidental Ingestion	2E-02	7E-02	2E-08	1E-07
	Dermal Contact	3E-04	2E-03	9E-10	1E-08
	Inhalation (particulates)	1E-03	2E-03	6E-13	2E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 6	Incidental Ingestion	2E-02	8E-02	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	1E-03	2E-03	1E-12	4E-12
	Total	2E-02	8E-02	3E-08	2E-07
Grid 7	Incidental Ingestion	3E-02	1E-01	2E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	2E-03	3E-03	1E-12	4E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 8	Incidental Ingestion	4E-02	2E-01	8E-08	6E-07
	Dermal Contact	2E-03	1E-02	3E-09	4E-08
	Inhalation (particulates)	2E-03	3E-03	3E-12	1E-11
	Total	5E-02	2E-01	8E-08	7E-07
Grid 9	Incidental Ingestion	2E-02	8E-02	3E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation (particulates)	1E-03	2E-03	9E-13	3E-12
	Total	2E-02	8E-02	3E-08	2E-07
Grid 11	Incidental Ingestion	2E-02	6E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	9E-10	1E-08
	Inhalation (particulates)	9E-04	2E-03	9E-13	4E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 12	Incidental Ingestion	4E-02	2E-01	4E-08	3E-07
	Dermal Contact	7E-04	4E-03	2E-09	2E-08
	Inhalation (particulates)	5E-03	9E-03	1E-12	6E-12
	Total	4E-02	2E-01	4E-08	3E-07
Grid 13	Incidental Ingestion	3E-02	1E-01	3E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation (particulates)	2E-03	3E-03	1E-12	4E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 14	Incidental Ingestion	2E-02	9E-02	4E-08	3E-07
	Dermal Contact	7E-04	4E-03	2E-09	2E-08
	Inhalation (particulates)	1E-03	2E-03	1E-12	5E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 15	Incidental Ingestion	1E-02	5E-02	2E-08	2E-07
	Dermal Contact	2E-04	1E-03	6E-10	7E-09
	Inhalation (particulates)	7E-04	1E-03	9E-13	4E-12
	Total	1E-02	5E-02	2E-08	2E-07
Grid 16	Incidental Ingestion	2E-02	7E-02	2E-08	2E-07
	Dermal Contact	3E-04	2E-03	9E-10	1E-08
	Inhalation (particulates)	1E-03	2E-03	8E-13	3E-12
	Total	2E-02	7E-02	2E-08	2E-07
Grid 17	Incidental Ingestion	2E-02	8E-02	2E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	1E-03	2E-03	1E-12	4E-12
	Total	2E-02	8E-02	3E-08	2E-07
Grid 18	Incidental Ingestion	2E-02	1E-01	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	2E-03	4E-03	1E-12	4E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 19	Incidental Ingestion	3E-02	1E-01	3E-08	2E-07
	Dermal Contact	3E-04	2E-03	1E-09	1E-08
	Inhalation (particulates)	2E-03	4E-03	1E-12	5E-12
	Total	3E-02	1E-01	3E-08	2E-07
Grid 22	Incidental Ingestion	3E-02	1E-01	4E-08	3E-07
	Dermal Contact	5E-04	3E-03	2E-09	2E-08
	Inhalation (particulates)	2E-03	3E-03	1E-12	5E-12
	Total	3E-02	1E-01	4E-08	3E-07
Grid 23	Incidental Ingestion	3E-02	1E-01	3E-08	2E-07
	Dermal Contact	4E-04	2E-03	1E-09	2E-08
	Inhalation (particulates)	2E-03	3E-03	1E-12	4E-12
	Total	3E-02	1E-01	3E-08	2E-07

HI = hazard index; CTE = central tendency estimate; RME = reasonable maximum exposure.

[a]Non-cancer hazards and cancer risks from dioxins, furans and PCBs were calculated two ways as either $TEQ_{D/F}$ and Aroclor-1254 or as $TEQ_{D/F/P}$ and Total non-co-planar PCBs. Total Non-cancer HIs and cancer risks shown in the table reflect the maximum estimates from the two separate approaches.

[b]Orange highlight flags non-cancer hazards > 1E+00 and cancer risks≥ 1E-04. Blue highlight flags cancer risks > 1E-05.

Table 5-5. Non-Cancer Hazards for Hypothetical Future Residents Exposed to OU2 Groundwater

Panel A: Total Non-Cancer Hazards

Well ID	Aquifer	HI	
		CTE	RME
MCSMW1	Unit 1	2E-01	4E-01
MW4	Unit 1	--	--
MW7	Unit 1	--	--
WFB1	Unit 1	--	--
NFMW13	Unit 1	1E+00	**3E+00**
NFMW14	Unit 1	1E-01	3E-01
NFMW15	Unit 1	**2E+00**	**6E+00**
NFMW16	Unit 1	5E-01	1E+00
NFMW17	Unit 1	2E-01	5E-01
NFMW18	Unit 1	4E-01	1E+00
NFMW5	Unit 1	8E-01	**2E+00**
NFMW6	Unit 1	1E+00	**4E+00**
Car Wash Well	Unit 3	1E-01	3E-01
Cartridge Building Well	Unit 3	3E-01	9E-01
Hoffman Construction Well	Unit 3	2E-01	6E-01
Log Chipper Well	Unit 3	**5E+00**	**1E+01**
Waste Fuel Boiler Well	Unit 3	3E-01	7E-01

Panel B: COPC-specific and Target Organ-Specific Non-Cancer Hazards

Well ID	COPC	Target Organ/System	HQ		Endpoint HI	
			CTE	RME	CTE	RME
NFMW13	$TEQ_{(D/F)}$	Reproductive	--	--	--	--
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	2E-01	5E-01	2E-01	5E-01
	Vanadium		4E-03	1E-02		
	Barium	Kidney	2E-02	4E-02	2E-02	4E-02
	Chromium	--	1E-03	3E-03	1E-03	3E-03
	Cobalt	Thyroid	4E-02	1E-01	4E-02	1E-01
	Copper	--	8E-04	2E-03	8E-04	2E-03
	Iron	Gastrointestinal	3E-02	7E-02	3E-02	7E-02
	Manganese	Nervous	8E-01	**2E+00**	8E-01	**2E+00**
NFMW15	$TEQ_{(D/F)}$	Reproductive	4E-02	1E-01	4E-02	1E-01
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	6E-01	**2E+00**	7E-01	**2E+00**
	Vanadium		1E-01	3E-01		
	Barium	Kidney	1E-02	4E-02	1E-02	4E-02
	Chromium	--	8E-03	2E-02	8E-03	2E-02
	Cobalt	Thyroid	5E-02	1E-01	5E-02	1E-01
	Copper	--	2E-02	6E-02	2E-02	6E-02
	Iron	Gastrointestinal	3E-02	8E-02	3E-02	8E-02
	Manganese	Nervous	**2E+00**	**4E+00**	**2E+00**	**4E+00**
NFMW5	$TEQ_{(D/F)}$	Reproductive	3E-02	8E-02	3E-02	8E-02
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	7E-02	2E-01	7E-02	2E-01
	Vanadium		2E-03	4E-03		
	Barium	Kidney	2E-02	5E-02	2E-02	5E-02
	Chromium	--	8E-04	2E-03	8E-04	2E-03
	Cobalt	Thyroid	2E-02	5E-02	2E-02	5E-02
	Copper	--	3E-04	9E-04	3E-04	9E-04
	Iron	Gastrointestinal	2E-02	4E-02	2E-02	4E-02
	Manganese	Nervous	6E-01	**2E+00**	6E-01	**2E+00**
NFMW6	$TEQ_{(D/F)}$	Reproductive	3E-02	7E-02	3E-02	7E-02
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	2E-02	5E-02	2E-02	5E-02
	Vanadium		3E-03	7E-03		
	Barium	Kidney	2E-02	6E-02	2E-02	6E-02
	Chromium	--	2E-03	4E-03	2E-03	4E-03
	Cobalt	Thyroid	--	--	--	--
	Copper	--	3E-04	8E-04	3E-04	8E-04
	Iron	Gastrointestinal	2E-02	6E-02	2E-02	6E-02
	Manganese	Nervous	1E+00	**4E+00**	1E+00	**4E+00**
Log Chipper Well	$TEQ_{(D/F)}$	Reproductive	--	--	--	--
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	1E+00	**3E+00**	1E+00	**3E+00**
	Vanadium		2E-02	6E-02		
	Barium	Kidney	1E-02	3E-02	1E-02	3E-02
	Chromium	--	2E-02	4E-02	2E-02	4E-02
	Cobalt	Thyroid	1E+00	**3E+00**	1E+00	**3E+00**
	Copper	--	7E-03	2E-02	7E-03	2E-02
	Iron	Gastrointestinal	8E-01	**2E+00**	8E-01	**2E+00**
	Manganese	Nervous	**2E+00**	**4E+00**	**2E+00**	**4E+00**

ID = identification; HI = hazard index; HQ = hazard quotient; COPC = contaminant of potential concern; CTE = central tendency exposure; RME = reasonable maximum exposure; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; -- = COPC was either not detected or not analyzed for in this well.

Bolded values highlighted orange represent HQ > 1E+00.

Table 5-6. Cancer Risks for Hypothetical Future Residents Exposed to OU2 Groundwater

Well ID	Aquifer	Risk	
		CTE	RME
MCSMW1	Unit 1	6E-06	3E-05
MW4	Unit 1	--	--
MW7	Unit 1	--	--
WFB1	Unit 1	--	--
NFMW13	Unit 1	2E-05	9E-05
NFMW14	Unit 1	1E-05	4E-05
NFMW15	Unit 1	7E-05	**3E-04**
NFMW16	Unit 1	3E-05	**1E-04**
NFMW17	Unit 1	2E-05	8E-05
NFMW18	Unit 1	2E-05	9E-05
NFMW5	Unit 1	8E-06	4E-05
NFMW6	Unit 1	7E-06	2E-05
Car Wash Well	Unit 3	1E-05	5E-05
Cartage Building Well	Unit 3	3E-05	**1E-04**
Hoffman Construction Well	Unit 3	2E-05	7E-05
Log Chipper Well	Unit 3	**1E-04**	**6E-04**
Waste Fuel Boiler Well	Unit 3	2E-05	5E-05

Well ID	COPC	Risk	
		CTE	RME
NFMW15	$TEQ_{(D/F)}$	7E-07	4E-06
	Aroclor-1260	4E-07	2E-06
	Arsenic	5E-05	**3E-04**
	Chromium	3E-05	7E-05
NFMW16	$TEQ_{(D/F)}$	7E-07	4E-06
	Aroclor-1260	--	--
	Arsenic	2E-05	**1E-04**
	Chromium	4E-06	1E-05
Cartage Building Well	$TEQ_{(D/F)}$	--	--
	Aroclor-1260	--	--
	Arsenic	2E-05	**1E-04**
	Chromium	9E-06	2E-05
Log Chipper Well	$TEQ_{(D/F)}$	--	--
	Aroclor-1260	--	--
	Arsenic	7E-05	**4E-04**
	Chromium	6E-05	**1E-04**

ID = identification; HI = hazard index; HQ = hazard quotient; COPC = contaminant of potential concern; CTE = central tendency exposure; RME = reasonable maximum exposure; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; -- = COPC was either not detected or not analyzed for in this well.

Bolded values highlighted orange represent risk ≥ 1E-04. Blue highlighted values represent risk > 1E-05.

Table 5-7. Non-cancer Hazards for Hypothetical Future Commercial/Industrial Workers Exposed to OU2 Groundwater

Panel A: Total Non-Cancer Hazards

Well ID	Aquifer	HI	
		CTE	RME
MCSMW1	Unit 1	5E-02	1E-01
MW4	Unit 1	--	--
MW7	Unit 1	--	--
WFB1	Unit 1	--	--
NFMW13	Unit 1	4E-01	9E-01
NFMW14	Unit 1	4E-02	9E-02
NFMW15	Unit 1	9E-01	**2E+00**
NFMW16	Unit 1	2E-01	4E-01
NFMW17	Unit 1	6E-02	1E-01
NFMW18	Unit 1	1E-01	3E-01
NFMW5	Unit 1	3E-01	6E-01
NFMW6	Unit 1	5E-01	1E+00
Car Wash Well	Unit 3	5E-02	1E-01
Cartridge Building Well	Unit 3	1E-01	3E-01
Hoffman Construction Well	Unit 3	9E-02	2E-01
Log Chipper Well	Unit 3	**2E+00**	**4E+00**
Waste Fuel Boiler Well	Unit 3	9E-02	2E-01

Panel B: COPC-specific and Target Organ-Specific Non-Cancer Hazards

Well ID	COPC	Target Organ/System	HQ		Endpoint HI	
			CTE	RME	CTE	RME
NFMW15	$TEQ_{(D/F)}$	Reproductive	2E-02	3E-02	2E-02	3E-02
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	2E-01	7E-02	3E-01	2E-01
	Vanadium		4E-02	9E-02		
	Barium	Kidney	5E-03	1E-02	5E-03	1E-02
	Chromium	--	3E-03	6E-03	3E-03	6E-03
	Cobalt	Thyroid	2E-02	4E-02	2E-02	4E-02
	Copper	--	8E-03	2E-02	8E-03	2E-02
	Iron	Gastrointestinal	1E-02	3E-02	1E-02	3E-02
	Manganese	Nervous	5E-01	1E+00	5E-01	1E+00
Log Chipper Well	$TEQ_{(D/F)}$	Reproductive	--	--	--	--
	Aroclor-1260	--	--	--	--	--
	Arsenic	Dermal	3E-01	8E-01	4E-01	8E-01
	Vanadium		8E-03	2E-02		
	Barium	Kidney	3E-03	8E-03	3E-03	8E-03
	Chromium	--	6E-03	1E-02	6E-03	1E-02
	Cobalt	Thyroid	4E-01	9E-01	4E-01	9E-01
	Copper	--	2E-03	6E-03	2E-03	6E-03
	Iron	Gastrointestinal	3E-01	6E-01	3E-01	6E-01
	Manganese	Nervous	6E-01	1E+00	6E-01	1E+00

ID = identification; HI = hazard index; HQ = hazard quotient; COPC = contaminant of potential concern; CTE = central tendency exposure; RME = reasonable maximum exposure; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; -- = COPC was either not detected or not analyzed for in this well.

Bolded values highlighted orange represent HQ > 1E+00.

Table 5-8. Cancer Risks for Hypothetical Future Commercial/Industrial Workers Exposed to OU2 Groundwater

Well ID	Aquifer	Risk	
		CTE	RME
MCSMW1	Unit 1	2E-06	1E-05
MW4	Unit 1	--	--
MW7	Unit 1	--	--
WFB1	Unit 1	--	--
NFMW13	Unit 1	4E-06	2E-05
NFMW14	Unit 1	1E-06	7E-06
NFMW15	Unit 1	1E-05	8E-05
NFMW16	Unit 1	6E-06	4E-05
NFMW17	Unit 1	3E-06	2E-05
NFMW18	Unit 1	3E-06	2E-05
NFMW5	Unit 1	2E-06	1E-05
NFMW6	Unit 1	6E-07	4E-06
Car Wash Well	Unit 3	2E-06	1E-05
Cartage Building Well	Unit 3	6E-06	4E-05
Hoffman Construction Well	Unit 3	2E-06	1E-05
Log Chipper Well	Unit 3	2E-05	**1E-04**
Waste Fuel Boiler Well	Unit 3	1E-06	7E-06

Well ID	COPC	Risk	
		CTE	RME
Log Chipper Well	$TEQ_{(D/F)}$	--	--
	Aroclor-1260	--	--
	Arsenic	2E-05	**1E-04**
	Chromium	1E-06	7E-06

ID = identification; HI = hazard index; HQ = hazard quotient; COPC = contaminant of potential concern; CTE = central tendency exposure; RME = reasonable maximum exposure; $TEQ_{(D/F)}$ = toxicity equivalent for dioxins and furans; -- = COPC was either not detected or not analyzed for in this well.

Bolded values highlighted orange represent risk ≥ 1E-04. Blue highlighted values represent risk > 1E-05.

Table 5-9. Non-Cancer Hazards from Combined Exposures to OU2 Soils and Groundwater

Panel A: Noncancer Hazards to Hypothetical Future Residents

Well ID	Groundwater HI		Soil			Total HI (Grid)	
	CTE	RME	Grid	CTE HI	RME HI	CTE	RME
MCSMW1	2E-01	4E-01	18	2E-01	4E-01	3E-01	8E-01
MW4	--	--	n/a	n/a	n/a	n/a	n/a
MW7	--	--	n/a	n/a	n/a	n/a	n/a
WFB1	--	--	n/a	n/a	n/a	n/a	n/a
NFMW13	1E+00	**3E+00**	1	2E-01	5E-01	1E+00	**3E+00**
NFMW14	1E-01	3E-01	8	3E-01	8E-01	4E-01	1E+00
NFMW15	**2E+00**	**6E+00**	11	1E-01	3E-01	**3E+00**	**7E+00**
NFMW16	5E-01	1E+00	11	1E-01	3E-01	6E-01	**2E+00**
NFMW17	2E-01	5E-01	14	2E-01	5E-01	4E-01	1E+00
NFMW18	4E-01	1E+00	18	2E-01	4E-01	6E-01	**2E+00**
NFMW5	8E-01	**2E+00**	4	1E-01	4E-01	9E-01	**2E+00**
NFMW6	1E+00	**4E+00**	10	no data	no data	n/a	n/a
Car Wash Well	1E-01	3E-01	12	2E-01	6E-01	4E-01	9E-01
Cartage Building Well	3E-01	9E-01	9	1E-01	4E-01	5E-01	1E+00
Hoffman Construction Well	2E-01	6E-01	15	8E-02	2E-01	3E-01	8E-01
Log Chipper Well	**5E+00**	**1E+01**	5	1E-01	3E-01	**5E+00**	**1E+01**
Waste Fuel Boiler Well	3E-01	7E-01	13	2E-01	4E-01	4E-01	1E+00

Panel B: Noncancer Hazards to Hypothetical Future Workers

Well ID	Groundwater HI		Soil			Total HI (Grid)	
	CTE	RME	Grid	CTE HI	RME HI	CTE	RME
MCSMW1	5E-02	1E-01	18	4E-02	1E-01	1E-01	2E-01
MW4	--	--	n/a	n/a	n/a	n/a	n/a
MW7	--	--	n/a	n/a	n/a	n/a	n/a
WFB1	--	--	n/a	n/a	n/a	n/a	n/a
NFMW13	4E-01	9E-01	1	5E-02	1E-01	4E-01	1E+00
NFMW14	4E-02	9E-02	8	8E-02	2E-01	1E-01	3E-01
NFMW15	9E-01	**2E+00**	11	3E-02	6E-02	9E-01	**2E+00**
NFMW16	2E-01	4E-01	11	3E-02	6E-02	2E-01	4E-01
NFMW17	6E-02	1E-01	14	5E-02	1E-01	1E-01	3E-01
NFMW18	1E-01	3E-01	18	4E-02	1E-01	2E-01	4E-01
NFMW5	3E-01	6E-01	4	4E-02	8E-02	3E-01	7E-01
NFMW6	5E-01	1E+00	10	no data	no data	n/a	n/a
Car Wash Well	5E-02	1E-01	12	6E-02	1E-01	1E-01	2E-01
Cartage Building Well	1E-01	3E-01	9	4E-02	8E-02	2E-01	4E-01
Hoffman Construction Well	9E-02	2E-01	15	2E-02	5E-02	1E-01	2E-01
Log Chipper Well	**2E+00**	**4E+00**	5	3E-02	7E-02	**2E+00**	**4E+00**
Waste Fuel Boiler Well	9E-02	2E-01	13	4E-02	1E-01	1E-01	3E-01

ID = identifier; HI = hazard index; CTE = central tendency exposure; RME = reasonable maximum exposure; n/a = not able to be calculated; -- = COPC concentrations were not detected.

Bolded values highlighted orange represent HI > 1E+00.

Table 5-10. Total Risks from Combined Exposures to OU2 Soils and Groundwater

Panel A: Cancer Risks to Hypothetical Future Residents

Well ID	Groundwater Risk		Soil Risk			Total Risk (Grid)	
	CTE	RME	Grid	CTE	RME	CTE	RME
MCSMW1	6E-06	3E-05	18	2E-05	7E-05	3E-05	**1E-04**
MW4	--	--	n/a	n/a	n/a	n/a	n/a
MW7	--	--	n/a	n/a	n/a	n/a	n/a
WFB1	--	--	n/a	n/a	n/a	n/a	n/a
NFMW13	2E-05	9E-05	1	2E-05	7E-05	4E-05	**2E-04**
NFMW14	1E-05	4E-05	8	7E-05	**2E-04**	8E-05	**2E-04**
NFMW15	7E-05	**3E-04**	11	2E-05	6E-05	9E-05	**4E-04**
NFMW16	3E-05	**1E-04**	11	2E-05	6E-05	5E-05	**2E-04**
NFMW17	2E-05	8E-05	14	3E-05	9E-05	5E-05	**2E-04**
NFMW18	2E-05	9E-05	18	2E-05	7E-05	5E-05	**2E-04**
NFMW5	8E-06	4E-05	4	2E-05	6E-05	3E-05	9E-05
NFMW6	7E-06	2E-05	10	no data	no data	n/a	n/a
Car Wash Well	1E-05	5E-05	12	3E-05	1E-04	4E-05	**1E-04**
Cartage Building Well	3E-05	**1E-04**	9	2E-05	6E-05	5E-05	**2E-04**
Hoffman Construction Well	2E-05	7E-05	15	2E-05	6E-05	4E-05	**1E-04**
Log Chipper Well	**1E-04**	**6E-04**	5	1E-05	4E-05	**1E-04**	**6E-04**
Waste Fuel Boiler Well	2E-05	5E-05	13	2E-05	6E-05	4E-05	**1E-04**

Panel B: Cancer Risks to Hypothetical Future Workers

Well ID	Groundwater Risk		Soil Risk			Total Risk (Grid)	
	CTE	RME	Grid	CTE	RME	CTE	RME
MCSMW1	2E-06	1E-05	18	6E-07	4E-06	2E-06	1E-05
MW4	--	--	n/a	n/a	n/a	n/a	n/a
MW7	--	--	n/a	n/a	n/a	n/a	n/a
WFB1	--	--	n/a	n/a	n/a	n/a	n/a
NFMW13	4E-06	2E-05	1	7E-07	4E-06	4E-06	3E-05
NFMW14	1E-06	7E-06	8	2E-06	1E-05	3E-06	2E-05
NFMW15	1E-05	8E-05	11	4E-07	3E-06	1E-05	9E-05
NFMW16	6E-06	4E-05	11	4E-07	3E-06	6E-06	4E-05
NFMW17	3E-06	2E-05	14	8E-07	5E-06	4E-06	2E-05
NFMW18	3E-06	2E-05	18	6E-07	4E-06	4E-06	3E-05
NFMW5	2E-06	1E-05	4	5E-07	3E-06	2E-06	1E-05
NFMW6	6E-07	4E-06	10	no data	no data	n/a	n/a
Car Wash Well	2E-06	1E-05	12	9E-07	5E-06	3E-06	2E-05
Cartage Building Well	6E-06	4E-05	9	6E-07	3E-06	6E-06	4E-05
Hoffman Construction Well	2E-06	1E-05	15	4E-07	3E-06	3E-06	2E-05
Log Chipper Well	2E-05	**1E-04**	5	4E-07	2E-06	2E-05	**1E-04**
Waste Fuel Boiler Well	1E-06	7E-06	13	6E-07	4E-06	2E-06	1E-05

ID = identifier; HI = hazard index; CTE = central tendency exposure; RME = reasonable maximum exposure; n/a = not able to be calculated; -- = COPC concentrations were not detected.

Bolded values highlighted orange represent risk ≥ 1E-04. Blue highlighted values represent risk > 1E-05.

APPENDIX A

OU2 DATA SUMMARY

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

1.0 INTRODUCTION

This appendix summarizes the data utilized in this OU2 Human Health Risk Assessment (HHRA). As described in the main text of this OU2 HHRA, soil and groundwater samples were collected within OU2 between 2014 and 2020. These data were collected following approved sampling plans as part of ongoing remedial investigation (RI) activities. This appendix presents a brief overview of the available data used in the OU2 HHRA. Additional details on sampling and analysis can be found in the RI reports available on the Site webpage[1].

Data collected prior to 2014 to support the Preliminary Assessment/Site Investigation are not used in the HHRA due to deviations from the Quality Assurance Project Plan (QAPP) that occurred during sampling and analysis of those samples. Instead, USEPA used those data to inform the RI Work Plan and focused collection on those areas identified as having potentially elevated contamination. The sampling conducted as part of RI activities are more recent, were collected in accordance with the USEPA approved QAPP, and have been evaluated and determined to meet the needs of the risk assessment.

Data collected for the RIWP and associated Addenda have been uploaded to a USEPA Scribe database for the Smurfit-Stone/Frenchtown Mill Site. Data considered for use in the OU2/OU3 BERA were based on a Scribe download conducted May 2021. Not all data in Scribe were utilized in the OU2 risk evaluations presented within the HHRA. The available raw data were downloaded from the Scribe database and reduced to produce the Site datasets utilized in the OU2 HHRA as described below. Data used in the OU2 HHRA are provided as an electronic data file in Attachment A-1 to this appendix. Attachment A-1 includes separate tabs for each medium.

2.0 DATA SUMMARY

2.1 Site Soil

Soil samples were collected at locations throughout OU2 in April 2014, November/December 2015, August 2016, and October 2017. In 2014/2015, surface soils were collected as localized 5-point composites over a 1 to 2-meter area. In 2017, 20-point composite samples were collected from square grid units in OU2. Surface soil samples were collected from 0 to 2 inches and from 0 to 6 inches. Subsurface samples were collected as vertical composites from varying depths down to 18 feet. Only those samples collected down to 10 feet (the depth to which a construction worker may be exposed) were considered in the HHRA. All soil samples collected from the Site

[1] Smurfit-Stone Mill Frenchtown, Missoula, MT webpage:
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850

represent bulk soil. OU2 soil samples were analyzed for metals, dioxins/furans, PCBs (as Aroclors), SVOCs and VOCs (not all samples were analyzed for all contaminant classes listed here). These data are briefly summarized in the main text. More details on the soil sampling efforts are available in the RI Work Plan Addenda available on the Site webpage.

PCBs in OU2 soils sampled in 2014 and 2015 were evaluated based on measuring concentrations of the Aroclor mixtures. These evaluations were consistent with the data quality objectives in the site-specific QAPP. This approach was considered adequate because the available historical information did not suggest any specific source of PCBs associated with the historical Mill operations. Once PCBs were determined to be present at concentrations above human health-based screening levels in localized areas of OU2 (high-density pulp tank and transformer storage building), additional soil samples collected from OU2 in 2017 were analyzed for PCB congeners.

2.2 Site Groundwater

Within the Scribe database, the location zone for all groundwater samples is entered as “OU3”. Based on the maps provided in the RI reports, the following groundwater wells have been identified for inclusion in OU2: MCMW1, MW4, MW7, NFMW13, NFMW14, NFMW15, NFMW16, NFMW17, NFMW18, NFMW5, NFMW6, WFB1, car wash well, cartridge building well, Hoffman construction well, log chipper well, and the waste fuel boiler well. The monitoring wells (those identified as “MW”) are located within the water table aquifer below the Site that is generally present to a depth of approximately 35 feet below ground surface (ft bgs) (referred to as hydrostratigraphic unit 1) (NewFields 2020). The water supply wells (car wash, cartridge building, Hoffman construction, log chipper, and waste fuel boiler wells) are located within the regional water supply aquifer that is generally present from approximately 130 to 160 ft bgs (referred to as hydrostratigraphic unit 3) (NewFields 2020). Groundwater samples have been collected from these 17 wells. Three wells were sampled in April 2014, 11 wells were sampled in December 2015, five wells were sampled in June 2016, eight wells were repeatedly sampled in July 2017, June 2018, December 2018, June 2019 and September 2019, and the water supply wells were sampled in June 2019. The monitoring wells and the waste fuel boiler well was also sampled in 2020. Groundwater samples have been analyzed for total recoverable and dissolved metals, dioxins/furans, PCBs (as Aroclors), SVOCs and VOCs. Not all samples were analyzed for all contaminant classes. Various field parameters were also measured including pH, temperature, dissolved oxygen, oxidation reduction potential, specific conductance, alkalinity and anions.

3.0 DATA REDUCTION

3.1 Categorization as Surface Soil and Subsurface Soil

For the purposes of the HHRA, surface soil samples were classified as samples collected from a starting depth of either zero or one inch down to six inches below ground surface (bgs). Samples collected from at or below one-foot bgs were classified as subsurface soil samples. Subsurface data used in the OU2 HHRA were restricted to samples collected within the top 10 feet bgs.

3.2 Treatment of Field Duplicates

In accordance with the RIWP QAPP, blind field duplicates (one for every twenty natural samples) were collected to provide quality assurance for field sampling. Two concentration results for a parent sample-duplicate pair were reduced to a single value for each contaminant as follows:

- If both the parent sample and the duplicate sample results were detected, the maximum detected concentration was retained and the result was flagged as a detect.
- If both the parent sample and the duplicate sample results were qualified as not detected, the maximum MDL was retained and the result was flagged as a non-detect.
- If one result from the sample pair was detected, while the other was qualified as not detected, the detected concentration was retained and the result was flagged as a detect.

Total PCB and TEQ concentrations were calculated for each parent sample and field duplicate as described below. For each sample pair, the results were reduced to a single value for each calculated result in accordance with the protocol presented above. Duplicate reduction was not done at the congener level.

3.3 Treatment of Multiple Analytical Results

Some soil samples collected within OU2 were analyzed using two extraction methods during VOC analysis: EPA 5035/5030B and EPA 5035 Low. This resulted in several samples having two results for each VOC in the Scribe database. These results were reduced to a single value for each contaminant as follows:

- If both the results were detected, the maximum detected concentration was retained and the result was flagged as a detect.
- If both results were qualified as not detected, the maximum MDL was retained and the result was flagged as a non-detect.

- If one of the results was detected, while the other was qualified as not detected, the detected concentration was retained and the result was flagged as a detect.

3.4 Treatment of Non-detects

When calculating summary statistics, NDs were evaluated at ½ DL. When inputting data to ProUCL for the purposes of comparing Site and background data or calculating 95 UCL values, ND data were based on the DL (i.e., sample-specific detection limit).

Various detection limits were reported for Site data by laboratories and are defined slightly different by each laboratory that analyzed Site samples. Pace Analytical performed sample analyses for metals, PCBs (in abiotic media only), SVOCs and VOCs. For each sample result, Pace reported a "MDL" (method detection limit; adjusted for sample dilution) and "RDL/QL" (laboratory reporting limit/quantitation level). The MDL refers to the lowest concentration that can be detected by the laboratory with confidence that the analyte is present (i.e., not a false positive). The RDL/QL refers to the lowest concentration that can be reported with confidence in the accuracy and precision of the value. Concentrations below this limit can be detected, but the value should be considered estimated. The MDL reported by Pace was used as the DL for Site data. Dioxins/furans were analyzed by Frontier Analytical (Frontier) for all media except the northern pike and rainbow trout tissue samples. For Frontier, the reported MDL is the method detection limit under ideal conditions – not accounting for matrix interferences, dilution, etc. If an analyte is not detected in a sample, Frontier calculates a sample-specific detection limit and reports it as the RDL. The QL reported by Frontier is the lowest point of calibration on the instrument. This is analogous to the QL reported by Pace: analytes detected below this limit are present, but the reported value is estimated. The RDL reported by Frontier was used as the DL for Site data.

3.5 Calculation Total PCB Concentrations

There are 209 PCB congeners. PCBs generally occur as a mixture of congeners. Aroclors are commercial mixtures of PCB congeners that contain many of the individual congeners in varying ratios. When Aroclors are released into the environment, the original congener composition of the PCB mixture changes due to differential fate and transport processes (USEPA 1996). Chemical analyses of environmental samples often report PCB concentrations in terms of the Aroclor mixture(s) they most closely resemble. All PCB data in OU2 soil collected prior to 2017, and all PCB data in OU2 groundwater were reported in concentrations of Aroclor mixtures.

There are potential risks associated with possible enhancement of highly toxic, dioxin-like PCB congeners (toxicologically related to 2,3,7,8- TCDD), whereby congener-based analysis can be utilized to ensure that overall PCB risks are not underestimated (USEPA 1996). As such, soil samples collected from OU2 in 2017 were analyzed for individual PCB congeners. For those samples for which PCB-congener data were available, total PCB concentrations were calculated by summing across all PCB congeners assuming ½ DL for concentrations qualified as non-detects. Total dioxin-like PCB concentrations and total non-dioxin-like PCB concentrations were also calculated in this manner.

Exposure concentrations were based on maintaining measurements of PCBs as Aroclors separate from measurements of PCB congeners. Preference was given to evaluating exposures based on PCB congeners when those data were available. In the absence of congener data, PCB exposures were evaluated based on the available Aroclor data.

3.6 Calculation of TEQ

Because dioxin and furan congeners and dioxin-like PCBs all act by the same mechanism as 2,3,7,8-TCDD, data for the dioxin and furan congeners and dioxin-like PCBs was converted to a TCDD toxicity equivalent value (TEQ) by computing the sum across congeners of the product of congener-specific concentration and relative Toxicity Equivalence Factor (TEF):

$$TEQ = \sum (Ci \times TEFi)$$

TEFs were based on USEPA (2010). In the site database, separate TEQ values were calculated for dioxins and furans, dioxin-like PCBs, and dioxins, furans, and dioxin-like PCBs combined. For each type of TEQ, three alternative values were computed in the Site database, differing in the numeric concentration values assigned to concentrations flagged as ND as: ND = 0, ND = ½ DL, and ND = ½ MDL. A TEQ concentration is flagged as ND only if no individual was detected in that sample. Exposure and risk estimates in the HHRA are based on evaluating TEQ assuming ND = ½ DL consistent with other regional risk assessments.

4.0 SUPPLEMENTATION OF EXCAVATED SOIL

As described in the RIWP Addendum 5, PCBs were detected at elevated levels at the HDPT and the TSB locations. A soil removal action was done in December 2017 at these locations in accordance with RIWP Addendum 5. Soil data collected in 2014-2016 from areas included in the soil excavation are no longer valid for evaluating human health exposures. As such, these data were excluded from the dataset included in the OU2 HHRA. The PRPs provided the USEPA with a list of sample IDs to exclude from the OU2 HHRA dataset as shown in Table A-1. Data for backfill soil were used in place of these excluded data.

Based on input from NewFields, the soil samples identified in Table A-2 that were collected in 2014, 2015, and 2017 were used to generate backfill concentrations that were added to the site database for use in the OU2 HHRA. Concentrations for the samples listed in Table A-2 were reduced to a single concentration for each contaminant analyzed as follows:

- For each contaminant, the average concentration across the samples was calculated and used as the backfill concentration. If a result was qualified as a non-detect, the MDL was used to calculate the average.

- For each contaminant, if at least one sample result was detected, the average value was considered detected. If concentrations across samples for a given contaminant were all qualified as non-detect, the calculated average concentrations were flagged as non-detect.

This approach resulted in concentration data for a single contrived backfill sample. This sample was used in place of the samples listed in Table A-1 for characterizing both surface soil and subsurface soil concentrations at the HDPT foundation and TSB foundation areas. These data are included in Attachment 1 with the following sample IDs:

- BACKFILL-HDPT-SS
- BACKFILL-HDPT-SB
- BACKFILL-TSB-SS
- BACKFILL-TSB-SB

5.0 REFERENCES

MDEQ. 2011. Montana Dioxin Background Investigation Report. Montana Department of Environmental Quality. April 2011.

MDEQ. 2013. Background Concentrations of Inorganic Constituents in Montana Surface Soils. Montana Department of Environmental Quality. September 2013.

USEPA 1996. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. EPA/600/P-96/001F. September. 1996.

USEPA 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. EPA/100/R 10/005. December.

Table A-1. Sample Collected from HDPT and TSB December 2017 Removal Action Areas

Location	Sample	Sample Date
High Density Pulp Tank (HDPT)	SS18-IN-(12)	12/15/2015
	SS19-IN-(24)	12/15/2015
	IN-HDPT40-SB1	8/22/2016
	FD1-SO (Dup)	8/22/2016
	IN-HDPT38-SB1	8/22/2016
	IN-HDPT38-SB2	8/22/2016
	IN-HDPT38-SB3	8/22/2016
	IN-HDPT38-SB4	8/22/2016
	IN-HDPT39-SB1	8/22/2016
	IN-HDPT39-SB2	8/22/2016
	IN-HDPT39-SB4	8/22/2016
	IN-HDPT39-SB6	8/22/2016
	IN-HDPT40-SB1	8/22/2016
	IN-HDPT40-SB2	8/22/2016
	IN-HDPT40-SB3	8/22/2016
	IN-HDPT40-SB4	8/22/2016
Transformer Storage Building (TSB)	IN-TSB44-SB1	8/22/2016
	IN-TSB44-SB2	8/22/2016
	IN-TSB45-SB1	8/22/2016
	IN-TSB46-SB1	8/22/2016
	IN-TSB47-SB1	8/22/2016
	SS28-IN-(0-2)c	12/4/2015

Table A-2. Samples Used to Generate Backfill Concentrations

Sample	Sample Date	Analysis				
		Metals	TEQ	SVOC	VOC	PCB
AG8-1-SS_4/18/14_NM	4/18/2014	X	X			
SS69-AG8-(0-2)c	11/22/2015	X	X	X		
Backfill Source AG8	10/28/2017					X
SS70-AG8-(5-7)c	11/22/2015	X	X	X		
SS22-IN-(12)	12/15/2015				X	
SS23-IN-(24)	12/15/2015				X	

ATTACHMENT A-1

Data Used in the Smurfit-Stone/Frenchtown Mill OU2 HHRA

Electronic File

[OU2 HHRA Appendix A_Attachment A-1.xlsx]

APPENDIX B

Screening Level Evaluations

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

This appendix presents a screening level evaluation of those pathways identified as “minor” in the OU2 conceptual site model (CSM) (see Figure 3-1 of the main document). These pathways include the following:

- Inhalation of soil particulates generated via wind erosion
- Inhalation of vapors released from surface soils
- Dermal contact with groundwater used in future residential and commercial buildings

As discussed in the main text of the human health risk assessment (HHRA) for the OU2 Site, ingestion is the primary pathway by which exposure to site media is expected to occur at the OU2 Site. In general, the above pathways are considered minor exposure pathways when compared to the ingestion pathway. This screening level evaluation considers the relative risks from exposure to a chemical from each of the pathways listed above compared to the relative risks from exposure of the same chemical via the ingestion pathway.

Inhalation of Contaminants in Soil

As described in the main text of this HHRA, human receptors at the OU2 Site may be exposed to contaminated soil via inhalation of soil particulates suspended in air by wind disturbance or via inhalation of vapors in the air emitted from soil. This section evaluates the relative comparison between the ingestion pathway and the inhalation pathway for exposures to soil. The basic equations recommended by USEPA (1989; 2009) for evaluating exposures via ingestion and inhalation are described in brief below.

<u>Ingestion Exposures</u>

The daily ingested intake for chronic exposures is calculated as (USEPA 1989):

$$DI = C \cdot (IR / BW) \cdot (EF \cdot ED / AT)$$

where:

DI	=	Daily intake of chemical (mg per kg of body weight per day).
C	=	Concentration of the chemical in the contaminated environmental medium (soil, water) to which the person is exposed. The units are mg/kg for soil and mg/m^3 for air.
IR	=	Intake rate of the contaminated environmental medium. The units are kg/day for soil and L/day for water.
BW	=	Body weight of the exposed person (kg).

EF	=	Exposure frequency (days/year).
ED	=	Exposure duration (years).
AT	=	Averaging time (days).

Inhalation Exposures

The inhaled exposure concentration (EC) for chronic exposures is calculated as (USEPA 2009):

$$EC = Ca \cdot (ET \cdot EF \cdot ED / AT)$$

where:

EC	=	Exposure Concentration ($\mu g/m^3$). This is the time-weighted concentration based on the characteristics of the exposure scenario being evaluated.
Ca	=	Concentration of the chemical in air ($\mu g/m^3$) to which the person is exposed.
ET	=	Exposure time (hours/day).
EF	=	Exposure frequency (days/year).
ED	=	Exposure duration (years).
AT	=	Averaging time (hours).

and

$$Ca = Cs / PEF \text{ or } VF$$

where:

Cs	=	Concentration of the chemical in soil (mg/kg)
PEF	=	Particulate Emission Factor (m^3/kg)
VF	=	Volatilization Factor (m^3/kg)

To compare the relative contributions to exposure from the two pathways, non-cancer hazards and cancer risks were calculated as follows:

Non-cancer hazard quotients

$$HQ = DI / RfD \quad \text{(ingestion pathway)}$$

$$HQ = EC / RfC \quad \text{(inhalation pathway)}$$

Cancer risks

$$\text{Risk} = \text{DI} \cdot \text{SF} \quad \text{(ingestion pathway)}$$

$$\text{Risk} = \text{EC} \cdot \text{UR} \quad \text{(inhalation pathway)}$$

Based on the above equations, the relative magnitude of risks from inhalation exposures can be compared to risks from ingestion exposure by calculating the ratio as follows:

$$\text{Ratio} = \text{Inhalation Risk / Ingestion Risk}$$

Using the exposure parameters for a resident, cancer risks and non-cancer HQ values were calculated for 2,3,7,8-TCDD (herein referred to as dioxin) as an example, assuming an arbitrary soil concentration.

Media	Endpoint	Pathway	Ratio (Inhalation/Ingestion)
Soil	Cancer	Inhalation (particulates)	6E-05 (<0.01%)
		Inhalation (vapor)	4E-02 (4%)
	Non-cancer	Inhalation (particulates)	3E-06 (<0.001%)
		Inhalation (vapor)	2E-03 (0.2%)

As shown in the table above, risks from inhalation exposures are small compared to risks from ingestion exposures (<5%). These findings support designating the inhalation pathways for soil exposures as minor for the purposes of this assessment.

Dermal Contact with Water

As described in the main text of this HHRA, if groundwater were used in future residential buildings at the OU2 site, residents may be exposed while bathing/showering. The basic equations recommended by USEPA (1989; 2004) for evaluating exposures and risk via dermal contact are described in brief below.

Dermal Exposure

The dermally absorbed dose (DAD) is quantified using an equation of the following general form (USEPA 2004):

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

where:

DAD	=	Dermally absorbed dose (mg of chemical per kg of body weight per day).
DA_{event}	=	Absorbed dose per event (mg of chemical per square centimeter of skin surface area per event).
EF	=	Exposure frequency (days/year).
ED	=	Exposure duration (years).
EV	=	Event frequency (events/day).
SA	=	Surface area (cm^2).
BW	=	Body weight of the exposed person (kg).
AT	=	Averaging time (days).

<u>Non-cancer hazard quotients</u>

$$HQ = DAD/RfD_{ABS} \quad \text{(dermal pathway; } RfD_{ABS}=RfD \cdot ABS_{GI}\text{)}$$

<u>Cancer Risk</u>

$$Risk = DAD \cdot SF_{ABS} \quad \text{(dermal pathway; } SF_{ABS} = SF/ABS_{GI}\text{)}$$

Using the exposure parameters for a resident, dermal cancer risks and non-cancer HQ values were calculated for antimony as an example, assuming an arbitrary water concentration. The (dermal/ingestion) ratio between the non-cancer HQs for antimony is 8E-05 (0.01%). These findings support designating the dermal pathway for groundwater exposures to hypothetical future commercial workers as minor for the purposes of this assessment.

References

USEPA. 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). United States Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC.

USEPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. United States Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/R/99/005. July.

USEPA. 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Final. United States Environmental Protection Agency, Office of Emergency and Remedial Response. EPA-540-R-070-002. OSWER 9285.7-82. January.

USEPA. 2016. Vapor Intrusion Screening Level Calculator (VISL). Version 3.5.1. Based on the May 2016 USEPA Regional Screening Level Tables. https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-levels-visls.

APPENDIX C

ProUCL Output

95UCL Recommendations for Groundwater

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.14/28/2021 3:45:32 PM
From File	Rev2_OU2 ProUCL Input 04.28.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aroclor-1260 (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (mcsmw1) 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.

Aroclor-1260 (mw4)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (mw4) 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.

Aroclor-1260 (mw7)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (mw7) 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.

Aroclor-1260 (nfmw13)

General Statistics

Total Number of Observations	2	Number of Distinct Observations	2
Number of Detects	0	Number of Non-Detects	2
Number of Distinct Detects	0	Number of Distinct Non-Detects	2

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 Aroclor-1260 (nfmw13) 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.

Aroclor-1260 (nfmw14)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (nfmw14) 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.

Aroclor-1260 (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.05	Minimum Non-Detect	0.015
Maximum Detect	0.12	Maximum Non-Detect	0.035
Variance Detects	6.8420E-4	Percent Non-Detects	37.5%
Mean Detects	0.0858	SD Detects	0.0262
Median Detects	0.081	CV Detects	0.305
Skewness Detects	-0.0839	Kurtosis Detects	0.159
Mean of Logged Detects	-2.497	SD of Logged Detects	0.328

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	0.982	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level

Lilliefors Test Statistic	0.183	**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	0.0593	KM Standard Error of Mean	0.0154
KM SD	0.0389	95% KM (BCA) UCL	0.0888
95% KM (t) UCL	0.0884	95% KM (Percentile Bootstrap) UCL	0.0838
95% KM (z) UCL	0.0846	95% KM Bootstrap t UCL	0.0744
90% KM Chebyshev UCL	0.105	95% KM Chebyshev UCL	0.126
97.5% KM Chebyshev UCL	0.155	99% KM Chebyshev UCL	0.212

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.238	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.207	**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)	12.4	k star (bias corrected MLE)	5.095
Theta hat (MLE)	0.00692	Theta star (bias corrected MLE)	0.0168
nu hat (MLE)	124	nu star (bias corrected)	50.95
Mean (detects)	0.0858		

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	0.014	Mean	0.0622
Maximum	0.12	Median	0.064
SD	0.0383	CV	0.616
k hat (MLE)	2.44	k star (bias corrected MLE)	1.609
Theta hat (MLE)	0.0255	Theta star (bias corrected MLE)	0.0387
nu hat (MLE)	39.04	nu star (bias corrected)	25.74
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (25.74, α)	15.18	Adjusted Chi Square Value (25.74, β)	13.17
95% Gamma Approximate UCL (use when n>=50)	0.106	95% Gamma Adjusted UCL (use when n<50)	0.122

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0593	SD (KM)	0.0389
Variance (KM)	0.00152	SE of Mean (KM)	0.0154
k hat (KM)	2.314	k star (KM)	1.53
nu hat (KM)	37.03	nu star (KM)	24.48
theta hat (KM)	0.0256	theta star (KM)	0.0387
80% gamma percentile (KM)	0.0915	90% gamma percentile (KM)	0.123
95% gamma percentile (KM)	0.153	99% gamma percentile (KM)	0.222

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (24.48, α)	14.21	Adjusted Chi Square Value (24.48, β)	12.28
95% Gamma Approximate KM-UCL (use when n>=50)	0.102	95% Gamma Adjusted KM-UCL (use when n<50)	0.118

Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.954	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.234	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	0.0666	Mean in Log Scale	-2.826
SD in Original Scale	0.0332	SD in Log Scale	0.523
95% t UCL (assumes normality of ROS data)	0.0888	95% Percentile Bootstrap UCL	0.0855
95% BCA Bootstrap UCL	0.087	95% Bootstrap t UCL	0.0927
95% H-UCL (Log ROS)	0.109		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-3.135	KM Geo Mean	0.0435
KM SD (logged)	0.857	95% Critical H Value (KM-Log)	3.082
KM Standard Error of Mean (logged)	0.339	95% H-UCL (KM -Log)	0.17
KM SD (logged)	0.857	95% Critical H Value (KM-Log)	3.082
KM Standard Error of Mean (logged)	0.339		

DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0589	Mean in Log Scale	-3.183
SD in Original Scale	0.0421	SD in Log Scale	1.014
95% t UCL (Assumes normality)	0.0872	95% H-Stat UCL	0.261
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 0.0884

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Aroclor-1260 (nfmw16)

General Statistics			
Total Number of Observations	5	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	5
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 Aroclor-1260 (nfmw16) was not processed!

Aroclor-1260 (nfmw17)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	7
Number of Detects	0	Number of Non-Detects	7
Number of Distinct Detects	0	Number of Distinct Non-Detects	7

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 Aroclor-1260 (nfmw17) was not processed!

Aroclor-1260 (nfmw18)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (nfmw18) 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.

Aroclor-1260 (nfmw5)

General Statistics

Total Number of Observations	3	Number of Distinct Observations	3
Number of Detects	0	Number of Non-Detects	3
Number of Distinct Detects	0	Number of Distinct Non-Detects	3

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 Aroclor-1260 (nfmw5) was not processed!

Aroclor-1260 (nfmw6)

General Statistics

Total Number of Observations	7	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	7
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 Aroclor-1260 (nfmw6) was not processed!

Aroclor-1260 (waste fuel boiler well)

General Statistics

Total Number of Observations	3	Number of Distinct Observations	3
Number of Detects	0	Number of Non-Detects	3
Number of Distinct Detects	0	Number of Distinct Non-Detects	3

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 Aroclor-1260 (waste fuel boiler well) was not processed!

Aroclor-1260 (wfb1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Aroclor-1260 (wfb1) 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.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.14/28/2021 3:50:42 PM
From File	Rev2_OU2 ProUCL Input 04.28.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	2.1	Mean	2.1
Maximum	2.1	Median	2.1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Arsenic (car wash well) 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.

Arsenic (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	6.1	Mean	6.1
Maximum	6.1	Median	6.1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Arsenic (cartage building well) 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.

Arsenic (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	2.1	Mean	2.1
Maximum	2.1	Median	2.1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Arsenic (hoffman construction well) 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.

Arsenic (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	21.9	Mean	21.9
Maximum	21.9	Median	21.9

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Arsenic (log chipper well) 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.

Arsenic (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	1.6	Mean	1.6
Maximum	1.6	Median	1.6

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Arsenic (mcsmw1) 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.

Arsenic (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	2	Minimum Non-Detect	2.3
Maximum Detect	4.9	Maximum Non-Detect	2.3
Variance Detects	1.11	Percent Non-Detects	12.5%
Mean Detects	3.443	SD Detects	1.053
Median Detects	3.4	CV Detects	0.306
Skewness Detects	0.1	Kurtosis Detects	-1.302

Mean of Logged Detects	1.194	SD of Logged Detects	0.32

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	0.967	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**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	3.263	KM Standard Error of Mean	0.393
KM SD	1.029	95% KM (BCA) UCL	3.9
95% KM (t) UCL	4.007	95% KM (Percentile Bootstrap) UCL	3.875
95% KM (z) UCL	3.909	95% KM Bootstrap t UCL	4.055
90% KM Chebyshev UCL	4.442	95% KM Chebyshev UCL	4.976
97.5% KM Chebyshev UCL	5.718	99% KM Chebyshev UCL	7.174

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.195	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.151	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.312	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)	11.92	k star (bias corrected MLE)	6.906
Theta hat (MLE)	0.289	Theta star (bias corrected MLE)	0.499
nu hat (MLE)	166.9	nu star (bias corrected)	96.68
Mean (detects)	3.443		

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	1.839	Mean	3.242
Maximum	4.9	Median	3.1
SD	1.128	CV	0.348
k hat (MLE)	9.157	k star (bias corrected MLE)	5.806
Theta hat (MLE)	0.354	Theta star (bias corrected MLE)	0.558
nu hat (MLE)	146.5	nu star (bias corrected)	92.9
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (92.90, α)	71.67	Adjusted Chi Square Value (92.90, β)	66.97
95% Gamma Approximate UCL (use when n>=50)	4.203	95% Gamma Adjusted UCL (use when n<50)	4.498

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3.263	SD (KM)	1.029

Variance (KM)	1.06	SE of Mean (KM)	0.393
k hat (KM)	10.04	k star (KM)	6.36
nu hat (KM)	160.7	nu star (KM)	101.8
theta hat (KM)	0.325	theta star (KM)	0.513
80% gamma percentile (KM)	4.272	90% gamma percentile (KM)	4.991
95% gamma percentile (KM)	5.64	99% gamma percentile (KM)	6.996

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (101.76, α)	79.49	Adjusted Chi Square Value (101.76, β)	74.52
95% Gamma Approximate KM-UCL (use when n>=50)	4.177	95% Gamma Adjusted KM-UCL (use when n<50)	4.455

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	0.128	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	3.256	Mean in Log Scale	1.128
SD in Original Scale	1.109	SD in Log Scale	0.35
95% t UCL (assumes normality of ROS data)	3.999	95% Percentile Bootstrap UCL	3.925
95% BCA Bootstrap UCL	3.894	95% Bootstrap t UCL	4.093
95% H-UCL (Log ROS)	4.35		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.131	KM Geo Mean	3.099
KM SD (logged)	0.323	95% Critical H Value (KM-Log)	2.088
KM Standard Error of Mean (logged)	0.123	95% H-UCL (KM -Log)	4.214
KM SD (logged)	0.323	95% Critical H Value (KM-Log)	2.088
KM Standard Error of Mean (logged)	0.123		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3.156	Mean in Log Scale	1.062
SD in Original Scale	1.268	SD in Log Scale	0.476
95% t UCL (Assumes normality)	4.006	95% H-Stat UCL	4.914

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 4.007

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.73	Mean	0.975
Maximum	1.3	Median	0.94
SD	0.168	Std. Error of Mean	0.0595
Coefficient of Variation	0.172	Skewness	0.816

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	0.939	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	1.088	95% Adjusted-CLT UCL (Chen-1995)	1.091
		95% Modified-t UCL (Johnson-1978)	1.091

Gamma GOF Test

A-D Test Statistic	0.296	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.178	**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)	39.93	k star (bias corrected MLE)	25.04
Theta hat (MLE)	0.0244	Theta star (bias corrected MLE)	0.0389
nu hat (MLE)	638.9	nu star (bias corrected)	400.6
MLE Mean (bias corrected)	0.975	MLE Sd (bias corrected)	0.195
		Approximate Chi Square Value (0.05)	355.2
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	344.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.1	95% Adjusted Gamma UCL (use when n<50)	1.134

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.195	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.315	Mean of logged Data	-0.0379
Maximum of Logged Data	0.262	SD of logged Data	0.169

Assuming Lognormal Distribution

95% H-UCL	1.103	90% Chebyshev (MVUE) UCL	1.149
95% Chebyshev (MVUE) UCL	1.228	97.5% Chebyshev (MVUE) UCL	1.338
99% Chebyshev (MVUE) UCL	1.553		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.073	95% Jackknife UCL	1.088
95% Standard Bootstrap UCL	1.067	95% Bootstrap-t UCL	1.139
95% Hall's Bootstrap UCL	1.27	95% Percentile Bootstrap UCL	1.064
95% BCA Bootstrap UCL	1.086		
90% Chebyshev(Mean, Sd) UCL	1.153	95% Chebyshev(Mean, Sd) UCL	1.234
97.5% Chebyshev(Mean, Sd) UCL	1.346	99% Chebyshev(Mean, Sd) UCL	1.567

Suggested UCL to Use

95% Student's-t UCL 1.088

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	7.7	Mean	11.41
Maximum	16.8	Median	10.25
SD	3.283	Std. Error of Mean	1.161
Coefficient of Variation	0.288	Skewness	0.784

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	0.9	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	13.61	95% Adjusted-CLT UCL (Chen-1995)	13.67
		95% Modified-t UCL (Johnson-1978)	13.66

Gamma GOF Test

A-D Test Statistic	0.357	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.229	**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)	14.71	k star (bias corrected MLE)	9.277
Theta hat (MLE)	0.776	Theta star (bias corrected MLE)	1.23
nu hat (MLE)	235.4	nu star (bias corrected)	148.4
MLE Mean (bias corrected)	11.41	MLE Sd (bias corrected)	3.747
		Approximate Chi Square Value (0.05)	121.3
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	115.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	13.97	95% Adjusted Gamma UCL (use when n<50)	14.72

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.041	Mean of logged Data	2.4
Maximum of Logged Data	2.821	SD of logged Data	0.277

Assuming Lognormal Distribution

95% H-UCL	14.17	90% Chebyshev (MVUE) UCL	14.76
95% Chebyshev (MVUE) UCL	16.29	97.5% Chebyshev (MVUE) UCL	18.4
99% Chebyshev (MVUE) UCL	22.55		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	13.32	95% Jackknife UCL	13.61
95% Standard Bootstrap UCL	13.18	95% Bootstrap-t UCL	14.95
95% Hall's Bootstrap UCL	14.91	95% Percentile Bootstrap UCL	13.18
95% BCA Bootstrap UCL	13.48		
90% Chebyshev(Mean, Sd) UCL	14.89	95% Chebyshev(Mean, Sd) UCL	16.47
97.5% Chebyshev(Mean, Sd) UCL	18.66	99% Chebyshev(Mean, Sd) UCL	22.96

Suggested UCL to Use

95% Student's-t UCL 13.61

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.

Arsenic (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	2.4	Mean	4.444
Maximum	7	Median	3.3
SD	1.907	Std. Error of Mean	0.636
Coefficient of Variation	0.429	Skewness	0.508

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	0.818	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.281	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	5.627	95% Adjusted-CLT UCL (Chen-1995)	5.605
		95% Modified-t UCL (Johnson-1978)	5.645

Gamma GOF Test

A-D Test Statistic	0.723	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.722	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.274	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.33	k star (bias corrected MLE)	4.294
Theta hat (MLE)	0.702	Theta star (bias corrected MLE)	1.035
nu hat (MLE)	113.9	nu star (bias corrected)	77.3
MLE Mean (bias corrected)	4.444	MLE Sd (bias corrected)	2.145
		Approximate Chi Square Value (0.05)	58.05
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	54.54

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	5.919	95% Adjusted Gamma UCL (use when n<50)	6.299

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.856	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	0.875	Mean of logged Data	1.411
Maximum of Logged Data	1.946	SD of logged Data	0.425

Assuming Lognormal Distribution

95% H-UCL	6.204	90% Chebyshev (MVUE) UCL	6.344
95% Chebyshev (MVUE) UCL	7.207	97.5% Chebyshev (MVUE) UCL	8.405
99% Chebyshev (MVUE) UCL	10.76		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	5.49	95% Jackknife UCL	5.627
95% Standard Bootstrap UCL	5.463	95% Bootstrap-t UCL	5.851
95% Hall's Bootstrap UCL	5.224	95% Percentile Bootstrap UCL	5.444
95% BCA Bootstrap UCL	5.567		
90% Chebyshev(Mean, Sd) UCL	6.352	95% Chebyshev(Mean, Sd) UCL	7.216
97.5% Chebyshev(Mean, Sd) UCL	8.415	99% Chebyshev(Mean, Sd) UCL	10.77

Suggested UCL to Use

95% Adjusted Gamma UCL 6.299

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 (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
		Number of Missing Observations	0
Minimum	2.5	Mean	2.875
Maximum	3.4	Median	2.85
SD	0.333	Std. Error of Mean	0.118
Coefficient of Variation	0.116	Skewness	0.57

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	0.907	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	3.098	95% Adjusted-CLT UCL (Chen-1995)	3.094
		95% Modified-t UCL (Johnson-1978)	3.102

Gamma GOF Test

A-D Test Statistic	0.359	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.715	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	0.294	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	87.41	k star (bias corrected MLE)	54.71
Theta hat (MLE)	0.0329	Theta star (bias corrected MLE)	0.0525
nu hat (MLE)	1399	nu star (bias corrected)	875.4
MLE Mean (bias corrected)	2.875	MLE Sd (bias corrected)	0.389
		Approximate Chi Square Value (0.05)	807.7
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	791.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.116	95% Adjusted Gamma UCL (use when n<50)	3.181

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.2	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	1.05
Maximum of Logged Data	1.224	SD of logged Data	0.114

Assuming Lognormal Distribution

95% H-UCL	3.117	90% Chebyshev (MVUE) UCL	3.222
95% Chebyshev (MVUE) UCL	3.38	97.5% Chebyshev (MVUE) UCL	3.598
99% Chebyshev (MVUE) UCL	4.027		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.069	95% Jackknife UCL	3.098
95% Standard Bootstrap UCL	3.059	95% Bootstrap-t UCL	3.174
95% Hall's Bootstrap UCL	3.253	95% Percentile Bootstrap UCL	3.063
95% BCA Bootstrap UCL	3.088		
90% Chebyshev(Mean, Sd) UCL	3.228	95% Chebyshev(Mean, Sd) UCL	3.388
97.5% Chebyshev(Mean, Sd) UCL	3.61	99% Chebyshev(Mean, Sd) UCL	4.046

Suggested UCL to Use

95% Student's-t UCL 3.098

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	2.3	Minimum Non-Detect	2.3
Maximum Detect	3.9	Maximum Non-Detect	2.3
Variance Detects	0.227	Percent Non-Detects	12.5%
Mean Detects	3.2	SD Detects	0.476
Median Detects	3.2	CV Detects	0.149
Skewness Detects	-0.817	Kurtosis Detects	2.757
Mean of Logged Detects	1.153	SD of Logged Detects	0.16

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	0.893	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.274	**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	3.088	KM Standard Error of Mean	0.194
KM SD	0.509	95% KM (BCA) UCL	3.4
95% KM (t) UCL	3.455	95% KM (Percentile Bootstrap) UCL	3.388
95% KM (z) UCL	3.407	95% KM Bootstrap t UCL	3.398
90% KM Chebyshev UCL	3.67	95% KM Chebyshev UCL	3.934
97.5% KM Chebyshev UCL	4.3	99% KM Chebyshev UCL	5.02

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.579	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.289	**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)	48.26	k star (bias corrected MLE)	27.67
Theta hat (MLE)	0.0663	Theta star (bias corrected MLE)	0.116
nu hat (MLE)	675.7	nu star (bias corrected)	387.4
Mean (detects)	3.2		

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	2.194	Mean	3.074
Maximum	3.9	Median	3.2
SD	0.566	CV	0.184
k hat (MLE)	31.06	k star (bias corrected MLE)	19.49
Theta hat (MLE)	0.099	Theta star (bias corrected MLE)	0.158
nu hat (MLE)	496.9	nu star (bias corrected)	311.9
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (311.91, α)	272	Adjusted Chi Square Value (311.91, β)	262.5
95% Gamma Approximate UCL (use when n>=50)	3.525	95% Gamma Adjusted UCL (use when n<50)	3.652

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3.088	SD (KM)	0.509
Variance (KM)	0.259	SE of Mean (KM)	0.194
k hat (KM)	36.86	k star (KM)	23.12
nu hat (KM)	589.8	nu star (KM)	370
theta hat (KM)	0.0838	theta star (KM)	0.134
80% gamma percentile (KM)	3.611	90% gamma percentile (KM)	3.934
95% gamma percentile (KM)	4.214	99% gamma percentile (KM)	4.774

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (369.97, α)	326.4	Adjusted Chi Square Value (369.97, β)	316
95% Gamma Approximate KM-UCL (use when n>=50)	3.5	95% Gamma Adjusted KM-UCL (use when n<50)	3.615

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.854	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.304	**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	3.077	Mean in Log Scale	1.108
SD in Original Scale	0.561	SD in Log Scale	0.194
95% t UCL (assumes normality of ROS data)	3.453	95% Percentile Bootstrap UCL	3.375
95% BCA Bootstrap UCL	3.35	95% Bootstrap t UCL	3.399
95% H-UCL (Log ROS)	3.558		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.113	KM Geo Mean	3.043
KM SD (logged)	0.174	95% Critical H Value (KM-Log)	1.917
KM Standard Error of Mean (logged)	0.0665	95% H-UCL (KM -Log)	3.505
KM SD (logged)	0.174	95% Critical H Value (KM-Log)	1.917
KM Standard Error of Mean (logged)	0.0665		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	2.944	Mean in Log Scale	1.026

SD in Original Scale	0.848	SD in Log Scale	0.387
95% t UCL (Assumes normality)	3.512	95% H-Stat UCL	4.137

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 3.455

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.69	Mean	1.179
Maximum	2.4	Median	0.98
SD	0.513	Std. Error of Mean	0.171
Coefficient of Variation	0.436	Skewness	1.926

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	0.805	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data Not 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 Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1.497	95% Adjusted-CLT UCL (Chen-1995)	1.578
		95% Modified-t UCL (Johnson-1978)	1.515

Gamma GOF Test

A-D Test Statistic	0.437	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.722	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	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.614	k star (bias corrected MLE)	5.15
Theta hat (MLE)	0.155	Theta star (bias corrected MLE)	0.229

nu hat (MLE)	137	nu star (bias corrected)	92.7
MLE Mean (bias corrected)	1.179	MLE Sd (bias corrected)	0.519
		Approximate Chi Square Value (0.05)	71.5
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	67.58

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.529	95% Adjusted Gamma UCL (use when n<50)	1.617

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.18	**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	-0.371	Mean of logged Data	0.0975
Maximum of Logged Data	0.875	SD of logged Data	0.37

Assuming Lognormal Distribution

95% H-UCL	1.552	90% Chebyshev (MVUE) UCL	1.608
95% Chebyshev (MVUE) UCL	1.805	97.5% Chebyshev (MVUE) UCL	2.08
99% Chebyshev (MVUE) UCL	2.619		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.46	95% Jackknife UCL	1.497
95% Standard Bootstrap UCL	1.441	95% Bootstrap-t UCL	1.73
95% Hall's Bootstrap UCL	2.626	95% Percentile Bootstrap UCL	1.47
95% BCA Bootstrap UCL	1.596		
90% Chebyshev(Mean, Sd) UCL	1.692	95% Chebyshev(Mean, Sd) UCL	1.925
97.5% Chebyshev(Mean, Sd) UCL	2.248	99% Chebyshev(Mean, Sd) UCL	2.882

Suggested UCL to Use

95% Student's-t UCL 1.497

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 (nfmw6)

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	0.16	Minimum Non-Detect	2.3

Maximum Detect	0.54	Maximum Non-Detect	2.3
Variance Detects	0.0179	Percent Non-Detects	11.11%
Mean Detects	0.326	SD Detects	0.134
Median Detects	0.35	CV Detects	0.41
Skewness Detects	0.17	Kurtosis Detects	-0.98
Mean of Logged Detects	-1.202	SD of Logged Detects	0.444

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	0.938	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.182	**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	0.326	KM Standard Error of Mean	0.0473
KM SD	0.125	95% KM (BCA) UCL	0.401
95% KM (t) UCL	0.414	95% KM (Percentile Bootstrap) UCL	0.395
95% KM (z) UCL	0.404	95% KM Bootstrap t UCL	0.422
90% KM Chebyshev UCL	0.468	95% KM Chebyshev UCL	0.533
97.5% KM Chebyshev UCL	0.622	99% KM Chebyshev UCL	0.797

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.366	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	**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)	6.292	k star (bias corrected MLE)	4.016
Theta hat (MLE)	0.0519	Theta star (bias corrected MLE)	0.0812
nu hat (MLE)	100.7	nu star (bias corrected)	64.25
Mean (detects)	0.326		

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	0.16	Mean	0.325
Maximum	0.54	Median	0.34
SD	0.125	CV	0.386
k hat (MLE)	7.052	k star (bias corrected MLE)	4.775
Theta hat (MLE)	0.0461	Theta star (bias corrected MLE)	0.068
nu hat (MLE)	126.9	nu star (bias corrected)	85.96
Adjusted Level of Significance (β)	0.0231		

Approximate Chi Square Value (85.96, α)	65.58	Adjusted Chi Square Value (85.96, β)	61.84
95% Gamma Approximate UCL (use when n>=50)	0.426	95% Gamma Adjusted UCL (use when n<50)	0.452

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.326	SD (KM)	0.125
Variance (KM)	0.0157	SE of Mean (KM)	0.0473
k hat (KM)	6.791	k star (KM)	4.601
nu hat (KM)	122.2	nu star (KM)	82.83
theta hat (KM)	0.048	theta star (KM)	0.0709
80% gamma percentile (KM)	0.443	90% gamma percentile (KM)	0.53
95% gamma percentile (KM)	0.61	99% gamma percentile (KM)	0.779

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (82.83, α)	62.85	Adjusted Chi Square Value (82.83, β)	59.19
95% Gamma Approximate KM-UCL (use when n>=50)	0.43	95% Gamma Adjusted KM-UCL (use when n<50)	0.456

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.918	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.234	**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	0.323	Mean in Log Scale	-1.202
SD in Original Scale	0.125	SD in Log Scale	0.415
95% t UCL (assumes normality of ROS data)	0.401	95% Percentile Bootstrap UCL	0.391
95% BCA Bootstrap UCL	0.389	95% Bootstrap t UCL	0.403
95% H-UCL (Log ROS)	0.45		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.202	KM Geo Mean	0.301
KM SD (logged)	0.415	95% Critical H Value (KM-Log)	2.15
KM Standard Error of Mean (logged)	0.157	95% H-UCL (KM -Log)	0.45
KM SD (logged)	0.415	95% Critical H Value (KM-Log)	2.15
KM Standard Error of Mean (logged)	0.157		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.418	Mean in Log Scale	-1.053
SD in Original Scale	0.302	SD in Log Scale	0.61
95% t UCL (Assumes normality)	0.605	95% H-Stat UCL	0.715

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 0.414

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.44	Minimum Non-Detect	0.5
Maximum Detect	1.3	Maximum Non-Detect	2.3
Variance Detects	0.134	Percent Non-Detects	37.5%
Mean Detects	0.646	SD Detects	0.367
Median Detects	0.49	CV Detects	0.568
Skewness Detects	2.202	Kurtosis Detects	4.88
Mean of Logged Detects	-0.532	SD of Logged Detects	0.448

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	0.628	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.434	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	0.597	KM Standard Error of Mean	0.122
KM SD	0.288	95% KM (BCA) UCL	0.823
95% KM (t) UCL	0.828	95% KM (Percentile Bootstrap) UCL	0.808
95% KM (z) UCL	0.798	95% KM Bootstrap t UCL	2.323
90% KM Chebyshev UCL	0.963	95% KM Chebyshev UCL	1.129
97.5% KM Chebyshev UCL	1.359	99% KM Chebyshev UCL	1.81

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.003	Anderson-Darling GOF Test
5% A-D Critical Value	0.681	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.434	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.358	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)	5.423	k star (bias corrected MLE)	2.303
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.281
nu hat (MLE)	54.23	nu star (bias corrected)	23.03
Mean (detects)	0.646		

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	0.44	Mean	0.592
Maximum	1.3	Median	0.498
SD	0.289	CV	0.488
k hat (MLE)	7.484	k star (bias corrected MLE)	4.761
Theta hat (MLE)	0.0791	Theta star (bias corrected MLE)	0.124
nu hat (MLE)	119.7	nu star (bias corrected)	76.17
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (76.17, α)	57.07	Adjusted Chi Square Value (76.17, β)	52.91
95% Gamma Approximate UCL (use when n>=50)	0.79	95% Gamma Adjusted UCL (use when n<50)	0.852

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.597	SD (KM)	0.288
Variance (KM)	0.083	SE of Mean (KM)	0.122
k hat (KM)	4.296	k star (KM)	2.768
nu hat (KM)	68.74	nu star (KM)	44.3
theta hat (KM)	0.139	theta star (KM)	0.216
80% gamma percentile (KM)	0.86	90% gamma percentile (KM)	1.078
95% gamma percentile (KM)	1.283	99% gamma percentile (KM)	1.728

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (44.30, α)	30.03	Adjusted Chi Square Value (44.30, β)	27.09
95% Gamma Approximate KM-UCL (use when n>=50)	0.881	95% Gamma Adjusted KM-UCL (use when n<50)	0.976

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.681	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.407	**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	0.594	Mean in Log Scale	-0.587
SD in Original Scale	0.287	SD in Log Scale	0.35
95% t UCL (assumes normality of ROS data)	0.787	95% Percentile Bootstrap UCL	0.793
95% BCA Bootstrap UCL	0.889	95% Bootstrap t UCL	1.771
95% H-UCL (Log ROS)	0.783		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.593	KM Geo Mean	0.553
KM SD (logged)	0.353	95% Critical H Value (KM-Log)	2.128
KM Standard Error of Mean (logged)	0.15	95% H-UCL (KM -Log)	0.782
KM SD (logged)	0.353	95% Critical H Value (KM-Log)	2.128
KM Standard Error of Mean (logged)	0.15		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.614	Mean in Log Scale	-0.645
SD in Original Scale	0.391	SD in Log Scale	0.586
95% t UCL (Assumes normality)	0.876	95% H-Stat UCL	1.086

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	0.828	KM H-UCL	0.782
95% KM (BCA) UCL	0.823		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	340	Mean	340
Maximum	340	Median	340

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Barium (car wash well) 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.

Barium (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	136	Mean	136
Maximum	136	Median	136

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Barium (cartage building well) 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.

Barium (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	173	Mean	173

Maximum	173	Median	173

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Barium (hoffman construction well) 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.

Barium (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	146	Mean	146
Maximum	146	Median	146

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Barium (log chipper well) 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.

Barium (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	150	Mean	150
Maximum	150	Median	150

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Barium (mcsmw1) 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.

Barium (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	196	Mean	234.3
Maximum	283	Median	240.5
SD	28.63	Std. Error of Mean	10.12

Coefficient of Variation	0.122	Skewness	0.249

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	0.934	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	253.4	95% Adjusted-CLT UCL (Chen-1995)	251.9
		95% Modified-t UCL (Johnson-1978)	253.6

Gamma GOF Test

A-D Test Statistic	0.371	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**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)	76.79	k star (bias corrected MLE)	48.07
Theta hat (MLE)	3.051	Theta star (bias corrected MLE)	4.873
nu hat (MLE)	1229	nu star (bias corrected)	769.2
MLE Mean (bias corrected)	234.3	MLE Sd (bias corrected)	33.78
		Approximate Chi Square Value (0.05)	705.8
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	690.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	255.3	95% Adjusted Gamma UCL (use when n<50)	261

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.278	Mean of logged Data	5.45
Maximum of Logged Data	5.645	SD of logged Data	0.122

Assuming Lognormal Distribution

95% H-UCL	255.6	90% Chebyshev (MVUE) UCL	264.6
95% Chebyshev (MVUE) UCL	278.4	97.5% Chebyshev (MVUE) UCL	297.5
99% Chebyshev (MVUE) UCL	335		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	250.9	95% Jackknife UCL	253.4
95% Standard Bootstrap UCL	249.5	95% Bootstrap-t UCL	254.1
95% Hall's Bootstrap UCL	251.5	95% Percentile Bootstrap UCL	250
95% BCA Bootstrap UCL	250.3		
90% Chebyshev(Mean, Sd) UCL	264.6	95% Chebyshev(Mean, Sd) UCL	278.4
97.5% Chebyshev(Mean, Sd) UCL	297.5	99% Chebyshev(Mean, Sd) UCL	335

Suggested UCL to Use

95% Student's-t UCL 253.4

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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	267	Mean	348.6
Maximum	519	Median	291
SD	100.9	Std. Error of Mean	35.66
Coefficient of Variation	0.289	Skewness	0.961

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	0.795	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.299	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	416.2	95% Adjusted-CLT UCL (Chen-1995)	420.2
		95% Modified-t UCL (Johnson-1978)	418.2

Gamma GOF Test

A-D Test Statistic	0.818	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.716	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.297	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.294	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	15.07	k star (bias corrected MLE)	9.5
Theta hat (MLE)	23.14	Theta star (bias corrected MLE)	36.7
nu hat (MLE)	241.1	nu star (bias corrected)	152
MLE Mean (bias corrected)	348.6	MLE Sd (bias corrected)	113.1
		Approximate Chi Square Value (0.05)	124.5
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	118.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	425.6	95% Adjusted Gamma UCL (use when n<50)	448.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.807	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.278	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.587	Mean of logged Data	5.82
Maximum of Logged Data	6.252	SD of logged Data	0.271

Assuming Lognormal Distribution

95% H-UCL	430	90% Chebyshev (MVUE) UCL	448.3
95% Chebyshev (MVUE) UCL	493.7	97.5% Chebyshev (MVUE) UCL	556.7
99% Chebyshev (MVUE) UCL	680.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	407.3	95% Jackknife UCL	416.2
95% Standard Bootstrap UCL	402	95% Bootstrap-t UCL	467.9
95% Hall's Bootstrap UCL	408.1	95% Percentile Bootstrap UCL	409
95% BCA Bootstrap UCL	411.5		
90% Chebyshev(Mean, Sd) UCL	455.6	95% Chebyshev(Mean, Sd) UCL	504.1
97.5% Chebyshev(Mean, Sd) UCL	571.3	99% Chebyshev(Mean, Sd) UCL	703.5

Suggested UCL to Use

95% Student's-t UCL	416.2	or 95% Modified-t UCL	418.2
or 95% H-UCL	430		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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.

Barium (nfmw15)

General Statistics			
Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	90.4	Mean	174.1
Maximum	240	Median	186.5
SD	54.71	Std. Error of Mean	19.34
Coefficient of Variation	0.314	Skewness	-0.641

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	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	210.8	95% Adjusted-CLT UCL (Chen-1995)	201.3
		95% Modified-t UCL (Johnson-1978)	210

Gamma GOF Test		
A-D Test Statistic	0.57	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.234	**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)	9.639	k star (bias corrected MLE)	6.108
Theta hat (MLE)	18.06	Theta star (bias corrected MLE)	28.51
nu hat (MLE)	154.2	nu star (bias corrected)	97.73
MLE Mean (bias corrected)	174.1	MLE Sd (bias corrected)	70.46
		Approximate Chi Square Value (0.05)	75.92
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	71.07

Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	224.1	95% Adjusted Gamma UCL (use when n<50)	239.4

Lognormal GOF Test		
Shapiro Wilk Test Statistic	0.845	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.255	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.504	Mean of logged Data	5.107
Maximum of Logged Data	5.481	SD of logged Data	0.366

Assuming Lognormal Distribution

95% H-UCL	237.5	90% Chebyshev (MVUE) UCL	243.3
95% Chebyshev (MVUE) UCL	274.3	97.5% Chebyshev (MVUE) UCL	317.2
99% Chebyshev (MVUE) UCL	401.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	205.9	95% Jackknife UCL	210.8
95% Standard Bootstrap UCL	204	95% Bootstrap-t UCL	206.7
95% Hall's Bootstrap UCL	199.8	95% Percentile Bootstrap UCL	202.1
95% BCA Bootstrap UCL	200.1		
90% Chebyshev(Mean, Sd) UCL	232.2	95% Chebyshev(Mean, Sd) UCL	258.4
97.5% Chebyshev(Mean, Sd) UCL	294.9	99% Chebyshev(Mean, Sd) UCL	366.6

Suggested UCL to Use

95% Student's-t UCL 210.8

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.

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 (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	92.2	Mean	194.9
Maximum	269	Median	208
SD	70.54	Std. Error of Mean	23.51
Coefficient of Variation	0.362	Skewness	-0.535

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

Shapiro Wilk Test Statistic	0.871	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.223	**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	238.7	95% Adjusted-CLT UCL (Chen-1995)	229.1
		95% Modified-t UCL (Johnson-1978)	238

Gamma GOF Test

A-D Test Statistic	0.624	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.233	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.035	k star (bias corrected MLE)	4.764
Theta hat (MLE)	27.71	Theta star (bias corrected MLE)	40.92
nu hat (MLE)	126.6	nu star (bias corrected)	85.76
MLE Mean (bias corrected)	194.9	MLE Sd (bias corrected)	89.31
		Approximate Chi Square Value (0.05)	65.41
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	61.68

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	255.6	95% Adjusted Gamma UCL (use when n<50)	271

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.524	Mean of logged Data	5.2
Maximum of Logged Data	5.595	SD of logged Data	0.428

Assuming Lognormal Distribution

95% H-UCL	275.7	90% Chebyshev (MVUE) UCL	281.6
95% Chebyshev (MVUE) UCL	320.2	97.5% Chebyshev (MVUE) UCL	373.6
99% Chebyshev (MVUE) UCL	478.7		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	233.6	95% Jackknife UCL	238.7
95% Standard Bootstrap UCL	231.1	95% Bootstrap-t UCL	234.6
95% Hall's Bootstrap UCL	228	95% Percentile Bootstrap UCL	231.2
95% BCA Bootstrap UCL	228		
90% Chebyshev(Mean, Sd) UCL	265.5	95% Chebyshev(Mean, Sd) UCL	297.4
97.5% Chebyshev(Mean, Sd) UCL	341.8	99% Chebyshev(Mean, Sd) UCL	428.9

Suggested UCL to Use

95% Student's-t UCL 238.7

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.

Barium (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	80.4	Mean	120.5
Maximum	213	Median	102
SD	51.82	Std. Error of Mean	18.32
Coefficient of Variation	0.43	Skewness	1.342

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	0.747	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.36	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	155.2	95% Adjusted-CLT UCL (Chen-1995)	159.9
		95% Modified-t UCL (Johnson-1978)	156.7

Gamma GOF Test

A-D Test Statistic	0.888	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.717	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.337	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.295	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.492	k star (bias corrected MLE)	4.766
Theta hat (MLE)	16.09	Theta star (bias corrected MLE)	25.29
nu hat (MLE)	119.9	nu star (bias corrected)	76.25
MLE Mean (bias corrected)	120.5	MLE Sd (bias corrected)	55.2
		Approximate Chi Square Value (0.05)	57.14
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	52.97

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	160.8	95% Adjusted Gamma UCL (use when n<50)	173.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.803	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.313	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.387	Mean of logged Data	4.724
Maximum of Logged Data	5.361	SD of logged Data	0.377

Assuming Lognormal Distribution

95% H-UCL	164.5	90% Chebyshev (MVUE) UCL	168
95% Chebyshev (MVUE) UCL	189.8	97.5% Chebyshev (MVUE) UCL	220.1
99% Chebyshev (MVUE) UCL	279.7		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	150.6	95% Jackknife UCL	155.2
95% Standard Bootstrap UCL	148.1	95% Bootstrap-t UCL	256.4
95% Hall's Bootstrap UCL	392.7	95% Percentile Bootstrap UCL	150.3
95% BCA Bootstrap UCL	154.6		
90% Chebyshev(Mean, Sd) UCL	175.5	95% Chebyshev(Mean, Sd) UCL	200.4
97.5% Chebyshev(Mean, Sd) UCL	234.9	99% Chebyshev(Mean, Sd) UCL	302.8

Suggested UCL to Use

95% Student's-t UCL	155.2	or 95% Modified-t UCL	156.7

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.

Barium (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	79.8	Mean	108.6
Maximum	134	Median	113
SD	19.85	Std. Error of Mean	7.019
Coefficient of Variation	0.183	Skewness	-0.301

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	0.934	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.164	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.283	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	121.9	95% Adjusted-CLT UCL (Chen-1995)	119.4
		95% Modified-t UCL (Johnson-1978)	121.8
Gamma GOF Test			
A-D Test Statistic	0.353	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.187	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)	32.65	k star (bias corrected MLE)	20.49
Theta hat (MLE)	3.327	Theta star (bias corrected MLE)	5.301
nu hat (MLE)	522.4	nu star (bias corrected)	327.8
MLE Mean (bias corrected)	108.6	MLE Sd (bias corrected)	24
		Approximate Chi Square Value (0.05)	286.9
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	277.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	124.1	95% Adjusted Gamma UCL (use when n<50)	128.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.922	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.38	Mean of logged Data	4.672
Maximum of Logged Data	4.898	SD of logged Data	0.19
Assuming Lognormal Distribution			
95% H-UCL	125.1	90% Chebyshev (MVUE) UCL	130.6
95% Chebyshev (MVUE) UCL	140.5	97.5% Chebyshev (MVUE) UCL	154.3
99% Chebyshev (MVUE) UCL	181.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	120.2	95% Jackknife UCL	121.9
95% Standard Bootstrap UCL	119.3	95% Bootstrap-t UCL	120.7
95% Hall's Bootstrap UCL	118	95% Percentile Bootstrap UCL	119.5

95% BCA Bootstrap UCL	118.8		
90% Chebyshev(Mean, Sd) UCL	129.7	95% Chebyshev(Mean, Sd) UCL	139.2
97.5% Chebyshev(Mean, Sd) UCL	152.4	99% Chebyshev(Mean, Sd) UCL	178.4

Suggested UCL to Use

95% Student's-t UCL 121.9

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.

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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	206	Mean	265.4
Maximum	306	Median	268
SD	31.06	Std. Error of Mean	10.35
Coefficient of Variation	0.117	Skewness	-0.86

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	0.941	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.187	**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	284.7	95% Adjusted-CLT UCL (Chen-1995)	279.3
		95% Modified-t UCL (Johnson-1978)	284.2

Gamma GOF Test

A-D Test Statistic	0.38	**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	0.202	**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)	76.93	k star (bias corrected MLE)	51.36
Theta hat (MLE)	3.451	Theta star (bias corrected MLE)	5.168

nu hat (MLE)	1385	nu star (bias corrected)	924.5
MLE Mean (bias corrected)	265.4	MLE Sd (bias corrected)	37.04
		Approximate Chi Square Value (0.05)	854.9
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	840.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	287	95% Adjusted Gamma UCL (use when n<50)	291.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.207	**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	5.328	Mean of logged Data	5.575
Maximum of Logged Data	5.724	SD of logged Data	0.123

Assuming Lognormal Distribution

95% H-UCL	287.9	90% Chebyshev (MVUE) UCL	298.3
95% Chebyshev (MVUE) UCL	313.1	97.5% Chebyshev (MVUE) UCL	333.7
99% Chebyshev (MVUE) UCL	374.1		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	282.5	95% Jackknife UCL	284.7
95% Standard Bootstrap UCL	281.5	95% Bootstrap-t UCL	281.3
95% Hall's Bootstrap UCL	280	95% Percentile Bootstrap UCL	279.4
95% BCA Bootstrap UCL	279.3		
90% Chebyshev(Mean, Sd) UCL	296.5	95% Chebyshev(Mean, Sd) UCL	310.6
97.5% Chebyshev(Mean, Sd) UCL	330.1	99% Chebyshev(Mean, Sd) UCL	368.4

Suggested UCL to Use

95% Student's-t UCL 284.7

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.

Barium (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	229	Mean	298.6

Maximum	391	Median	297
SD	47.29	Std. Error of Mean	15.76
Coefficient of Variation	0.158	Skewness	0.621

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	0.974	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.146	**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	327.9	95% Adjusted-CLT UCL (Chen-1995)	328
		95% Modified-t UCL (Johnson-1978)	328.4

Gamma GOF Test

A-D Test Statistic	0.149	**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	0.125	**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)	46	k star (bias corrected MLE)	30.74
Theta hat (MLE)	6.49	Theta star (bias corrected MLE)	9.711
nu hat (MLE)	828.1	nu star (bias corrected)	553.4
MLE Mean (bias corrected)	298.6	MLE Sd (bias corrected)	53.85
		Approximate Chi Square Value (0.05)	499.8
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	489.1

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	330.5	95% Adjusted Gamma UCL (use when n<50)	337.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.991	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.118	**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	5.434	Mean of logged Data	5.688
Maximum of Logged Data	5.969	SD of logged Data	0.156

Assuming Lognormal Distribution

95% H-UCL	331.4	90% Chebyshev (MVUE) UCL	345.2
95% Chebyshev (MVUE) UCL	366.4	97.5% Chebyshev (MVUE) UCL	395.7

99% Chebyshev (MVUE) UCL	453.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	324.5	95% Jackknife UCL	327.9
95% Standard Bootstrap UCL	322.9	95% Bootstrap-t UCL	332.4
95% Hall's Bootstrap UCL	340.6	95% Percentile Bootstrap UCL	324
95% BCA Bootstrap UCL	326		
90% Chebyshev(Mean, Sd) UCL	345.8	95% Chebyshev(Mean, Sd) UCL	367.3
97.5% Chebyshev(Mean, Sd) UCL	397	99% Chebyshev(Mean, Sd) UCL	455.4

Suggested UCL to Use

95% Student's-t UCL	327.9

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.

Barium (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	153	Mean	171
Maximum	235	Median	162
SD	26.54	Std. Error of Mean	9.385
Coefficient of Variation	0.155	Skewness	2.547

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	0.634	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.39	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	188.8	95% Adjusted-CLT UCL (Chen-1995)	195.5
		95% Modified-t UCL (Johnson-1978)	190.2

Gamma GOF Test

A-D Test Statistic	1.251	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.715	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.375	Kolmogorov-Smirnov Gamma GOF Test

5% K-S Critical Value	0.293	Data Not Gamma Distributed at 5% Significance Level	

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	56.11	k star (bias corrected MLE)	35.15
Theta hat (MLE)	3.048	Theta star (bias corrected MLE)	4.865
nu hat (MLE)	897.7	nu star (bias corrected)	562.4
MLE Mean (bias corrected)	171	MLE Sd (bias corrected)	28.84
		Approximate Chi Square Value (0.05)	508.4
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	495.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	189.2	95% Adjusted Gamma UCL (use when n<50)	194.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.675	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.366	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	5.03	Mean of logged Data	5.133
Maximum of Logged Data	5.46	SD of logged Data	0.137

Assuming Lognormal Distribution

95% H-UCL	188.6	90% Chebyshev (MVUE) UCL	195.8
95% Chebyshev (MVUE) UCL	207	97.5% Chebyshev (MVUE) UCL	222.7
99% Chebyshev (MVUE) UCL	253.4		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	186.4	95% Jackknife UCL	188.8
95% Standard Bootstrap UCL	185.5	95% Bootstrap-t UCL	228.1
95% Hall's Bootstrap UCL	246.7	95% Percentile Bootstrap UCL	188.4
95% BCA Bootstrap UCL	192.4		
90% Chebyshev(Mean, Sd) UCL	199.2	95% Chebyshev(Mean, Sd) UCL	211.9
97.5% Chebyshev(Mean, Sd) UCL	229.6	99% Chebyshev(Mean, Sd) UCL	264.4

Suggested UCL to Use

95% Student's-t UCL	188.8	or 95% Modified-t UCL	190.2

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.

Chromium (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	0.26	Mean	0.26
Maximum	0.26	Median	0.26

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Chromium (car wash well) 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.

Chromium (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	0.6	Mean	0.6
Maximum	0.6	Median	0.6

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Chromium (cartage building well) 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.

Chromium (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	0.86	Mean	0.86
Maximum	0.86	Median	0.86

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Chromium (hoffman construction well) 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.

Chromium (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0

Minimum	3.8	Mean	3.8
Maximum	3.8	Median	3.8

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chromium (log chipper well) 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.

Chromium (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Chromium (mcsmw1) 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.

Chromium (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	2	Number of Non-Detects	6
Number of Distinct Detects	2	Number of Distinct Non-Detects	5
Minimum Detect	0.21	Minimum Non-Detect	0.16
Maximum Detect	0.31	Maximum Non-Detect	4.6
Variance Detects	0.005	Percent Non-Detects	75%
Mean Detects	0.26	SD Detects	0.0707
Median Detects	0.26	CV Detects	0.272
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.366	SD of Logged Detects	0.275

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

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

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.2	KM Standard Error of Mean	0.0369
KM SD	0.0583	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.27	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.261	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.311	95% KM Chebyshev UCL	0.361
97.5% KM Chebyshev UCL	0.43	99% KM Chebyshev UCL	0.567

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	26.7	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00974	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	106.8	nu star (bias corrected)	N/A
Mean (detects)	0.26		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.2	SD (KM)	0.0583
Variance (KM)	0.0034	SE of Mean (KM)	0.0369
k hat (KM)	11.76	k star (KM)	7.436
nu hat (KM)	188.2	nu star (KM)	119
theta hat (KM)	0.017	theta star (KM)	0.0269
80% gamma percentile (KM)	0.258	90% gamma percentile (KM)	0.298
95% gamma percentile (KM)	0.334	99% gamma percentile (KM)	0.409

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0195
Approximate Chi Square Value (118.98, α)	94.79	Adjusted Chi Square Value (118.98, β)	89.34
95% Gamma Approximate KM-UCL (use when n>=50)	0.251	95% Gamma Adjusted KM-UCL (use when n<50)	0.266

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	0.145	Mean in Log Scale	-2.047
SD in Original Scale	0.0794	SD in Log Scale	0.493
95% t UCL (assumes normality of ROS data)	0.198	95% Percentile Bootstrap UCL	0.193
95% BCA Bootstrap UCL	0.196	95% Bootstrap t UCL	0.266
95% H-UCL (Log ROS)	0.226		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.646	KM Geo Mean	0.193
KM SD (logged)	0.26	95% Critical H Value (KM-Log)	2.009
KM Standard Error of Mean (logged)	0.164	95% H-UCL (KM -Log)	0.243
KM SD (logged)	0.26	95% Critical H Value (KM-Log)	2.009
KM Standard Error of Mean (logged)	0.164		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.613	Mean in Log Scale	-1.265
SD in Original Scale	0.85	SD in Log Scale	1.265
95% t UCL (Assumes normality)	1.182	95% H-Stat UCL	4.483

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	0.27	KM H-UCL	0.243
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.

Chromium (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	4	Number of Non-Detects	4
Number of Distinct Detects	4	Number of Distinct Non-Detects	3
Minimum Detect	0.23	Minimum Non-Detect	0.21
Maximum Detect	0.54	Maximum Non-Detect	0.8
Variance Detects	0.0242	Percent Non-Detects	50%
Mean Detects	0.378	SD Detects	0.155
Median Detects	0.37	CV Detects	0.412
Skewness Detects	0.0953	Kurtosis Detects	-5.095
Mean of Logged Detects	-1.042	SD of Logged Detects	0.429

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	0.862	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.275	**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	0.33	KM Standard Error of Mean	0.0654
KM SD	0.132	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.454	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.438	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.526	95% KM Chebyshev UCL	0.615
97.5% KM Chebyshev UCL	0.738	99% KM Chebyshev UCL	0.98

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.458	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.658	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.3	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.395	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)	7.566	k star (bias corrected MLE)	2.058
Theta hat (MLE)	0.0499	Theta star (bias corrected MLE)	0.183
nu hat (MLE)	60.53	nu star (bias corrected)	16.46
Mean (detects)	0.378		

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	0.128	Mean	0.309
Maximum	0.54	Median	0.278
SD	0.138	CV	0.448
k hat (MLE)	5.743	k star (bias corrected MLE)	3.672
Theta hat (MLE)	0.0538	Theta star (bias corrected MLE)	0.0841
nu hat (MLE)	91.88	nu star (bias corrected)	58.76
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (58.76, α)	42.14	Adjusted Chi Square Value (58.76, β)	38.6
95% Gamma Approximate UCL (use when n>=50)	0.431	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.33	SD (KM)	0.132
Variance (KM)	0.0174	SE of Mean (KM)	0.0654
k hat (KM)	6.259	k star (KM)	3.995
nu hat (KM)	100.1	nu star (KM)	63.92
theta hat (KM)	0.0527	theta star (KM)	0.0826
80% gamma percentile (KM)	0.455	90% gamma percentile (KM)	0.551
95% gamma percentile (KM)	0.64	99% gamma percentile (KM)	0.829

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (63.92, α)	46.53	Adjusted Chi Square Value (63.92, β)	42.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.453	95% Gamma Adjusted KM-UCL (use when n<50)	0.493

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.861	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.263	**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	0.308	Mean in Log Scale	-1.256
SD in Original Scale	0.134	SD in Log Scale	0.42
95% t UCL (assumes normality of ROS data)	0.398	95% Percentile Bootstrap UCL	0.385
95% BCA Bootstrap UCL	0.396	95% Bootstrap t UCL	0.498
95% H-UCL (Log ROS)	0.443		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.183	KM Geo Mean	0.306

KM SD (logged)	0.378	95% Critical H Value (KM-Log)	2.163
KM Standard Error of Mean (logged)	0.189	95% H-UCL (KM -Log)	0.448
KM SD (logged)	0.378	95% Critical H Value (KM-Log)	2.163
KM Standard Error of Mean (logged)	0.189		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.314	Mean in Log Scale	-1.264
SD in Original Scale	0.145	SD in Log Scale	0.518
95% t UCL (Assumes normality)	0.412	95% H-Stat UCL	0.516

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 0.454

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.

Chromium (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.49	Minimum Non-Detect	0.8
Maximum Detect	2.8	Maximum Non-Detect	4.6
Variance Detects	1	Percent Non-Detects	37.5%
Mean Detects	1.32	SD Detects	1
Median Detects	0.82	CV Detects	0.757
Skewness Detects	0.98	Kurtosis Detects	-0.83
Mean of Logged Detects	0.0464	SD of Logged Detects	0.756

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	0.857	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.291	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	1.107	KM Standard Error of Mean	0.351
KM SD	0.829	95% KM (BCA) UCL	1.729
95% KM (t) UCL	1.773	95% KM (Percentile Bootstrap) UCL	1.663

95% KM (z) UCL	1.685	95% KM Bootstrap t UCL	3.542
90% KM Chebyshev UCL	2.161	95% KM Chebyshev UCL	2.639
97.5% KM Chebyshev UCL	3.301	99% KM Chebyshev UCL	4.603

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.392	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.684	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.271	**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)	2.315	k star (bias corrected MLE)	1.059
Theta hat (MLE)	0.57	Theta star (bias corrected MLE)	1.246
nu hat (MLE)	23.15	nu star (bias corrected)	10.59
Mean (detects)	1.32		

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	0.416	Mean	1.068
Maximum	2.8	Median	0.712
SD	0.843	CV	0.79
k hat (MLE)	2.433	k star (bias corrected MLE)	1.604
Theta hat (MLE)	0.439	Theta star (bias corrected MLE)	0.666
nu hat (MLE)	38.93	nu star (bias corrected)	25.66
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (25.66, α)	15.12	Adjusted Chi Square Value (25.66, β)	13.12
95% Gamma Approximate UCL (use when n>=50)	1.812	95% Gamma Adjusted UCL (use when n<50)	2.089

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.107	SD (KM)	0.829
Variance (KM)	0.688	SE of Mean (KM)	0.351
k hat (KM)	1.783	k star (KM)	1.198
nu hat (KM)	28.52	nu star (KM)	19.16
theta hat (KM)	0.621	theta star (KM)	0.925
80% gamma percentile (KM)	1.753	90% gamma percentile (KM)	2.438
95% gamma percentile (KM)	3.114	99% gamma percentile (KM)	4.663

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (19.16, α)	10.23	Adjusted Chi Square Value (19.16, β)	8.634
95% Gamma Approximate KM-UCL (use when n>=50)	2.073	95% Gamma Adjusted KM-UCL (use when n<50)	2.457

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.907	**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	1.078	Mean in Log Scale	-0.127
SD in Original Scale	0.832	SD in Log Scale	0.634
95% t UCL (assumes normality of ROS data)	1.635	95% Percentile Bootstrap UCL	1.568
95% BCA Bootstrap UCL	1.67	95% Bootstrap t UCL	3.376
95% H-UCL (Log ROS)	2.009		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.129	KM Geo Mean	0.879
KM SD (logged)	0.642	95% Critical H Value (KM-Log)	2.615
KM Standard Error of Mean (logged)	0.274	95% H-UCL (KM -Log)	2.036
KM SD (logged)	0.642	95% Critical H Value (KM-Log)	2.615
KM Standard Error of Mean (logged)	0.274		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.225	Mean in Log Scale	-0.0681
SD in Original Scale	0.957	SD in Log Scale	0.782
95% t UCL (Assumes normality)	1.866	95% H-Stat UCL	2.996

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 1.773

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	3	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	4
Minimum Detect	0.24	Minimum Non-Detect	0.21
Maximum Detect	0.29	Maximum Non-Detect	0.8
Variance Detects	6.3333E-4	Percent Non-Detects	66.67%
Mean Detects	0.267	SD Detects	0.0252
Median Detects	0.27	CV Detects	0.0944
Skewness Detects	-0.586	Kurtosis Detects	N/A
Mean of Logged Detects	-1.325	SD of Logged Detects	0.0956

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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	0.987	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	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	0.244	KM Standard Error of Mean	0.0175
KM SD	0.032	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.277	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.273	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.297	95% KM Chebyshev UCL	0.32
97.5% KM Chebyshev UCL	0.353	99% KM Chebyshev UCL	0.418

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	165.8	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00161	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	994.8	nu star (bias corrected)	N/A
Mean (detects)	0.267		

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	0.18	Mean	0.237
Maximum	0.29	Median	0.237
SD	0.034	CV	0.144
k hat (MLE)	53.06	k star (bias corrected MLE)	35.45
Theta hat (MLE)	0.00446	Theta star (bias corrected MLE)	0.00668
nu hat (MLE)	955.1	nu star (bias corrected)	638.1
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (638.09, α)	580.5	Adjusted Chi Square Value (638.09, β)	568.9
95% Gamma Approximate UCL (use when n>=50)	0.26	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.244	SD (KM)	0.032
Variance (KM)	0.00102	SE of Mean (KM)	0.0175
k hat (KM)	58.14	k star (KM)	38.83
nu hat (KM)	1047	nu star (KM)	699
theta hat (KM)	0.0042	theta star (KM)	0.00628
80% gamma percentile (KM)	0.276	90% gamma percentile (KM)	0.295
95% gamma percentile (KM)	0.312	99% gamma percentile (KM)	0.344

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (699.02, α)	638.7	Adjusted Chi Square Value (699.02, β)	626.5

95% Gamma Approximate KM-UCL (use when n>=50)	0.267	95% Gamma Adjusted KM-UCL (use when n<50)	0.272

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.231	**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	0.239	Mean in Log Scale	-1.441
SD in Original Scale	0.0314	SD in Log Scale	0.133
95% t UCL (assumes normality of ROS data)	0.258	95% Percentile Bootstrap UCL	0.255
95% BCA Bootstrap UCL	0.255	95% Bootstrap t UCL	0.258
95% H-UCL (Log ROS)	0.26		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.419	KM Geo Mean	0.242
KM SD (logged)	0.13	95% Critical H Value (KM-Log)	1.846
KM Standard Error of Mean (logged)	0.0714	95% H-UCL (KM -Log)	0.266
KM SD (logged)	0.13	95% Critical H Value (KM-Log)	1.846
KM Standard Error of Mean (logged)	0.0714		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.234	Mean in Log Scale	-1.534
SD in Original Scale	0.0917	SD in Log Scale	0.45
95% t UCL (Assumes normality)	0.291	95% H-Stat UCL	0.338

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 0.277

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	4	Number of Non-Detects	4
Number of Distinct Detects	4	Number of Distinct Non-Detects	4
Minimum Detect	0.36	Minimum Non-Detect	0.49
Maximum Detect	0.62	Maximum Non-Detect	1
Variance Detects	0.0135	Percent Non-Detects	50%
Mean Detects	0.46	SD Detects	0.116
Median Detects	0.43	CV Detects	0.253
Skewness Detects	1.166	Kurtosis Detects	0.685

Mean of Logged Detects	-0.799	SD of Logged Detects	0.241

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	0.909	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.226	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	0.442	KM Standard Error of Mean	0.0455
KM SD	0.0901	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.528	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.517	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.579	95% KM Chebyshev UCL	0.641
97.5% KM Chebyshev UCL	0.726	99% KM Chebyshev UCL	0.895

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.311	Anderson-Darling GOF Test	
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.254	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)	22.34	k star (bias corrected MLE)	5.751
Theta hat (MLE)	0.0206	Theta star (bias corrected MLE)	0.08
nu hat (MLE)	178.7	nu star (bias corrected)	46.01
Mean (detects)	0.46		

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	0.36	Mean	0.441
Maximum	0.62	Median	0.422
SD	0.0794	CV	0.18
k hat (MLE)	40.43	k star (bias corrected MLE)	25.35
Theta hat (MLE)	0.0109	Theta star (bias corrected MLE)	0.0174
nu hat (MLE)	646.9	nu star (bias corrected)	405.6
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (405.64, α)	360	Adjusted Chi Square Value (405.64, β)	349
95% Gamma Approximate UCL (use when n>=50)	0.497	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.442	SD (KM)	0.0901

Variance (KM)	0.00812	SE of Mean (KM)	0.0455
k hat (KM)	24.09	k star (KM)	15.14
nu hat (KM)	385.5	nu star (KM)	242.3
theta hat (KM)	0.0184	theta star (KM)	0.0292
80% gamma percentile (KM)	0.534	90% gamma percentile (KM)	0.593
95% gamma percentile (KM)	0.644	99% gamma percentile (KM)	0.749

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (242.25, α)	207.2	Adjusted Chi Square Value (242.25, β)	199
95% Gamma Approximate KM-UCL (use when n>=50)	0.517	95% Gamma Adjusted KM-UCL (use when n<50)	0.538

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.937	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.223	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	0.44	Mean in Log Scale	-0.834
SD in Original Scale	0.0797	SD in Log Scale	0.164
95% t UCL (assumes normality of ROS data)	0.493	95% Percentile Bootstrap UCL	0.49
95% BCA Bootstrap UCL	0.504	95% Bootstrap t UCL	0.56
95% H-UCL (Log ROS)	0.495		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.835	KM Geo Mean	0.434
KM SD (logged)	0.189	95% Critical H Value (KM-Log)	1.932
KM Standard Error of Mean (logged)	0.0975	95% H-UCL (KM -Log)	0.507
KM SD (logged)	0.189	95% Critical H Value (KM-Log)	1.932
KM Standard Error of Mean (logged)	0.0975		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.404	Mean in Log Scale	-0.95
SD in Original Scale	0.126	SD in Log Scale	0.323
95% t UCL (Assumes normality)	0.489	95% H-Stat UCL	0.526

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.

Chromium (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.25	Minimum Non-Detect	0.5
Maximum Detect	0.68	Maximum Non-Detect	3.2
Variance Detects	0.0314	Percent Non-Detects	37.5%
Mean Detects	0.526	SD Detects	0.177
Median Detects	0.61	CV Detects	0.337
Skewness Detects	-1.177	Kurtosis Detects	0.373
Mean of Logged Detects	-0.702	SD of Logged Detects	0.414

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	0.875	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.282	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	0.497	KM Standard Error of Mean	0.0783
KM SD	0.164	95% KM (BCA) UCL	0.617
95% KM (t) UCL	0.645	95% KM (Percentile Bootstrap) UCL	0.617
95% KM (z) UCL	0.625	95% KM Bootstrap t UCL	0.623
90% KM Chebyshev UCL	0.732	95% KM Chebyshev UCL	0.838
97.5% KM Chebyshev UCL	0.986	99% KM Chebyshev UCL	1.276

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.508	Anderson-Darling GOF Test
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.311	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)	8.531	k star (bias corrected MLE)	3.546
Theta hat (MLE)	0.0617	Theta star (bias corrected MLE)	0.148
nu hat (MLE)	85.31	nu star (bias corrected)	35.46
Mean (detects)	0.526		

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	0.25	Mean	0.495
Maximum	0.68	Median	0.484
SD	0.145	CV	0.294

k hat (MLE)	11.55	k star (bias corrected MLE)	7.3
Theta hat (MLE)	0.0429	Theta star (bias corrected MLE)	0.0678
nu hat (MLE)	184.8	nu star (bias corrected)	116.8
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (116.80, α)	92.85	Adjusted Chi Square Value (116.80, β)	87.46
95% Gamma Approximate UCL (use when n>=50)	0.623	95% Gamma Adjusted UCL (use when n<50)	0.661

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.497	SD (KM)	0.164
Variance (KM)	0.0269	SE of Mean (KM)	0.0783
k hat (KM)	9.163	k star (KM)	5.81
nu hat (KM)	146.6	nu star (KM)	92.96
theta hat (KM)	0.0542	theta star (KM)	0.0855
80% gamma percentile (KM)	0.657	90% gamma percentile (KM)	0.772
95% gamma percentile (KM)	0.877	99% gamma percentile (KM)	1.096

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (92.96, α)	71.72	Adjusted Chi Square Value (92.96, β)	67.02
95% Gamma Approximate KM-UCL (use when n>=50)	0.644	95% Gamma Adjusted KM-UCL (use when n<50)	0.689

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.82	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.292	**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	0.487	Mean in Log Scale	-0.766
SD in Original Scale	0.149	SD in Log Scale	0.338
95% t UCL (assumes normality of ROS data)	0.587	95% Percentile Bootstrap UCL	0.562
95% BCA Bootstrap UCL	0.563	95% Bootstrap t UCL	0.585
95% H-UCL (Log ROS)	0.645		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.767	KM Geo Mean	0.464
KM SD (logged)	0.387	95% Critical H Value (KM-Log)	2.176
KM Standard Error of Mean (logged)	0.189	95% H-UCL (KM -Log)	0.688
KM SD (logged)	0.387	95% Critical H Value (KM-Log)	2.176
KM Standard Error of Mean (logged)	0.189		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.61	Mean in Log Scale	-0.668
SD in Original Scale	0.433	SD in Log Scale	0.605
95% t UCL (Assumes normality)	0.9	95% H-Stat UCL	1.102

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 0.645

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	8
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 Chromium (nfmw5) was not processed!

Chromium (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	3	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	4
Minimum Detect	0.22	Minimum Non-Detect	0.21
Maximum Detect	0.42	Maximum Non-Detect	3.2
Variance Detects	0.01	Percent Non-Detects	66.67%
Mean Detects	0.32	SD Detects	0.1
Median Detects	0.32	CV Detects	0.313
Skewness Detects	-1.30E-15	Kurtosis Detects	N/A
Mean of Logged Detects	-1.174	SD of Logged Detects	0.325

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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	1	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.175	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	0.276	KM Standard Error of Mean	0.0455
KM SD	0.0831	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.361	95% KM (Percentile Bootstrap) UCL	N/A

95% KM (z) UCL	0.351	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.413	95% KM Chebyshev UCL	0.474
97.5% KM Chebyshev UCL	0.56	99% KM Chebyshev UCL	0.729

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	14.76	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.0217	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	88.57	nu star (bias corrected)	N/A
Mean (detects)	0.32		

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	0.207
Maximum	0.42	Median	0.201
SD	0.126	CV	0.607
k hat (MLE)	1.645	k star (bias corrected MLE)	1.171
Theta hat (MLE)	0.126	Theta star (bias corrected MLE)	0.177
nu hat (MLE)	29.61	nu star (bias corrected)	21.07
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (21.07, α)	11.65	Adjusted Chi Square Value (21.07, β)	10.2
95% Gamma Approximate UCL (use when n>=50)	0.375	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.276	SD (KM)	0.0831
Variance (KM)	0.0069	SE of Mean (KM)	0.0455
k hat (KM)	11.03	k star (KM)	7.43
nu hat (KM)	198.6	nu star (KM)	133.7
theta hat (KM)	0.025	theta star (KM)	0.0371
80% gamma percentile (KM)	0.356	90% gamma percentile (KM)	0.411
95% gamma percentile (KM)	0.461	99% gamma percentile (KM)	0.564

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (133.74, α)	108	Adjusted Chi Square Value (133.74, β)	103.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.342	95% Gamma Adjusted KM-UCL (use when n<50)	0.358

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.209	**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	0.227	Mean in Log Scale	-1.572
SD in Original Scale	0.1	SD in Log Scale	0.455
95% t UCL (assumes normality of ROS data)	0.289	95% Percentile Bootstrap UCL	0.281

95% BCA Bootstrap UCL	0.29	95% Bootstrap t UCL	0.305
95% H-UCL (Log ROS)	0.328		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.328	KM Geo Mean	0.265
KM SD (logged)	0.279	95% Critical H Value (KM-Log)	1.988
KM Standard Error of Mean (logged)	0.153	95% H-UCL (KM -Log)	0.335
KM SD (logged)	0.279	95% Critical H Value (KM-Log)	1.988
KM Standard Error of Mean (logged)	0.153		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.408	Mean in Log Scale	-1.25
SD in Original Scale	0.461	SD in Log Scale	0.818
95% t UCL (Assumes normality)	0.693	95% H-Stat UCL	0.913

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 0.361

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.31	Minimum Non-Detect	0.44
Maximum Detect	1.1	Maximum Non-Detect	4.6
Variance Detects	0.107	Percent Non-Detects	37.5%
Mean Detects	0.526	SD Detects	0.326
Median Detects	0.42	CV Detects	0.621
Skewness Detects	2.049	Kurtosis Detects	4.333
Mean of Logged Detects	-0.76	SD of Logged Detects	0.504

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	0.72	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.38	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	0.498	KM Standard Error of Mean	0.126
KM SD	0.275	95% KM (BCA) UCL	0.74
95% KM (t) UCL	0.736	95% KM (Percentile Bootstrap) UCL	0.708
95% KM (z) UCL	0.705	95% KM Bootstrap t UCL	1.3
90% KM Chebyshev UCL	0.875	95% KM Chebyshev UCL	1.046
97.5% KM Chebyshev UCL	1.283	99% KM Chebyshev UCL	1.749

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.633	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.681	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.346	**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)	4.423	k star (bias corrected MLE)	1.902
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.276
nu hat (MLE)	44.23	nu star (bias corrected)	19.02
Mean (detects)	0.526		

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	0.31	Mean	0.486
Maximum	1.1	Median	0.44
SD	0.255	CV	0.526
k hat (MLE)	6.203	k star (bias corrected MLE)	3.96
Theta hat (MLE)	0.0784	Theta star (bias corrected MLE)	0.123
nu hat (MLE)	99.25	nu star (bias corrected)	63.37
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (63.37, α)	46.05	Adjusted Chi Square Value (63.37, β)	42.35
95% Gamma Approximate UCL (use when n>=50)	0.669	95% Gamma Adjusted UCL (use when n<50)	0.727

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.498	SD (KM)	0.275
Variance (KM)	0.0754	SE of Mean (KM)	0.126
k hat (KM)	3.286	k star (KM)	2.137
nu hat (KM)	52.58	nu star (KM)	34.2
theta hat (KM)	0.151	theta star (KM)	0.233
80% gamma percentile (KM)	0.739	90% gamma percentile (KM)	0.953
95% gamma percentile (KM)	1.156	99% gamma percentile (KM)	1.605

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (34.20, α)	21.82	Adjusted Chi Square Value (34.20, β)	19.36
95% Gamma Approximate KM-UCL (use when n>=50)	0.78	95% Gamma Adjusted KM-UCL (use when n<50)	0.879

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.825	**Shapiro Wilk GOF Test**

5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.313	**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	0.483	Mean in Log Scale	-0.809
SD in Original Scale	0.255	SD in Log Scale	0.392
95% t UCL (assumes normality of ROS data)	0.654	95% Percentile Bootstrap UCL	0.655
95% BCA Bootstrap UCL	0.735	95% Bootstrap t UCL	1.003
95% H-UCL (Log ROS)	0.665		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.806	KM Geo Mean	0.447
KM SD (logged)	0.427	95% Critical H Value (KM-Log)	2.236
KM Standard Error of Mean (logged)	0.197	95% H-UCL (KM -Log)	0.702
KM SD (logged)	0.427	95% Critical H Value (KM-Log)	2.236
KM Standard Error of Mean (logged)	0.197		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.844	Mean in Log Scale	-0.501
SD in Original Scale	0.757	SD in Log Scale	0.853
95% t UCL (Assumes normality)	1.351	95% H-Stat UCL	2.35

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	0.879	95% GROS Adjusted Gamma UCL	0.727

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Cobalt (car wash well) 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.

Cobalt (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Cobalt (cartage building well) 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.

Cobalt (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Cobalt (hoffman construction well) 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.

Cobalt (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	26	Mean	26
Maximum	26	Median	26

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Cobalt (log chipper well) 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.

Cobalt (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Cobalt (mcsmw1) 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.

Cobalt (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	0.038	Minimum Non-Detect	1.7
Maximum Detect	1.2	Maximum Non-Detect	1.7
Variance Detects	0.155	Percent Non-Detects	12.5%
Mean Detects	0.701	SD Detects	0.393
Median Detects	0.77	CV Detects	0.561
Skewness Detects	-0.571	Kurtosis Detects	-0.133
Mean of Logged Detects	-0.696	SD of Logged Detects	1.188

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	0.962	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.148	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	0.701	KM Standard Error of Mean	0.149
KM SD	0.364	95% KM (BCA) UCL	0.914
95% KM (t) UCL	0.983	95% KM (Percentile Bootstrap) UCL	0.923
95% KM (z) UCL	0.946	95% KM Bootstrap t UCL	0.948
90% KM Chebyshev UCL	1.147	95% KM Chebyshev UCL	1.349
97.5% KM Chebyshev UCL	1.63	99% KM Chebyshev UCL	2.181

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.659	Anderson-Darling GOF Test
5% A-D Critical Value	0.72	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.276	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.317	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)	1.614	k star (bias corrected MLE)	1.018
Theta hat (MLE)	0.434	Theta star (bias corrected MLE)	0.689
nu hat (MLE)	22.6	nu star (bias corrected)	14.25

Mean (detects)	0.701		

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	0.038	Mean	0.692
Maximum	1.2	Median	0.701
SD	0.365	CV	0.527
k hat (MLE)	1.823	k star (bias corrected MLE)	1.223
Theta hat (MLE)	0.38	Theta star (bias corrected MLE)	0.566
nu hat (MLE)	29.17	nu star (bias corrected)	19.56
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (19.56, α)	10.53	Adjusted Chi Square Value (19.56, β)	8.904
95% Gamma Approximate UCL (use when n>=50)	1.287	95% Gamma Adjusted UCL (use when n<50)	1.522

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.701	SD (KM)	0.364
Variance (KM)	0.133	SE of Mean (KM)	0.149
k hat (KM)	3.704	k star (KM)	2.399
nu hat (KM)	59.27	nu star (KM)	38.38
theta hat (KM)	0.189	theta star (KM)	0.292
80% gamma percentile (KM)	1.027	90% gamma percentile (KM)	1.307
95% gamma percentile (KM)	1.572	99% gamma percentile (KM)	2.152

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (38.38, α)	25.19	Adjusted Chi Square Value (38.38, β)	22.52
95% Gamma Approximate KM-UCL (use when n>=50)	1.068	95% Gamma Adjusted KM-UCL (use when n<50)	1.195

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	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	0.676	Mean in Log Scale	-0.696
SD in Original Scale	0.371	SD in Log Scale	1.1
95% t UCL (assumes normality of ROS data)	0.925	95% Percentile Bootstrap UCL	0.884
95% BCA Bootstrap UCL	0.872	95% Bootstrap t UCL	0.924
95% H-UCL (Log ROS)	4.205		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.696	KM Geo Mean	0.499
KM SD (logged)	1.1	95% Critical H Value (KM-Log)	3.675
KM Standard Error of Mean (logged)	0.449	95% H-UCL (KM -Log)	4.205
KM SD (logged)	1.1	95% Critical H Value (KM-Log)	3.675
KM Standard Error of Mean (logged)	0.449		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.72	Mean in Log Scale	-0.629
SD in Original Scale	0.368	SD in Log Scale	1.116
95% t UCL (Assumes normality)	0.966	95% H-Stat UCL	4.76

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 0.983

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	8
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 Cobalt (nfmw14) was not processed!

Cobalt (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.58	Mean	0.873
Maximum	1.4	Median	0.76
SD	0.301	Std. Error of Mean	0.107
Coefficient of Variation	0.345	Skewness	0.873

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	0.884	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.239	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	1.074	95% Adjusted-CLT UCL (Chen-1995)	1.083
		95% Modified-t UCL (Johnson-1978)	1.08

Gamma GOF Test

A-D Test Statistic	0.408	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.248	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)	10.43	k star (bias corrected MLE)	6.603
Theta hat (MLE)	0.0836	Theta star (bias corrected MLE)	0.132
nu hat (MLE)	166.9	nu star (bias corrected)	105.6
MLE Mean (bias corrected)	0.873	MLE Sd (bias corrected)	0.34
		Approximate Chi Square Value (0.05)	82.93
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	77.85

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.112	95% Adjusted Gamma UCL (use when n<50)	1.184

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.913	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.23	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.545	Mean of logged Data	-0.185
Maximum of Logged Data	0.336	SD of logged Data	0.328

Assuming Lognormal Distribution

95% H-UCL	1.137	90% Chebyshev (MVUE) UCL	1.175
95% Chebyshev (MVUE) UCL	1.313	97.5% Chebyshev (MVUE) UCL	1.505
99% Chebyshev (MVUE) UCL	1.88		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.048	95% Jackknife UCL	1.074
95% Standard Bootstrap UCL	1.037	95% Bootstrap-t UCL	1.166
95% Hall's Bootstrap UCL	1.1	95% Percentile Bootstrap UCL	1.041
95% BCA Bootstrap UCL	1.069		
90% Chebyshev(Mean, Sd) UCL	1.192	95% Chebyshev(Mean, Sd) UCL	1.337
97.5% Chebyshev(Mean, Sd) UCL	1.538	99% Chebyshev(Mean, Sd) UCL	1.932

Suggested UCL to Use

95% Student's-t UCL 1.074

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	9
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 Cobalt (nfmw16) was not processed!

Cobalt (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	8
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 Cobalt (nfmw17) was not processed!

Cobalt (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	0.12	Minimum Non-Detect	1.7
Maximum Detect	0.88	Maximum Non-Detect	1.7
Variance Detects	0.0793	Percent Non-Detects	12.5%
Mean Detects	0.523	SD Detects	0.282
Median Detects	0.62	CV Detects	0.539
Skewness Detects	-0.37	Kurtosis Detects	-1.265
Mean of Logged Detects	-0.836	SD of Logged Detects	0.738

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	0.943	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.206	**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	0.523	KM Standard Error of Mean	0.106
KM SD	0.261	95% KM (BCA) UCL	0.685
95% KM (t) UCL	0.724	95% KM (Percentile Bootstrap) UCL	0.685
95% KM (z) UCL	0.698	95% KM Bootstrap t UCL	0.709
90% KM Chebyshev UCL	0.842	95% KM Chebyshev UCL	0.987
97.5% KM Chebyshev UCL	1.188	99% KM Chebyshev UCL	1.582

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.422	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.713	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.26	**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)	2.823	k star (bias corrected MLE)	1.708
Theta hat (MLE)	0.185	Theta star (bias corrected MLE)	0.306
nu hat (MLE)	39.52	nu star (bias corrected)	23.91
Mean (detects)	0.523		

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	0.12	Mean	0.518
Maximum	0.88	Median	0.553
SD	0.261	CV	0.504
k hat (MLE)	3.199	k star (bias corrected MLE)	2.083
Theta hat (MLE)	0.162	Theta star (bias corrected MLE)	0.249
nu hat (MLE)	51.19	nu star (bias corrected)	33.33
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (33.33, α)	21.13	Adjusted Chi Square Value (33.33, β)	18.71
95% Gamma Approximate UCL (use when n>=50)	0.817	95% Gamma Adjusted UCL (use when n<50)	0.923

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.523	SD (KM)	0.261
Variance (KM)	0.068	SE of Mean (KM)	0.106
k hat (KM)	4.022	k star (KM)	2.597
nu hat (KM)	64.36	nu star (KM)	41.56
theta hat (KM)	0.13	theta star (KM)	0.201
80% gamma percentile (KM)	0.759	90% gamma percentile (KM)	0.958
95% gamma percentile (KM)	1.144	99% gamma percentile (KM)	1.553

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (41.56, α)	27.78	Adjusted Chi Square Value (41.56, β)	24.97
95% Gamma Approximate KM-UCL (use when n>=50)	0.782	95% Gamma Adjusted KM-UCL (use when n<50)	0.87

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.87	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.257	**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	0.512	Mean in Log Scale	-0.836
SD in Original Scale	0.263	SD in Log Scale	0.684
95% t UCL (assumes normality of ROS data)	0.688	95% Percentile Bootstrap UCL	0.65
95% BCA Bootstrap UCL	0.649	95% Bootstrap t UCL	0.676
95% H-UCL (Log ROS)	1.1		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.836	KM Geo Mean	0.433
KM SD (logged)	0.684	95% Critical H Value (KM-Log)	2.701
KM Standard Error of Mean (logged)	0.279	95% H-UCL (KM -Log)	1.1
KM SD (logged)	0.684	95% Critical H Value (KM-Log)	2.701
KM Standard Error of Mean (logged)	0.279		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.564	Mean in Log Scale	-0.752
SD in Original Scale	0.285	SD in Log Scale	0.724
95% t UCL (Assumes normality)	0.755	95% H-Stat UCL	1.313

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 0.724

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.

Cobalt (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	8
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 Cobalt (nfmw5) was not processed!

Cobalt (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	6
Number of Detects	0	Number of Non-Detects	9
Number of Distinct Detects	0	Number of Distinct Non-Detects	6

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 (nfmw6) was not processed!

Cobalt (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	8
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 Cobalt (waste fuel boiler well) was not processed!

Copper (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	1.8	Mean	1.8
Maximum	1.8	Median	1.8

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Copper (car wash well) 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.

Copper (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1

		Number of Missing Observations	0
Minimum	14	Mean	14
Maximum	14	Median	14

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Copper (cartage building well) 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.

Copper (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	1.3	Mean	1.3
Maximum	1.3	Median	1.3

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Copper (hoffman construction well) 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.

Copper (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	20.7	Mean	20.7
Maximum	20.7	Median	20.7

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Copper (log chipper well) 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.

Copper (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	1.9	Mean	1.9

Maximum	1.9	Median	1.9

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Copper (mcsmw1) 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.

Copper (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	5	Number of Distinct Non-Detects	1
Minimum Detect	0.94	Minimum Non-Detect	4.3
Maximum Detect	2.7	Maximum Non-Detect	4.3
Variance Detects	0.394	Percent Non-Detects	12.5%
Mean Detects	1.991	SD Detects	0.628
Median Detects	2.2	CV Detects	0.315
Skewness Detects	-1.001	Kurtosis Detects	-0.211
Mean of Logged Detects	0.634	SD of Logged Detects	0.383

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	0.846	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.344	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	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	1.991	KM Standard Error of Mean	0.237
KM SD	0.581	95% KM (BCA) UCL	2.333
95% KM (t) UCL	2.441	95% KM (Percentile Bootstrap) UCL	2.333
95% KM (z) UCL	2.382	95% KM Bootstrap t UCL	2.347
90% KM Chebyshev UCL	2.703	95% KM Chebyshev UCL	3.025
97.5% KM Chebyshev UCL	3.473	99% KM Chebyshev UCL	4.352

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.787	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.709	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.376	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.312	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)	9.243	k star (bias corrected MLE)	5.377

Theta hat (MLE)	0.215	Theta star (bias corrected MLE)	0.37
nu hat (MLE)	129.4	nu star (bias corrected)	75.28
Mean (detects)	1.991		

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	0.94	Mean	1.986
Maximum	2.7	Median	2.2
SD	0.581	CV	0.293
k hat (MLE)	10.53	k star (bias corrected MLE)	6.668
Theta hat (MLE)	0.189	Theta star (bias corrected MLE)	0.298
nu hat (MLE)	168.6	nu star (bias corrected)	106.7
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (106.68, α)	83.85	Adjusted Chi Square Value (106.68, β)	78.73
95% Gamma Approximate UCL (use when n>=50)	2.527	95% Gamma Adjusted UCL (use when n<50)	2.691

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.991	SD (KM)	0.581
Variance (KM)	0.338	SE of Mean (KM)	0.237
k hat (KM)	11.75	k star (KM)	7.426
nu hat (KM)	188	nu star (KM)	118.8
theta hat (KM)	0.17	theta star (KM)	0.268
80% gamma percentile (KM)	2.566	90% gamma percentile (KM)	2.966
95% gamma percentile (KM)	3.326	99% gamma percentile (KM)	4.072

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (118.81, α)	94.64	Adjusted Chi Square Value (118.81, β)	89.19
95% Gamma Approximate KM-UCL (use when n>=50)	2.5	95% Gamma Adjusted KM-UCL (use when n<50)	2.653

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.304	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	1.978	Mean in Log Scale	0.634
SD in Original Scale	0.582	SD in Log Scale	0.354
95% t UCL (assumes normality of ROS data)	2.368	95% Percentile Bootstrap UCL	2.286
95% BCA Bootstrap UCL	2.259	95% Bootstrap t UCL	2.292
95% H-UCL (Log ROS)	2.669		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	0.634	KM Geo Mean	1.885
KM SD (logged)	0.354	95% Critical H Value (KM-Log)	2.13
KM Standard Error of Mean (logged)	0.145	95% H-UCL (KM -Log)	2.669
KM SD (logged)	0.354	95% Critical H Value (KM-Log)	2.13
KM Standard Error of Mean (logged)	0.145		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.011	Mean in Log Scale	0.65
SD in Original Scale	0.584	SD in Log Scale	0.357
95% t UCL (Assumes normality)	2.402	95% H-Stat UCL	2.724

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 2.441

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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	0.48	Mean	1.91
Maximum	3.8	Median	1.6
SD	1.128	Std. Error of Mean	0.399
Coefficient of Variation	0.591	Skewness	0.862

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	0.887	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.254	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	2.666	95% Adjusted-CLT UCL (Chen-1995)	2.696
		95% Modified-t UCL (Johnson-1978)	2.686

Gamma GOF Test

A-D Test Statistic	0.345	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	0.179	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.175	k star (bias corrected MLE)	2.068
Theta hat (MLE)	0.602	Theta star (bias corrected MLE)	0.924
nu hat (MLE)	50.8	nu star (bias corrected)	33.08
MLE Mean (bias corrected)	1.91	MLE Sd (bias corrected)	1.328
		Approximate Chi Square Value (0.05)	20.93
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	18.53

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	3.019	95% Adjusted Gamma UCL (use when n<50)	3.411

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.93	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.197	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.734	Mean of logged Data	0.481
Maximum of Logged Data	1.335	SD of logged Data	0.646

Assuming Lognormal Distribution

95% H-UCL	3.783	90% Chebyshev (MVUE) UCL	3.281
95% Chebyshev (MVUE) UCL	3.89	97.5% Chebyshev (MVUE) UCL	4.736
99% Chebyshev (MVUE) UCL	6.398		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.566	95% Jackknife UCL	2.666
95% Standard Bootstrap UCL	2.513	95% Bootstrap-t UCL	3.374
95% Hall's Bootstrap UCL	8.717	95% Percentile Bootstrap UCL	2.588
95% BCA Bootstrap UCL	2.625		
90% Chebyshev(Mean, Sd) UCL	3.106	95% Chebyshev(Mean, Sd) UCL	3.648
97.5% Chebyshev(Mean, Sd) UCL	4.4	99% Chebyshev(Mean, Sd) UCL	5.878

Suggested UCL to Use

95% Student's-t UCL 2.666

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 (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	4.3	Mean	20.3
Maximum	93	Median	7.6
SD	30.44	Std. Error of Mean	10.76
Coefficient of Variation	1.5	Skewness	2.491

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	0.596	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.377	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	40.69	95% Adjusted-CLT UCL (Chen-1995)	48.13
		95% Modified-t UCL (Johnson-1978)	42.27

Gamma GOF Test

A-D Test Statistic	0.968	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.738	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.336	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.302	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.929	k star (bias corrected MLE)	0.664
Theta hat (MLE)	21.86	Theta star (bias corrected MLE)	30.58
nu hat (MLE)	14.86	nu star (bias corrected)	10.62
MLE Mean (bias corrected)	20.3	MLE Sd (bias corrected)	24.92
		Approximate Chi Square Value (0.05)	4.333
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	3.376

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	49.76	95% Adjusted Gamma UCL (use when n<50)	63.85

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.831	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.266	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.459	Mean of logged Data	2.384
Maximum of Logged Data	4.533	SD of logged Data	1.054

Assuming Lognormal Distribution

95% H-UCL	78.15	90% Chebyshev (MVUE) UCL	36.89
95% Chebyshev (MVUE) UCL	45.8	97.5% Chebyshev (MVUE) UCL	58.17
99% Chebyshev (MVUE) UCL	82.46		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	38	95% Jackknife UCL	40.69
95% Standard Bootstrap UCL	36.55	95% Bootstrap-t UCL	210.5
95% Hall's Bootstrap UCL	128.7	95% Percentile Bootstrap UCL	41.14
95% BCA Bootstrap UCL	50.08		
90% Chebyshev(Mean, Sd) UCL	52.59	95% Chebyshev(Mean, Sd) UCL	67.21
97.5% Chebyshev(Mean, Sd) UCL	87.51	99% Chebyshev(Mean, Sd) UCL	127.4

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL 67.21

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	7	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.54	Minimum Non-Detect	0.43
Maximum Detect	2	Maximum Non-Detect	0.68
Variance Detects	0.226	Percent Non-Detects	22.22%
Mean Detects	1.191	SD Detects	0.475
Median Detects	1.1	CV Detects	0.399
Skewness Detects	0.638	Kurtosis Detects	0.481
Mean of Logged Detects	0.104	SD of Logged Detects	0.417

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	0.929	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.291	**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	1.028	KM Standard Error of Mean	0.178

KM SD	0.494	95% KM (BCA) UCL	1.314
95% KM (t) UCL	1.36	95% KM (Percentile Bootstrap) UCL	1.314
95% KM (z) UCL	1.321	95% KM Bootstrap t UCL	1.402
90% KM Chebyshev UCL	1.563	95% KM Chebyshev UCL	1.805
97.5% KM Chebyshev UCL	2.141	99% KM Chebyshev UCL	2.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.342	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.709	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.248	**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)	7.183	k star (bias corrected MLE)	4.2
Theta hat (MLE)	0.166	Theta star (bias corrected MLE)	0.284
nu hat (MLE)	100.6	nu star (bias corrected)	58.8
Mean (detects)	1.191		

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	0.215	Mean	0.996
Maximum	2	Median	1.1
SD	0.568	CV	0.571
k hat (MLE)	2.843	k star (bias corrected MLE)	1.969
Theta hat (MLE)	0.35	Theta star (bias corrected MLE)	0.505
nu hat (MLE)	51.17	nu star (bias corrected)	35.45
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (35.45, α)	22.83	Adjusted Chi Square Value (35.45, β)	20.71
95% Gamma Approximate UCL (use when n>=50)	1.546	95% Gamma Adjusted UCL (use when n<50)	1.704

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.028	SD (KM)	0.494
Variance (KM)	0.244	SE of Mean (KM)	0.178
k hat (KM)	4.331	k star (KM)	2.961
nu hat (KM)	77.96	nu star (KM)	53.3
theta hat (KM)	0.237	theta star (KM)	0.347
80% gamma percentile (KM)	1.469	90% gamma percentile (KM)	1.83
95% gamma percentile (KM)	2.166	99% gamma percentile (KM)	2.896

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (53.30, α)	37.53	Adjusted Chi Square Value (53.30, β)	34.76
95% Gamma Approximate KM-UCL (use when n>=50)	1.46	95% Gamma Adjusted KM-UCL (use when n<50)	1.577

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.94	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.223	**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	1.027	Mean in Log Scale	-0.0976
SD in Original Scale	0.526	SD in Log Scale	0.543
95% t UCL (assumes normality of ROS data)	1.353	95% Percentile Bootstrap UCL	1.304
95% BCA Bootstrap UCL	1.333	95% Bootstrap t UCL	1.457
95% H-UCL (Log ROS)	1.634		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.0941	KM Geo Mean	0.91
KM SD (logged)	0.505	95% Critical H Value (KM-Log)	2.235
KM Standard Error of Mean (logged)	0.183	95% H-UCL (KM -Log)	1.542
KM SD (logged)	0.505	95% Critical H Value (KM-Log)	2.235
KM Standard Error of Mean (logged)	0.183		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.988	Mean in Log Scale	-0.21
SD in Original Scale	0.577	SD in Log Scale	0.729
95% t UCL (Assumes normality)	1.346	95% H-Stat UCL	2.105

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 1.36

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.59	Minimum Non-Detect	0.77
Maximum Detect	1.4	Maximum Non-Detect	1.1
Variance Detects	0.112	Percent Non-Detects	37.5%
Mean Detects	0.822	SD Detects	0.335
Median Detects	0.68	CV Detects	0.408
Skewness Detects	1.879	Kurtosis Detects	3.572
Mean of Logged Detects	-0.251	SD of Logged Detects	0.351

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	0.767	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.302	**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	0.76	KM Standard Error of Mean	0.103
KM SD	0.254	95% KM (BCA) UCL	0.944
95% KM (t) UCL	0.954	95% KM (Percentile Bootstrap) UCL	0.937
95% KM (z) UCL	0.928	95% KM Bootstrap t UCL	1.453
90% KM Chebyshev UCL	1.068	95% KM Chebyshev UCL	1.207
97.5% KM Chebyshev UCL	1.401	99% KM Chebyshev UCL	1.781

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.564	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.274	**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)	9.313	k star (bias corrected MLE)	3.859
Theta hat (MLE)	0.0883	Theta star (bias corrected MLE)	0.213
nu hat (MLE)	93.13	nu star (bias corrected)	38.59
Mean (detects)	0.822		

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	0.59	Mean	0.763
Maximum	1.4	Median	0.683
SD	0.267	CV	0.35
k hat (MLE)	12.74	k star (bias corrected MLE)	8.047
Theta hat (MLE)	0.0599	Theta star (bias corrected MLE)	0.0948
nu hat (MLE)	203.9	nu star (bias corrected)	128.7
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (128.74, α)	103.5	Adjusted Chi Square Value (128.74, β)	97.82
95% Gamma Approximate UCL (use when n>=50)	0.949	95% Gamma Adjusted UCL (use when n<50)	1.004

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.76	SD (KM)	0.254
Variance (KM)	0.0646	SE of Mean (KM)	0.103
k hat (KM)	8.924	k star (KM)	5.661
nu hat (KM)	142.8	nu star (KM)	90.57
theta hat (KM)	0.0851	theta star (KM)	0.134
80% gamma percentile (KM)	1.007	90% gamma percentile (KM)	1.186
95% gamma percentile (KM)	1.349	99% gamma percentile (KM)	1.691

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (90.57, α)	69.63	Adjusted Chi Square Value (90.57, β)	65
95% Gamma Approximate KM-UCL (use when n>=50)	0.988	95% Gamma Adjusted KM-UCL (use when n<50)	1.058

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.834	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.25	**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	0.765	Mean in Log Scale	-0.308
SD in Original Scale	0.266	SD in Log Scale	0.278
95% t UCL (assumes normality of ROS data)	0.943	95% Percentile Bootstrap UCL	0.932
95% BCA Bootstrap UCL	0.998	95% Bootstrap t UCL	1.581
95% H-UCL (Log ROS)	0.946		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.317	KM Geo Mean	0.728
KM SD (logged)	0.271	95% Critical H Value (KM-Log)	2.022
KM Standard Error of Mean (logged)	0.111	95% H-UCL (KM -Log)	0.929
KM SD (logged)	0.271	95% Critical H Value (KM-Log)	2.022
KM Standard Error of Mean (logged)	0.111		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.683	Mean in Log Scale	-0.459
SD in Original Scale	0.321	SD in Log Scale	0.404
95% t UCL (Assumes normality)	0.898	95% H-Stat UCL	0.959

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 0.954

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	3.3	Mean	5.15
Maximum	6.9	Median	5.25
SD	1.443	Std. Error of Mean	0.51
Coefficient of Variation	0.28	Skewness	-0.057

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	0.877	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.245	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	6.117	95% Adjusted-CLT UCL (Chen-1995)	5.978
		95% Modified-t UCL (Johnson-1978)	6.115

Gamma GOF Test

A-D Test Statistic	0.539	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.715	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.27	**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)	13.94	k star (bias corrected MLE)	8.795
Theta hat (MLE)	0.369	Theta star (bias corrected MLE)	0.586
nu hat (MLE)	223	nu star (bias corrected)	140.7
MLE Mean (bias corrected)	5.15	MLE Sd (bias corrected)	1.737
		Approximate Chi Square Value (0.05)	114.3
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	108.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6.34	95% Adjusted Gamma UCL (use when n<50)	6.692

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.88	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.26	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.194	Mean of logged Data	1.603
Maximum of Logged Data	1.932	SD of logged Data	0.292

Assuming Lognormal Distribution

95% H-UCL	6.495	90% Chebyshev (MVUE) UCL	6.755
95% Chebyshev (MVUE) UCL	7.48	97.5% Chebyshev (MVUE) UCL	8.487
99% Chebyshev (MVUE) UCL	10.46		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	5.989	95% Jackknife UCL	6.117
95% Standard Bootstrap UCL	5.939	95% Bootstrap-t UCL	6.102
95% Hall's Bootstrap UCL	5.759	95% Percentile Bootstrap UCL	5.913
95% BCA Bootstrap UCL	5.95		
90% Chebyshev(Mean, Sd) UCL	6.681	95% Chebyshev(Mean, Sd) UCL	7.374
97.5% Chebyshev(Mean, Sd) UCL	8.337	99% Chebyshev(Mean, Sd) UCL	10.23

Suggested UCL to Use

95% Student's-t UCL 6.117

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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.

Copper (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	3
Number of Distinct Detects	6	Number of Distinct Non-Detects	3
Minimum Detect	0.42	Minimum Non-Detect	0.43
Maximum Detect	1.8	Maximum Non-Detect	1.1
Variance Detects	0.279	Percent Non-Detects	33.33%
Mean Detects	0.843	SD Detects	0.528
Median Detects	0.63	CV Detects	0.626
Skewness Detects	1.515	Kurtosis Detects	1.85
Mean of Logged Detects	-0.309	SD of Logged Detects	0.554

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	0.828	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.274	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	0.724	KM Standard Error of Mean	0.159
KM SD	0.432	95% KM (BCA) UCL	0.983
95% KM (t) UCL	1.02	95% KM (Percentile Bootstrap) UCL	0.974
95% KM (z) UCL	0.985	95% KM Bootstrap t UCL	1.453
90% KM Chebyshev UCL	1.201	95% KM Chebyshev UCL	1.418

97.5% KM Chebyshev UCL	1.718	99% KM Chebyshev UCL	2.308

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.397	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.7	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.236	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.334	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)	3.762	k star (bias corrected MLE)	1.992
Theta hat (MLE)	0.224	Theta star (bias corrected MLE)	0.423
nu hat (MLE)	45.15	nu star (bias corrected)	23.91
Mean (detects)	0.843		

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	0.195	Mean	0.691
Maximum	1.8	Median	0.484
SD	0.483	CV	0.698
k hat (MLE)	2.935	k star (bias corrected MLE)	2.031
Theta hat (MLE)	0.236	Theta star (bias corrected MLE)	0.341
nu hat (MLE)	52.83	nu star (bias corrected)	36.55
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (36.55, α)	23.71	Adjusted Chi Square Value (36.55, β)	21.56
95% Gamma Approximate UCL (use when n>=50)	1.066	95% Gamma Adjusted UCL (use when n<50)	1.172

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.724	SD (KM)	0.432
Variance (KM)	0.187	SE of Mean (KM)	0.159
k hat (KM)	2.805	k star (KM)	1.944
nu hat (KM)	50.49	nu star (KM)	34.99
theta hat (KM)	0.258	theta star (KM)	0.372
80% gamma percentile (KM)	1.087	90% gamma percentile (KM)	1.417
95% gamma percentile (KM)	1.732	99% gamma percentile (KM)	2.432

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (34.99, α)	22.46	Adjusted Chi Square Value (34.99, β)	20.37
95% Gamma Approximate KM-UCL (use when n>=50)	1.127	95% Gamma Adjusted KM-UCL (use when n<50)	1.243

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.201	**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	0.714	Mean in Log Scale	-0.474

SD in Original Scale	0.463	SD in Log Scale	0.519
95% t UCL (assumes normality of ROS data)	1.001	95% Percentile Bootstrap UCL	0.975
95% BCA Bootstrap UCL	1.096	95% Bootstrap t UCL	1.654
95% H-UCL (Log ROS)	1.077		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.454	KM Geo Mean	0.635
KM SD (logged)	0.473	95% Critical H Value (KM-Log)	2.205
KM Standard Error of Mean (logged)	0.177	95% H-UCL (KM -Log)	1.027
KM SD (logged)	0.473	95% Critical H Value (KM-Log)	2.205
KM Standard Error of Mean (logged)	0.177		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.703	Mean in Log Scale	-0.52
SD in Original Scale	0.476	SD in Log Scale	0.599
95% t UCL (Assumes normality)	0.998	95% H-Stat UCL	1.192

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 1.02

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.

Copper (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	4	Number of Non-Detects	5
Number of Distinct Detects	4	Number of Distinct Non-Detects	3
Minimum Detect	0.36	Minimum Non-Detect	0.43
Maximum Detect	1.6	Maximum Non-Detect	4.3
Variance Detects	0.32	Percent Non-Detects	55.56%
Mean Detects	0.773	SD Detects	0.565
Median Detects	0.565	CV Detects	0.732
Skewness Detects	1.724	Kurtosis Detects	3.015
Mean of Logged Detects	-0.431	SD of Logged Detects	0.65

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	0.815	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.329	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	0.575	KM Standard Error of Mean	0.165
KM SD	0.401	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.881	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.846	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.069	95% KM Chebyshev UCL	1.293
97.5% KM Chebyshev UCL	1.603	99% KM Chebyshev UCL	2.214

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.389	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.659	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**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)	3.056	k star (bias corrected MLE)	0.931
Theta hat (MLE)	0.253	Theta star (bias corrected MLE)	0.83
nu hat (MLE)	24.45	nu star (bias corrected)	7.446
Mean (detects)	0.773		

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	0.48
Maximum	1.6	Median	0.36
SD	0.458	CV	0.954
k hat (MLE)	1.096	k star (bias corrected MLE)	0.805
Theta hat (MLE)	0.438	Theta star (bias corrected MLE)	0.596
nu hat (MLE)	19.73	nu star (bias corrected)	14.48
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (14.48, α)	6.904	Adjusted Chi Square Value (14.48, β)	5.837
95% Gamma Approximate UCL (use when n>=50)	1.007	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.575	SD (KM)	0.401
Variance (KM)	0.161	SE of Mean (KM)	0.165
k hat (KM)	2.053	k star (KM)	1.443
nu hat (KM)	36.95	nu star (KM)	25.97
theta hat (KM)	0.28	theta star (KM)	0.398
80% gamma percentile (KM)	0.893	90% gamma percentile (KM)	1.209
95% gamma percentile (KM)	1.517	99% gamma percentile (KM)	2.214

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (25.97, α)	15.35	Adjusted Chi Square Value (25.97, β)	13.66
95% Gamma Approximate KM-UCL (use when n>=50)	0.972	95% Gamma Adjusted KM-UCL (use when n<50)	1.093

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.925	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.241	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	0.536	Mean in Log Scale	-0.797
SD in Original Scale	0.418	SD in Log Scale	0.569
95% t UCL (assumes normality of ROS data)	0.795	95% Percentile Bootstrap UCL	0.787
95% BCA Bootstrap UCL	0.921	95% Bootstrap t UCL	1.416
95% H-UCL (Log ROS)	0.852		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.708	KM Geo Mean	0.493
KM SD (logged)	0.494	95% Critical H Value (KM-Log)	2.222
KM Standard Error of Mean (logged)	0.205	95% H-UCL (KM -Log)	0.82
KM SD (logged)	0.494	95% Critical H Value (KM-Log)	2.222
KM Standard Error of Mean (logged)	0.205		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.709	Mean in Log Scale	-0.696
SD in Original Scale	0.692	SD in Log Scale	0.852
95% t UCL (Assumes normality)	1.138	95% H-Stat UCL	1.727

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 0.881

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	2	Mean	5.163
Maximum	12.3	Median	4.15
SD	3.28	Std. Error of Mean	1.16
Coefficient of Variation	0.635	Skewness	1.692

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	0.818	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.24	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.283	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	7.359	95% Adjusted-CLT UCL (Chen-1995)	7.811
		95% Modified-t UCL (Johnson-1978)	7.475

Gamma GOF Test

A-D Test Statistic	0.319	**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	0.201	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.296	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.519	k star (bias corrected MLE)	2.283
Theta hat (MLE)	1.467	Theta star (bias corrected MLE)	2.261
nu hat (MLE)	56.31	nu star (bias corrected)	36.53
MLE Mean (bias corrected)	5.163	MLE Sd (bias corrected)	3.417
		Approximate Chi Square Value (0.05)	23.69
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	21.12

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	7.959	95% Adjusted Gamma UCL (use when n<50)	8.93

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.693	Mean of logged Data	1.493
Maximum of Logged Data	2.51	SD of logged Data	0.567

Assuming Lognormal Distribution

95% H-UCL	8.872	90% Chebyshev (MVUE) UCL	8.219
95% Chebyshev (MVUE) UCL	9.627	97.5% Chebyshev (MVUE) UCL	11.58
99% Chebyshev (MVUE) UCL	15.42		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	7.07	95% Jackknife UCL	7.359

95% Standard Bootstrap UCL	6.962	95% Bootstrap-t UCL	9.149
95% Hall's Bootstrap UCL	14.61	95% Percentile Bootstrap UCL	7.013
95% BCA Bootstrap UCL	7.688		
90% Chebyshev(Mean, Sd) UCL	8.641	95% Chebyshev(Mean, Sd) UCL	10.22
97.5% Chebyshev(Mean, Sd) UCL	12.4	99% Chebyshev(Mean, Sd) UCL	16.7

Suggested UCL to Use

95% Student's-t UCL 7.359

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	479	Mean	479
Maximum	479	Median	479

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Iron (car wash well) 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 (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	2120	Mean	2120
Maximum	2120	Median	2120

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Iron (cartage building well) 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 (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1

		Number of Missing Observations	0
Minimum	7000	Mean	7000
Maximum	7000	Median	7000

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Iron (hoffman construction well) 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 (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	41100	Mean	41100
Maximum	41100	Median	41100

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Iron (log chipper well) 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 (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	142	Mean	142
Maximum	142	Median	142

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Iron (mcsmw1) 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 (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	114	Minimum Non-Detect	18.5

Maximum Detect	2040	Maximum Non-Detect	18.5
Variance Detects	460511	Percent Non-Detects	12.5%
Mean Detects	1134	SD Detects	678.6
Median Detects	1330	CV Detects	0.598
Skewness Detects	-0.321	Kurtosis Detects	-0.848
Mean of Logged Detects	6.74	SD of Logged Detects	1.007

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	0.968	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.185	**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	994.7	KM Standard Error of Mean	265
KM SD	693.9	95% KM (BCA) UCL	1422
95% KM (t) UCL	1497	95% KM (Percentile Bootstrap) UCL	1390
95% KM (z) UCL	1431	95% KM Bootstrap t UCL	1456
90% KM Chebyshev UCL	1790	95% KM Chebyshev UCL	2150
97.5% KM Chebyshev UCL	2650	99% KM Chebyshev UCL	3631

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.437	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.717	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.251	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.316	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)	1.85	k star (bias corrected MLE)	1.152
Theta hat (MLE)	613.1	Theta star (bias corrected MLE)	984.2
nu hat (MLE)	25.9	nu star (bias corrected)	16.13
Mean (detects)	1134		

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	75.95	Mean	1002
Maximum	2040	Median	1132
SD	731.2	CV	0.73
k hat (MLE)	1.2	k star (bias corrected MLE)	0.834
Theta hat (MLE)	834.6	Theta star (bias corrected MLE)	1202
nu hat (MLE)	19.21	nu star (bias corrected)	13.34
Adjusted Level of Significance (β)	0.0195		

Approximate Chi Square Value (13.34, α)	6.12	Adjusted Chi Square Value (13.34, β)	4.939
95% Gamma Approximate UCL (use when n>=50)	2183	95% Gamma Adjusted UCL (use when n<50)	2705

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	994.7	SD (KM)	693.9
Variance (KM)	481518	SE of Mean (KM)	265
k hat (KM)	2.055	k star (KM)	1.368
nu hat (KM)	32.88	nu star (KM)	21.88
theta hat (KM)	484.1	theta star (KM)	727.3
80% gamma percentile (KM)	1554	90% gamma percentile (KM)	2120
95% gamma percentile (KM)	2673	99% gamma percentile (KM)	3929

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (21.88, α)	12.25	Adjusted Chi Square Value (21.88, β)	10.47
95% Gamma Approximate KM-UCL (use when n>=50)	1777	95% Gamma Adjusted KM-UCL (use when n<50)	2078

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.253	**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	1004	Mean in Log Scale	6.46
SD in Original Scale	728.7	SD in Log Scale	1.223
95% t UCL (assumes normality of ROS data)	1492	95% Percentile Bootstrap UCL	1421
95% BCA Bootstrap UCL	1407	95% Bootstrap t UCL	1494
95% H-UCL (Log ROS)	8566		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	6.262	KM Geo Mean	524.2
KM SD (logged)	1.536	95% Critical H Value (KM-Log)	4.838
KM Standard Error of Mean (logged)	0.586	95% H-UCL (KM -Log)	28262
KM SD (logged)	1.536	95% Critical H Value (KM-Log)	4.838
KM Standard Error of Mean (logged)	0.586		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	993.5	Mean in Log Scale	6.175
SD in Original Scale	743.6	SD in Log Scale	1.849
95% t UCL (Assumes normality)	1492	95% H-Stat UCL	143219

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 1497

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	7
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 Iron (nfmw14) was not processed!

Iron (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	789	Mean	1317
Maximum	2080	Median	1137
SD	556.5	Std. Error of Mean	196.8
Coefficient of Variation	0.423	Skewness	0.466

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	0.835	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.243	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	1690	95% Adjusted-CLT UCL (Chen-1995)	1675
		95% Modified-t UCL (Johnson-1978)	1695

Gamma GOF Test

A-D Test Statistic	0.613	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.718	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.242	**Kolmogorov-Smirnov Gamma GOF Test**
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

k hat (MLE)	6.552	k star (bias corrected MLE)	4.178
Theta hat (MLE)	201	Theta star (bias corrected MLE)	315.2

nu hat (MLE)	104.8	nu star (bias corrected)	66.85
MLE Mean (bias corrected)	1317	MLE Sd (bias corrected)	644.2
		Approximate Chi Square Value (0.05)	49.03
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	45.2

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1795	95% Adjusted Gamma UCL (use when n<50)	1948

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.844	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.219	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	6.671	Mean of logged Data	7.105
Maximum of Logged Data	7.64	SD of logged Data	0.422

Assuming Lognormal Distribution

95% H-UCL	1899	90% Chebyshev (MVUE) UCL	1908
95% Chebyshev (MVUE) UCL	2177	97.5% Chebyshev (MVUE) UCL	2550
99% Chebyshev (MVUE) UCL	3282		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1641	95% Jackknife UCL	1690
95% Standard Bootstrap UCL	1618	95% Bootstrap-t UCL	1744
95% Hall's Bootstrap UCL	1570	95% Percentile Bootstrap UCL	1612
95% BCA Bootstrap UCL	1649		
90% Chebyshev(Mean, Sd) UCL	1907	95% Chebyshev(Mean, Sd) UCL	2175
97.5% Chebyshev(Mean, Sd) UCL	2546	99% Chebyshev(Mean, Sd) UCL	3275

Suggested UCL to Use

95% Student's-t UCL 1690

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw16)

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	11.7	Minimum Non-Detect	27.2
Maximum Detect	60.8	Maximum Non-Detect	50
Variance Detects	315.9	Percent Non-Detects	22.22%
Mean Detects	33.09	SD Detects	17.77

Median Detects	36.3	CV Detects	0.537
Skewness Detects	0.281	Kurtosis Detects	-1.045
Mean of Logged Detects	3.354	SD of Logged Detects	0.607

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	0.941	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.194	**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	30.48	KM Standard Error of Mean	6.06
KM SD	16.13	95% KM (BCA) UCL	39.82
95% KM (t) UCL	41.75	95% KM (Percentile Bootstrap) UCL	40.28
95% KM (z) UCL	40.45	95% KM Bootstrap t UCL	44.1
90% KM Chebyshev UCL	48.66	95% KM Chebyshev UCL	56.89
97.5% KM Chebyshev UCL	68.32	99% KM Chebyshev UCL	90.77

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.312	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.711	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.21	**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)	3.612	k star (bias corrected MLE)	2.159
Theta hat (MLE)	9.16	Theta star (bias corrected MLE)	15.32
nu hat (MLE)	50.57	nu star (bias corrected)	30.23
Mean (detects)	33.09		

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	11.7	Mean	30.58
Maximum	60.8	Median	25.63
SD	16.29	CV	0.533
k hat (MLE)	4.006	k star (bias corrected MLE)	2.745
Theta hat (MLE)	7.633	Theta star (bias corrected MLE)	11.14
nu hat (MLE)	72.11	nu star (bias corrected)	49.41
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (49.41, α)	34.27	Adjusted Chi Square Value (49.41, β)	31.63
95% Gamma Approximate UCL (use when n>=50)	44.08	95% Gamma Adjusted UCL (use when n<50)	47.76

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	30.48	SD (KM)	16.13
Variance (KM)	260.2	SE of Mean (KM)	6.06
k hat (KM)	3.571	k star (KM)	2.455
nu hat (KM)	64.28	nu star (KM)	44.19
theta hat (KM)	8.536	theta star (KM)	12.42
80% gamma percentile (KM)	44.53	90% gamma percentile (KM)	56.54
95% gamma percentile (KM)	67.86	99% gamma percentile (KM)	92.67

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (44.19, α)	29.94	Adjusted Chi Square Value (44.19, β)	27.49
95% Gamma Approximate KM-UCL (use when n>=50)	44.98	95% Gamma Adjusted KM-UCL (use when n<50)	48.99

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.933	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.224	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	30.26	Mean in Log Scale	3.275
SD in Original Scale	16.47	SD in Log Scale	0.555
95% t UCL (assumes normality of ROS data)	40.47	95% Percentile Bootstrap UCL	38.74
95% BCA Bootstrap UCL	39.91	95% Bootstrap t UCL	42.87
95% H-UCL (Log ROS)	48.71		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	3.266	KM Geo Mean	26.2
KM SD (logged)	0.563	95% Critical H Value (KM-Log)	2.346
KM Standard Error of Mean (logged)	0.216	95% H-UCL (KM -Log)	48.93
KM SD (logged)	0.563	95% Critical H Value (KM-Log)	2.346
KM Standard Error of Mean (logged)	0.216		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	30.02	Mean in Log Scale	3.257
SD in Original Scale	16.79	SD in Log Scale	0.581
95% t UCL (Assumes normality)	40.43	95% H-Stat UCL	50.17

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 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.

Iron (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	7
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 Iron (nfmw17) was not processed!

Iron (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	35.1	Mean	154.2
Maximum	278	Median	168.5
SD	92.81	Std. Error of Mean	32.81
Coefficient of Variation	0.602	Skewness	0.0182

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	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	216.3	95% Adjusted-CLT UCL (Chen-1995)	208.4
		95% Modified-t UCL (Johnson-1978)	216.4

Gamma GOF Test

A-D Test Statistic	0.399	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.203	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.297	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.387	k star (bias corrected MLE)	1.575
Theta hat (MLE)	64.59	Theta star (bias corrected MLE)	97.88
nu hat (MLE)	38.19	nu star (bias corrected)	25.2
MLE Mean (bias corrected)	154.2	MLE Sd (bias corrected)	122.8
		Approximate Chi Square Value (0.05)	14.77

Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	12.79

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	263.1	95% Adjusted Gamma UCL (use when n<50)	303.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.883	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.23	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.558	Mean of logged Data	4.814
Maximum of Logged Data	5.628	SD of logged Data	0.786

Assuming Lognormal Distribution

95% H-UCL	399.7	90% Chebyshev (MVUE) UCL	296.3
95% Chebyshev (MVUE) UCL	358	97.5% Chebyshev (MVUE) UCL	443.5
99% Chebyshev (MVUE) UCL	611.6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	208.1	95% Jackknife UCL	216.3
95% Standard Bootstrap UCL	204.4	95% Bootstrap-t UCL	215.9
95% Hall's Bootstrap UCL	207.3	95% Percentile Bootstrap UCL	205.4
95% BCA Bootstrap UCL	210.4		
90% Chebyshev(Mean, Sd) UCL	252.6	95% Chebyshev(Mean, Sd) UCL	297.2
97.5% Chebyshev(Mean, Sd) UCL	359.1	99% Chebyshev(Mean, Sd) UCL	480.6

Suggested UCL to Use

95% Student's-t UCL 216.3

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	349	Mean	675.3
Maximum	1160	Median	661
SD	263.2	Std. Error of Mean	87.72
Coefficient of Variation	0.39	Skewness	0.579

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	0.949	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.172	**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	838.4	95% Adjusted-CLT UCL (Chen-1995)	837.7
		95% Modified-t UCL (Johnson-1978)	841.3

Gamma GOF Test

A-D Test Statistic	0.226	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.722	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	0.28	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.346	k star (bias corrected MLE)	4.972
Theta hat (MLE)	91.93	Theta star (bias corrected MLE)	135.8
nu hat (MLE)	132.2	nu star (bias corrected)	89.49
MLE Mean (bias corrected)	675.3	MLE Sd (bias corrected)	302.9
		Approximate Chi Square Value (0.05)	68.68
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	64.84

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	880	95% Adjusted Gamma UCL (use when n<50)	932

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**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	5.855	Mean of logged Data	6.446
Maximum of Logged Data	7.056	SD of logged Data	0.402

Assuming Lognormal Distribution

95% H-UCL	925.1	90% Chebyshev (MVUE) UCL	951
95% Chebyshev (MVUE) UCL	1075	97.5% Chebyshev (MVUE) UCL	1248
99% Chebyshev (MVUE) UCL	1587		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	819.6	95% Jackknife UCL	838.4
95% Standard Bootstrap UCL	811.8	95% Bootstrap-t UCL	870.2
95% Hall's Bootstrap UCL	900.7	95% Percentile Bootstrap UCL	812.3
95% BCA Bootstrap UCL	835.3		
90% Chebyshev(Mean, Sd) UCL	938.5	95% Chebyshev(Mean, Sd) UCL	1058
97.5% Chebyshev(Mean, Sd) UCL	1223	99% Chebyshev(Mean, Sd) UCL	1548

Suggested UCL to Use

95% Student's-t UCL 838.4

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.

Iron (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	821	Mean	1070
Maximum	1410	Median	1090
SD	175.7	Std. Error of Mean	58.57
Coefficient of Variation	0.164	Skewness	0.582

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	0.968	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.136	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	1179	95% Adjusted-CLT UCL (Chen-1995)	1178
		95% Modified-t UCL (Johnson-1978)	1181

Gamma GOF Test

A-D Test Statistic	0.174	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	0.124	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)	42.72	k star (bias corrected MLE)	28.55
Theta hat (MLE)	25.04	Theta star (bias corrected MLE)	37.47

nu hat (MLE)	769	nu star (bias corrected)	514
MLE Mean (bias corrected)	1070	MLE Sd (bias corrected)	200.2
		Approximate Chi Square Value (0.05)	462.4
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	452

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1189	95% Adjusted Gamma UCL (use when n<50)	1216

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.984	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.13	**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	6.711	Mean of logged Data	6.964
Maximum of Logged Data	7.251	SD of logged Data	0.162

Assuming Lognormal Distribution

95% H-UCL	1193	90% Chebyshev (MVUE) UCL	1243
95% Chebyshev (MVUE) UCL	1322	97.5% Chebyshev (MVUE) UCL	1431
99% Chebyshev (MVUE) UCL	1646		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1166	95% Jackknife UCL	1179
95% Standard Bootstrap UCL	1160	95% Bootstrap-t UCL	1197
95% Hall's Bootstrap UCL	1199	95% Percentile Bootstrap UCL	1164
95% BCA Bootstrap UCL	1168		
90% Chebyshev(Mean, Sd) UCL	1246	95% Chebyshev(Mean, Sd) UCL	1325
97.5% Chebyshev(Mean, Sd) UCL	1436	99% Chebyshev(Mean, Sd) UCL	1653

Suggested UCL to Use

95% Student's-t UCL 1179

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	2
Number of Distinct Detects	6	Number of Distinct Non-Detects	2
Minimum Detect	95.7	Minimum Non-Detect	109
Maximum Detect	9380	Maximum Non-Detect	434
Variance Detects	13783239	Percent Non-Detects	25%
Mean Detects	1858	SD Detects	3713

Median Detects	147.5	CV Detects	1.998
Skewness Detects	2.372	Kurtosis Detects	5.676
Mean of Logged Detects	5.936	SD of Logged Detects	1.83

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	0.574	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.397	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	1421	KM Standard Error of Mean	1174
KM SD	3031	95% KM (BCA) UCL	3723
95% KM (t) UCL	3645	95% KM (Percentile Bootstrap) UCL	3590
95% KM (z) UCL	3352	95% KM Bootstrap t UCL	168955
90% KM Chebyshev UCL	4943	95% KM Chebyshev UCL	6538
97.5% KM Chebyshev UCL	8753	99% KM Chebyshev UCL	13102

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.912	Anderson-Darling GOF Test
5% A-D Critical Value	0.749	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.387	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.352	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)	0.412	k star (bias corrected MLE)	0.317
Theta hat (MLE)	4515	Theta star (bias corrected MLE)	5864
nu hat (MLE)	4.94	nu star (bias corrected)	3.803
Mean (detects)	1858		

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	1394
Maximum	9380	Median	129.5
SD	3254	CV	2.334
k hat (MLE)	0.189	k star (bias corrected MLE)	0.201
Theta hat (MLE)	7392	Theta star (bias corrected MLE)	6928
nu hat (MLE)	3.017	nu star (bias corrected)	3.219
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (3.22, α)	0.44	Adjusted Chi Square Value (3.22, β)	0.255
95% Gamma Approximate UCL (use when n>=50)	10194	95% Gamma Adjusted UCL (use when n<50)	17579

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1421	SD (KM)	3031
Variance (KM)	9188829	SE of Mean (KM)	1174
k hat (KM)	0.22	k star (KM)	0.221
nu hat (KM)	3.516	nu star (KM)	3.531
theta hat (KM)	6467	theta star (KM)	6439
80% gamma percentile (KM)	1964	90% gamma percentile (KM)	4292
95% gamma percentile (KM)	7130	99% gamma percentile (KM)	14823

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (3.53, α)	0.546	Adjusted Chi Square Value (3.53, β)	0.323
95% Gamma Approximate KM-UCL (use when n>=50)	9195	95% Gamma Adjusted KM-UCL (use when n<50)	15544

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.782	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.353	**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	1415	Mean in Log Scale	5.505
SD in Original Scale	3244	SD in Log Scale	1.777
95% t UCL (assumes normality of ROS data)	3587	95% Percentile Bootstrap UCL	3598
95% BCA Bootstrap UCL	4751	95% Bootstrap t UCL	109638
95% H-UCL (Log ROS)	48132		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	5.62	KM Geo Mean	275.8
KM SD (logged)	1.55	95% Critical H Value (KM-Log)	4.878
KM Standard Error of Mean (logged)	0.601	95% H-UCL (KM -Log)	15967
KM SD (logged)	1.55	95% Critical H Value (KM-Log)	4.878
KM Standard Error of Mean (logged)	0.601		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1428	Mean in Log Scale	5.625
SD in Original Scale	3238	SD in Log Scale	1.692
95% t UCL (Assumes normality)	3597	95% H-Stat UCL	33725

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 8753

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (car wash well)

General Statistics			
Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Manganese (car wash well) 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.

Manganese (cartage building well)

General Statistics			
Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Manganese (cartage building well) 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.

Manganese (hoffman construction well)

General Statistics			
Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Manganese (hoffman construction well) 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.

Manganese (log chipper well)

General Statistics			
Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	3020	Mean	3020
Maximum	3020	Median	3020

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Manganese (log chipper well) 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.

Manganese (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	82.8	Mean	82.8
Maximum	82.8	Median	82.8

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Manganese (mcsmw1) 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.

Manganese (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	23.2	Mean	1141
Maximum	1650	Median	1275
SD	496.5	Std. Error of Mean	175.5
Coefficient of Variation	0.435	Skewness	-1.909

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	0.809	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.266	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	1473	95% Adjusted-CLT UCL (Chen-1995)	1303
		95% Modified-t UCL (Johnson-1978)	1453

Gamma GOF Test

A-D Test Statistic	1.659	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.729	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.399	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.299	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.447	k star (bias corrected MLE)	0.988
Theta hat (MLE)	788.2	Theta star (bias corrected MLE)	1155
nu hat (MLE)	23.15	nu star (bias corrected)	15.8
MLE Mean (bias corrected)	1141	MLE Sd (bias corrected)	1148
		Approximate Chi Square Value (0.05)	7.824
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	6.456

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2304	95% Adjusted Gamma UCL (use when n<50)	2792

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.528	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.428	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.144	Mean of logged Data	6.655
Maximum of Logged Data	7.409	SD of logged Data	1.428

Assuming Lognormal Distribution

95% H-UCL	25052	90% Chebyshev (MVUE) UCL	4461
95% Chebyshev (MVUE) UCL	5683	97.5% Chebyshev (MVUE) UCL	7380
99% Chebyshev (MVUE) UCL	10712		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1429	95% Jackknife UCL	1473
95% Standard Bootstrap UCL	1403	95% Bootstrap-t UCL	1366
95% Hall's Bootstrap UCL	1336	95% Percentile Bootstrap UCL	1369
95% BCA Bootstrap UCL	1339		
90% Chebyshev(Mean, Sd) UCL	1667	95% Chebyshev(Mean, Sd) UCL	1906
97.5% Chebyshev(Mean, Sd) UCL	2237	99% Chebyshev(Mean, Sd) UCL	2887

Suggested UCL to Use

95% Student's-t UCL 1473

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.

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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	2.1	Mean	24.33
Maximum	83.7	Median	15.35
SD	25.82	Std. Error of Mean	9.128
Coefficient of Variation	1.061	Skewness	2.099

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	0.756	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.287	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	41.62	95% Adjusted-CLT UCL (Chen-1995)	46.58
		95% Modified-t UCL (Johnson-1978)	42.75

Gamma GOF Test

A-D Test Statistic	0.306	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	0.177	Kolmogorov-Smirnov Gamma GOF Test
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

k hat (MLE)	1.203	k star (bias corrected MLE)	0.835
Theta hat (MLE)	20.22	Theta star (bias corrected MLE)	29.13
nu hat (MLE)	19.24	nu star (bias corrected)	13.36
MLE Mean (bias corrected)	24.33	MLE Sd (bias corrected)	26.62
		Approximate Chi Square Value (0.05)	6.136
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	4.953

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	52.97	95% Adjusted Gamma UCL (use when n<50)	65.61

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.24	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.742	Mean of logged Data	2.721
Maximum of Logged Data	4.427	SD of logged Data	1.112

Assuming Lognormal Distribution

95% H-UCL	133.8	90% Chebyshev (MVUE) UCL	55.88
95% Chebyshev (MVUE) UCL	69.7	97.5% Chebyshev (MVUE) UCL	88.88
99% Chebyshev (MVUE) UCL	126.6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	39.34	95% Jackknife UCL	41.62
95% Standard Bootstrap UCL	38.22	95% Bootstrap-t UCL	61.09
95% Hall's Bootstrap UCL	100.8	95% Percentile Bootstrap UCL	40.04
95% BCA Bootstrap UCL	48		
90% Chebyshev(Mean, Sd) UCL	51.71	95% Chebyshev(Mean, Sd) UCL	64.11
97.5% Chebyshev(Mean, Sd) UCL	81.33	99% Chebyshev(Mean, Sd) UCL	115.1

Suggested UCL to Use

95% Adjusted Gamma UCL 65.61

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.

Manganese (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1760	Mean	2476
Maximum	3340	Median	2395
SD	493.4	Std. Error of Mean	174.4
Coefficient of Variation	0.199	Skewness	0.458

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	0.983	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level	

Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	2807	95% Adjusted-CLT UCL (Chen-1995)	2793
		95% Modified-t UCL (Johnson-1978)	2811

Gamma GOF Test

A-D Test Statistic	0.142	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.13	**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)	29.1	k star (bias corrected MLE)	18.27
Theta hat (MLE)	85.09	Theta star (bias corrected MLE)	135.5
nu hat (MLE)	465.6	nu star (bias corrected)	292.4
MLE Mean (bias corrected)	2476	MLE Sd (bias corrected)	579.3
		Approximate Chi Square Value (0.05)	253.8
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	244.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2853	95% Adjusted Gamma UCL (use when n<50)	2959

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.993	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.121	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	7.473	Mean of logged Data	7.797
Maximum of Logged Data	8.114	SD of logged Data	0.199

Assuming Lognormal Distribution

95% H-UCL	2873	90% Chebyshev (MVUE) UCL	3000
95% Chebyshev (MVUE) UCL	3237	97.5% Chebyshev (MVUE) UCL	3566
99% Chebyshev (MVUE) UCL	4213		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2763	95% Jackknife UCL	2807
95% Standard Bootstrap UCL	2746	95% Bootstrap-t UCL	2869
95% Hall's Bootstrap UCL	2928	95% Percentile Bootstrap UCL	2749
95% BCA Bootstrap UCL	2755		
90% Chebyshev(Mean, Sd) UCL	3000	95% Chebyshev(Mean, Sd) UCL	3237
97.5% Chebyshev(Mean, Sd) UCL	3566	99% Chebyshev(Mean, Sd) UCL	4212

Suggested UCL to Use

95% Student's-t UCL 2807

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	46.7	Mean	125.1
Maximum	254	Median	72.9
SD	86.6	Std. Error of Mean	28.87
Coefficient of Variation	0.692	Skewness	0.473

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	0.809	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.282	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	178.8	95% Adjusted-CLT UCL (Chen-1995)	177.4
		95% Modified-t UCL (Johnson-1978)	179.5

Gamma GOF Test

A-D Test Statistic	0.839	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.729	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.253	Kolmogorov-Smirnov Gamma GOF Test
5% K-S Critical Value	0.282	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.275	k star (bias corrected MLE)	1.591
Theta hat (MLE)	54.98	Theta star (bias corrected MLE)	78.63
nu hat (MLE)	40.95	nu star (bias corrected)	28.64
MLE Mean (bias corrected)	125.1	MLE Sd (bias corrected)	99.18
		Approximate Chi Square Value (0.05)	17.42
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	15.61

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	205.6	95% Adjusted Gamma UCL (use when n<50)	229.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.242	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.844	Mean of logged Data	4.593
Maximum of Logged Data	5.537	SD of logged Data	0.738

Assuming Lognormal Distribution

95% H-UCL	262	90% Chebyshev (MVUE) UCL	220.1
95% Chebyshev (MVUE) UCL	263	97.5% Chebyshev (MVUE) UCL	322.7
99% Chebyshev (MVUE) UCL	439.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	172.6	95% Jackknife UCL	178.8
95% Standard Bootstrap UCL	169.9	95% Bootstrap-t UCL	188.5
95% Hall's Bootstrap UCL	159.8	95% Percentile Bootstrap UCL	172.9
95% BCA Bootstrap UCL	169.7		
90% Chebyshev(Mean, Sd) UCL	211.7	95% Chebyshev(Mean, Sd) UCL	250.9
97.5% Chebyshev(Mean, Sd) UCL	305.4	99% Chebyshev(Mean, Sd) UCL	412.3

Suggested UCL to Use

95% Adjusted Gamma UCL	229.5

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.

Manganese (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	3	Number of Non-Detects	5
Number of Distinct Detects	3	Number of Distinct Non-Detects	4
Minimum Detect	0.25	Minimum Non-Detect	0.22
Maximum Detect	1.3	Maximum Non-Detect	1.2
Variance Detects	0.29	Percent Non-Detects	62.5%
Mean Detects	0.707	SD Detects	0.538
Median Detects	0.57	CV Detects	0.762
Skewness Detects	1.069	Kurtosis Detects	N/A
Mean of Logged Detects	-0.562	SD of Logged Detects	0.824

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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	0.952	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.267	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	0.413	KM Standard Error of Mean	0.156
KM SD	0.356	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.708	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.669	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.88	95% KM Chebyshev UCL	1.091
97.5% KM Chebyshev UCL	1.385	99% KM Chebyshev UCL	1.961

Gamma GOF Tests on Detected Observations Only
Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	2.481	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.285	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	14.89	nu star (bias corrected)	N/A
Mean (detects)	0.707		

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	0.273
Maximum	1.3	Median	0.0152
SD	0.46	CV	1.689
k hat (MLE)	0.389	k star (bias corrected MLE)	0.326
Theta hat (MLE)	0.701	Theta star (bias corrected MLE)	0.835
nu hat (MLE)	6.222	nu star (bias corrected)	5.222
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (5.22, α)	1.256	Adjusted Chi Square Value (5.22, β)	0.834
95% Gamma Approximate UCL (use when n>=50)	1.133	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.413	SD (KM)	0.356
Variance (KM)	0.127	SE of Mean (KM)	0.156

k hat (KM)	1.35	k star (KM)	0.927
nu hat (KM)	21.61	nu star (KM)	14.84
theta hat (KM)	0.306	theta star (KM)	0.446
80% gamma percentile (KM)	0.669	90% gamma percentile (KM)	0.97
95% gamma percentile (KM)	1.272	99% gamma percentile (KM)	1.978

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (14.84, α)	7.149	Adjusted Chi Square Value (14.84, β)	5.853
95% Gamma Approximate KM-UCL (use when n>=50)	0.858	95% Gamma Adjusted KM-UCL (use when n<50)	1.048

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	1	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.175	**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	0.332	Mean in Log Scale	-1.656
SD in Original Scale	0.425	SD in Log Scale	1.059
95% t UCL (assumes normality of ROS data)	0.616	95% Percentile Bootstrap UCL	0.58
95% BCA Bootstrap UCL	0.708	95% Bootstrap t UCL	1.664
95% H-UCL (Log ROS)	1.398		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.122	KM Geo Mean	0.326
KM SD (logged)	0.614	95% Critical H Value (KM-Log)	2.561
KM Standard Error of Mean (logged)	0.273	95% H-UCL (KM -Log)	0.712
KM SD (logged)	0.614	95% Critical H Value (KM-Log)	2.561
KM Standard Error of Mean (logged)	0.273		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.431	Mean in Log Scale	-1.167
SD in Original Scale	0.397	SD in Log Scale	0.85
95% t UCL (Assumes normality)	0.697	95% H-Stat UCL	1.196

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 0.708

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	88.4	Mean	246.9
Maximum	384	Median	243
SD	102.6	Std. Error of Mean	36.26
Coefficient of Variation	0.415	Skewness	-0.223

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	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	315.6	95% Adjusted-CLT UCL (Chen-1995)	303.5
		95% Modified-t UCL (Johnson-1978)	315.2

Gamma GOF Test

A-D Test Statistic	0.281	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.719	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogorov-Smirnov Gamma GOF Test**
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

k hat (MLE)	5.419	k star (bias corrected MLE)	3.47
Theta hat (MLE)	45.57	Theta star (bias corrected MLE)	71.16
nu hat (MLE)	86.7	nu star (bias corrected)	55.52
MLE Mean (bias corrected)	246.9	MLE Sd (bias corrected)	132.6
		Approximate Chi Square Value (0.05)	39.4
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	35.99

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	348	95% Adjusted Gamma UCL (use when n<50)	380.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.482	Mean of logged Data	5.414
Maximum of Logged Data	5.951	SD of logged Data	0.498

Assuming Lognormal Distribution

95% H-UCL	395.7	90% Chebyshev (MVUE) UCL	383.3
95% Chebyshev (MVUE) UCL	443.8	97.5% Chebyshev (MVUE) UCL	527.6
99% Chebyshev (MVUE) UCL	692.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	306.6	95% Jackknife UCL	315.6
95% Standard Bootstrap UCL	303.1	95% Bootstrap-t UCL	312.6
95% Hall's Bootstrap UCL	303.2	95% Percentile Bootstrap UCL	301.6
95% BCA Bootstrap UCL	298.8		
90% Chebyshev(Mean, Sd) UCL	355.7	95% Chebyshev(Mean, Sd) UCL	405
97.5% Chebyshev(Mean, Sd) UCL	473.4	99% Chebyshev(Mean, Sd) UCL	607.8

Suggested UCL to Use

95% Student's-t UCL 315.6

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.

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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	606	Mean	959.9
Maximum	1230	Median	984
SD	226.3	Std. Error of Mean	75.45
Coefficient of Variation	0.236	Skewness	-0.606

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	0.908	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.176	**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	1100	95% Adjusted-CLT UCL (Chen-1995)	1068

95% Modified-t UCL (Johnson-1978)	1098

Gamma GOF Test

A-D Test Statistic	0.491	**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	0.193	**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)	18.02	k star (bias corrected MLE)	12.09
Theta hat (MLE)	53.27	Theta star (bias corrected MLE)	79.42
nu hat (MLE)	324.3	nu star (bias corrected)	217.5
MLE Mean (bias corrected)	959.9	MLE Sd (bias corrected)	276.1
		Approximate Chi Square Value (0.05)	184.4
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	178

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1132	95% Adjusted Gamma UCL (use when n<50)	1173

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	**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	6.407	Mean of logged Data	6.839
Maximum of Logged Data	7.115	SD of logged Data	0.259

Assuming Lognormal Distribution

95% H-UCL	1156	90% Chebyshev (MVUE) UCL	1212
95% Chebyshev (MVUE) UCL	1325	97.5% Chebyshev (MVUE) UCL	1483
99% Chebyshev (MVUE) UCL	1792		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1084	95% Jackknife UCL	1100
95% Standard Bootstrap UCL	1077	95% Bootstrap-t UCL	1088
95% Hall's Bootstrap UCL	1064	95% Percentile Bootstrap UCL	1078
95% BCA Bootstrap UCL	1067		
90% Chebyshev(Mean, Sd) UCL	1186	95% Chebyshev(Mean, Sd) UCL	1289
97.5% Chebyshev(Mean, Sd) UCL	1431	99% Chebyshev(Mean, Sd) UCL	1711

Suggested UCL to Use

95% Student's-t UCL	1100

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw6)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	1730	Mean	2302
Maximum	2820	Median	2300
SD	371.7	Std. Error of Mean	123.9
Coefficient of Variation	0.161	Skewness	-0.315

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	0.955	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.139	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	2533	95% Adjusted-CLT UCL (Chen-1995)	2492
		95% Modified-t UCL (Johnson-1978)	2530

Gamma GOF Test

A-D Test Statistic	0.273	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	0.151	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)	41.21	k star (bias corrected MLE)	27.55
Theta hat (MLE)	55.87	Theta star (bias corrected MLE)	83.58
nu hat (MLE)	741.7	nu star (bias corrected)	495.8
MLE Mean (bias corrected)	2302	MLE Sd (bias corrected)	438.7
		Approximate Chi Square Value (0.05)	445.2
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	435

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2564	95% Adjusted Gamma UCL (use when n<50)	2624

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	0.168	**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	7.456	Mean of logged Data	7.729
Maximum of Logged Data	7.944	SD of logged Data	0.168

Assuming Lognormal Distribution

95% H-UCL	2579	90% Chebyshev (MVUE) UCL	2690
95% Chebyshev (MVUE) UCL	2865	97.5% Chebyshev (MVUE) UCL	3109
99% Chebyshev (MVUE) UCL	3587		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2506	95% Jackknife UCL	2533
95% Standard Bootstrap UCL	2494	95% Bootstrap-t UCL	2519
95% Hall's Bootstrap UCL	2509	95% Percentile Bootstrap UCL	2488
95% BCA Bootstrap UCL	2476		
90% Chebyshev(Mean, Sd) UCL	2674	95% Chebyshev(Mean, Sd) UCL	2842
97.5% Chebyshev(Mean, Sd) UCL	3076	99% Chebyshev(Mean, Sd) UCL	3535

Suggested UCL to Use

95% Student's-t UCL 2533

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	6	Number of Non-Detects	2
Number of Distinct Detects	6	Number of Distinct Non-Detects	2
Minimum Detect	2.6	Minimum Non-Detect	4.7
Maximum Detect	36.8	Maximum Non-Detect	53.8
Variance Detects	185.3	Percent Non-Detects	25%
Mean Detects	9.533	SD Detects	13.61
Median Detects	2.9	CV Detects	1.428
Skewness Detects	2.265	Kurtosis Detects	5.194
Mean of Logged Detects	1.652	SD of Logged Detects	1.074

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	0.615	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.351	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	8.568	KM Standard Error of Mean	4.863
KM SD	11.74	95% KM (BCA) UCL	17.18
95% KM (t) UCL	17.78	95% KM (Percentile Bootstrap) UCL	17.21
95% KM (z) UCL	16.57	95% KM Bootstrap t UCL	459.6
90% KM Chebyshev UCL	23.16	95% KM Chebyshev UCL	29.76
97.5% KM Chebyshev UCL	38.93	99% KM Chebyshev UCL	56.95

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.98	Anderson-Darling GOF Test	
5% A-D Critical Value	0.716	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.388	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.341	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)	0.962	k star (bias corrected MLE)	0.592
Theta hat (MLE)	9.909	Theta star (bias corrected MLE)	16.1
nu hat (MLE)	11.55	nu star (bias corrected)	7.106
Mean (detects)	9.533		

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	1.866	Mean	8.055
Maximum	36.8	Median	2.9
SD	11.86	CV	1.473
k hat (MLE)	1.029	k star (bias corrected MLE)	0.726
Theta hat (MLE)	7.827	Theta star (bias corrected MLE)	11.09
nu hat (MLE)	16.46	nu star (bias corrected)	11.62
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (11.62, α)	4.98	Adjusted Chi Square Value (11.62, β)	3.938
95% Gamma Approximate UCL (use when n>=50)	18.8	95% Gamma Adjusted UCL (use when n<50)	23.77

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	8.568	SD (KM)	11.74
Variance (KM)	137.9	SE of Mean (KM)	4.863
k hat (KM)	0.532	k star (KM)	0.416
nu hat (KM)	8.516	nu star (KM)	6.656
theta hat (KM)	16.1	theta star (KM)	20.6
80% gamma percentile (KM)	13.89	90% gamma percentile (KM)	24.03

95% gamma percentile (KM)	35.12	99% gamma percentile (KM)	62.89

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (6.66, α)	1.984	Adjusted Chi Square Value (6.66, β)	1.405
95% Gamma Approximate KM-UCL (use when n>=50)	28.75	95% Gamma Adjusted KM-UCL (use when n<50)	40.6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.364	**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	8.143	Mean in Log Scale	1.579
SD in Original Scale	11.8	SD in Log Scale	0.923
95% t UCL (assumes normality of ROS data)	16.04	95% Percentile Bootstrap UCL	15.82
95% BCA Bootstrap UCL	19.79	95% Bootstrap t UCL	91.9
95% H-UCL (Log ROS)	23		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.562	KM Geo Mean	4.767
KM SD (logged)	0.934	95% Critical H Value (KM-Log)	3.266
KM Standard Error of Mean (logged)	0.387	95% H-UCL (KM -Log)	23.36
KM SD (logged)	0.934	95% Critical H Value (KM-Log)	3.266
KM Standard Error of Mean (logged)	0.387		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	10.81	Mean in Log Scale	1.757
SD in Original Scale	13.45	SD in Log Scale	1.134
95% t UCL (Assumes normality)	19.82	95% H-Stat UCL	55.32

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 29.76

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.

Vanadium (car wash well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	0.91	Mean	0.91
Maximum	0.91	Median	0.91

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Vanadium (car wash well) 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.

Vanadium (cartage building well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	7.1	Mean	7.1
Maximum	7.1	Median	7.1

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Vanadium (cartage building well) 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.

Vanadium (hoffman construction well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	2.3	Mean	2.3
Maximum	2.3	Median	2.3

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!

The data set for variable Vanadium (hoffman construction well) 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.

Vanadium (log chipper well)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	8.8	Mean	8.8
Maximum	8.8	Median	8.8

Warning: This data set only has 1 observations!

Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Vanadium (log chipper well) 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.

Vanadium (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	2.1	Mean	2.1
Maximum	2.1	Median	2.1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable Vanadium (mcsmw1) 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.

Vanadium (nfmw13)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	0.45	Minimum Non-Detect	5.3
Maximum Detect	2.1	Maximum Non-Detect	5.3
Variance Detects	0.34	Percent Non-Detects	12.5%
Mean Detects	0.893	SD Detects	0.584
Median Detects	0.62	CV Detects	0.654
Skewness Detects	1.9	Kurtosis Detects	3.434
Mean of Logged Detects	-0.252	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	0.741	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.344	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	0.893	KM Standard Error of Mean	0.221
KM SD	0.54	95% KM (BCA) UCL	1.249

95% KM (t) UCL	1.311	95% KM (Percentile Bootstrap) UCL	1.24
95% KM (z) UCL	1.256	95% KM Bootstrap t UCL	2.939
90% KM Chebyshev UCL	1.555	95% KM Chebyshev UCL	1.854
97.5% KM Chebyshev UCL	2.27	99% KM Chebyshev UCL	3.087

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.707	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.324	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.313	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)	3.762	k star (bias corrected MLE)	2.245
Theta hat (MLE)	0.237	Theta star (bias corrected MLE)	0.398
nu hat (MLE)	52.67	nu star (bias corrected)	31.43
Mean (detects)	0.893		

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	0.885
Maximum	2.1	Median	0.66
SD	0.541	CV	0.611
k hat (MLE)	4.268	k star (bias corrected MLE)	2.751
Theta hat (MLE)	0.207	Theta star (bias corrected MLE)	0.322
nu hat (MLE)	68.29	nu star (bias corrected)	44.02
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (44.02, α)	29.8	Adjusted Chi Square Value (44.02, β)	26.88
95% Gamma Approximate UCL (use when n>=50)	1.307	95% Gamma Adjusted UCL (use when n<50)	1.449

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.893	SD (KM)	0.54
Variance (KM)	0.292	SE of Mean (KM)	0.221
k hat (KM)	2.732	k star (KM)	1.791
nu hat (KM)	43.7	nu star (KM)	28.65
theta hat (KM)	0.327	theta star (KM)	0.499
80% gamma percentile (KM)	1.354	90% gamma percentile (KM)	1.783
95% gamma percentile (KM)	2.194	99% gamma percentile (KM)	3.113

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (28.65, α)	17.43	Adjusted Chi Square Value (28.65, β)	15.26
95% Gamma Approximate KM-UCL (use when n>=50)	1.467	95% Gamma Adjusted KM-UCL (use when n<50)	1.676

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.292	**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	0.878	Mean in Log Scale	-0.252
SD in Original Scale	0.542	SD in Log Scale	0.491
95% t UCL (assumes normality of ROS data)	1.241	95% Percentile Bootstrap UCL	1.21
95% BCA Bootstrap UCL	1.332	95% Bootstrap t UCL	2.254
95% H-UCL (Log ROS)	1.354		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.252	KM Geo Mean	0.777
KM SD (logged)	0.491	95% Critical H Value (KM-Log)	2.339
KM Standard Error of Mean (logged)	0.201	95% H-UCL (KM -Log)	1.354
KM SD (logged)	0.491	95% Critical H Value (KM-Log)	2.339
KM Standard Error of Mean (logged)	0.201		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.113	Mean in Log Scale	-0.0987
SD in Original Scale	0.823	SD in Log Scale	0.655
95% t UCL (Assumes normality)	1.664	95% H-Stat UCL	2.161

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	1.676	95% GROS Adjusted Gamma UCL	1.449

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 (nfmw14)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.56	Minimum Non-Detect	1.3
Maximum Detect	0.93	Maximum Non-Detect	1.3
Variance Detects	0.0152	Percent Non-Detects	12.5%
Mean Detects	0.73	SD Detects	0.123
Median Detects	0.73	CV Detects	0.169
Skewness Detects	0.341	Kurtosis Detects	-0.00688
Mean of Logged Detects	-0.327	SD of Logged Detects	0.169

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	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.214	**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	0.73	KM Standard Error of Mean	0.0466
KM SD	0.114	95% KM (BCA) UCL	0.8
95% KM (t) UCL	0.818	95% KM (Percentile Bootstrap) UCL	0.804
95% KM (z) UCL	0.807	95% KM Bootstrap t UCL	0.839
90% KM Chebyshev UCL	0.87	95% KM Chebyshev UCL	0.933
97.5% KM Chebyshev UCL	1.021	99% KM Chebyshev UCL	1.194

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.233	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**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)	41.01	k star (bias corrected MLE)	23.53
Theta hat (MLE)	0.0178	Theta star (bias corrected MLE)	0.031
nu hat (MLE)	574.1	nu star (bias corrected)	329.4
Mean (detects)	0.73		

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	0.56	Mean	0.729
Maximum	0.93	Median	0.728
SD	0.114	CV	0.157
k hat (MLE)	46.84	k star (bias corrected MLE)	29.36
Theta hat (MLE)	0.0156	Theta star (bias corrected MLE)	0.0248
nu hat (MLE)	749.4	nu star (bias corrected)	469.7
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (469.70, α)	420.5	Adjusted Chi Square Value (469.70, β)	408.6
95% Gamma Approximate UCL (use when n>=50)	0.815	95% Gamma Adjusted UCL (use when n<50)	0.839

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.73	SD (KM)	0.114
Variance (KM)	0.0131	SE of Mean (KM)	0.0466
k hat (KM)	40.81	k star (KM)	25.59
nu hat (KM)	653	nu star (KM)	409.5
theta hat (KM)	0.0179	theta star (KM)	0.0285
80% gamma percentile (KM)	0.848	90% gamma percentile (KM)	0.92

95% gamma percentile (KM)	0.982	99% gamma percentile (KM)	1.107

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (409.46, α)	363.6	Adjusted Chi Square Value (409.46, β)	352.6
95% Gamma Approximate KM-UCL (use when n>=50)	0.822	95% Gamma Adjusted KM-UCL (use when n<50)	0.848

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.185	**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	0.729	Mean in Log Scale	-0.327
SD in Original Scale	0.114	SD in Log Scale	0.157
95% t UCL (assumes normality of ROS data)	0.805	95% Percentile Bootstrap UCL	0.793
95% BCA Bootstrap UCL	0.8	95% Bootstrap t UCL	0.816
95% H-UCL (Log ROS)	0.817		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.327	KM Geo Mean	0.721
KM SD (logged)	0.157	95% Critical H Value (KM-Log)	1.9
KM Standard Error of Mean (logged)	0.064	95% H-UCL (KM -Log)	0.817
KM SD (logged)	0.157	95% Critical H Value (KM-Log)	1.9
KM Standard Error of Mean (logged)	0.064		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.72	Mean in Log Scale	-0.34
SD in Original Scale	0.118	SD in Log Scale	0.161
95% t UCL (Assumes normality)	0.799	95% H-Stat UCL	0.81

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 0.818

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	4.7	Mean	15.7
Maximum	55.4	Median	7.55

SD	18.1	Std. Error of Mean	6.398
Coefficient of Variation	1.153	Skewness	1.957

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	0.663	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.411	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	27.82	95% Adjusted-CLT UCL (Chen-1995)	30.96
		95% Modified-t UCL (Johnson-1978)	28.56

Gamma GOF Test

A-D Test Statistic	1.064	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.394	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.3	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.323	k star (bias corrected MLE)	0.91
Theta hat (MLE)	11.87	Theta star (bias corrected MLE)	17.25
nu hat (MLE)	21.16	nu star (bias corrected)	14.56
MLE Mean (bias corrected)	15.7	MLE Sd (bias corrected)	16.46
		Approximate Chi Square Value (0.05)	6.956
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	5.681

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32.86	95% Adjusted Gamma UCL (use when n<50)	40.24

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.793	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.35	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.548	Mean of logged Data	2.33
Maximum of Logged Data	4.015	SD of logged Data	0.894

Assuming Lognormal Distribution

95% H-UCL	44.8	90% Chebyshev (MVUE) UCL	28.35
95% Chebyshev (MVUE) UCL	34.67	97.5% Chebyshev (MVUE) UCL	43.43
99% Chebyshev (MVUE) UCL	60.66		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	26.22	95% Jackknife UCL	27.82
95% Standard Bootstrap UCL	25.57	95% Bootstrap-t UCL	130.8
95% Hall's Bootstrap UCL	143.8	95% Percentile Bootstrap UCL	25.34
95% BCA Bootstrap UCL	30.83		
90% Chebyshev(Mean, Sd) UCL	34.9	95% Chebyshev(Mean, Sd) UCL	43.59
97.5% Chebyshev(Mean, Sd) UCL	55.66	99% Chebyshev(Mean, Sd) UCL	79.36

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	43.59

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.

Vanadium (nfmw16)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	7
Number of Detects	8	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	0.48	Minimum Non-Detect	1.3
Maximum Detect	1.5	Maximum Non-Detect	1.3
Variance Detects	0.135	Percent Non-Detects	11.11%
Mean Detects	0.975	SD Detects	0.367
Median Detects	0.92	CV Detects	0.376
Skewness Detects	0.0722	Kurtosis Detects	-1.373
Mean of Logged Detects	-0.0939	SD of Logged Detects	0.407

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	0.943	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.187	**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	0.949	KM Standard Error of Mean	0.123
KM SD	0.338	95% KM (BCA) UCL	1.158
95% KM (t) UCL	1.177	95% KM (Percentile Bootstrap) UCL	1.132
95% KM (z) UCL	1.151	95% KM Bootstrap t UCL	1.175
90% KM Chebyshev UCL	1.317	95% KM Chebyshev UCL	1.484
97.5% KM Chebyshev UCL	1.716	99% KM Chebyshev UCL	2.171

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.284	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.717	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.203	**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)	7.456	k star (bias corrected MLE)	4.744
Theta hat (MLE)	0.131	Theta star (bias corrected MLE)	0.206
nu hat (MLE)	119.3	nu star (bias corrected)	75.9
Mean (detects)	0.975		

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	0.48	Mean	0.95
Maximum	1.5	Median	0.84
SD	0.351	CV	0.37
k hat (MLE)	7.962	k star (bias corrected MLE)	5.382
Theta hat (MLE)	0.119	Theta star (bias corrected MLE)	0.177
nu hat (MLE)	143.3	nu star (bias corrected)	96.88
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (96.88, α)	75.18	Adjusted Chi Square Value (96.88, β)	71.16
95% Gamma Approximate UCL (use when n>=50)	1.224	95% Gamma Adjusted UCL (use when n<50)	1.294

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.949	SD (KM)	0.338
Variance (KM)	0.114	SE of Mean (KM)	0.123
k hat (KM)	7.891	k star (KM)	5.335
nu hat (KM)	142	nu star (KM)	96.03
theta hat (KM)	0.12	theta star (KM)	0.178
80% gamma percentile (KM)	1.266	90% gamma percentile (KM)	1.499
95% gamma percentile (KM)	1.71	99% gamma percentile (KM)	2.155

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (96.03, α)	74.43	Adjusted Chi Square Value (96.03, β)	70.43
95% Gamma Approximate KM-UCL (use when n>=50)	1.224	95% Gamma Adjusted KM-UCL (use when n<50)	1.294

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**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	0.947	Mean in Log Scale	-0.119
SD in Original Scale	0.353	SD in Log Scale	0.388

95% t UCL (assumes normality of ROS data)	1.166	95% Percentile Bootstrap UCL	1.136
95% BCA Bootstrap UCL	1.139	95% Bootstrap t UCL	1.18
95% H-UCL (Log ROS)	1.281		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.121	KM Geo Mean	0.886
KM SD (logged)	0.378	95% Critical H Value (KM-Log)	2.105
KM Standard Error of Mean (logged)	0.139	95% H-UCL (KM -Log)	1.261
KM SD (logged)	0.378	95% Critical H Value (KM-Log)	2.105
KM Standard Error of Mean (logged)	0.139		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.939	Mean in Log Scale	-0.131
SD in Original Scale	0.36	SD in Log Scale	0.397
95% t UCL (Assumes normality)	1.162	95% H-Stat UCL	1.28

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 1.177

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw17)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
		Number of Missing Observations	0
Minimum	1.7	Mean	2.4
Maximum	3.3	Median	2.25
SD	0.524	Std. Error of Mean	0.185
Coefficient of Variation	0.218	Skewness	0.692

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	0.939	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.201	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.283	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	2.751	95% Adjusted-CLT UCL (Chen-1995)	2.753
		95% Modified-t UCL (Johnson-1978)	2.758

Gamma GOF Test

A-D Test Statistic	0.277	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**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)	24.96	k star (bias corrected MLE)	15.68
Theta hat (MLE)	0.0962	Theta star (bias corrected MLE)	0.153
nu hat (MLE)	399.4	nu star (bias corrected)	250.9
MLE Mean (bias corrected)	2.4	MLE Sd (bias corrected)	0.606
		Approximate Chi Square Value (0.05)	215.3
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	206.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.798	95% Adjusted Gamma UCL (use when n<50)	2.911

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.531	Mean of logged Data	0.855
Maximum of Logged Data	1.194	SD of logged Data	0.213

Assuming Lognormal Distribution

95% H-UCL	2.818	90% Chebyshev (MVUE) UCL	2.943
95% Chebyshev (MVUE) UCL	3.19	97.5% Chebyshev (MVUE) UCL	3.532
99% Chebyshev (MVUE) UCL	4.204		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.705	95% Jackknife UCL	2.751
95% Standard Bootstrap UCL	2.688	95% Bootstrap-t UCL	2.919
95% Hall's Bootstrap UCL	3.446	95% Percentile Bootstrap UCL	2.7
95% BCA Bootstrap UCL	2.713		
90% Chebyshev(Mean, Sd) UCL	2.955	95% Chebyshev(Mean, Sd) UCL	3.207
97.5% Chebyshev(Mean, Sd) UCL	3.556	99% Chebyshev(Mean, Sd) UCL	4.242

Suggested UCL to Use

95% Student's-t UCL 2.751

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw18)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	2.3	Minimum Non-Detect	5.3
Maximum Detect	4.2	Maximum Non-Detect	5.3
Variance Detects	0.559	Percent Non-Detects	12.5%
Mean Detects	3.029	SD Detects	0.748
Median Detects	2.9	CV Detects	0.247
Skewness Detects	0.829	Kurtosis Detects	-0.956
Mean of Logged Detects	1.083	SD of Logged Detects	0.236

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	0.871	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.23	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	3.029	KM Standard Error of Mean	0.283
KM SD	0.692	95% KM (BCA) UCL	3.486
95% KM (t) UCL	3.564	95% KM (Percentile Bootstrap) UCL	3.483
95% KM (z) UCL	3.493	95% KM Bootstrap t UCL	4.153
90% KM Chebyshev UCL	3.876	95% KM Chebyshev UCL	4.26
97.5% KM Chebyshev UCL	4.793	99% KM Chebyshev UCL	5.84

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.436	Anderson-Darling GOF Test
5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.207	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)	20.45	k star (bias corrected MLE)	11.78
Theta hat (MLE)	0.148	Theta star (bias corrected MLE)	0.257
nu hat (MLE)	286.2	nu star (bias corrected)	164.9
Mean (detects)	3.029		

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	2.3	Mean	3.024
Maximum	4.2	Median	2.946
SD	0.692	CV	0.229
k hat (MLE)	23.33	k star (bias corrected MLE)	14.67
Theta hat (MLE)	0.13	Theta star (bias corrected MLE)	0.206
nu hat (MLE)	373.3	nu star (bias corrected)	234.7
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (234.67, α)	200.2	Adjusted Chi Square Value (234.67, β)	192.1
95% Gamma Approximate UCL (use when n>=50)	3.545	95% Gamma Adjusted UCL (use when n<50)	3.694

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3.029	SD (KM)	0.692
Variance (KM)	0.479	SE of Mean (KM)	0.283
k hat (KM)	19.14	k star (KM)	12.05
nu hat (KM)	306.3	nu star (KM)	192.7
theta hat (KM)	0.158	theta star (KM)	0.251
80% gamma percentile (KM)	3.728	90% gamma percentile (KM)	4.187
95% gamma percentile (KM)	4.592	99% gamma percentile (KM)	5.418

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (192.75, α)	161.6	Adjusted Chi Square Value (192.75, β)	154.4
95% Gamma Approximate KM-UCL (use when n>=50)	3.612	95% Gamma Adjusted KM-UCL (use when n<50)	3.781

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.189	**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	3.019	Mean in Log Scale	1.083
SD in Original Scale	0.693	SD in Log Scale	0.219
95% t UCL (assumes normality of ROS data)	3.483	95% Percentile Bootstrap UCL	3.413
95% BCA Bootstrap UCL	3.469	95% Bootstrap t UCL	3.803
95% H-UCL (Log ROS)	3.56		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.083	KM Geo Mean	2.955
KM SD (logged)	0.219	95% Critical H Value (KM-Log)	1.963
KM Standard Error of Mean (logged)	0.0893	95% H-UCL (KM -Log)	3.56
KM SD (logged)	0.219	95% Critical H Value (KM-Log)	1.963
KM Standard Error of Mean (logged)	0.0893		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.981	Mean in Log Scale	1.07
SD in Original Scale	0.705	SD in Log Scale	0.222
95% t UCL (Assumes normality)	3.454	95% H-Stat UCL	3.524

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 3.564

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (nfmw5)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	5
Number of Detects	3	Number of Non-Detects	6
Number of Distinct Detects	3	Number of Distinct Non-Detects	3
Minimum Detect	0.29	Minimum Non-Detect	0.27
Maximum Detect	1.3	Maximum Non-Detect	1.3
Variance Detects	0.333	Percent Non-Detects	66.67%
Mean Detects	0.633	SD Detects	0.577
Median Detects	0.31	CV Detects	0.912
Skewness Detects	1.73	Kurtosis Detects	N/A
Mean of Logged Detects	-0.716	SD of Logged Detects	0.848

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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	0.765	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.379	**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	0.393	KM Standard Error of Mean	0.131
KM SD	0.321	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.637	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.609	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.786	95% KM Chebyshev UCL	0.965
97.5% KM Chebyshev UCL	1.212	99% KM Chebyshev UCL	1.697

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	2.083	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.304	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	12.5	nu star (bias corrected)	N/A
Mean (detects)	0.633		

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	0.218
Maximum	1.3	Median	0.01
SD	0.425	CV	1.951
k hat (MLE)	0.373	k star (bias corrected MLE)	0.323
Theta hat (MLE)	0.584	Theta star (bias corrected MLE)	0.675
nu hat (MLE)	6.714	nu star (bias corrected)	5.809
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (5.81, α)	1.543	Adjusted Chi Square Value (5.81, β)	1.128
95% Gamma Approximate UCL (use when n>=50)	0.82	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.393	SD (KM)	0.321
Variance (KM)	0.103	SE of Mean (KM)	0.131
k hat (KM)	1.503	k star (KM)	1.076
nu hat (KM)	27.05	nu star (KM)	19.36
theta hat (KM)	0.262	theta star (KM)	0.366
80% gamma percentile (KM)	0.629	90% gamma percentile (KM)	0.89
95% gamma percentile (KM)	1.148	99% gamma percentile (KM)	1.746

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (19.36, α)	10.38	Adjusted Chi Square Value (19.36, β)	9.03
95% Gamma Approximate KM-UCL (use when n>=50)	0.734	95% Gamma Adjusted KM-UCL (use when n<50)	0.844

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.371	**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	0.259	Mean in Log Scale	-2.081
SD in Original Scale	0.403	SD in Log Scale	1.218
95% t UCL (assumes normality of ROS data)	0.509	95% Percentile Bootstrap UCL	0.508
95% BCA Bootstrap UCL	0.606	95% Bootstrap t UCL	1.088
95% H-UCL (Log ROS)	1.312		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-1.104	KM Geo Mean	0.332
KM SD (logged)	0.486	95% Critical H Value (KM-Log)	2.215

KM Standard Error of Mean (logged)	0.199	95% H-UCL (KM -Log)	0.546
KM SD (logged)	0.486	95% Critical H Value (KM-Log)	2.215
KM Standard Error of Mean (logged)	0.199		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.399	Mean in Log Scale	-1.253
SD in Original Scale	0.385	SD in Log Scale	0.832
95% t UCL (Assumes normality)	0.637	95% H-Stat UCL	0.941

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 0.637

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 (nfmw6)

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	0.29	Minimum Non-Detect	0.27
Maximum Detect	1.5	Maximum Non-Detect	5.3
Variance Detects	0.227	Percent Non-Detects	22.22%
Mean Detects	0.749	SD Detects	0.477
Median Detects	0.78	CV Detects	0.637
Skewness Detects	0.554	Kurtosis Detects	-1.108
Mean of Logged Detects	-0.483	SD of Logged Detects	0.69

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	0.882	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.244	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	0.689	KM Standard Error of Mean	0.169

KM SD	0.442	95% KM (BCA) UCL	0.956
95% KM (t) UCL	1.003	95% KM (Percentile Bootstrap) UCL	0.95
95% KM (z) UCL	0.967	95% KM Bootstrap t UCL	1.151
90% KM Chebyshev UCL	1.195	95% KM Chebyshev UCL	1.425
97.5% KM Chebyshev UCL	1.743	99% KM Chebyshev UCL	2.369

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.492	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.713	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.274	**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)	2.736	k star (bias corrected MLE)	1.658
Theta hat (MLE)	0.274	Theta star (bias corrected MLE)	0.451
nu hat (MLE)	38.3	nu star (bias corrected)	23.22
Mean (detects)	0.749		

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	0.647
Maximum	1.5	Median	0.571
SD	0.481	CV	0.743
k hat (MLE)	1.109	k star (bias corrected MLE)	0.814
Theta hat (MLE)	0.583	Theta star (bias corrected MLE)	0.795
nu hat (MLE)	19.97	nu star (bias corrected)	14.65
Adjusted Level of Significance (β)	0.0231		
Approximate Chi Square Value (14.65, α)	7.017	Adjusted Chi Square Value (14.65, β)	5.939
95% Gamma Approximate UCL (use when n>=50)	1.35	95% Gamma Adjusted UCL (use when n<50)	1.595

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.689	SD (KM)	0.442
Variance (KM)	0.196	SE of Mean (KM)	0.169
k hat (KM)	2.426	k star (KM)	1.691
nu hat (KM)	43.66	nu star (KM)	30.44
theta hat (KM)	0.284	theta star (KM)	0.407
80% gamma percentile (KM)	1.051	90% gamma percentile (KM)	1.394
95% gamma percentile (KM)	1.724	99% gamma percentile (KM)	2.464

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (30.44, α)	18.84	Adjusted Chi Square Value (30.44, β)	16.94
95% Gamma Approximate KM-UCL (use when n>=50)	1.113	95% Gamma Adjusted KM-UCL (use when n<50)	1.238

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.258	**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	0.652	Mean in Log Scale	-0.69
SD in Original Scale	0.466	SD in Log Scale	0.815
95% t UCL (assumes normality of ROS data)	0.941	95% Percentile Bootstrap UCL	0.9
95% BCA Bootstrap UCL	0.933	95% Bootstrap t UCL	0.992
95% H-UCL (Log ROS)	1.585		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.587	KM Geo Mean	0.556
KM SD (logged)	0.657	95% Critical H Value (KM-Log)	2.545
KM Standard Error of Mean (logged)	0.251	95% H-UCL (KM -Log)	1.247
KM SD (logged)	0.657	95% Critical H Value (KM-Log)	2.545
KM Standard Error of Mean (logged)	0.251		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.892	Mean in Log Scale	-0.49
SD in Original Scale	0.804	SD in Log Scale	0.955
95% t UCL (Assumes normality)	1.39	95% H-Stat UCL	2.786

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 1.003

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 (waste fuel boiler well)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	2
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.45	Minimum Non-Detect	1.3
Maximum Detect	1.6	Maximum Non-Detect	5.3
Variance Detects	0.197	Percent Non-Detects	25%
Mean Detects	0.7	SD Detects	0.443
Median Detects	0.52	CV Detects	0.634
Skewness Detects	2.386	Kurtosis Detects	5.757
Mean of Logged Detects	-0.47	SD of Logged Detects	0.47

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	0.595	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.423	**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	0.674	KM Standard Error of Mean	0.158
KM SD	0.38	95% KM (BCA) UCL	0.936
95% KM (t) UCL	0.973	95% KM (Percentile Bootstrap) UCL	0.936
95% KM (z) UCL	0.934	95% KM Bootstrap t UCL	2.808
90% KM Chebyshev UCL	1.148	95% KM Chebyshev UCL	1.362
97.5% KM Chebyshev UCL	1.659	99% KM Chebyshev UCL	2.244

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.173	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.699	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.398	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.333	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)	4.569	k star (bias corrected MLE)	2.395
Theta hat (MLE)	0.153	Theta star (bias corrected MLE)	0.292
nu hat (MLE)	54.82	nu star (bias corrected)	28.75
Mean (detects)	0.7		

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	0.45	Mean	0.673
Maximum	1.6	Median	0.539
SD	0.379	CV	0.562
k hat (MLE)	5.842	k star (bias corrected MLE)	3.734
Theta hat (MLE)	0.115	Theta star (bias corrected MLE)	0.18
nu hat (MLE)	93.47	nu star (bias corrected)	59.75
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (59.75, α)	42.98	Adjusted Chi Square Value (59.75, β)	39.4
95% Gamma Approximate UCL (use when n>=50)	0.936	95% Gamma Adjusted UCL (use when n<50)	1.021

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.674	SD (KM)	0.38
Variance (KM)	0.145	SE of Mean (KM)	0.158
k hat (KM)	3.14	k star (KM)	2.046
nu hat (KM)	50.25	nu star (KM)	32.74
theta hat (KM)	0.215	theta star (KM)	0.33
80% gamma percentile (KM)	1.007	90% gamma percentile (KM)	1.304
95% gamma percentile (KM)	1.588	99% gamma percentile (KM)	2.216

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (32.74, α)	20.66	Adjusted Chi Square Value (32.74, β)	18.27
95% Gamma Approximate KM-UCL (use when n>=50)	1.069	95% Gamma Adjusted KM-UCL (use when n<50)	1.208

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.673	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.368	**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	0.671	Mean in Log Scale	-0.488
SD in Original Scale	0.379	SD in Log Scale	0.399
95% t UCL (assumes normality of ROS data)	0.924	95% Percentile Bootstrap UCL	0.928
95% BCA Bootstrap UCL	1.071	95% Bootstrap t UCL	1.969
95% H-UCL (Log ROS)	0.925		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.497	KM Geo Mean	0.608
KM SD (logged)	0.404	95% Critical H Value (KM-Log)	2.2
KM Standard Error of Mean (logged)	0.168	95% H-UCL (KM -Log)	0.923
KM SD (logged)	0.404	95% Critical H Value (KM-Log)	2.2
KM Standard Error of Mean (logged)	0.168		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.938	Mean in Log Scale	-0.285
SD in Original Scale	0.787	SD in Log Scale	0.645
95% t UCL (Assumes normality)	1.465	95% H-Stat UCL	1.757

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	0.973	KM H-UCL	0.923
95% KM (BCA) UCL	0.936		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and 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 5.14/28/2021 3:44:15 PM
From File	Rev2_OU2 ProUCL Input 04.28.2021.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

TEQ (ND = 1/2 DL) (mcsmw1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
		Number of Missing Observations	0
Minimum	9.9930E-7	Mean	9.9930E-7
Maximum	9.9930E-7	Median	9.9930E-7

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable TEQ (ND = 1/2 DL) (mcsmw1) 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.

TEQ (ND = 1/2 DL) (mw4)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable TEQ (ND = 1/2 DL) (mw4) 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.

TEQ (ND = 1/2 DL) (mw7)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable TEQ (ND = 1/2 DL) (mw7) 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.

TEQ (ND = 1/2 DL) (nfmw13)

General Statistics

Total Number of Observations	4	Number of Distinct Observations	4
Number of Detects	0	Number of Non-Detects	4
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 TEQ (ND = 1/2 DL) (nfmw13) was not processed!

TEQ (ND = 1/2 DL) (nfmw14)

General Statistics

Total Number of Observations	5	Number of Distinct Observations	5
Number of Detects	0	Number of Non-Detects	5
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 TEQ (ND = 1/2 DL) (nfmw14) was not processed!

TEQ (ND = 1/2 DL) (nfmw15)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	1.4913E-6	Mean	2.0025E-6
Maximum	2.6052E-6	Median	1.9617E-6
SD	4.0932E-7	Std. Error of Mean	1.4472E-7
Coefficient of Variation	N/A	Skewness	0.211

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	0.929	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.19	Lilliefors GOF Test
5% Lilliefors Critical Value	0.283	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	2.2767E-6	95% Adjusted-CLT UCL (Chen-1995)	2.2521E-6
		95% Modified-t UCL (Johnson-1978)	2.2785E-6

Gamma GOF Test

A-D Test Statistic	0.346	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.187	**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)	27.36	k star (bias corrected MLE)	17.18
Theta hat (MLE)	7.3197E-8	Theta star (bias corrected MLE)	1.1655E-7
nu hat (MLE)	437.7	nu star (bias corrected)	274.9
MLE Mean (bias corrected)	2.0025E-6	MLE Sd (bias corrected)	4.8311E-7
		Approximate Chi Square Value (0.05)	237.5
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	228.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.3179E-6	95% Adjusted Gamma UCL (use when n<50)	2.4073E-6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-13.42	Mean of logged Data	-13.14
Maximum of Logged Data	-12.86	SD of logged Data	0.205

Assuming Lognormal Distribution

95% H-UCL	2.3357E-6	90% Chebyshev (MVUE) UCL	2.4395E-6
95% Chebyshev (MVUE) UCL	2.6375E-6	97.5% Chebyshev (MVUE) UCL	2.9122E-6
99% Chebyshev (MVUE) UCL	3.4518E-6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.2406E-6	95% Jackknife UCL	2.2767E-6
95% Standard Bootstrap UCL	2.2219E-6	95% Bootstrap-t UCL	2.3032E-6
95% Hall's Bootstrap UCL	2.2035E-6	95% Percentile Bootstrap UCL	2.2291E-6
95% BCA Bootstrap UCL	2.2219E-6		
90% Chebyshev(Mean, Sd) UCL	2.4367E-6	95% Chebyshev(Mean, Sd) UCL	2.6333E-6
97.5% Chebyshev(Mean, Sd) UCL	2.9063E-6	99% Chebyshev(Mean, Sd) UCL	3.4424E-6

Suggested UCL to Use

95% Student's-t UCL 2.28E-06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

TEQ (ND = 1/2 DL) (nfmw16)

General Statistics

Total Number of Observations	11	Number of Distinct Observations	11
Number of Detects	10	Number of Non-Detects	1
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	1.1394E-6	Minimum Non-Detect	1.0082E-6
Maximum Detect	5.0918E-6	Maximum Non-Detect	1.0082E-6
Variance Detects	1.633E-12	Percent Non-Detects	9.091%
Mean Detects	1.9538E-6	SD Detects	1.2781E-6
Median Detects	1.4179E-6	CV Detects	N/A
Skewness Detects	2.075	Kurtosis Detects	3.998
Mean of Logged Detects	-13.28	SD of Logged Detects	0.5

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.683	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.335	**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	1.8678E-6	KM Standard Error of Mean	3.7744E-7
KM SD	1.1876E-6	95% KM (BCA) UCL	2.5609E-6
95% KM (t) UCL	2.5519E-6	95% KM (Percentile Bootstrap) UCL	2.5241E-6
95% KM (z) UCL	2.4887E-6	95% KM Bootstrap t UCL	4.3811E-6
90% KM Chebyshev UCL	3.0002E-6	95% KM Chebyshev UCL	3.51E-06
97.5% KM Chebyshev UCL	4.2250E-6	99% KM Chebyshev UCL	5.6234E-6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.107	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.73	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.278	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.268	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)	3.866	k star (bias corrected MLE)	2.773
Theta hat (MLE)	5.0536E-7	Theta star (bias corrected MLE)	7.0458E-7
nu hat (MLE)	77.32	nu star (bias corrected)	55.46
Mean (detects)	1.9538E-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	1.1394E-6	Mean	9.1087E-4
Maximum	0.01	Median	1.5788E-6
SD	0.00301	CV	3.31
k hat (MLE)	0.141	k star (bias corrected MLE)	0.163
Theta hat (MLE)	0.00645	Theta star (bias corrected MLE)	0.00558
nu hat (MLE)	3.106	nu star (bias corrected)	3.593
Adjusted Level of Significance (β)	0.0278		
Approximate Chi Square Value (3.59, α)	0.568	Adjusted Chi Square Value (3.59, β)	0.408
95% Gamma Approximate UCL (use when n>=50)	0.00576	95% Gamma Adjusted UCL (use when n<50)	0.00801

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.8678E-6	SD (KM)	1.1876E-6
Variance (KM)	1.410E-12	SE of Mean (KM)	3.7744E-7
k hat (KM)	2.474	k star (KM)	1.86
nu hat (KM)	54.42	nu star (KM)	40.91
theta hat (KM)	7.5510E-7	theta star (KM)	1.0044E-6
80% gamma percentile (KM)	2.8204E-6	90% gamma percentile (KM)	3.6958E-6
95% gamma percentile (KM)	4.5344E-6	99% gamma percentile (KM)	6.4027E-6

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (40.91, α)	27.25	Adjusted Chi Square Value (40.91, β)	25.45
95% Gamma Approximate KM-UCL (use when n>=50)	2.8039E-6	95% Gamma Adjusted KM-UCL (use when n<50)	3.0029E-6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.79	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.24	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	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	1.8260E-6	Mean in Log Scale	-13.38
SD in Original Scale	1.2845E-6	SD in Log Scale	0.586
95% t UCL (assumes normality of ROS data)	2.5279E-6	95% Percentile Bootstrap UCL	2.4642E-6
95% BCA Bootstrap UCL	2.7409E-6	95% Bootstrap t UCL	3.8256E-6
95% H-UCL (Log ROS)	2.7948E-6		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-13.33	KM Geo Mean	1.6275E-6
KM SD (logged)	0.477	95% Critical H Value (KM-Log)	2.147
KM Standard Error of Mean (logged)	0.152	95% H-UCL (KM -Log)	2.5220E-6
KM SD (logged)	0.477	95% Critical H Value (KM-Log)	2.147
KM Standard Error of Mean (logged)	0.152		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.8220E-6	Mean in Log Scale	-13.39
SD in Original Scale	1.2889E-6	SD in Log Scale	0.601
95% t UCL (Assumes normality)	2.5264E-6	95% H-Stat UCL	2.8407E-6

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 2.52E-06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

TEQ (ND = 1/2 DL) (nfmw17)

General Statistics

Total Number of Observations	5	Number of Distinct Observations	5
Number of Detects	1	Number of Non-Detects	4
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 TEQ (ND = 1/2 DL) (nfmw17) was not processed!

TEQ (ND = 1/2 DL) (nfmw18)

General Statistics

Total Number of Observations	3	Number of Distinct Observations	3
		Number of Missing Observations	0
Minimum	1.3192E-6	Mean	1.4514E-6
Maximum	1.6429E-6	Median	1.3922E-6
SD	1.6979E-7	Std. Error of Mean	9.8030E-8
Coefficient of Variation	N/A	Skewness	1.38

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	0.909	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.767	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.303	Lilliefors GOF Test
5% Lilliefors Critical Value	0.425	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	1.7377E-6	95% Adjusted-CLT UCL (Chen-1995)	1.6961E-6
		95% Modified-t UCL (Johnson-1978)	1.7507E-6

Gamma GOF Test

Not Enough Data to Perform GOF Test

Gamma Statistics

k hat (MLE)	113.1	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.2833E-8	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	678.6	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A
		Approximate Chi Square Value (0.05)	N/A
Adjusted Level of Significance	N/A	Adjusted Chi Square Value	N/A

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	N/A	95% Adjusted Gamma UCL (use when n<50)	N/A

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.767	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.294	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.425	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-13.54	Mean of logged Data	-13.45
Maximum of Logged Data	-13.32	SD of logged Data	0.114

Assuming Lognormal Distribution

95% H-UCL	1.8259E-6	90% Chebyshev (MVUE) UCL	1.7384E-6
95% Chebyshev (MVUE) UCL	1.8684E-6	97.5% Chebyshev (MVUE) UCL	2.0488E-6
99% Chebyshev (MVUE) UCL	2.4033E-6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.6127E-6	95% Jackknife UCL	1.7377E-6
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	1.7455E-6	95% Chebyshev(Mean, Sd) UCL	1.8787E-6
97.5% Chebyshev(Mean, Sd) UCL	2.0636E-6	99% Chebyshev(Mean, Sd) UCL	2.4268E-6

Suggested UCL to Use

95% Student's-t UCL 1.74E-06

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.

TEQ (ND = 1/2 DL) (nfmw5)

General Statistics

Total Number of Observations	5	Number of Distinct Observations	5

Number of Detects	2	Number of Non-Detects	3
Number of Distinct Detects	2	Number of Distinct Non-Detects	3
Minimum Detect	9.8300E-7	Minimum Non-Detect	1.2690E-6
Maximum Detect	1.6545E-6	Maximum Non-Detect	1.9586E-6
Variance Detects	2.255E-13	Percent Non-Detects	60%
Mean Detects	1.3188E-6	SD Detects	4.7484E-7
Median Detects	1.3188E-6	CV Detects	N/A
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-13.57	SD of Logged Detects	0.368

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

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

Not Enough Data to Perform GOF Test

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.1509E-6	KM Standard Error of Mean	2.0561E-7
KM SD	2.9078E-7	95% KM (BCA) UCL	N/A
95% KM (t) UCL	1.5892E-6	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	1.4891E-6	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	1.7677E-6	95% KM Chebyshev UCL	2.0471E-6
97.5% KM Chebyshev UCL	2.4349E-6	99% KM Chebyshev UCL	3.1967E-6

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	15.09	k star (bias corrected MLE)	N/A
Theta hat (MLE)	8.7418E-8	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	60.34	nu star (bias corrected)	N/A
Mean (detects)	1.3188E-6		

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.1509E-6	SD (KM)	2.9078E-7
Variance (KM)	8.455E-14	SE of Mean (KM)	2.0561E-7
k hat (KM)	15.67	k star (KM)	6.399
nu hat (KM)	156.7	nu star (KM)	63.99
theta hat (KM)	7.3468E-8	theta star (KM)	1.7984E-7
80% gamma percentile (KM)	1.5061E-6	90% gamma percentile (KM)	1.7587E-6
95% gamma percentile (KM)	1.9867E-6	99% gamma percentile (KM)	2.4633E-6

Gamma Kaplan-Meier (KM) Statistics

		Adjusted Level of Significance (β)	0.0086
Approximate Chi Square Value (63.99, α)	46.59	Adjusted Chi Square Value (63.99, β)	40.18
95% Gamma Approximate KM-UCL (use when n>=50)	1.5808E-6	95% Gamma Adjusted KM-UCL (use when n<50)	1.8330E-6

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	1.1408E-6	Mean in Log Scale	-13.71
SD in Original Scale	2.9165E-7	SD in Log Scale	0.226
95% t UCL (assumes normality of ROS data)	1.4189E-6	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	1.4746E-6		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-13.7	KM Geo Mean	1.1197E-6
KM SD (logged)	0.225	95% Critical H Value (KM-Log)	2.246
KM Standard Error of Mean (logged)	0.159	95% H-UCL (KM -Log)	1.4794E-6
KM SD (logged)	0.225	95% Critical H Value (KM-Log)	2.246
KM Standard Error of Mean (logged)	0.159		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	9.8757E-7	Mean in Log Scale	-13.89
SD in Original Scale	4.0627E-7	SD in Log Scale	0.379
95% t UCL (Assumes normality)	1.3749E-6	95% H-Stat UCL	1.6347E-6

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	1.59E-06	KM H-UCL	1.4794E-6
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.

TEQ (ND = 1/2 DL) (nfmw6)

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	7	Number of Non-Detects	1
Number of Distinct Detects	7	Number of Distinct Non-Detects	1
Minimum Detect	7.2523E-7	Minimum Non-Detect	1.0781E-6
Maximum Detect	1.9964E-6	Maximum Non-Detect	1.0781E-6
Variance Detects	1.618E-13	Percent Non-Detects	12.5%
Mean Detects	1.2831E-6	SD Detects	4.0220E-7
Median Detects	1.3498E-6	CV Detects	N/A
Skewness Detects	0.557	Kurtosis Detects	1.159
Mean of Logged Detects	-13.61	SD of Logged Detects	0.322

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	0.948	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.238	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	1.2277E-6	KM Standard Error of Mean	1.4637E-7
KM SD	3.8006E-7	95% KM (BCA) UCL	1.4822E-6
95% KM (t) UCL	1.5050E-6	95% KM (Percentile Bootstrap) UCL	1.4510E-6
95% KM (z) UCL	1.4685E-6	95% KM Bootstrap t UCL	1.5288E-6
90% KM Chebyshev UCL	1.6668E-6	95% KM Chebyshev UCL	1.8658E-6
97.5% KM Chebyshev UCL	2.1418E-6	99% KM Chebyshev UCL	2.6841E-6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.271	Anderson-Darling GOF Test	
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.197	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.312	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)	11.75	k star (bias corrected MLE)	6.81
Theta hat (MLE)	1.0920E-7	Theta star (bias corrected MLE)	1.8843E-7
nu hat (MLE)	164.5	nu star (bias corrected)	95.33
Mean (detects)	1.2831E-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	7.2523E-7	Mean	0.00125
Maximum	0.01	Median	1.3669E-6
SD	0.00354	CV	2.826
k hat (MLE)	0.135	k star (bias corrected MLE)	0.167
Theta hat (MLE)	0.0093	Theta star (bias corrected MLE)	0.00747
nu hat (MLE)	2.153	nu star (bias corrected)	2.679
Adjusted Level of Significance (β)	0.0195		
Approximate Chi Square Value (2.68, α)	0.284	Adjusted Chi Square Value (2.68, β)	0.164
95% Gamma Approximate UCL (use when n>=50)	0.0118	95% Gamma Adjusted UCL (use when n<50)	0.0204

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.2277E-6	SD (KM)	3.8006E-7
Variance (KM)	1.444E-13	SE of Mean (KM)	1.4637E-7
k hat (KM)	10.43	k star (KM)	6.605
nu hat (KM)	167	nu star (KM)	105.7
theta hat (KM)	1.1765E-7	theta star (KM)	1.8587E-7

80% gamma percentile (KM)	1.6014E-6	90% gamma percentile (KM)	1.8658E-6
95% gamma percentile (KM)	2.1042E-6	99% gamma percentile (KM)	2.6018E-6

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (105.68, α)	82.96	Adjusted Chi Square Value (105.68, β)	77.88
95% Gamma Approximate KM-UCL (use when n>=50)	1.5640E-6	95% Gamma Adjusted KM-UCL (use when n<50)	1.6661E-6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.196	**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	1.2276E-6	Mean in Log Scale	-13.66
SD in Original Scale	4.0409E-7	SD in Log Scale	0.327
95% t UCL (assumes normality of ROS data)	1.4983E-6	95% Percentile Bootstrap UCL	1.4530E-6
95% BCA Bootstrap UCL	1.4880E-6	95% Bootstrap t UCL	1.5374E-6
95% H-UCL (Log ROS)	1.6007E-6		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-13.66	KM Geo Mean	1.1705E-6
KM SD (logged)	0.311	95% Critical H Value (KM-Log)	2.072
KM Standard Error of Mean (logged)	0.121	95% H-UCL (KM -Log)	1.5668E-6
KM SD (logged)	0.311	95% Critical H Value (KM-Log)	2.072
KM Standard Error of Mean (logged)	0.121		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.1901E-6	Mean in Log Scale	-13.71
SD in Original Scale	4.5592E-7	SD in Log Scale	0.417
95% t UCL (Assumes normality)	1.4955E-6	95% H-Stat UCL	1.7151E-6

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 1.51E-06

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

TEQ (ND = 1/2 DL) (waste fuel boiler well)

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	8
Number of Distinct Detects	1	Number of Distinct Non-Detects	8

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 TEQ (ND = 1/2 DL) (waste fuel boiler well) was not processed!

TEQ (ND = 1/2 DL) (wfb1)

General Statistics

Total Number of Observations	1	Number of Distinct Observations	1
Number of Detects	0	Number of Non-Detects	1
Number of Distinct Detects	0	Number of Distinct Non-Detects	1

Warning: This data set only has 1 observations!
Data set is too small to compute reliable and meaningful statistics and estimates!
The data set for variable TEQ (ND = 1/2 DL) (wfb1) 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.

APPENDIX D

Detailed Risk Calculations

OU2 Smurfit-Stone/Frenchtown Mill Site
Human Health Risk Assessment

Population **Hypothetical Future Residents**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	1.50E-06	3.87E-06
Cancer	2.57E-07	1.44E-06
Cancer MMOA	3.45E-06	9.44E-06

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
	TEQ-D/F (ND=1/2 DL)	5.4E-06	1.00	8.0E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.4E-12	7.7E-12	130000	2E-07	1E-06
	Aroclor-1254	1.4E-01	1.00	2.1E-07	5.5E-07	2.0E-05	1E-02	3E-02	3.6E-08	2.0E-07	2	7E-08	4E-07
	Aluminum	7.4E+03	1.00	1.1E-02	2.9E-02	1.0E+00	1E-02	3E-02					
	Arsenic	4.8E+00	0.60	4.3E-06	1.1E-05	3.0E-04	1E-02	4E-02	7.3E-07	4.1E-06	1.5	1E-06	6E-06
1	Chromium	1.3E+01	1.00	2.0E-05	5.1E-05	3.0E-03	7E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	5.6E+00	1.00	8.4E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.7E-02	7.0E-01	3E-02	8E-02					
	Manganese	6.4E+02	1.00	9.5E-04	2.5E-03	2.4E-02	4E-02	1E-01					
	Thallium	8.3E-02	1.00	1.2E-07	3.2E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F (ND=1/2 DL)	3.5E-06	1.00	5.3E-12	1.4E-11	7.0E-10	8E-03	2E-02	9.0E-13	5.1E-12	130000	1E-07	7E-07
	Aroclor-1254	2.5E-02	1.00	3.7E-08	9.6E-08	2.0E-05	2E-03	5E-03	6.3E-09	3.6E-08	2	1E-08	7E-08
	Aluminum	6.6E+03	1.00	9.8E-03	2.5E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.5E+00	0.60	3.1E-06	8.1E-06	3.0E-04	1E-02	3E-02	5.4E-07	3.0E-06	1.5	8E-07	5E-06
2	Chromium	9.9E+00	1.00	1.5E-05	3.8E-05	3.0E-03	5E-03	1E-02	3.4E-05	9.3E-05	0.5	2E-05	5E-05
	Cobalt	3.6E+00	1.00	5.4E-06	1.4E-05	3.0E-04	2E-02	5E-02					
	Iron	9.5E+03	1.00	1.4E-02	3.7E-02	7.0E-01	2E-02	5E-02					
	Manganese	2.9E+02	1.00	4.4E-04	1.1E-03	2.4E-02	2E-02	5E-02					
	Thallium	9.9E-02	1.00	1.5E-07	3.8E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F (ND=1/2 DL)	1.6E-06	1.00	2.4E-12	6.2E-12	7.0E-10	3E-03	9E-03	4.1E-13	2.3E-12	130000	5E-08	3E-07
	Aroclor-1254	3.2E-02	1.00	4.8E-08	1.2E-07	2.0E-05	2E-03	6E-03	8.2E-09	4.6E-08	2	2E-08	9E-08
	Aluminum	1.1E+04	1.00	1.7E-02	4.4E-02	1.0E+00	2E-02	4E-02					
	Arsenic	3.9E+00	0.60	3.5E-06	9.1E-06	3.0E-04	1E-02	3E-02	6.0E-07	3.4E-06	1.5	9E-07	5E-06
4	Chromium	1.0E+01	1.00	1.5E-05	3.9E-05	3.0E-03	5E-03	1E-02	3.5E-05	9.6E-05	0.5	2E-05	5E-05
	Cobalt	4.8E+00	1.00	7.2E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.2E+04	1.00	1.8E-02	4.8E-02	7.0E-01	3E-02	7E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.2E-01	1.00	1.8E-07	4.7E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F (ND=1/2 DL)	1.5E-06	1.00	2.2E-12	5.6E-12	7.0E-10	3E-03	8E-03	3.7E-13	2.1E-12	130000	5E-08	3E-07
	Aroclor-1254	2.1E-03	1.00	3.1E-09	7.9E-09	2.0E-05	2E-04	4E-04	5.3E-10	2.9E-09	2	1E-09	6E-09
	Aluminum	6.2E+03	1.00	9.3E-03	2.4E-02	1.0E+00	9E-03	2E-02					
	Arsenic	3.3E+00	0.60	3.0E-06	7.7E-06	3.0E-04	1E-02	3E-02	5.1E-07	2.9E-06	1.5	8E-07	4E-06
5	Chromium	7.1E+00	1.00	1.1E-05	2.7E-05	3.0E-03	4E-03	9E-03	2.4E-05	6.7E-05	0.5	1E-05	3E-05
	Cobalt	3.4E+00	1.00	5.0E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Iron	7.8E+03	1.00	1.2E-02	3.0E-02	7.0E-01	2E-02	4E-02					
	Manganese	3.7E+02	1.00	5.5E-04	1.4E-03	2.4E-02	2E-02	6E-02					
	Thallium	2.3E-01	1.00	3.5E-07	8.9E-07	1.0E-05	3E-02	9E-02					
	TEQ-D/F (ND=1/2 DL)	2.2E-05	1.00	3.3E-11	8.6E-11	7.0E-10	5E-02	1E-01	5.7E-12	3.2E-11	130000	7E-07	4E-06
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.9E+03	1.00	1.3E-02	3.4E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.2E+00	0.60	2.9E-06	7.4E-06	3.0E-04	1E-02	2E-02	4.9E-07	2.8E-06	1.5	7E-07	4E-06
6	Chromium	1.2E+01	1.00	1.9E-05	4.8E-05	3.0E-03	6E-03	2E-02	4.3E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	4.0E+00	1.00	6.0E-06	1.5E-05	3.0E-04	2E-02	5E-02					
	Iron	1.1E+04	1.00	1.6E-02	4.1E-02	7.0E-01	2E-02	6E-02					
	Manganese	3.5E+02	1.00	5.3E-04	1.4E-03	2.4E-02	2E-02	6E-02					
	Thallium	9.0E-02	1.00	1.3E-07	3.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F (ND=1/2 DL)	6.0E-07	1.00	9.1E-13	2.3E-12	7.0E-10	1E-03	3E-03	1.6E-13	8.7E-13	130000	2E-08	1E-07
	Aroclor-1254	3.2E-02	1.00	4.8E-08	1.2E-07	2.0E-05	2E-03	6E-03	8.2E-09	4.6E-08	2	2E-08	9E-08
	Aluminum	1.9E+04	1.00	2.8E-02	7.3E-02	1.0E+00	3E-02	7E-02					
	Arsenic	2.8E+00	0.60	2.5E-06	6.5E-06	3.0E-04	8E-03	2E-02	4.3E-07	2.4E-06	1.5	6E-07	4E-06
7	Chromium	1.3E+01	1.00	1.9E-05	4.8E-05	3.0E-03	6E-03	2E-02	4.3E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	6.0E+00	1.00	9.0E-06	2.3E-05	3.0E-04	3E-02	8E-02					
	Iron	1.7E+04	1.00	2.5E-02	6.5E-02	7.0E-01	4E-02	9E-02					
	Manganese	3.9E+02	1.00	5.8E-04	1.5E-03	2.4E-02	2E-02	6E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					
	TEQ-D/F (ND=1/2 DL)	8.8E-06	1.00	1.3E-11	3.4E-11	7.0E-10	2E-02	5E-02	2.3E-12	1.3E-11	130000	3E-07	2E-06
	Aroclor-1254	4.1E-01	1.00	6.2E-07	1.6E-06	2.0E-05	3E-02	8E-02	1.1E-07	5.9E-07	2	2E-07	1E-06
	Aluminum	1.3E+04	1.00	1.9E-02	5.0E-02	1.0E+00	2E-02	5E-02					
	Arsenic	4.7E+00	0.60	4.2E-06	1.1E-05	3.0E-04	1E-02	4E-02	7.2E-07	4.1E-06	1.5	1E-06	6E-06
8	Chromium	4.0E+01	1.00	5.9E-05	1.5E-04	3.0E-03	2E-02	5E-02	1.4E-04	3.7E-04	0.5	7E-05	2E-04
	Cobalt	6.9E+00	1.00	1.0E-05	2.7E-05	3.0E-04	3E-02	9E-02					
	Iron	3.7E+04	1.00	5.6E-02	1.4E-01	7.0E-01	8E-02	2E-01					
	Manganese	4.6E+02	1.00	6.9E-04	1.8E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					
	TEQ-D/F (ND=1/2 DL)	9.0E-06	1.00	1.3E-11	3.5E-11	7.0E-10	2E-02	5E-02	2.3E-12	1.3E-11	130000	3E-07	2E-06
	Aroclor-1254	1.6E-02	1.00	2.4E-08	6.3E-08	2.0E-05	1E-03	3E-03	4.2E-09	2.3E-08	2	8E-09	5E-08
	Aluminum	1.1E+04	1.00	1.6E-02	4.2E-02	1.0E+00	2E-02	4E-02					
	Arsenic	4.1E+00	0.60	3.7E-06	9.5E-06	3.0E-04	1E-02	3E-02	6.3E-07	3.5E-06	1.5	9E-07	5E-06
9	Chromium	1.0E+01	1.00	1.6E-05	4.0E-05	3.0E-03	5E-03	1E-02	3.6E-05	9.8E-05	0.5	2E-05	5E-05
	Cobalt	4.8E+00	1.00	7.2E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.2E+04	1.00	1.9E-02	4.8E-02	7.0E-01	3E-02	7E-02					
	Manganese	2.9E+02	1.00	4.3E-04	1.1E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.2E-01	1.00	1.7E-07	4.5E-07	1.0E-05	2E-02	4E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg\text{-}d)^{-1}$	CTE	RME
	TEQ-D/F (ND=1/2 DL)	3.1E-06	1.00	4.6E-12	1.2E-11	7.0E-10	7E-03	2E-02	7.8E-13	4.4E-12	130000	1E-07	6E-07
	Aroclor-1254	4.8E-03	1.00	7.2E-09	1.9E-08	2.0E-05	4E-04	9E-04	1.2E-09	6.9E-09	2	2E-09	1E-08
	Aluminum	8.3E+03	1.00	1.2E-02	3.2E-02	1.0E+00	1E-02	3E-02					
	Arsenic	2.6E+00	0.60	2.4E-06	6.1E-06	3.0E-04	8E-03	2E-02	4.0E-07	2.3E-06	1.5	6E-07	3E-06
11	Chromium	1.1E+01	1.00	1.7E-05	4.4E-05	3.0E-03	6E-03	1E-02	4.0E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	4.2E+00	1.00	6.3E-06	1.6E-05	3.0E-04	2E-02	5E-02					
	Iron	1.1E+04	1.00	1.7E-02	4.3E-02	7.0E-01	2E-02	6E-02					
	Manganese	2.5E+02	1.00	3.8E-04	9.8E-04	2.4E-02	2E-02	4E-02					
	Thallium	9.8E-02	1.00	1.5E-07	3.8E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F (ND=1/2 DL)	3.4E-06	1.00	5.1E-12	1.3E-11	7.0E-10	7E-03	2E-02	8.7E-13	4.9E-12	130000	1E-07	6E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.4E+04	1.00	2.2E-02	5.6E-02	1.0E+00	2E-02	6E-02					
	Arsenic	7.7E+00	0.60	6.9E-06	1.8E-05	3.0E-04	2E-02	6E-02	1.2E-06	6.6E-06	1.5	2E-06	1E-05
12	Chromium	1.8E+01	1.00	2.7E-05	6.9E-05	3.0E-03	9E-03	2E-02	6.1E-05	1.7E-04	0.5	3E-05	8E-05
	Cobalt	5.2E+00	1.00	7.7E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.8E-02	7.0E-01	3E-02	8E-02					
	Manganese	1.6E+03	1.00	2.4E-03	6.3E-03	2.4E-02	1E-01	3E-01					
	Thallium	9.0E-02	1.00	1.3E-07	3.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F (ND=1/2 DL)	4.0E-06	1.00	6.0E-12	1.5E-11	7.0E-10	9E-03	2E-02	1.0E-12	5.7E-12	130000	1E-07	7E-07
	Aroclor-1254	5.7E-03	1.00	8.5E-09	2.2E-08	2.0E-05	4E-04	1E-03	1.5E-09	8.2E-09	2	3E-09	2E-08
	Aluminum	1.5E+04	1.00	2.2E-02	5.6E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.2E+00	0.60	4.6E-06	1.2E-05	3.0E-04	2E-02	4E-02	7.9E-07	4.5E-06	1.5	1E-06	7E-06
13	Chromium	1.2E+01	1.00	1.7E-05	4.5E-05	3.0E-03	6E-03	1E-02	4.0E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	6.3E+00	1.00	9.5E-06	2.5E-05	3.0E-04	3E-02	8E-02					
	Iron	1.5E+04	1.00	2.3E-02	5.9E-02	7.0E-01	3E-02	8E-02					
	Manganese	4.9E+02	1.00	7.3E-04	1.9E-03	2.4E-02	3E-02	8E-02					
	Thallium	1.3E-01	1.00	2.0E-07	5.1E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F (ND=1/2 DL)	2.1E-05	1.00	3.1E-11	8.0E-11	7.0E-10	4E-02	1E-01	5.3E-12	3.0E-11	130000	7E-07	4E-06
	Aroclor-1254	1.0E-01	1.00	1.6E-07	4.0E-07	2.0E-05	8E-03	2E-02	2.7E-08	1.5E-07	2	5E-08	3E-07
	Aluminum	1.0E+04	1.00	1.5E-02	4.0E-02	1.0E+00	2E-02	4E-02					
	Arsenic	4.1E+00	0.60	3.7E-06	9.6E-06	3.0E-04	1E-02	3E-02	6.3E-07	3.6E-06	1.5	1E-06	5E-06
14	Chromium	1.6E+01	1.00	2.4E-05	6.1E-05	3.0E-03	8E-03	2E-02	5.5E-05	1.5E-04	0.5	3E-05	7E-05
	Cobalt	5.1E+00	1.00	7.6E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.3E-02	6.0E-02	7.0E-01	3E-02	9E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.1E-01	1.00	1.7E-07	4.4E-07	1.0E-05	2E-02	4E-02					
	TEQ-D/F (ND=1/2 DL)	1.6E-06	1.00	2.4E-12	6.2E-12	7.0E-10	3E-03	9E-03	4.1E-13	2.3E-12	130000	5E-08	3E-07
	Aroclor-1254	2.8E-03	1.00	4.2E-09	1.1E-08	2.0E-05	2E-04	5E-04	7.2E-10	4.0E-09	2	1E-09	8E-09
	Aluminum	5.1E+03	1.00	7.6E-03	2.0E-02	1.0E+00	8E-03	2E-02					
	Arsenic	2.3E+00	0.60	2.0E-06	5.3E-06	3.0E-04	7E-03	2E-02	3.5E-07	2.0E-06	1.5	5E-07	3E-06
15	Chromium	1.1E+01	1.00	1.7E-05	4.4E-05	3.0E-03	6E-03	1E-02	3.9E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	3.0E+00	1.00	4.5E-06	1.2E-05	3.0E-04	2E-02	4E-02					
	Iron	8.7E+03	1.00	1.3E-02	3.4E-02	7.0E-01	2E-02	5E-02					
	Manganese	2.0E+02	1.00	2.9E-04	7.6E-04	2.4E-02	1E-02	3E-02					
	Thallium	6.6E-02	1.00	9.9E-08	2.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F (ND=1/2 DL)	5.3E-06	1.00	8.0E-12	2.1E-11	7.0E-10	1E-02	3E-02	1.4E-12	7.6E-12	130000	2E-07	1E-06
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03	1.00	1.2E-02	3.1E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.3E+00	0.60	3.0E-06	7.7E-06	3.0E-04	1E-02	3E-02	5.1E-07	2.8E-06	1.5	8E-07	4E-06
16	Chromium	9.2E+00	1.00	1.4E-05	3.6E-05	3.0E-03	5E-03	1E-02	3.2E-05	8.7E-05	0.5	2E-05	4E-05
	Cobalt	4.4E+00	1.00	6.6E-06	1.7E-05	3.0E-04	2E-02	6E-02					
	Iron	1.1E+04	1.00	1.6E-02	4.2E-02	7.0E-01	2E-02	6E-02					
	Manganese	3.1E+02	1.00	4.6E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.0E-01	1.00	1.5E-07	3.9E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F (ND=1/2 DL)	2.2E-06	1.00	3.3E-12	8.6E-12	7.0E-10	5E-03	1E-02	5.7E-13	3.2E-12	130000	7E-08	4E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03	1.00	1.5E-02	3.8E-02	1.0E+00	1E-02	4E-02					
	Arsenic	4.0E+00	0.60	3.6E-06	9.3E-06	3.0E-04	1E-02	3E-02	6.2E-07	3.5E-06	1.5	9E-07	5E-06
17	Chromium	1.2E+01	1.00	1.8E-05	4.6E-05	3.0E-03	6E-03	2E-02	4.1E-05	1.1E-04	0.5	2E-05	6E-05
	Cobalt	5.0E+00	1.00	7.5E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.3E+04	1.00	1.9E-02	4.9E-02	7.0E-01	3E-02	7E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.0E-01	1.00	1.5E-07	4.0E-07	1.0E-05	2E-02	4E-02					
	TEQ-D/F (ND=1/2 DL)	6.8E-06	1.00	1.0E-11	2.6E-11	7.0E-10	1E-02	4E-02	1.7E-12	9.8E-12	130000	2E-07	1E-06
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.5E+04	1.00	2.2E-02	5.8E-02	1.0E+00	2E-02	6E-02					
	Arsenic	4.4E+00	0.60	4.0E-06	1.0E-05	3.0E-04	1E-02	3E-02	6.8E-07	3.8E-06	1.5	1E-06	6E-06
18	Chromium	1.3E+01	1.00	1.9E-05	5.0E-05	3.0E-03	6E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	5.7E+00	1.00	8.5E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.7E-02	7.0E-01	3E-02	8E-02					
	Manganese	5.3E+02	1.00	7.9E-04	2.0E-03	2.4E-02	3E-02	8E-02					
	Thallium	1.4E-01	1.00	2.1E-07	5.4E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F (ND=1/2 DL)	2.9E-06	1.00	4.4E-12	1.1E-11	7.0E-10	6E-03	2E-02	7.5E-13	4.2E-12	130000	1E-07	5E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	2.3E+04	1.00	3.4E-02	8.7E-02	1.0E+00	3E-02	9E-02					
	Arsenic	4.3E+00	0.60	3.9E-06	1.0E-05	3.0E-04	1E-02	3E-02	6.6E-07	3.7E-06	1.5	1E-06	6E-06
19	Chromium	1.4E+01	1.00	2.1E-05	5.5E-05	3.0E-03	7E-03	2E-02	4.9E-05	1.3E-04	0.5	2E-05	7E-05
	Cobalt	6.7E+00	1.00	1.0E-05	2.6E-05	3.0E-04	3E-02	9E-02					
	Iron	1.9E+04	1.00	2.8E-02	7.2E-02	7.0E-01	4E-02	1E-01					
	Manganese	4.3E+02	1.00	6.4E-04	1.7E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.9E-01	1.00	2.8E-07	7.4E-07	1.0E-05	3E-02	7E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	$(mg/kg-d)^{-1}$	CTE	RME
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	1.00	2.2E-11	5.7E-11	7.0E-10	3E-02	8E-02	3.8E-12	2.1E-11	130000	5E-07	3E-06
	Aroclor-1254	2.5E-02	1.00	3.7E-08	9.7E-08	2.0E-05	2E-03	5E-03	6.4E-09	3.6E-08	2	1E-08	7E-08
	Aluminum	1.6E+04	1.00	2.3E-02	6.0E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.4E+00	0.60	4.9E-06	1.3E-05	3.0E-04	2E-02	4E-02	8.4E-07	4.7E-06	1.5	1E-06	7E-06
	Chromium	1.4E+01	1.00	2.1E-05	5.4E-05	3.0E-03	7E-03	2E-02	4.9E-05	1.3E-04	0.5	2E-05	7E-05
	Cobalt	6.3E+00	1.00	9.5E-06	2.4E-05	3.0E-04	3E-02	8E-02					
	Iron	1.7E+04	1.00	2.5E-02	6.4E-02	7.0E-01	4E-02	9E-02					
	Manganese	4.4E+02	1.00	6.5E-04	1.7E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.7E-07	1.0E-05	2E-02	6E-02					
23	TEQ-D/F (ND=1/2 DL)	6.9E-07	1.00	1.0E-12	2.7E-12	7.0E-10	1E-03	4E-03	1.8E-13	1.0E-12	130000	2E-08	1E-07
	Aroclor-1254	5.0E-03	1.00	7.4E-09	1.9E-08	2.0E-05	4E-04	1E-03	1.3E-09	7.1E-09	2	3E-09	1E-08
	Aluminum	1.7E+04	1.00	2.5E-02	6.4E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.3E+00	0.60	4.8E-06	1.2E-05	3.0E-04	2E-02	4E-02	8.2E-07	4.6E-06	1.5	1E-06	7E-06
	Chromium	1.3E+01	1.00	1.9E-05	5.0E-05	3.0E-03	6E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	7.1E+00	1.00	1.1E-05	2.7E-05	3.0E-04	4E-02	9E-02					
	Iron	1.6E+04	1.00	2.4E-02	6.3E-02	7.0E-01	3E-02	9E-02					
	Manganese	4.0E+02	1.00	6.0E-04	1.6E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					

Population **Hypothetical Future Residents**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	1.50E-06	3.87E-06
Cancer	2.57E-07	1.44E-06
Cancer MMOA	3.45E-06	9.44E-06

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	1.00	2.0E-11	5.3E-11	7.0E-10	3E-02	8E-02	3.5E-12	2.0E-11	130000	5E-07	3E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	1.00	2.9E-07	7.5E-07				5.0E-08	2.8E-07	2	1E-07	6E-07
	Aluminum	7.4E+03	1.00	1.1E-02	2.9E-02	1.0E+00	1E-02	3E-02					
	Arsenic	4.8E+00	0.60	4.3E-06	1.1E-05	3.0E-04	1E-02	4E-02	7.3E-07	4.1E-06	1.5	1E-06	6E-06
1	Chromium	1.3E+01	1.00	2.0E-05	5.1E-05	3.0E-03	7E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	5.6E+00	1.00	8.4E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.7E-02	7.0E-01	3E-02	8E-02					
	Manganese	6.4E+02	1.00	9.5E-04	2.5E-03	2.4E-02	4E-02	1E-01					
	Thallium	8.3E-02	1.00	1.2E-07	3.2E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	1.00	7.9E-12	2.0E-11	7.0E-10	1E-02	3E-02	1.4E-12	7.6E-12	130000	2E-07	1E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	1.00	4.3E-08	1.1E-07				7.3E-09	4.1E-08	2	1E-08	8E-08
	Aluminum	6.6E+03	1.00	9.8E-03	2.5E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.5E+00	0.60	3.1E-06	8.1E-06	3.0E-04	1E-02	3E-02	5.4E-07	3.0E-06	1.5	8E-07	5E-06
2	Chromium	9.9E+00	1.00	1.5E-05	3.8E-05	3.0E-03	5E-03	1E-02	3.4E-05	9.3E-05	0.5	2E-05	5E-05
	Cobalt	3.6E+00	1.00	5.4E-06	1.4E-05	3.0E-04	2E-02	5E-02					
	Iron	9.5E+03	1.00	1.4E-02	3.7E-02	7.0E-01	2E-02	5E-02					
	Manganese	2.9E+02	1.00	4.4E-04	1.1E-03	2.4E-02	2E-02	5E-02					
	Thallium	9.9E-02	1.00	1.5E-07	3.8E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	1.00	9.7E-12	2.5E-11	7.0E-10	1E-02	4E-02	1.7E-12	9.3E-12	130000	2E-07	1E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	1.7E-07	4.3E-07				2.9E-08	1.6E-07	2	6E-08	3E-07
	Aluminum	1.1E+04	1.00	1.7E-02	4.4E-02	1.0E+00	2E-02	4E-02					
	Arsenic	3.9E+00	0.60	3.5E-06	9.1E-06	3.0E-04	1E-02	3E-02	6.0E-07	3.4E-06	1.5	9E-07	5E-06
4	Chromium	1.0E+01	1.00	1.5E-05	3.9E-05	3.0E-03	5E-03	1E-02	3.5E-05	9.6E-05	0.5	2E-05	5E-05
	Cobalt	4.8E+00	1.00	7.2E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.2E+04	1.00	1.8E-02	4.8E-02	7.0E-01	3E-02	7E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.2E-01	1.00	1.8E-07	4.7E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	6.2E+03	1.00	9.3E-03	2.4E-02	1.0E+00	9E-03	2E-02					
	Arsenic	3.3E+00	0.60	3.0E-06	7.7E-06	3.0E-04	1E-02	3E-02	5.1E-07	2.9E-06	1.5	8E-07	4E-06
5	Chromium	7.1E+00	1.00	1.1E-05	2.7E-05	3.0E-03	4E-03	9E-03	2.4E-05	6.7E-05	0.5	1E-05	3E-05
	Cobalt	3.4E+00	1.00	5.0E-06	1.3E-05	3.0E-04	2E-02	4E-02					
	Iron	7.8E+03	1.00	1.2E-02	3.0E-02	7.0E-01	2E-02	4E-02					
	Manganese	3.7E+02	1.00	5.5E-04	1.4E-03	2.4E-02	2E-02	6E-02					
	Thallium	2.3E-01	1.00	3.5E-07	8.9E-07	1.0E-05	3E-02	9E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.9E+03	1.00	1.3E-02	3.4E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.2E+00	0.60	2.9E-06	7.4E-06	3.0E-04	1E-02	2E-02	4.9E-07	2.8E-06	1.5	7E-07	4E-06
6	Chromium	1.2E+01	1.00	1.9E-05	4.8E-05	3.0E-03	6E-03	2E-02	4.3E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	4.0E+00	1.00	6.0E-06	1.5E-05	3.0E-04	2E-02	5E-02					
	Iron	1.1E+04	1.00	1.6E-02	4.1E-02	7.0E-01	2E-02	6E-02					
	Manganese	3.5E+02	1.00	5.3E-04	1.4E-03	2.4E-02	2E-02	6E-02					
	Thallium	9.0E-02	1.00	1.3E-07	3.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	1.00	9.7E-12	2.5E-11	7.0E-10	1E-02	4E-02	1.7E-12	9.3E-12	130000	2E-07	1E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	1.7E-07	4.3E-07				2.9E-08	1.6E-07	2	6E-08	3E-07
	Aluminum	1.9E+04	1.00	2.8E-02	7.3E-02	1.0E+00	3E-02	7E-02					
	Arsenic	2.8E+00	0.60	2.5E-06	6.5E-06	3.0E-04	8E-03	2E-02	4.3E-07	2.4E-06	1.5	6E-07	4E-06
7	Chromium	1.3E+01	1.00	1.9E-05	4.8E-05	3.0E-03	6E-03	2E-02	4.3E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	6.0E+00	1.00	9.0E-06	2.3E-05	3.0E-04	3E-02	8E-02					
	Iron	1.7E+04	1.00	2.5E-02	6.5E-02	7.0E-01	4E-02	9E-02					
	Manganese	3.9E+02	1.00	5.8E-04	1.5E-03	2.4E-02	2E-02	6E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-05	1.00	6.3E-11	1.6E-10	7.0E-10	9E-02	2E-01	1.1E-11	6.1E-11	130000	1E-06	8E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E+00	1.00	1.5E-06	3.9E-06				2.6E-07	1.4E-06	2	5E-07	3E-06
	Aluminum	1.3E+04	1.00	1.9E-02	5.0E-02	1.0E+00	2E-02	5E-02					
	Arsenic	4.7E+00	0.60	4.2E-06	1.1E-05	3.0E-04	1E-02	4E-02	7.2E-07	4.1E-06	1.5	1E-06	6E-06
8	Chromium	4.0E+01	1.00	5.9E-05	1.5E-04	3.0E-03	2E-02	5E-02	1.4E-04	3.7E-04	0.5	7E-05	2E-04
	Cobalt	6.9E+00	1.00	1.0E-05	2.7E-05	3.0E-04	3E-02	9E-02					
	Iron	3.7E+04	1.00	5.6E-02	1.4E-01	7.0E-01	8E-02	2E-01					
	Manganese	4.6E+02	1.00	6.9E-04	1.8E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	1.00	1.6E-11	4.0E-11	7.0E-10	2E-02	6E-02	2.7E-12	1.5E-11	130000	3E-07	2E-06
	Total Non-coplanarPCBs (ND=1/2 DL)	3.3E-02	1.00	4.9E-08	1.3E-07				8.4E-09	4.7E-08	2	2E-08	9E-08
	Aluminum	1.1E+04	1.00	1.6E-02	4.2E-02	1.0E+00	2E-02	4E-02					
	Arsenic	4.1E+00	0.60	3.7E-06	9.5E-06	3.0E-04	1E-02	3E-02	6.3E-07	3.5E-06	1.5	9E-07	5E-06
9	Chromium	1.0E+01	1.00	1.6E-05	4.0E-05	3.0E-03	5E-03	1E-02	3.6E-05	9.8E-05	0.5	2E-05	5E-05
	Cobalt	4.8E+00	1.00	7.2E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.2E+04	1.00	1.9E-02	4.8E-02	7.0E-01	3E-02	7E-02					
	Manganese	2.9E+02	1.00	4.3E-04	1.1E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.2E-01	1.00	1.7E-07	4.5E-07	1.0E-05	2E-02	4E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.3E+03	1.00	1.2E-02	3.2E-02	1.0E+00	1E-02	3E-02					
	Arsenic	2.6E+00	0.60	2.4E-06	6.1E-06	3.0E-04	8E-03	2E-02	4.0E-07	2.3E-06	1.5	6E-07	3E-06
11	Chromium	1.1E+01	1.00	1.7E-05	4.4E-05	3.0E-03	6E-03	1E-02	4.0E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	4.2E+00	1.00	6.3E-06	1.6E-05	3.0E-04	2E-02	5E-02					
	Iron	1.1E+04	1.00	1.7E-02	4.3E-02	7.0E-01	2E-02	6E-02					
	Manganese	2.5E+02	1.00	3.8E-04	9.8E-04	2.4E-02	2E-02	4E-02					
	Thallium	9.8E-02	1.00	1.5E-07	3.8E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanarPCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	1.4E+04	1.00	2.2E-02	5.6E-02	1.0E+00	2E-02	6E-02					
	Arsenic	7.7E+00	0.60	6.9E-06	1.8E-05	3.0E-04	2E-02	6E-02	1.2E-06	6.6E-06	1.5	2E-06	1E-05
12	Chromium	1.8E+01	1.00	2.7E-05	6.9E-05	3.0E-03	9E-03	2E-02	6.1E-05	1.7E-04	0.5	3E-05	8E-05
	Cobalt	5.2E+00	1.00	7.7E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.8E-02	7.0E-01	3E-02	8E-02					
	Manganese	1.6E+03	1.00	2.4E-03	6.3E-03	2.4E-02	1E-01	3E-01					
	Thallium	9.0E-02	1.00	1.3E-07	3.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	3.8E-06	1.00	5.7E-12	1.5E-11	7.0E-10	8E-03	2E-02	9.8E-13	5.5E-12	130000	1E-07	7E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.5E-02	1.00	2.2E-08	5.7E-08				3.8E-09	2.1E-08	2	8E-09	4E-08
	Aluminum	1.5E+04	1.00	2.2E-02	5.6E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.2E+00	0.60	4.6E-06	1.2E-05	3.0E-04	2E-02	4E-02	7.9E-07	4.5E-06	1.5	1E-06	7E-06
13	Chromium	1.2E+01	1.00	1.7E-05	4.5E-05	3.0E-03	6E-03	1E-02	4.0E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	6.3E+00	1.00	9.5E-06	2.5E-05	3.0E-04	3E-02	8E-02					
	Iron	1.5E+04	1.00	2.3E-02	5.9E-02	7.0E-01	3E-02	8E-02					
	Manganese	4.9E+02	1.00	7.3E-04	1.9E-03	2.4E-02	3E-02	8E-02					
	Thallium	1.3E-01	1.00	2.0E-07	5.1E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	3.0E-05	1.00	4.6E-11	1.2E-10	7.0E-10	7E-02	2E-01	7.8E-12	4.4E-11	130000	1E-06	6E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	6.7E-02	1.00	1.0E-07	2.6E-07				1.7E-08	9.6E-08	2	3E-08	2E-07
	Aluminum	1.0E+04	1.00	1.5E-02	4.0E-02	1.0E+00	2E-02	4E-02					
	Arsenic	4.1E+00	0.60	3.7E-06	9.6E-06	3.0E-04	1E-02	3E-02	6.3E-07	3.6E-06	1.5	1E-06	5E-06
14	Chromium	1.6E+01	1.00	2.4E-05	6.1E-05	3.0E-03	8E-03	2E-02	5.5E-05	1.5E-04	0.5	3E-05	7E-05
	Cobalt	5.1E+00	1.00	7.6E-06	2.0E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.3E-02	6.0E-02	7.0E-01	3E-02	9E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.1E-01	1.00	1.7E-07	4.4E-07	1.0E-05	2E-02	4E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	5.1E+03	1.00	7.6E-03	2.0E-02	1.0E+00	8E-03	2E-02					
	Arsenic	2.3E+00	0.60	2.0E-06	5.3E-06	3.0E-04	7E-03	2E-02	3.5E-07	2.0E-06	1.5	5E-07	3E-06
15	Chromium	1.1E+01	1.00	1.7E-05	4.4E-05	3.0E-03	6E-03	1E-02	3.9E-05	1.1E-04	0.5	2E-05	5E-05
	Cobalt	3.0E+00	1.00	4.5E-06	1.2E-05	3.0E-04	2E-02	4E-02					
	Iron	8.7E+03	1.00	1.3E-02	3.4E-02	7.0E-01	2E-02	5E-02					
	Manganese	2.0E+02	1.00	2.9E-04	7.6E-04	2.4E-02	1E-02	3E-02					
	Thallium	6.6E-02	1.00	9.9E-08	2.5E-07	1.0E-05	1E-02	3E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.0E+03	1.00	1.2E-02	3.1E-02	1.0E+00	1E-02	3E-02					
	Arsenic	3.3E+00	0.60	3.0E-06	7.7E-06	3.0E-04	1E-02	3E-02	5.1E-07	2.8E-06	1.5	8E-07	4E-06
16	Chromium	9.2E+00	1.00	1.4E-05	3.6E-05	3.0E-03	5E-03	1E-02	3.2E-05	8.7E-05	0.5	2E-05	4E-05
	Cobalt	4.4E+00	1.00	6.6E-06	1.7E-05	3.0E-04	2E-02	6E-02					
	Iron	1.1E+04	1.00	1.6E-02	4.2E-02	7.0E-01	2E-02	6E-02					
	Manganese	3.1E+02	1.00	4.6E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.0E-01	1.00	1.5E-07	3.9E-07	1.0E-05	1E-02	4E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	9.9E+03	1.00	1.5E-02	3.8E-02	1.0E+00	1E-02	4E-02					
	Arsenic	4.0E+00	0.60	3.6E-06	9.3E-06	3.0E-04	1E-02	3E-02	6.2E-07	3.5E-06	1.5	9E-07	5E-06
17	Chromium	1.2E+01	1.00	1.8E-05	4.6E-05	3.0E-03	6E-03	2E-02	4.1E-05	1.1E-04	0.5	2E-05	6E-05
	Cobalt	5.0E+00	1.00	7.5E-06	1.9E-05	3.0E-04	2E-02	6E-02					
	Iron	1.3E+04	1.00	1.9E-02	4.9E-02	7.0E-01	3E-02	7E-02					
	Manganese	3.2E+02	1.00	4.8E-04	1.2E-03	2.4E-02	2E-02	5E-02					
	Thallium	1.0E-01	1.00	1.5E-07	4.0E-07	1.0E-05	2E-02	4E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	1.5E+04	1.00	2.2E-02	5.8E-02	1.0E+00	2E-02	6E-02					
	Arsenic	4.4E+00	0.60	4.0E-06	1.0E-05	3.0E-04	1E-02	3E-02	6.8E-07	3.8E-06	1.5	1E-06	6E-06
18	Chromium	1.3E+01	1.00	1.9E-05	5.0E-05	3.0E-03	6E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	5.7E+00	1.00	8.5E-06	2.2E-05	3.0E-04	3E-02	7E-02					
	Iron	1.5E+04	1.00	2.2E-02	5.7E-02	7.0E-01	3E-02	8E-02					
	Manganese	5.3E+02	1.00	7.9E-04	2.0E-03	2.4E-02	3E-02	8E-02					
	Thallium	1.4E-01	1.00	2.1E-07	5.4E-07	1.0E-05	2E-02	5E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	2.3E+04	1.00	3.4E-02	8.7E-02	1.0E+00	3E-02	9E-02					
	Arsenic	4.3E+00	0.60	3.9E-06	1.0E-05	3.0E-04	1E-02	3E-02	6.6E-07	3.7E-06	1.5	1E-06	6E-06
19	Chromium	1.4E+01	1.00	2.1E-05	5.5E-05	3.0E-03	7E-03	2E-02	4.9E-05	1.3E-04	0.5	2E-05	7E-05
	Cobalt	6.7E+00	1.00	1.0E-05	2.6E-05	3.0E-04	3E-02	9E-02					
	Iron	1.9E+04	1.00	2.8E-02	7.2E-02	7.0E-01	4E-02	1E-01					
	Manganese	4.3E+02	1.00	6.4E-04	1.7E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.9E-01	1.00	2.8E-07	7.4E-07	1.0E-05	3E-02	7E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	1.00	4.0E-11	1.0E-10	7.0E-10	6E-02	1E-01	6.8E-12	3.8E-11	130000	9E-07	5E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	1.00	1.5E-07	4.0E-07				2.7E-08	1.5E-07	2	5E-08	3E-07
	Aluminum	1.6E+04	1.00	2.3E-02	6.0E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.4E+00	0.60	4.9E-06	1.3E-05	3.0E-04	2E-02	4E-02	8.4E-07	4.7E-06	1.5	1E-06	7E-06
	Chromium	1.4E+01	1.00	2.1E-05	5.4E-05	3.0E-03	7E-03	2E-02	4.9E-05	1.3E-04	0.5	2E-05	7E-05
	Cobalt	6.3E+00	1.00	9.5E-06	2.4E-05	3.0E-04	3E-02	8E-02					
	Iron	1.7E+04	1.00	2.5E-02	6.4E-02	7.0E-01	4E-02	9E-02					
	Manganese	4.4E+02	1.00	6.5E-04	1.7E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.7E-07	1.0E-05	2E-02	6E-02					
23	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-06	1.00	1.5E-12	3.9E-12	7.0E-10	2E-03	6E-03	2.6E-13	1.5E-12	130000	3E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	6.9E-03	1.00	1.0E-08	2.7E-08				1.8E-09	1.0E-08	2	4E-09	2E-08
	Aluminum	1.7E+04	1.00	2.5E-02	6.4E-02	1.0E+00	2E-02	6E-02					
	Arsenic	5.3E+00	0.60	4.8E-06	1.2E-05	3.0E-04	2E-02	4E-02	8.2E-07	4.6E-06	1.5	1E-06	7E-06
	Chromium	1.3E+01	1.00	1.9E-05	5.0E-05	3.0E-03	6E-03	2E-02	4.5E-05	1.2E-04	0.5	2E-05	6E-05
	Cobalt	7.1E+00	1.00	1.1E-05	2.7E-05	3.0E-04	4E-02	9E-02					
	Iron	1.6E+04	1.00	2.4E-02	6.3E-02	7.0E-01	3E-02	9E-02					
	Manganese	4.0E+02	1.00	6.0E-04	1.6E-03	2.4E-02	3E-02	7E-02					
	Thallium	1.5E-01	1.00	2.2E-07	5.8E-07	1.0E-05	2E-02	6E-02					

Population **Hypothetical Future Residents**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.51E-06	1.09E-05
Cancer	2.58E-07	4.05E-06
Cancer MMOA	5.06E-06	3.85E-05

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F (ND=1/2 DL)	5.4E-06	0.03	2.4E-13	1.8E-12	7.0E-10	3E-04	3E-03	4.2E-14	6.5E-13	130000	5E-09	8E-08
	Aroclor-1254	1.4E-01	0.14	3.0E-08	2.2E-07	2.0E-05	1E-03	1E-02	5.1E-09	8.0E-08	2	1E-08	2E-07
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	2.2E-07	1.6E-06	3.0E-04	7E-04	5E-03	3.7E-08	5.8E-07	1.5	6E-08	9E-07
1	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.6E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	3.5E-06	0.03	1.6E-13	1.1E-12	7.0E-10	2E-04	2E-03	2.7E-14	4.3E-13	130000	4E-09	6E-08
	Aroclor-1254	2.5E-02	0.14	5.2E-09	3.8E-08	2.0E-05	3E-04	2E-03	8.9E-10	1.4E-08	2	2E-09	3E-08
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	1.6E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.7E-08	4.2E-07	1.5	4E-08	6E-07
2	Chromium	9.9E+00				7.5E-05					20		
	Cobalt	3.6E+00				3.0E-04							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	1.6E-06	0.03	7.2E-14	5.2E-13	7.0E-10	1E-04	7E-04	1.2E-14	1.9E-13	130000	2E-09	3E-08
	Aroclor-1254	3.2E-02	0.14	6.7E-09	4.9E-08	2.0E-05	3E-04	2E-03	1.1E-09	1.8E-08	2	2E-09	4E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	1.8E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.0E-08	4.7E-07	1.5	5E-08	7E-07
4	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	1.5E-06	0.03	6.6E-14	4.8E-13	7.0E-10	9E-05	7E-04	1.1E-14	1.8E-13	130000	1E-09	2E-08
	Aroclor-1254	2.1E-03	0.14	4.3E-10	3.1E-09	2.0E-05	2E-05	2E-04	7.4E-11	1.2E-09	2	1E-10	2E-09
	Aluminum	6.2E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.5E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.6E-08	4.0E-07	1.5	4E-08	6E-07
5	Chromium	7.1E+00				7.5E-05					20		
	Cobalt	3.4E+00				3.0E-04							
	Iron	7.8E+03				7.0E-01							
	Manganese	3.7E+02				9.6E-04							
	Thallium	2.3E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	2.2E-05	0.03	1.0E-12	7.2E-12	7.0E-10	1E-03	1E-02	1.7E-13	2.7E-12	130000	2E-08	3E-07
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.9E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	1.4E-07	1.0E-06	3.0E-04	5E-04	3E-03	2.5E-08	3.9E-07	1.5	4E-08	6E-07
6	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	4.0E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	6.0E-07	0.03	2.7E-14	2.0E-13	7.0E-10	4E-05	3E-04	4.7E-15	7.3E-14	130000	6E-10	1E-08
	Aroclor-1254	3.2E-02	0.14	6.7E-09	4.9E-08	2.0E-05	3E-04	2E-03	1.1E-09	1.8E-08	2	2E-09	4E-08
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	1.3E-07	9.2E-07	3.0E-04	4E-04	3E-03	2.2E-08	3.4E-07	1.5	3E-08	5E-07
7	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	6.0E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	8.8E-06	0.03	4.0E-13	2.9E-12	7.0E-10	6E-04	4E-03	6.8E-14	1.1E-12	130000	9E-09	1E-07
	Aroclor-1254	4.1E-01	0.14	8.7E-08	6.3E-07	2.0E-05	4E-03	3E-02	1.5E-08	2.3E-07	2	3E-08	5E-07
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	2.1E-07	1.5E-06	3.0E-04	7E-04	5E-03	3.6E-08	5.7E-07	1.5	5E-08	9E-07
8	Chromium	4.0E+01				7.5E-05					20		
	Cobalt	6.9E+00				3.0E-04							
	Iron	3.7E+04				7.0E-01							
	Manganese	4.6E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	9.0E-06	0.03	4.1E-13	2.9E-12	7.0E-10	6E-04	4E-03	7.0E-14	1.1E-12	130000	9E-09	1E-07
	Aroclor-1254	1.6E-02	0.14	3.4E-09	2.5E-08	2.0E-05	2E-04	1E-03	5.9E-10	9.2E-09	2	1E-09	2E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	1.9E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.2E-08	5.0E-07	1.5	5E-08	7E-07
9	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer						Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F (ND=1/2 DL)	3.1E-06	0.03	1.4E-13	1.0E-12	7.0E-10	2E-04	1E-03	2.4E-14	3.7E-13	130000	3E-09	5E-08
	Aroclor-1254	4.8E-03	0.14	1.0E-09	7.3E-09	2.0E-05	5E-05	4E-04	1.7E-10	2.7E-09	2	3E-10	5E-09
	Aluminum	8.3E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	1.2E-07	8.6E-07	3.0E-04	4E-04	3E-03	2.0E-08	3.2E-07	1.5	3E-08	5E-07
11	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	4.2E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.8E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	3.4E-06	0.03	1.5E-13	1.1E-12	7.0E-10	2E-04	2E-03	2.6E-14	4.1E-13	130000	3E-09	5E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	7.7E+00	0.03	3.5E-07	2.5E-06	3.0E-04	1E-03	8E-03	5.9E-08	9.3E-07	1.5	9E-08	1E-06
12	Chromium	1.8E+01				7.5E-05					20		
	Cobalt	5.2E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	1.6E+03				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	4.0E-06	0.03	1.8E-13	1.3E-12	7.0E-10	3E-04	2E-03	3.1E-14	4.8E-13	130000	4E-09	6E-08
	Aroclor-1254	5.7E-03	0.14	1.2E-09	8.7E-09	2.0E-05	6E-05	4E-04	2.1E-10	3.2E-09	2	4E-10	6E-09
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	2.3E-07	1.7E-06	3.0E-04	8E-04	6E-03	4.0E-08	6.3E-07	1.5	6E-08	9E-07
13	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.9E+02				9.6E-04							
	Thallium	1.3E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	2.1E-05	0.03	9.3E-13	6.7E-12	7.0E-10	1E-03	1E-02	1.6E-13	2.5E-12	130000	2E-08	3E-07
	Aroclor-1254	1.0E-01	0.14	2.2E-08	1.6E-07	2.0E-05	1E-03	8E-03	3.8E-09	5.9E-08	2	8E-09	1E-07
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	1.9E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.2E-08	5.0E-07	1.5	5E-08	8E-07
14	Chromium	1.6E+01				7.5E-05					20		
	Cobalt	5.1E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.1E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	1.6E-06	0.03	7.2E-14	5.2E-13	7.0E-10	1E-04	7E-04	1.2E-14	1.9E-13	130000	2E-09	3E-08
	Aroclor-1254	2.8E-03	0.14	5.9E-10	4.3E-09	2.0E-05	3E-05	2E-04	1.0E-10	1.6E-09	2	2E-10	3E-09
	Aluminum	5.1E+03				1.0E+00							
	Arsenic	2.3E+00	0.03	1.0E-07	7.4E-07	3.0E-04	3E-04	2E-03	1.8E-08	2.8E-07	1.5	3E-08	4E-07
15	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	3.0E+00				3.0E-04							
	Iron	8.7E+03				7.0E-01							
	Manganese	2.0E+02				9.6E-04							
	Thallium	6.6E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	5.3E-06	0.03	2.4E-13	1.7E-12	7.0E-10	3E-04	2E-03	4.1E-14	6.4E-13	130000	5E-09	8E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.5E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.6E-08	4.0E-07	1.5	4E-08	6E-07
16	Chromium	9.2E+00				7.5E-05					20		
	Cobalt	4.4E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	2.2E-06	0.03	1.0E-13	7.3E-13	7.0E-10	1E-04	1E-03	1.7E-14	2.7E-13	130000	2E-09	4E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	1.8E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.1E-08	4.9E-07	1.5	5E-08	7E-07
17	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	5.0E+00				3.0E-04							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	6.8E-06	0.03	3.1E-13	2.2E-12	7.0E-10	4E-04	3E-03	5.3E-14	8.2E-13	130000	7E-09	1E-07
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	4.4E+00	0.03	2.0E-07	1.4E-06	3.0E-04	7E-04	5E-03	3.4E-08	5.3E-07	1.5	5E-08	8E-07
18	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.7E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	5.3E+02				9.6E-04							
	Thallium	1.4E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	2.9E-06	0.03	1.3E-13	9.6E-13	7.0E-10	2E-04	1E-03	2.3E-14	3.6E-13	130000	3E-09	5E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	2.3E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	1.9E-07	1.4E-06	3.0E-04	6E-04	5E-03	3.3E-08	5.2E-07	1.5	5E-08	8E-07
19	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.7E+00				3.0E-04							
	Iron	1.9E+04				7.0E-01							
	Manganese	4.3E+02				9.6E-04							
	Thallium	1.9E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	0.03	6.6E-13	4.8E-12	7.0E-10	9E-04	7E-03	1.1E-13	1.8E-12	130000	1E-08	2E-07
	Aroclor-1254	2.5E-02	0.14	5.3E-09	3.8E-08	2.0E-05	3E-04	2E-03	9.0E-10	1.4E-08	2	2E-09	3E-08
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	2.5E-07	1.8E-06	3.0E-04	8E-04	6E-03	4.2E-08	6.6E-07	1.5	6E-08	1E-06
	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
23	TEQ-D/F (ND=1/2 DL)	6.9E-07	0.03	3.1E-14	2.3E-13	7.0E-10	4E-05	3E-04	5.4E-15	8.4E-14	130000	7E-10	1E-08
	Aroclor-1254	5.0E-03	0.14	1.0E-09	7.5E-09	2.0E-05	5E-05	4E-04	1.8E-10	2.8E-09	2	4E-10	6E-09
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.3E+00	0.03	2.4E-07	1.7E-06	3.0E-04	8E-04	6E-03	4.1E-08	6.4E-07	1.5	6E-08	1E-06
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	7.1E+00				3.0E-04							
	Iron	1.6E+04				7.0E-01							
	Manganese	4.0E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							

Population **Hypothetical Future Residents**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.51E-06	1.09E-05
Cancer	2.58E-07	4.05E-06
Cancer MMOA	5.06E-06	3.85E-05

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
		EPC		DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
1	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	0.03	6.2E-13	4.5E-12	7.0E-10	9E-04	6E-03	1.1E-13	1.7E-12	130000	1E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	0.14	4.1E-08	3.0E-07				7.0E-09	1.1E-07	2	1E-08	2E-07
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	2.2E-07	1.6E-06	3.0E-04	7E-04	5E-03	3.7E-08	5.8E-07	1.5	6E-08	9E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.6E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				1.0E-05							
2	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	0.03	2.4E-13	1.7E-12	7.0E-10	3E-04	2E-03	4.1E-14	6.4E-13	130000	5E-09	8E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	0.14	6.0E-09	4.3E-08				1.0E-09	1.6E-08	2	2E-09	3E-08
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	1.6E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.7E-08	4.2E-07	1.5	4E-08	6E-07
	Chromium	9.9E+00				7.5E-05					20		
	Cobalt	3.6E+00				3.0E-04							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				1.0E-05							
4	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	0.03	2.9E-13	2.1E-12	7.0E-10	4E-04	3E-03	5.0E-14	7.9E-13	130000	7E-09	1E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	2.3E-08	1.7E-07				4.0E-09	6.3E-08	2	8E-09	1E-07
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	1.8E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.0E-08	4.7E-07	1.5	5E-08	7E-07
	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							
5	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	6.2E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.5E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.6E-08	4.0E-07	1.5	4E-08	6E-07
	Chromium	7.1E+00				7.5E-05					20		
	Cobalt	3.4E+00				3.0E-04							
	Iron	7.8E+03				7.0E-01							
	Manganese	3.7E+02				9.6E-04							
	Thallium	2.3E-01				1.0E-05							
6	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.9E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	1.4E-07	1.0E-06	3.0E-04	5E-04	3E-03	2.5E-08	3.9E-07	1.5	4E-08	6E-07
	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	4.0E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
7	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	0.03	2.9E-13	2.1E-12	7.0E-10	4E-04	3E-03	5.0E-14	7.9E-13	130000	7E-09	1E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	2.3E-08	1.7E-07				4.0E-09	6.3E-08	2	8E-09	1E-07
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	1.3E-07	9.2E-07	3.0E-04	4E-04	3E-03	2.2E-08	3.4E-07	1.5	3E-08	5E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	6.0E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
8	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-05	0.03	1.9E-12	1.4E-11	7.0E-10	3E-03	2E-02	3.3E-13	5.1E-12	130000	4E-08	7E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E+00	0.14	2.1E-07	1.5E-06				3.6E-08	5.7E-07	2	7E-08	1E-06
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	2.1E-07	1.5E-06	3.0E-04	7E-04	5E-03	3.6E-08	5.7E-07	1.5	5E-08	9E-07
	Chromium	4.0E+01				7.5E-05					20		
	Cobalt	6.9E+00				3.0E-04							
	Iron	3.7E+04				7.0E-01							
	Manganese	4.6E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
9	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	0.03	4.7E-13	3.4E-12	7.0E-10	7E-04	5E-03	8.1E-14	1.3E-12	130000	1E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	0.14	6.9E-09	5.0E-08				1.2E-09	1.8E-08	2	2E-09	4E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	1.9E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.2E-08	5.0E-07	1.5	5E-08	7E-07
	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.3E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	1.2E-07	8.6E-07	3.0E-04	4E-04	3E-03	2.0E-08	3.2E-07	1.5	3E-08	5E-07
11	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	4.2E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.8E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	7.7E+00	0.03	3.5E-07	2.5E-06	3.0E-04	1E-03	8E-03	5.9E-08	9.3E-07	1.5	9E-08	1E-06
12	Chromium	1.8E+01				7.5E-05					20		
	Cobalt	5.2E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	1.6E+03				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.8E-06	0.03	1.7E-13	1.3E-12	7.0E-10	2E-04	2E-03	3.0E-14	4.6E-13	130000	4E-09	6E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.5E-02	0.14	3.1E-09	2.3E-08				5.3E-10	8.4E-09	2	1E-09	2E-08
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	2.3E-07	1.7E-06	3.0E-04	8E-04	6E-03	4.0E-08	6.3E-07	1.5	6E-08	9E-07
13	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.9E+02				9.6E-04							
	Thallium	1.3E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.0E-05	0.03	1.4E-12	9.9E-12	7.0E-10	2E-03	1E-02	2.4E-13	3.7E-12	130000	3E-08	5E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	6.7E-02	0.14	1.4E-08	1.0E-07				2.4E-09	3.8E-08	2	5E-09	8E-08
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	1.9E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.2E-08	5.0E-07	1.5	5E-08	8E-07
14	Chromium	1.6E+01				7.5E-05					20		
	Cobalt	5.1E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.1E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	5.1E+03				1.0E+00							
	Arsenic	2.3E+00	0.03	1.0E-07	7.4E-07	3.0E-04	3E-04	2E-03	1.8E-08	2.8E-07	1.5	3E-08	4E-07
15	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	3.0E+00				3.0E-04							
	Iron	8.7E+03				7.0E-01							
	Manganese	2.0E+02				9.6E-04							
	Thallium	6.6E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.5E-07	1.1E-06	3.0E-04	5E-04	4E-03	2.6E-08	4.0E-07	1.5	4E-08	6E-07
16	Chromium	9.2E+00				7.5E-05					20		
	Cobalt	4.4E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	1.8E-07	1.3E-06	3.0E-04	6E-04	4E-03	3.1E-08	4.9E-07	1.5	5E-08	7E-07
17	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	5.0E+00				3.0E-04							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	4.4E+00	0.03	2.0E-07	1.4E-06	3.0E-04	7E-04	5E-03	3.4E-08	5.3E-07	1.5	5E-08	8E-07
18	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.7E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	5.3E+02				9.6E-04							
	Thallium	1.4E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	2.3E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	1.9E-07	1.4E-06	3.0E-04	6E-04	5E-03	3.3E-08	5.2E-07	1.5	5E-08	8E-07
19	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.7E+00				3.0E-04							
	Iron	1.9E+04				7.0E-01							
	Manganese	4.3E+02				9.6E-04							
	Thallium	1.9E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	0.03	1.2E-12	8.7E-12	7.0E-10	2E-03	1E-02	2.1E-13	3.2E-12	130000	3E-08	4E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	0.14	2.2E-08	1.6E-07				3.7E-09	5.9E-08	2	7E-09	1E-07
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	2.5E-07	1.8E-06	3.0E-04	8E-04	6E-03	4.2E-08	6.6E-07	1.5	6E-08	1E-06
	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
23	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-06	0.03	4.6E-14	3.3E-13	7.0E-10	7E-05	5E-04	7.8E-15	1.2E-13	130000	1E-09	2E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	6.9E-03	0.14	1.5E-09	1.1E-08				2.5E-10	3.9E-09	2	5E-10	8E-09
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.3E+00	0.03	2.4E-07	1.7E-06	3.0E-04	8E-04	6E-03	4.1E-08	6.4E-07	1.5	6E-08	1E-06
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	7.1E+00				3.0E-04							
	Iron	1.6E+04				7.0E-01							
	Manganese	4.0E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							

Population	**Hypothetical Future Commercial/Industrial Workers**
Exposure Area	**Random 20-acre grids across OU2**
Medium	**Surface Soil**
Exposure Route	**Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
1	TEQ-D/F (ND=1/2 DL)	5.4E-06	1.00	2.0E-12	4.6E-12	7.0E-10	3E-03	7E-03	2.6E-13	1.6E-12	130000	3E-08	2E-07
	Aroclor-1254	1.4E-01	1.00	5.3E-08	1.2E-07	2.0E-05	3E-03	6E-03	6.8E-09	4.3E-08	2	1E-08	9E-08
	Aluminum	7.4E+03	1.00	2.8E-03	6.3E-03	1.0E+00	3E-03	6E-03					
	Arsenic	4.8E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1.4E-07	8.7E-07	1.5	2E-07	1E-06
	Chromium	1.3E+01	1.00	4.9E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.3E-07	4.0E-06	0.5	3E-07	2E-06
	Cobalt	5.6E+00	1.00	2.1E-06	4.8E-06	3.0E-04	7E-03	2E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	6.4E+02	1.00	2.4E-04	5.4E-04	2.4E-02	1E-02	2E-02					
	Thallium	8.3E-02	1.00	3.1E-08	7.1E-08	1.0E-05	3E-03	7E-03					
2	TEQ-D/F (ND=1/2 DL)	3.5E-06	1.00	1.3E-12	3.0E-12	7.0E-10	2E-03	4E-03	1.7E-13	1.1E-12	130000	2E-08	1E-07
	Aroclor-1254	2.5E-02	1.00	9.3E-09	2.1E-08	2.0E-05	5E-04	1E-03	1.2E-09	7.6E-09	2	2E-09	2E-08
	Aluminum	6.6E+03	1.00	2.5E-03	5.6E-03	1.0E+00	2E-03	6E-03					
	Arsenic	3.5E+00	0.60	7.8E-07	1.8E-06	3.0E-04	3E-03	6E-03	1.0E-07	6.4E-07	1.5	2E-07	1E-06
	Chromium	9.9E+00	1.00	3.7E-06	8.5E-06	3.0E-03	1E-03	3E-03	4.8E-07	3.0E-06	0.5	2E-07	2E-06
	Cobalt	3.6E+00	1.00	1.4E-06	3.1E-06	3.0E-04	5E-03	1E-02					
	Iron	9.5E+03	1.00	3.6E-03	8.1E-03	7.0E-01	5E-03	1E-02					
	Manganese	2.9E+02	1.00	1.1E-04	2.5E-04	2.4E-02	5E-03	1E-02					
	Thallium	9.9E-02	1.00	3.7E-08	8.4E-08	1.0E-05	4E-03	8E-03					
4	TEQ-D/F (ND=1/2 DL)	1.6E-06	1.00	6.0E-13	1.4E-12	7.0E-10	9E-04	2E-03	7.7E-14	4.9E-13	130000	1E-08	6E-08
	Aroclor-1254	3.2E-02	1.00	1.2E-08	2.7E-08	2.0E-05	6E-04	1E-03	1.5E-09	9.7E-09	2	3E-09	2E-08
	Aluminum	1.1E+04	1.00	4.3E-03	9.8E-03	1.0E+00	4E-03	1E-02					
	Arsenic	3.9E+00	0.60	8.8E-07	2.0E-06	3.0E-04	3E-03	7E-03	1.1E-07	7.2E-07	1.5	2E-07	1E-06
	Chromium	1.0E+01	1.00	3.8E-06	8.7E-06	3.0E-03	1E-03	3E-03	4.9E-07	3.1E-06	0.5	2E-07	2E-06
	Cobalt	4.8E+00	1.00	1.8E-06	4.1E-06	3.0E-04	6E-03	1E-02					
	Iron	1.2E+04	1.00	4.6E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.7E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-05	5E-03	1E-02					
5	TEQ-D/F (ND=1/2 DL)	1.5E-06	1.00	5.5E-13	1.2E-12	7.0E-10	8E-04	2E-03	7.0E-14	4.5E-13	130000	9E-09	6E-08
	Aroclor-1254	2.1E-03	1.00	7.7E-10	1.8E-09	2.0E-05	4E-05	9E-05	9.9E-11	6.3E-10	2	2E-10	1E-09
	Aluminum	6.2E+03	1.00	2.3E-03	5.3E-03	1.0E+00	2E-03	5E-03					
	Arsenic	3.3E+00	0.60	7.5E-07	1.7E-06	3.0E-04	3E-03	6E-03	9.6E-08	6.1E-07	1.5	1E-07	9E-07
	Chromium	7.1E+00	1.00	2.7E-06	6.1E-06	3.0E-03	9E-04	2E-03	3.4E-07	2.2E-06	0.5	2E-07	1E-06
	Cobalt	3.4E+00	1.00	1.3E-06	2.9E-06	3.0E-04	4E-03	1E-02					
	Iron	7.8E+03	1.00	2.9E-03	6.7E-03	7.0E-01	4E-03	1E-02					
	Manganese	3.7E+02	1.00	1.4E-04	3.1E-04	2.4E-02	6E-03	1E-02					
	Thallium	2.3E-01	1.00	8.7E-08	2.0E-07	1.0E-05	9E-03	2E-02					
6	TEQ-D/F (ND=1/2 DL)	2.2E-05	1.00	8.3E-12	1.9E-11	7.0E-10	1E-02	3E-02	1.1E-12	6.8E-12	130000	1E-07	9E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.9E+03	1.00	3.3E-03	7.6E-03	1.0E+00	3E-03	8E-03					
	Arsenic	3.2E+00	0.60	7.2E-07	1.6E-06	3.0E-04	2E-03	5E-03	9.3E-08	5.9E-07	1.5	1E-07	9E-07
	Chromium	1.2E+01	1.00	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.0E-07	3.8E-06	0.5	3E-07	2E-06
	Cobalt	4.0E+00	1.00	1.5E-06	3.4E-06	3.0E-04	5E-03	1E-02					
	Iron	1.1E+04	1.00	4.0E-03	9.1E-03	7.0E-01	6E-03	1E-02					
	Manganese	3.5E+02	1.00	1.3E-04	3.0E-04	2.4E-02	6E-03	1E-02					
	Thallium	9.0E-02	1.00	3.4E-08	7.7E-08	1.0E-05	3E-03	8E-03					
7	TEQ-D/F (ND=1/2 DL)	6.0E-07	1.00	2.3E-13	5.2E-13	7.0E-10	3E-04	7E-04	2.9E-14	1.8E-13	130000	4E-09	2E-08
	Aroclor-1254	3.2E-02	1.00	1.2E-08	2.7E-08	2.0E-05	6E-04	1E-03	1.5E-09	9.7E-09	2	3E-09	2E-08
	Aluminum	1.9E+04	1.00	7.1E-03	1.6E-02	1.0E+00	7E-03	2E-02					
	Arsenic	2.8E+00	0.60	6.3E-07	1.4E-06	3.0E-04	2E-03	5E-03	8.1E-08	5.1E-07	1.5	1E-07	8E-07
	Chromium	1.3E+01	1.00	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.0E-07	3.8E-06	0.5	3E-07	2E-06
	Cobalt	6.0E+00	1.00	2.3E-06	5.1E-06	3.0E-04	8E-03	2E-02					
	Iron	1.7E+04	1.00	6.3E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	3.9E+02	1.00	1.4E-04	3.3E-04	2.4E-02	6E-03	1E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					
8	TEQ-D/F (ND=1/2 DL)	8.8E-06	1.00	3.3E-12	7.6E-12	7.0E-10	5E-03	1E-02	4.3E-13	2.7E-12	130000	6E-08	4E-07
	Aroclor-1254	4.1E-01	1.00	1.5E-07	3.5E-07	2.0E-05	8E-03	2E-02	2.0E-08	1.3E-07	2	4E-08	3E-07
	Aluminum	1.3E+04	1.00	4.8E-03	1.1E-02	1.0E+00	5E-03	1E-02					
	Arsenic	4.7E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1.4E-07	8.6E-07	1.5	2E-07	1E-06
	Chromium	4.0E+01	1.00	1.5E-05	3.4E-05	3.0E-03	5E-03	1E-02	1.9E-06	1.2E-05	0.5	1E-06	6E-06
	Cobalt	6.9E+00	1.00	2.6E-06	5.9E-06	3.0E-04	9E-03	2E-02					
	Iron	3.7E+04	1.00	1.4E-02	3.2E-02	7.0E-01	2E-02	5E-02					
	Manganese	4.6E+02	1.00	1.7E-04	3.9E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
		EPC	RBA	DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
9	TEQ-D/F (ND=1/2 DL)	9.0E-06	1.00	3.4E-12	7.7E-12	7.0E-10	5E-03	1E-02	4.3E-13	2.8E-12	130000	6E-08	4E-07
	Aroclor-1254	1.6E-02	1.00	6.1E-09	1.4E-08	2.0E-05	3E-04	7E-04	7.8E-10	5.0E-09	2	2E-09	1E-08
	Aluminum	1.1E+04	1.00	4.0E-03	9.2E-03	1.0E+00	4E-03	9E-03					
	Arsenic	4.1E+00	0.60	9.2E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.5E-07	1.5	2E-07	1E-06
	Chromium	1.0E+01	1.00	3.9E-06	8.9E-06	3.0E-03	1E-03	3E-03	5.0E-07	3.2E-06	0.5	3E-07	2E-06
	Cobalt	4.8E+00	1.00	1.8E-06	4.1E-06	3.0E-04	6E-03	1E-02					
	Iron	1.2E+04	1.00	4.7E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	2.9E+02	1.00	1.1E-04	2.5E-04	2.4E-02	4E-03	1E-02					
	Thallium	1.2E-01	1.00	4.3E-08	9.9E-08	1.0E-05	4E-03	1E-02					
11	TEQ-D/F (ND=1/2 DL)	3.1E-06	1.00	1.1E-12	2.6E-12	7.0E-10	2E-03	4E-03	1.5E-13	9.3E-13	130000	2E-08	1E-07
	Aroclor-1254	4.8E-03	1.00	1.8E-09	4.1E-09	2.0E-05	9E-05	2E-04	2.3E-10	1.5E-09	2	5E-10	3E-09
	Aluminum	8.3E+03	1.00	3.1E-03	7.1E-03	1.0E+00	3E-03	7E-03					
	Arsenic	2.6E+00	0.60	5.9E-07	1.3E-06	3.0E-04	2E-03	4E-03	7.6E-08	4.8E-07	1.5	1E-07	7E-07
	Chromium	1.1E+01	1.00	4.3E-06	9.8E-06	3.0E-03	1E-03	3E-03	5.5E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	4.2E+00	1.00	1.6E-06	3.6E-06	3.0E-04	5E-03	1E-02					
	Iron	1.1E+04	1.00	4.2E-03	9.6E-03	7.0E-01	6E-03	1E-02					
	Manganese	2.5E+02	1.00	9.5E-05	2.2E-04	2.4E-02	4E-03	9E-03					
	Thallium	9.8E-02	1.00	3.7E-08	8.4E-08	1.0E-05	4E-03	8E-03					
12	TEQ-D/F (ND=1/2 DL)	3.4E-06	1.00	1.3E-12	2.9E-12	7.0E-10	2E-03	4E-03	1.6E-13	1.0E-12	130000	2E-08	1E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.4E+04	1.00	5.4E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Arsenic	7.7E+00	0.60	1.7E-06	3.9E-06	3.0E-04	6E-03	1E-02	2.2E-07	1.4E-06	1.5	3E-07	2E-06
	Chromium	1.8E+01	1.00	6.7E-06	1.5E-05	3.0E-03	2E-03	5E-03	8.6E-07	5.4E-06	0.5	4E-07	3E-06
	Cobalt	5.2E+00	1.00	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	1.6E+03	1.00	6.1E-04	1.4E-03	2.4E-02	3E-02	6E-02					
	Thallium	9.0E-02	1.00	3.4E-08	7.7E-08	1.0E-05	3E-03	8E-03					
13	TEQ-D/F (ND=1/2 DL)	4.0E-06	1.00	1.5E-12	3.4E-12	7.0E-10	2E-03	5E-03	1.9E-13	1.2E-12	130000	2E-08	2E-07
	Aroclor-1254	5.7E-03	1.00	2.1E-09	4.9E-09	2.0E-05	1E-04	2E-04	2.7E-10	1.7E-09	2	5E-10	3E-09
	Aluminum	1.5E+04	1.00	5.4E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Arsenic	5.2E+00	0.60	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1.5E-07	9.5E-07	1.5	2E-07	1E-06
	Chromium	1.2E+01	1.00	4.3E-06	9.9E-06	3.0E-03	1E-03	3E-03	5.6E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	6.3E+00	1.00	2.4E-06	5.4E-06	3.0E-04	8E-03	2E-02					
	Iron	1.5E+04	1.00	5.8E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	4.9E+02	1.00	1.8E-04	4.2E-04	2.4E-02	8E-03	2E-02					
	Thallium	1.3E-01	1.00	5.0E-08	1.1E-07	1.0E-05	5E-03	1E-02					
14	TEQ-D/F (ND=1/2 DL)	2.1E-05	1.00	7.7E-12	1.8E-11	7.0E-10	1E-02	3E-02	9.9E-13	6.3E-12	130000	1E-07	8E-07
	Aroclor-1254	1.0E-01	1.00	3.9E-08	8.9E-08	2.0E-05	2E-03	4E-03	5.0E-09	3.2E-08	2	1E-08	6E-08
	Aluminum	1.0E+04	1.00	3.8E-03	8.7E-03	1.0E+00	4E-03	9E-03					
	Arsenic	4.1E+00	0.60	9.3E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.6E-07	1.5	2E-07	1E-06
	Chromium	1.6E+01	1.00	6.0E-06	1.4E-05	3.0E-03	2E-03	5E-03	7.7E-07	4.9E-06	0.5	4E-07	2E-06
	Cobalt	5.1E+00	1.00	1.9E-06	4.3E-06	3.0E-04	6E-03	1E-02					
	Iron	1.5E+04	1.00	5.8E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.8E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.1E-01	1.00	4.3E-08	9.8E-08	1.0E-05	4E-03	1E-02					
15	TEQ-D/F (ND=1/2 DL)	1.6E-06	1.00	6.0E-13	1.4E-12	7.0E-10	9E-04	2E-03	7.7E-14	4.9E-13	130000	1E-08	6E-08
	Aroclor-1254	2.8E-03	1.00	1.0E-09	2.4E-09	2.0E-05	5E-05	1E-04	1.3E-10	8.5E-10	2	3E-10	2E-09
	Aluminum	5.1E+03	1.00	1.9E-03	4.4E-03	1.0E+00	2E-03	4E-03					
	Arsenic	2.3E+00	0.60	5.1E-07	1.2E-06	3.0E-04	2E-03	4E-03	6.6E-08	4.2E-07	1.5	1E-07	6E-07
	Chromium	1.1E+01	1.00	4.3E-06	9.7E-06	3.0E-03	1E-03	3E-03	5.5E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	3.0E+00	1.00	1.1E-06	2.6E-06	3.0E-04	4E-03	9E-03					
	Iron	8.7E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02					
	Manganese	2.0E+02	1.00	7.4E-05	1.7E-04	2.4E-02	3E-03	7E-03					
	Thallium	6.6E-02	1.00	2.5E-08	5.6E-08	1.0E-05	2E-03	6E-03					
16	TEQ-D/F (ND=1/2 DL)	5.3E-06	1.00	2.0E-12	4.5E-12	7.0E-10	3E-03	6E-03	2.6E-13	1.6E-12	130000	3E-08	2E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03	1.00	3.0E-03	6.9E-03	1.0E+00	3E-03	7E-03					
	Arsenic	3.3E+00	0.60	7.4E-07	1.7E-06	3.0E-04	2E-03	6E-03	9.5E-08	6.1E-07	1.5	1E-07	9E-07
	Chromium	9.2E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4.4E-07	2.8E-06	0.5	2E-07	1E-06
	Cobalt	4.4E+00	1.00	1.7E-06	3.8E-06	3.0E-04	6E-03	1E-02					
	Iron	1.1E+04	1.00	4.1E-03	9.2E-03	7.0E-01	6E-03	1E-02					
	Manganese	3.1E+02	1.00	1.1E-04	2.6E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.0E-01	1.00	3.8E-08	8.6E-08	1.0E-05	4E-03	9E-03					
17	TEQ-D/F (ND=1/2 DL)	2.2E-06	1.00	8.3E-13	1.9E-12	7.0E-10	1E-03	3E-03	1.1E-13	6.8E-13	130000	1E-08	9E-08
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03	1.00	3.7E-03	8.5E-03	1.0E+00	4E-03	8E-03					
	Arsenic	4.0E+00	0.60	9.0E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.3E-07	1.5	2E-07	1E-06
	Chromium	1.2E+01	1.00	4.5E-06	1.0E-05	3.0E-03	1E-03	3E-03	5.8E-07	3.7E-06	0.5	3E-07	2E-06
	Cobalt	5.0E+00	1.00	1.9E-06	4.3E-06	3.0E-04	6E-03	1E-02					
	Iron	1.3E+04	1.00	4.8E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.7E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.0E-01	1.00	3.9E-08	8.8E-08	1.0E-05	4E-03	9E-03					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
18	TEQ-D/F (ND=1/2 DL)	6.8E-06	1.00	2.5E-12	5.8E-12	7.0E-10	4E-03	8E-03	3.3E-13	2.1E-12	130000	4E-08	3E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.5E+04	1.00	5.6E-03	1.3E-02	1.0E+00	6E-03	1E-02					
	Arsenic	4.4E+00	0.60	9.9E-07	2.3E-06	3.0E-04	3E-03	8E-03	1.3E-07	8.1E-07	1.5	2E-07	1E-06
	Chromium	1.3E+01	1.00	4.9E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.3E-07	4.0E-06	0.5	3E-07	2E-06
	Cobalt	5.7E+00	1.00	2.1E-06	4.9E-06	3.0E-04	7E-03	2E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	5.3E+02	1.00	2.0E-04	4.5E-04	2.4E-02	8E-03	2E-02					
	Thallium	1.4E-01	1.00	5.3E-08	1.2E-07	1.0E-05	5E-03	1E-02					
19	TEQ-D/F (ND=1/2 DL)	2.9E-06	1.00	1.1E-12	2.5E-12	7.0E-10	2E-03	4E-03	1.4E-13	9.0E-13	130000	2E-08	1E-07
	Aroclor-1254	no data	1.00	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	2.3E+04	1.00	8.4E-03	1.9E-02	1.0E+00	8E-03	2E-02					
	Arsenic	4.3E+00	0.60	9.7E-07	2.2E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.9E-07	1.5	2E-07	1E-06
	Chromium	1.4E+01	1.00	5.4E-06	1.2E-05	3.0E-03	2E-03	4E-03	6.9E-07	4.4E-06	0.5	3E-07	2E-06
	Cobalt	6.7E+00	1.00	2.5E-06	5.7E-06	3.0E-04	8E-03	2E-02					
	Iron	1.9E+04	1.00	6.9E-03	1.6E-02	7.0E-01	1E-02	2E-02					
	Manganese	4.3E+02	1.00	1.6E-04	3.7E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-05	7E-03	2E-02					
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	1.00	5.5E-12	1.3E-11	7.0E-10	8E-03	2E-02	7.1E-13	4.5E-12	130000	9E-08	6E-07
	Aroclor-1254	2.5E-02	1.00	9.4E-09	2.1E-08	2.0E-05	5E-04	1E-03	1.2E-09	7.6E-09	2	2E-09	2E-08
	Aluminum	1.6E+04	1.00	5.9E-03	1.3E-02	1.0E+00	6E-03	1E-02					
	Arsenic	5.4E+00	0.60	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03	1.6E-07	1.0E-06	1.5	2E-07	1E-06
	Chromium	1.4E+01	1.00	5.3E-06	1.2E-05	3.0E-03	2E-03	4E-03	6.8E-07	4.3E-06	0.5	3E-07	2E-06
	Cobalt	6.3E+00	1.00	2.4E-06	5.4E-06	3.0E-04	8E-03	2E-02					
	Iron	1.7E+04	1.00	6.2E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	4.4E+02	1.00	1.6E-04	3.7E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.5E-01	1.00	5.5E-08	1.3E-07	1.0E-05	5E-03	1E-02					
23	TEQ-D/F (ND=1/2 DL)	6.9E-07	1.00	2.6E-13	5.9E-13	7.0E-10	4E-04	8E-04	3.3E-14	2.1E-13	130000	4E-09	3E-08
	Aroclor-1254	5.0E-03	1.00	1.9E-09	4.2E-09	2.0E-05	9E-05	2E-04	2.4E-10	1.5E-09	2	5E-10	3E-09
	Aluminum	1.7E+04	1.00	6.2E-03	1.4E-02	1.0E+00	6E-03	1E-02					
	Arsenic	5.3E+00	0.60	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1.5E-07	9.7E-07	1.5	2E-07	1E-06
	Chromium	1.3E+01	1.00	4.8E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.2E-07	3.9E-06	0.5	3E-07	2E-06
	Cobalt	7.1E+00	1.00	2.7E-06	6.1E-06	3.0E-04	9E-03	2E-02					
	Iron	1.6E+04	1.00	6.1E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	4.0E+02	1.00	1.5E-04	3.5E-04	2.4E-02	6E-03	1E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					

Population Hypothetical Future Commercial/Industrial Workers
Exposure Area Random 20-acre grids across OU2
Medium Surface Soil
Exposure Route Incidental Ingestion

HIFs	CTE	RME
Noncancer	3.75E-07	8.56E-07
Cancer	4.82E-08	3.06E-07

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	1.00	5.1E-12	1.2E-11	7.0E-10	7E-03	2E-02	6.6E-13	4.2E-12	130000	9E-08	5E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	1.00	7.3E-08	1.7E-07				9.4E-09	6.0E-08	2	2E-08	1E-07
	Aluminum	7.4E+03	1.00	2.8E-03	6.3E-03	1.0E+00	3E-03	6E-03					
	Arsenic	4.8E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1.4E-07	8.7E-07	1.5	2E-07	1E-06
1	Chromium	1.3E+01	1.00	4.9E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.3E-07	4.0E-06	0.5	3E-07	2E-06
	Cobalt	5.6E+00	1.00	2.1E-06	4.8E-06	3.0E-04	7E-03	2E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	6.4E+02	1.00	2.4E-04	5.4E-04	2.4E-02	1E-02	2E-02					
	Thallium	8.3E-02	1.00	3.1E-08	7.1E-08	1.0E-05	3E-03	7E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	1.00	2.0E-12	4.5E-12	7.0E-10	3E-03	6E-03	2.5E-13	1.6E-12	130000	3E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	1.00	1.1E-08	2.4E-08				1.4E-09	8.7E-09	2	3E-09	2E-08
	Aluminum	6.6E+03	1.00	2.5E-03	5.6E-03	1.0E+00	2E-03	6E-03					
	Arsenic	3.5E+00	0.60	7.8E-07	1.8E-06	3.0E-04	3E-03	6E-03	1.0E-07	6.4E-07	1.5	2E-07	1E-06
2	Chromium	9.9E+00	1.00	3.7E-06	8.5E-06	3.0E-03	1E-03	3E-03	4.8E-07	3.0E-06	0.5	2E-07	2E-06
	Cobalt	3.6E+00	1.00	1.4E-06	3.1E-06	3.0E-04	5E-03	1E-02					
	Iron	9.5E+03	1.00	3.6E-03	8.1E-03	7.0E-01	5E-03	1E-02					
	Manganese	2.9E+02	1.00	1.1E-04	2.5E-04	2.4E-02	5E-03	1E-02					
	Thallium	9.9E-02	1.00	3.7E-08	8.4E-08	1.0E-05	4E-03	8E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	1.00	2.4E-12	5.6E-12	7.0E-10	3E-03	8E-03	3.1E-13	2.0E-12	130000	4E-08	3E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	4.2E-08	9.5E-08				5.4E-09	3.4E-08	2	1E-08	7E-08
	Aluminum	1.1E+04	1.00	4.3E-03	9.8E-03	1.0E+00	4E-03	1E-02					
	Arsenic	3.9E+00	0.60	8.8E-07	2.0E-06	3.0E-04	3E-03	7E-03	1.1E-07	7.2E-07	1.5	2E-07	1E-06
4	Chromium	1.0E+01	1.00	3.8E-06	8.7E-06	3.0E-03	1E-03	3E-03	4.9E-07	3.1E-06	0.5	2E-07	2E-06
	Cobalt	4.8E+00	1.00	1.8E-06	4.1E-06	3.0E-04	6E-03	1E-02					
	Iron	1.2E+04	1.00	4.6E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.7E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.2E-01	1.00	4.6E-08	1.0E-07	1.0E-05	5E-03	1E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	6.2E+03	1.00	2.3E-03	5.3E-03	1.0E+00	2E-03	5E-03					
	Arsenic	3.3E+00	0.60	7.5E-07	1.7E-06	3.0E-04	3E-03	6E-03	9.6E-08	6.1E-07	1.5	1E-07	9E-07
5	Chromium	7.1E+00	1.00	2.7E-06	6.1E-06	3.0E-03	9E-04	2E-03	3.4E-07	2.2E-06	0.5	2E-07	1E-06
	Cobalt	3.4E+00	1.00	1.3E-06	2.9E-06	3.0E-04	4E-03	1E-02					
	Iron	7.8E+03	1.00	2.9E-03	6.7E-03	7.0E-01	4E-03	1E-02					
	Manganese	3.7E+02	1.00	1.4E-04	3.1E-04	2.4E-02	6E-03	1E-02					
	Thallium	2.3E-01	1.00	8.7E-08	2.0E-07	1.0E-05	9E-03	2E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.9E+03	1.00	3.3E-03	7.6E-03	1.0E+00	3E-03	8E-03					
	Arsenic	3.2E+00	0.60	7.2E-07	1.6E-06	3.0E-04	2E-03	5E-03	9.3E-08	5.9E-07	1.5	1E-07	9E-07
6	Chromium	1.2E+01	1.00	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.0E-07	3.8E-06	0.5	3E-07	2E-06
	Cobalt	4.0E+00	1.00	1.5E-06	3.4E-06	3.0E-04	5E-03	1E-02					
	Iron	1.1E+04	1.00	4.0E-03	9.1E-03	7.0E-01	6E-03	1E-02					
	Manganese	3.5E+02	1.00	1.3E-04	3.0E-04	2.4E-02	6E-03	1E-02					
	Thallium	9.0E-02	1.00	3.4E-08	7.7E-08	1.0E-05	3E-03	8E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	1.00	2.4E-12	5.6E-12	7.0E-10	3E-03	8E-03	3.1E-13	2.0E-12	130000	4E-08	3E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	4.2E-08	9.5E-08				5.4E-09	3.4E-08	2	1E-08	7E-08
	Aluminum	1.9E+04	1.00	7.1E-03	1.6E-02	1.0E+00	7E-03	2E-02					
	Arsenic	2.8E+00	0.60	6.3E-07	1.4E-06	3.0E-04	2E-03	5E-03	8.1E-08	5.1E-07	1.5	1E-07	8E-07
7	Chromium	1.3E+01	1.00	4.7E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.0E-07	3.8E-06	0.5	3E-07	2E-06
	Cobalt	6.0E+00	1.00	2.3E-06	5.1E-06	3.0E-04	8E-03	2E-02					
	Iron	1.7E+04	1.00	6.3E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	3.9E+02	1.00	1.4E-04	3.3E-04	2.4E-02	6E-03	1E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-05	1.00	1.6E-11	3.6E-11	7.0E-10	2E-02	5E-02	2.0E-12	1.3E-11	130000	3E-07	2E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E+00	1.00	3.8E-07	8.6E-07				4.9E-08	3.1E-07	2	1E-07	6E-07
	Aluminum	1.3E+04	1.00	4.8E-03	1.1E-02	1.0E+00	5E-03	1E-02					
	Arsenic	4.7E+00	0.60	1.1E-06	2.4E-06	3.0E-04	4E-03	8E-03	1.4E-07	8.6E-07	1.5	2E-07	1E-06
8	Chromium	4.0E+01	1.00	1.5E-05	3.4E-05	3.0E-03	5E-03	1E-02	1.9E-06	1.2E-05	0.5	1E-06	6E-06
	Cobalt	6.9E+00	1.00	2.6E-06	5.9E-06	3.0E-04	9E-03	2E-02					
	Iron	3.7E+04	1.00	1.4E-02	3.2E-02	7.0E-01	2E-02	5E-02					
	Manganese	4.6E+02	1.00	1.7E-04	3.9E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	1.00	3.9E-12	8.9E-12	7.0E-10	6E-03	1E-02	5.0E-13	3.2E-12	130000	7E-08	4E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	1.00	1.2E-08	2.8E-08				1.6E-09	1.0E-08	2	3E-09	2E-08
	Aluminum	1.1E+04	1.00	4.0E-03	9.2E-03	1.0E+00	4E-03	9E-03					
	Arsenic	4.1E+00	0.60	9.2E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.5E-07	1.5	2E-07	1E-06
9	Chromium	1.0E+01	1.00	3.9E-06	8.9E-06	3.0E-03	1E-03	3E-03	5.0E-07	3.2E-06	0.5	3E-07	2E-06
	Cobalt	4.8E+00	1.00	1.8E-06	4.1E-06	3.0E-04	6E-03	1E-02					
	Iron	1.2E+04	1.00	4.7E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	2.9E+02	1.00	1.1E-04	2.5E-04	2.4E-02	4E-03	1E-02					
	Thallium	1.2E-01	1.00	4.3E-08	9.9E-08	1.0E-05	4E-03	1E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
11	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.3E+03	1.00	3.1E-03	7.1E-03	1.0E+00	3E-03	7E-03					
	Arsenic	2.6E+00	0.60	5.9E-07	1.3E-06	3.0E-04	2E-03	4E-03	7.6E-08	4.8E-07	1.5	1E-07	7E-07
	Chromium	1.1E+01	1.00	4.3E-06	9.8E-06	3.0E-03	1E-03	3E-03	5.5E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	4.2E+00	1.00	1.6E-06	3.6E-06	3.0E-04	5E-03	1E-02					
	Iron	1.1E+04	1.00	4.2E-03	9.6E-03	7.0E-01	6E-03	1E-02					
	Manganese	2.5E+02	1.00	9.5E-05	2.2E-04	2.4E-02	4E-03	9E-03					
	Thallium	9.8E-02	1.00	3.7E-08	8.4E-08	1.0E-05	4E-03	8E-03					
12	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	1.4E+04	1.00	5.4E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Arsenic	7.7E+00	0.60	1.7E-06	3.9E-06	3.0E-04	6E-03	1E-02	2.2E-07	1.4E-06	1.5	3E-07	2E-06
	Chromium	1.8E+01	1.00	6.7E-06	1.5E-05	3.0E-03	2E-03	5E-03	8.6E-07	5.4E-06	0.5	4E-07	3E-06
	Cobalt	5.2E+00	1.00	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	1.6E+03	1.00	6.1E-04	1.4E-03	2.4E-02	3E-02	6E-02					
	Thallium	9.0E-02	1.00	3.4E-08	7.7E-08	1.0E-05	3E-03	8E-03					
13	TEQ-D/F/PCBs (ND=1/2 DL)	3.8E-06	1.00	1.4E-12	3.3E-12	7.0E-10	2E-03	5E-03	1.8E-13	1.2E-12	130000	2E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.5E-02	1.00	5.5E-09	1.3E-08				7.1E-10	4.5E-09	2	1E-09	9E-09
	Aluminum	1.5E+04	1.00	5.4E-03	1.2E-02	1.0E+00	5E-03	1E-02					
	Arsenic	5.2E+00	0.60	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1.5E-07	9.5E-07	1.5	2E-07	1E-06
	Chromium	1.2E+01	1.00	4.3E-06	9.9E-06	3.0E-03	1E-03	3E-03	5.6E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	6.3E+00	1.00	2.4E-06	5.4E-06	3.0E-04	8E-03	2E-02					
	Iron	1.5E+04	1.00	5.8E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	4.9E+02	1.00	1.8E-04	4.2E-04	2.4E-02	8E-03	2E-02					
	Thallium	1.3E-01	1.00	5.0E-08	1.1E-07	1.0E-05	5E-03	1E-02					
14	TEQ-D/F/PCBs (ND=1/2 DL)	3.0E-05	1.00	1.1E-11	2.6E-11	7.0E-10	2E-02	4E-02	1.5E-12	9.3E-12	130000	2E-07	1E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	6.7E-02	1.00	2.5E-08	5.7E-08				3.2E-09	2.0E-08	2	6E-09	4E-08
	Aluminum	1.0E+04	1.00	3.8E-03	8.7E-03	1.0E+00	4E-03	9E-03					
	Arsenic	4.1E+00	0.60	9.3E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.6E-07	1.5	2E-07	1E-06
	Chromium	1.6E+01	1.00	6.0E-06	1.4E-05	3.0E-03	2E-03	5E-03	7.7E-07	4.9E-06	0.5	4E-07	2E-06
	Cobalt	5.1E+00	1.00	1.9E-06	4.3E-06	3.0E-04	6E-03	1E-02					
	Iron	1.5E+04	1.00	5.8E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.8E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.1E-01	1.00	4.3E-08	9.8E-08	1.0E-05	4E-03	1E-02					
15	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	5.1E+03	1.00	1.9E-03	4.4E-03	1.0E+00	2E-03	4E-03					
	Arsenic	2.3E+00	0.60	5.1E-07	1.2E-06	3.0E-04	2E-03	4E-03	6.6E-08	4.2E-07	1.5	1E-07	6E-07
	Chromium	1.1E+01	1.00	4.3E-06	9.7E-06	3.0E-03	1E-03	3E-03	5.5E-07	3.5E-06	0.5	3E-07	2E-06
	Cobalt	3.0E+00	1.00	1.1E-06	2.6E-06	3.0E-04	4E-03	9E-03					
	Iron	8.7E+03	1.00	3.3E-03	7.5E-03	7.0E-01	5E-03	1E-02					
	Manganese	2.0E+02	1.00	7.4E-05	1.7E-04	2.4E-02	3E-03	7E-03					
	Thallium	6.6E-02	1.00	2.5E-08	5.6E-08	1.0E-05	2E-03	6E-03					
16	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.0E+03	1.00	3.0E-03	6.9E-03	1.0E+00	3E-03	7E-03					
	Arsenic	3.3E+00	0.60	7.4E-07	1.7E-06	3.0E-04	2E-03	6E-03	9.5E-08	6.1E-07	1.5	1E-07	9E-07
	Chromium	9.2E+00	1.00	3.5E-06	7.9E-06	3.0E-03	1E-03	3E-03	4.4E-07	2.8E-06	0.5	2E-07	1E-06
	Cobalt	4.4E+00	1.00	1.7E-06	3.8E-06	3.0E-04	6E-03	1E-02					
	Iron	1.1E+04	1.00	4.1E-03	9.2E-03	7.0E-01	6E-03	1E-02					
	Manganese	3.1E+02	1.00	1.1E-04	2.6E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.0E-01	1.00	3.8E-08	8.6E-08	1.0E-05	4E-03	9E-03					
17	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	9.9E+03	1.00	3.7E-03	8.5E-03	1.0E+00	4E-03	8E-03					
	Arsenic	4.0E+00	0.60	9.0E-07	2.1E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.3E-07	1.5	2E-07	1E-06
	Chromium	1.2E+01	1.00	4.5E-06	1.0E-05	3.0E-03	1E-03	3E-03	5.8E-07	3.7E-06	0.5	3E-07	2E-06
	Cobalt	5.0E+00	1.00	1.9E-06	4.3E-06	3.0E-04	6E-03	1E-02					
	Iron	1.3E+04	1.00	4.8E-03	1.1E-02	7.0E-01	7E-03	2E-02					
	Manganese	3.2E+02	1.00	1.2E-04	2.7E-04	2.4E-02	5E-03	1E-02					
	Thallium	1.0E-01	1.00	3.9E-08	8.8E-08	1.0E-05	4E-03	9E-03					
18	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	1.5E+04	1.00	5.6E-03	1.3E-02	1.0E+00	6E-03	1E-02					
	Arsenic	4.4E+00	0.60	9.9E-07	2.3E-06	3.0E-04	3E-03	8E-03	1.3E-07	8.1E-07	1.5	2E-07	1E-06
	Chromium	1.3E+01	1.00	4.9E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.3E-07	4.0E-06	0.5	3E-07	2E-06
	Cobalt	5.7E+00	1.00	2.1E-06	4.9E-06	3.0E-04	7E-03	2E-02					
	Iron	1.5E+04	1.00	5.6E-03	1.3E-02	7.0E-01	8E-03	2E-02					
	Manganese	5.3E+02	1.00	2.0E-04	4.5E-04	2.4E-02	8E-03	2E-02					
	Thallium	1.4E-01	1.00	5.3E-08	1.2E-07	1.0E-05	5E-03	1E-02					
19	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	2.3E+04	1.00	8.4E-03	1.9E-02	1.0E+00	8E-03	2E-02					
	Arsenic	4.3E+00	0.60	9.7E-07	2.2E-06	3.0E-04	3E-03	7E-03	1.2E-07	7.9E-07	1.5	2E-07	1E-06
	Chromium	1.4E+01	1.00	5.4E-06	1.2E-05	3.0E-03	2E-03	4E-03	6.9E-07	4.4E-06	0.5	3E-07	2E-06
	Cobalt	6.7E+00	1.00	2.5E-06	5.7E-06	3.0E-04	8E-03	2E-02					
	Iron	1.9E+04	1.00	6.9E-03	1.6E-02	7.0E-01	1E-02	2E-02					
	Manganese	4.3E+02	1.00	1.6E-04	3.7E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.9E-01	1.00	7.1E-08	1.6E-07	1.0E-05	7E-03	2E-02					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	1.00	9.9E-12	2.3E-11	7.0E-10	1E-02	3E-02	1.3E-12	8.1E-12	130000	2E-07	1E-06
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	1.00	3.9E-08	8.8E-08				5.0E-09	3.2E-08	2	1E-08	6E-08
	Aluminum	1.6E+04	1.00	5.9E-03	1.3E-02	1.0E+00	6E-03	1E-02					
	Arsenic	5.4E+00	0.60	1.2E-06	2.8E-06	3.0E-04	4E-03	9E-03	1.6E-07	1.0E-06	1.5	2E-07	1E-06
	Chromium	1.4E+01	1.00	5.3E-06	1.2E-05	3.0E-03	2E-03	4E-03	6.8E-07	4.3E-06	0.5	3E-07	2E-06
	Cobalt	6.3E+00	1.00	2.4E-06	5.4E-06	3.0E-04	8E-03	2E-02					
	Iron	1.7E+04	1.00	6.2E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	4.4E+02	1.00	1.6E-04	3.7E-04	2.4E-02	7E-03	2E-02					
	Thallium	1.5E-01	1.00	5.5E-08	1.3E-07	1.0E-05	5E-03	1E-02					
23	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-06	1.00	3.8E-13	8.7E-13	7.0E-10	5E-04	1E-03	4.9E-14	3.1E-13	130000	6E-09	4E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	6.9E-03	1.00	2.6E-09	5.9E-09				3.3E-10	2.1E-09	2	7E-10	4E-09
	Aluminum	1.7E+04	1.00	6.2E-03	1.4E-02	1.0E+00	6E-03	1E-02					
	Arsenic	5.3E+00	0.60	1.2E-06	2.7E-06	3.0E-04	4E-03	9E-03	1.5E-07	9.7E-07	1.5	2E-07	1E-06
	Chromium	1.3E+01	1.00	4.8E-06	1.1E-05	3.0E-03	2E-03	4E-03	6.2E-07	3.9E-06	0.5	3E-07	2E-06
	Cobalt	7.1E+00	1.00	2.7E-06	6.1E-06	3.0E-04	9E-03	2E-02					
	Iron	1.6E+04	1.00	6.1E-03	1.4E-02	7.0E-01	9E-03	2E-02					
	Manganese	4.0E+02	1.00	1.5E-04	3.5E-04	2.4E-02	6E-03	1E-02					
	Thallium	1.5E-01	1.00	5.6E-08	1.3E-07	1.0E-05	6E-03	1E-02					

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	1.85E-06	3.62E-06
Cancer	2.38E-07	1.29E-06

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
		EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F (ND=1/2 DL)	5.4E-06	0.03	3.0E-13	5.8E-13	7.0E-10	4E-04	8E-04	3.8E-14	2.1E-13	130000	5E-09	3E-08
	Aroclor-1254	1.4E-01	0.14	3.7E-08	7.2E-08	2.0E-05	2E-03	4E-03	4.7E-09	2.6E-08	2	9E-09	5E-08
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	2.6E-07	5.2E-07	3.0E-04	9E-04	2E-03	3.4E-08	1.8E-07	1.5	5E-08	3E-07
1	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.6E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	3.5E-06	0.03	2.0E-13	3.8E-13	7.0E-10	3E-04	5E-04	2.5E-14	1.4E-13	130000	3E-09	2E-08
	Aroclor-1254	2.5E-02	0.14	6.4E-09	1.3E-08	2.0E-05	3E-04	6E-04	8.2E-10	4.5E-09	2	2E-09	9E-09
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	1.9E-07	3.8E-07	3.0E-04	6E-04	1E-03	2.5E-08	1.4E-07	1.5	4E-08	2E-07
2	Chromium	9.9E+00				7.5E-05					20		
	Cobalt	3.6E+00				3.0E-04							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	1.6E-06	0.03	8.9E-14	1.7E-13	7.0E-10	1E-04	2E-04	1.1E-14	6.2E-14	130000	1E-09	8E-09
	Aroclor-1254	3.2E-02	0.14	8.2E-09	1.6E-08	2.0E-05	4E-04	8E-04	1.1E-09	5.8E-09	2	2E-09	1E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	2.2E-07	4.2E-07	3.0E-04	7E-04	1E-03	2.8E-08	1.5E-07	1.5	4E-08	2E-07
4	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	1.5E-06	0.03	8.1E-14	1.6E-13	7.0E-10	1E-04	2E-04	1.0E-14	5.7E-14	130000	1E-09	7E-09
	Aroclor-1254	2.1E-03	0.14	5.3E-10	1.0E-09	2.0E-05	3E-05	5E-05	6.8E-11	3.7E-10	2	1E-10	7E-10
	Aluminum	6.2E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.9E-07	3.6E-07	3.0E-04	6E-04	1E-03	2.4E-08	1.3E-07	1.5	4E-08	2E-07
5	Chromium	7.1E+00				7.5E-05					20		
	Cobalt	3.4E+00				3.0E-04							
	Iron	7.8E+03				7.0E-01							
	Manganese	3.7E+02				9.6E-04							
	Thallium	2.3E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	2.2E-05	0.03	1.2E-12	2.4E-12	7.0E-10	2E-03	3E-03	1.6E-13	8.6E-13	130000	2E-08	1E-07
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.9E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	1.8E-07	3.5E-07	3.0E-04	6E-04	1E-03	2.3E-08	1.2E-07	1.5	3E-08	2E-07
6	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	4.0E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	6.0E-07	0.03	3.4E-14	6.6E-14	7.0E-10	5E-05	9E-05	4.3E-15	2.3E-14	130000	6E-10	3E-09
	Aroclor-1254	3.2E-02	0.14	8.2E-09	1.6E-08	2.0E-05	4E-04	8E-04	1.1E-09	5.8E-09	2	2E-09	1E-08
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	1.6E-07	3.0E-07	3.0E-04	5E-04	1E-03	2.0E-08	1.1E-07	1.5	3E-08	2E-07
7	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	6.0E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	8.8E-06	0.03	4.9E-13	9.6E-13	7.0E-10	7E-04	1E-03	6.3E-14	3.4E-13	130000	8E-09	4E-08
	Aroclor-1254	4.1E-01	0.14	1.1E-07	2.1E-07	2.0E-05	5E-03	1E-02	1.4E-08	7.5E-08	2	3E-08	1E-07
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	2.6E-07	5.1E-07	3.0E-04	9E-04	2E-03	3.4E-08	1.8E-07	1.5	5E-08	3E-07
8	Chromium	4.0E+01				7.5E-05					20		
	Cobalt	6.9E+00				3.0E-04							
	Iron	3.7E+04				7.0E-01							
	Manganese	4.6E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
	TEQ-D/F (ND=1/2 DL)	9.0E-06	0.03	5.0E-13	9.8E-13	7.0E-10	7E-04	1E-03	6.4E-14	3.5E-13	130000	8E-09	5E-08
	Aroclor-1254	1.6E-02	0.14	4.2E-09	8.2E-09	2.0E-05	2E-04	4E-04	5.4E-10	2.9E-09	2	1E-09	6E-09
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	2.3E-07	4.5E-07	3.0E-04	8E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
9	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
11	TEQ-D/F (ND=1/2 DL)	3.1E-06	0.03	1.7E-13	3.3E-13	7.0E-10	2E-04	5E-04	2.2E-14	1.2E-13	130000	3E-09	2E-08
	Aroclor-1254	4.8E-03	0.14	1.2E-09	2.4E-09	2.0E-05	6E-05	1E-04	1.6E-10	8.7E-10	2	3E-10	2E-09
	Aluminum	8.3E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	1.5E-07	2.8E-07	3.0E-04	5E-04	9E-04	1.9E-08	1.0E-07	1.5	3E-08	2E-07
	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	4.2E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.8E-02				1.0E-05							
12	TEQ-D/F (ND=1/2 DL)	3.4E-06	0.03	1.9E-13	3.7E-13	7.0E-10	3E-04	5E-04	2.4E-14	1.3E-13	130000	3E-09	2E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	7.7E+00	0.03	4.3E-07	8.3E-07	3.0E-04	1E-03	3E-03	5.5E-08	3.0E-07	1.5	8E-08	4E-07
	Chromium	1.8E+01				7.5E-05					20		
	Cobalt	5.2E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	1.6E+03				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
13	TEQ-D/F (ND=1/2 DL)	4.0E-06	0.03	2.2E-13	4.3E-13	7.0E-10	3E-04	6E-04	2.8E-14	1.5E-13	130000	4E-09	2E-08
	Aroclor-1254	5.7E-03	0.14	1.5E-09	2.9E-09	2.0E-05	7E-05	1E-04	1.9E-10	1.0E-09	2	4E-10	2E-09
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	2.9E-07	5.6E-07	3.0E-04	1E-03	2E-03	3.7E-08	2.0E-07	1.5	6E-08	3E-07
	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.9E+02				9.6E-04							
	Thallium	1.3E-01				1.0E-05							
14	TEQ-D/F (ND=1/2 DL)	2.1E-05	0.03	1.1E-12	2.2E-12	7.0E-10	2E-03	3E-03	1.5E-13	8.0E-13	130000	2E-08	1E-07
	Aroclor-1254	1.0E-01	0.14	2.7E-08	5.3E-08	2.0E-05	1E-03	3E-03	3.5E-09	1.9E-08	2	7E-09	4E-08
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	2.3E-07	4.5E-07	3.0E-04	8E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
	Chromium	1.6E+01				7.5E-05					20		
	Cobalt	5.1E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.1E-01				1.0E-05							
15	TEQ-D/F (ND=1/2 DL)	1.6E-06	0.03	8.9E-14	1.7E-13	7.0E-10	1E-04	2E-04	1.1E-14	6.2E-14	130000	1E-09	8E-09
	Aroclor-1254	2.8E-03	0.14	7.2E-10	1.4E-09	2.0E-05	4E-05	7E-05	9.3E-11	5.1E-10	2	2E-10	1E-09
	Aluminum	5.1E+03				1.0E+00							
	Arsenic	2.3E+00	0.03	1.3E-07	2.5E-07	3.0E-04	4E-04	8E-04	1.6E-08	8.8E-08	1.5	2E-08	1E-07
	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	3.0E+00				3.0E-04							
	Iron	8.7E+03				7.0E-01							
	Manganese	2.0E+02				9.6E-04							
	Thallium	6.6E-02				1.0E-05							
16	TEQ-D/F (ND=1/2 DL)	5.3E-06	0.03	2.9E-13	5.8E-13	7.0E-10	4E-04	8E-04	3.8E-14	2.1E-13	130000	5E-09	3E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.8E-07	3.6E-07	3.0E-04	6E-04	1E-03	2.4E-08	1.3E-07	1.5	4E-08	2E-07
	Chromium	9.2E+00				7.5E-05					20		
	Cobalt	4.4E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
17	TEQ-D/F (ND=1/2 DL)	2.2E-06	0.03	1.2E-13	2.4E-13	7.0E-10	2E-04	3E-04	1.6E-14	8.6E-14	130000	2E-09	1E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	2.2E-07	4.3E-07	3.0E-04	7E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	5.0E+00				3.0E-04							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
18	TEQ-D/F (ND=1/2 DL)	6.8E-06	0.03	3.8E-13	7.4E-13	7.0E-10	5E-04	1E-03	4.8E-14	2.6E-13	130000	6E-09	3E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	4.4E+00	0.03	2.4E-07	4.8E-07	3.0E-04	8E-04	2E-03	3.1E-08	1.7E-07	1.5	5E-08	3E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.7E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	5.3E+02				9.6E-04							
	Thallium	1.4E-01				1.0E-05							
19	TEQ-D/F (ND=1/2 DL)	2.9E-06	0.03	1.6E-13	3.2E-13	7.0E-10	2E-04	5E-04	2.1E-14	1.1E-13	130000	3E-09	1E-08
	Aroclor-1254	no data	0.14	--	--	2.0E-05	--	--	--	--	2	--	--
	Aluminum	2.3E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	2.4E-07	4.7E-07	3.0E-04	8E-04	2E-03	3.1E-08	1.7E-07	1.5	5E-08	3E-07
	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.7E+00				3.0E-04							
	Iron	1.9E+04				7.0E-01							
	Manganese	4.3E+02				9.6E-04							
	Thallium	1.9E-01				1.0E-05							

Grid	COPC	EPC mg/kg	ABSd	Non-Cancer DAD (mg/kg-d) CTE	Non-Cancer DAD (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME	Cancer DAD (mg/kg-d) CTE	Cancer DAD (mg/kg-d) RME	oSF (mg/kg-d)-1	Risk CTE	Risk RME
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	0.03	8.1E-13	1.6E-12	7.0E-10	1E-03	2E-03	1.0E-13	5.7E-13	130000	1E-08	7E-08
	Aroclor-1254	2.5E-02	0.14	6.5E-09	1.3E-08	2.0E-05	3E-04	6E-04	8.3E-10	4.5E-09	2	2E-09	9E-09
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	3.0E-07	5.9E-07	3.0E-04	1E-03	2E-03	3.9E-08	2.1E-07	1.5	6E-08	3E-07
	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
23	TEQ-D/F (ND=1/2 DL)	6.9E-07	0.03	3.8E-14	7.5E-14	7.0E-10	5E-05	1E-04	4.9E-15	2.7E-14	130000	6E-10	3E-09
	Aroclor-1254	5.0E-03	0.14	1.3E-09	2.5E-09	2.0E-05	6E-05	1E-04	1.6E-10	9.0E-10	2	3E-10	2E-09
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.3E+00	0.03	2.9E-07	5.8E-07	3.0E-04	1E-03	2E-03	3.8E-08	2.1E-07	1.5	6E-08	3E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	7.1E+00				3.0E-04							
	Iron	1.6E+04				7.0E-01							
	Manganese	4.0E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							

Population	**Hypothetical Future Commercial/Industrial Workers**
Exposure Area	**Random 20-acre grids across OU2**
Medium	**Surface Soil**
Exposure Route	**Dermal Contact**

HIFs	CTE	RME
Noncancer	1.85E-06	3.62E-06
Cancer	2.38E-07	1.29E-06

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
1	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	0.03	7.6E-13	1.5E-12	7.0E-10	1E-03	2E-03	9.7E-14	5.3E-13	130000	1E-08	7E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	0.14	5.0E-08	9.9E-08				6.5E-09	3.5E-08	2	1E-08	7E-08
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	2.6E-07	5.2E-07	3.0E-04	9E-04	2E-03	3.4E-08	1.8E-07	1.5	5E-08	3E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.6E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				1.0E-05							
2	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	0.03	2.9E-13	5.7E-13	7.0E-10	4E-04	8E-04	3.8E-14	2.1E-13	130000	5E-09	3E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	0.14	7.4E-09	1.4E-08				9.5E-10	5.2E-09	2	2E-09	1E-08
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	1.9E-07	3.8E-07	3.0E-04	6E-04	1E-03	2.5E-08	1.4E-07	1.5	4E-08	2E-07
	Chromium	9.9E+00				7.5E-05					20		
	Cobalt	3.6E+00				3.0E-04							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				1.0E-05							
4	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	0.03	3.6E-13	7.1E-13	7.0E-10	5E-04	1E-03	4.6E-14	2.5E-13	130000	6E-09	3E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	2.9E-08	5.6E-08				3.7E-09	2.0E-08	2	7E-09	4E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	2.2E-07	4.2E-07	3.0E-04	7E-04	1E-03	2.8E-08	1.5E-07	1.5	4E-08	2E-07
	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							
5	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	6.2E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.9E-07	3.6E-07	3.0E-04	6E-04	1E-03	2.4E-08	1.3E-07	1.5	4E-08	2E-07
	Chromium	7.1E+00				7.5E-05					20		
	Cobalt	3.4E+00				3.0E-04							
	Iron	7.8E+03				7.0E-01							
	Manganese	3.7E+02				9.6E-04							
	Thallium	2.3E-01				1.0E-05							
6	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.9E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	1.8E-07	3.5E-07	3.0E-04	6E-04	1E-03	2.3E-08	1.2E-07	1.5	3E-08	2E-07
	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	4.0E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
7	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	0.03	3.6E-13	7.1E-13	7.0E-10	5E-04	1E-03	4.6E-14	2.5E-13	130000	6E-09	3E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	2.9E-08	5.6E-08				3.7E-09	2.0E-08	2	7E-09	4E-08
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	1.6E-07	3.0E-07	3.0E-04	5E-04	1E-03	2.0E-08	1.1E-07	1.5	3E-08	2E-07
	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	6.0E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
8	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-05	0.03	2.3E-12	4.6E-12	7.0E-10	3E-03	7E-03	3.0E-13	1.6E-12	130000	4E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E+00	0.14	2.6E-07	5.1E-07				3.4E-08	1.8E-07	2	7E-08	4E-07
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	2.6E-07	5.1E-07	3.0E-04	9E-04	2E-03	3.4E-08	1.8E-07	1.5	5E-08	3E-07
	Chromium	4.0E+01				7.5E-05					20		
	Cobalt	6.9E+00				3.0E-04							
	Iron	3.7E+04				7.0E-01							
	Manganese	4.6E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
9	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	0.03	5.8E-13	1.1E-12	7.0E-10	8E-04	2E-03	7.5E-14	4.1E-13	130000	1E-08	5E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	0.14	8.5E-09	1.7E-08				1.1E-09	5.9E-09	2	2E-09	1E-08
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	2.3E-07	4.5E-07	3.0E-04	8E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
	Chromium	1.0E+01				7.5E-05					20		
	Cobalt	4.8E+00				3.0E-04							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				1.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.3E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	1.5E-07	2.8E-07	3.0E-04	5E-04	9E-04	1.9E-08	1.0E-07	1.5	3E-08	2E-07
11	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	4.2E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.8E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	7.7E+00	0.03	4.3E-07	8.3E-07	3.0E-04	1E-03	3E-03	5.5E-08	3.0E-07	1.5	8E-08	4E-07
12	Chromium	1.8E+01				7.5E-05					20		
	Cobalt	5.2E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	1.6E+03				9.6E-04							
	Thallium	9.0E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.8E-06	0.03	2.1E-13	4.2E-13	7.0E-10	3E-04	6E-04	2.7E-14	1.5E-13	130000	4E-09	2E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.5E-02	0.14	3.8E-09	7.5E-09				4.9E-10	2.7E-09	2	1E-09	5E-09
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	2.9E-07	5.6E-07	3.0E-04	1E-03	2E-03	3.7E-08	2.0E-07	1.5	6E-08	3E-07
13	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.9E+02				9.6E-04							
	Thallium	1.3E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.0E-05	0.03	1.7E-12	3.3E-12	7.0E-10	2E-03	5E-03	2.2E-13	1.2E-12	130000	3E-08	2E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	6.7E-02	0.14	1.7E-08	3.4E-08				2.2E-09	1.2E-08	2	4E-09	2E-08
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	2.3E-07	4.5E-07	3.0E-04	8E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
14	Chromium	1.6E+01				7.5E-05					20		
	Cobalt	5.1E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.1E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	5.1E+03				1.0E+00							
	Arsenic	2.3E+00	0.03	1.3E-07	2.5E-07	3.0E-04	4E-04	8E-04	1.6E-08	8.8E-08	1.5	2E-08	1E-07
15	Chromium	1.1E+01				7.5E-05					20		
	Cobalt	3.0E+00				3.0E-04							
	Iron	8.7E+03				7.0E-01							
	Manganese	2.0E+02				9.6E-04							
	Thallium	6.6E-02				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	1.8E-07	3.6E-07	3.0E-04	6E-04	1E-03	2.4E-08	1.3E-07	1.5	4E-08	2E-07
16	Chromium	9.2E+00				7.5E-05					20		
	Cobalt	4.4E+00				3.0E-04							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	2.2E-07	4.3E-07	3.0E-04	7E-04	1E-03	2.9E-08	1.6E-07	1.5	4E-08	2E-07
17	Chromium	1.2E+01				7.5E-05					20		
	Cobalt	5.0E+00				3.0E-04							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	4.4E+00	0.03	2.4E-07	4.8E-07	3.0E-04	8E-04	2E-03	3.1E-08	1.7E-07	1.5	5E-08	3E-07
18	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	5.7E+00				3.0E-04							
	Iron	1.5E+04				7.0E-01							
	Manganese	5.3E+02				9.6E-04							
	Thallium	1.4E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	7.0E-10	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	2.3E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	2.4E-07	4.7E-07	3.0E-04	8E-04	2E-03	3.1E-08	1.7E-07	1.5	5E-08	3E-07
19	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.7E+00				3.0E-04							
	Iron	1.9E+04				7.0E-01							
	Manganese	4.3E+02				9.6E-04							
	Thallium	1.9E-01				1.0E-05							

				Non-Cancer					Cancer				
Grid	COPC	EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	0.03	1.5E-12	2.9E-12	7.0E-10	2E-03	4E-03	1.9E-13	1.0E-12	130000	2E-08	1E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	0.14	2.7E-08	5.2E-08				3.4E-09	1.9E-08	2	7E-09	4E-08
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	3.0E-07	5.9E-07	3.0E-04	1E-03	2E-03	3.9E-08	2.1E-07	1.5	6E-08	3E-07
22	Chromium	1.4E+01				7.5E-05					20		
	Cobalt	6.3E+00				3.0E-04							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-06	0.03	5.6E-14	1.1E-13	7.0E-10	8E-05	2E-04	7.2E-15	3.9E-14	130000	9E-10	5E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	6.9E-03	0.14	1.8E-09	3.5E-09				2.3E-10	1.3E-09	2	5E-10	3E-09
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.3E+00	0.03	2.9E-07	5.8E-07	3.0E-04	1E-03	2E-03	3.8E-08	2.1E-07	1.5	6E-08	3E-07
23	Chromium	1.3E+01				7.5E-05					20		
	Cobalt	7.1E+00				3.0E-04							
	Iron	1.6E+04				7.0E-01							
	Manganese	4.0E+02				9.6E-04							
	Thallium	1.5E-01				1.0E-05							

Population **Hypothetical Future Construction Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Surface & Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
1	TEQ-D/F (ND=1/2 DL)	5.359E-06	1.00	1.9E-12	7.5E-12	2.0E-08	9E-05	4E-04	1.3E-14	1.1E-13	130000	2E-09	1E-08
	Aroclor-1254	1.4E-01	1.00	4.9E-08	2.0E-07	3.0E-05	2E-03	7E-03	3.5E-10	2.8E-09	2	7E-10	6E-09
	Aluminum	7.4E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02					
	Arsenic	4.8E+00	0.60	1.0E-06	4.0E-06	3.0E-04	3E-03	1E-02	7.1E-09	5.7E-08	1.5	1E-08	9E-08
	Chromium	1.3E+01	1.00	4.6E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.3E-08	2.6E-07	0.5	2E-08	1E-07
	Cobalt	5.6E+00	1.00	2.0E-06	7.8E-06	3.0E-03	7E-04	3E-03					
	Iron	1.5E+04	1.00	5.2E-03	2.1E-02	7.0E-01	7E-03	3E-02					
	Manganese	6.4E+02	1.00	2.2E-04	8.9E-04	2.4E-02	9E-03	4E-02					
	Thallium	8.3E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03					
2	TEQ-D/F (ND=1/2 DL)	3.5E-06	1.00	1.2E-12	4.9E-12	2.0E-08	6E-05	2E-04	8.8E-15	7.0E-14	130000	1E-09	9E-09
	Aroclor-1254	2.5E-02	1.00	8.7E-09	3.5E-08	3.0E-05	3E-04	1E-03	6.2E-11	4.9E-10	2	1E-10	1E-09
	Aluminum	6.6E+03	1.00	2.3E-03	9.2E-03	1.0E+00	2E-03	9E-03					
	Arsenic	3.5E+00	0.60	7.3E-07	2.9E-06	3.0E-04	2E-03	1E-02	5.2E-09	4.2E-08	1.5	8E-09	6E-08
	Chromium	9.9E+00	1.00	3.5E-06	1.4E-05	5.0E-03	7E-04	3E-03	2.5E-08	2.0E-07	0.5	1E-08	1E-07
	Cobalt	3.6E+00	1.00	1.3E-06	5.1E-06	3.0E-03	4E-04	2E-03					
	Iron	9.5E+03	1.00	3.3E-03	1.3E-02	7.0E-01	5E-03	2E-02					
	Manganese	2.9E+02	1.00	1.0E-04	4.1E-04	2.4E-02	4E-03	2E-02					
	Thallium	9.9E-02	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	3E-03					
4	TEQ-D/F (ND=1/2 DL)	1.6E-06	1.00	5.5E-13	2.2E-12	2.0E-08	3E-05	1E-04	3.9E-15	3.1E-14	130000	5E-10	4E-09
	Aroclor-1254	3.1E-02	1.00	1.1E-08	4.3E-08	3.0E-05	4E-04	1E-03	7.6E-11	6.1E-10	2	2E-10	1E-09
	Aluminum	1.2E+04	1.00	4.2E-03	1.7E-02	1.0E+00	4E-03	2E-02					
	Arsenic	3.9E+00	0.60	8.1E-07	3.2E-06	3.0E-04	3E-03	1E-02	5.8E-09	4.6E-08	1.5	9E-09	7E-08
	Chromium	1.0E+01	1.00	3.6E-06	1.4E-05	5.0E-03	7E-04	3E-03	2.6E-08	2.0E-07	0.5	1E-08	1E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.8E-06	3.0E-03	6E-04	2E-03					
	Iron	1.2E+04	1.00	4.4E-03	1.7E-02	7.0E-01	6E-03	2E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.4E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.2E-01	1.00	4.3E-08	1.7E-07	4.0E-05	1E-03	4E-03					
5	TEQ-D/F (ND=1/2 DL)	1.5E-06	1.00	5.1E-13	2.0E-12	2.0E-08	3E-05	1E-04	3.6E-15	2.9E-14	130000	5E-10	4E-09
	Aroclor-1254	2.1E-03	1.00	7.2E-10	2.9E-09	3.0E-05	2E-05	1E-04	5.2E-12	4.1E-11	2	1E-11	8E-11
	Aluminum	7.4E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.6E+00	0.60	7.5E-07	3.0E-06	3.0E-04	2E-03	1E-02	5.3E-09	4.3E-08	1.5	8E-09	6E-08
	Chromium	7.8E+00	1.00	2.7E-06	1.1E-05	5.0E-03	5E-04	2E-03	1.9E-08	1.6E-07	0.5	1E-08	8E-08
	Cobalt	3.8E+00	1.00	1.3E-06	5.3E-06	3.0E-03	4E-04	2E-03					
	Iron	8.9E+03	1.00	3.1E-03	1.3E-02	7.0E-01	4E-03	2E-02					
	Manganese	3.5E+02	1.00	1.2E-04	4.8E-04	2.4E-02	5E-03	2E-02					
	Thallium	2.2E-01	1.00	7.8E-08	3.1E-07	4.0E-05	2E-03	8E-03					
6	TEQ-D/F (ND=1/2 DL)	1.9E-05	1.00	6.5E-12	2.6E-11	2.0E-08	3E-04	1E-03	4.6E-14	3.7E-13	130000	6E-09	5E-08
	Aroclor-1254	4.6E-03	1.00	1.6E-09	6.4E-09	3.0E-05	5E-05	2E-04	1.2E-11	9.2E-11	2	2E-11	2E-10
	Aluminum	9.8E+03	1.00	3.4E-03	1.4E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.2E+00	0.60	6.7E-07	2.7E-06	3.0E-04	2E-03	9E-03	4.8E-09	3.8E-08	1.5	7E-09	6E-08
	Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3.0E-08	2.4E-07	0.5	2E-08	1E-07
	Cobalt	4.3E+00	1.00	1.5E-06	6.0E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.9E-03	1.5E-02	7.0E-01	6E-03	2E-02					
	Manganese	3.6E+02	1.00	1.3E-04	5.1E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.1E-01	1.00	3.7E-08	1.5E-07	4.0E-05	9E-04	4E-03					
7	TEQ-D/F (ND=1/2 DL)	6.0E-07	1.00	2.1E-13	8.5E-13	2.0E-08	1E-05	4E-05	1.5E-15	1.2E-14	130000	2E-10	2E-09
	Aroclor-1254	3.1E-02	1.00	1.1E-08	4.3E-08	3.0E-05	4E-04	1E-03	7.6E-11	6.1E-10	2	2E-10	1E-09
	Aluminum	1.9E+04	1.00	6.6E-03	2.6E-02	1.0E+00	7E-03	3E-02					
	Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4.2E-09	3.4E-08	1.5	6E-09	5E-08
	Chromium	1.3E+01	1.00	4.4E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.1E-08	2.5E-07	0.5	2E-08	1E-07
	Cobalt	6.0E+00	1.00	2.1E-06	8.4E-06	3.0E-03	7E-04	3E-03					
	Iron	1.7E+04	1.00	5.9E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.9E+02	1.00	1.4E-04	5.4E-04	2.4E-02	6E-03	2E-02					
	Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03					
8	TEQ-D/F (ND=1/2 DL)	8.5E-06	1.00	3.0E-12	1.2E-11	2.0E-08	1E-04	6E-04	2.1E-14	1.7E-13	130000	3E-09	2E-08
	Aroclor-1254	3.9E-01	1.00	1.4E-07	5.5E-07	3.0E-05	5E-03	2E-02	9.9E-10	7.9E-09	2	2E-09	2E-08
	Aluminum	1.3E+04	1.00	4.5E-03	1.8E-02	1.0E+00	4E-03	2E-02					
	Arsenic	4.7E+00	0.60	9.8E-07	3.9E-06	3.0E-04	3E-03	1E-02	7.0E-09	5.6E-08	1.5	1E-08	8E-08
	Chromium	3.8E+01	1.00	1.3E-05	5.4E-05	5.0E-03	3E-03	1E-02	9.6E-08	7.6E-07	0.5	5E-08	4E-07
	Cobalt	6.8E+00	1.00	2.4E-06	9.6E-06	3.0E-03	8E-04	3E-03					
	Iron	3.6E+04	1.00	1.3E-02	5.1E-02	7.0E-01	2E-02	7E-02					
	Manganese	4.5E+02	1.00	1.6E-04	6.3E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.5E-01	1.00	5.2E-08	2.1E-07	4.0E-05	1E-03	5E-03					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F (ND=1/2 DL)	9.0E-06	1.00	3.2E-12	1.3E-11	2.0E-08	2E-04	6E-04	2.3E-14	1.8E-13	130000	3E-09	2E-08
	Aroclor-1254	1.6E-02	1.00	5.7E-09	2.3E-08	3.0E-05	2E-04	8E-04	4.1E-11	3.2E-10	2	8E-11	6E-10
	Aluminum	1.1E+04	1.00	3.8E-03	1.5E-02	1.0E+00	4E-03	2E-02					
	Arsenic	4.1E+00	0.60	8.6E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.2E-09	4.9E-08	1.5	9E-09	7E-08
9	Chromium	1.0E+01	1.00	3.6E-06	1.5E-05	5.0E-03	7E-04	3E-03	2.6E-08	2.1E-07	0.5	1E-08	1E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.8E-06	3.0E-03	6E-04	2E-03					
	Iron	1.2E+04	1.00	4.4E-03	1.7E-02	7.0E-01	6E-03	2E-02					
	Manganese	2.9E+02	1.00	1.0E-04	4.0E-04	2.4E-02	4E-03	2E-02					
	Thallium	1.2E-01	1.00	4.0E-08	1.6E-07	4.0E-05	1E-03	4E-03					
	TEQ-D/F (ND=1/2 DL)	2.7E-06	1.00	9.5E-13	3.8E-12	2.0E-08	5E-05	2E-04	6.8E-15	5.4E-14	130000	9E-10	7E-09
	Aroclor-1254	1.3E-02	1.00	4.7E-09	1.9E-08	3.0E-05	2E-04	6E-04	3.3E-11	2.7E-10	2	7E-11	5E-10
	Aluminum	8.0E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02					
	Arsenic	2.6E+00	0.60	5.5E-07	2.2E-06	3.0E-04	2E-03	7E-03	3.9E-09	3.1E-08	1.5	6E-09	5E-08
11	Chromium	1.1E+01	1.00	3.9E-06	1.5E-05	5.0E-03	8E-04	3E-03	2.8E-08	2.2E-07	0.5	1E-08	1E-07
	Cobalt	4.2E+00	1.00	1.5E-06	5.8E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.9E-03	1.5E-02	7.0E-01	6E-03	2E-02					
	Manganese	2.5E+02	1.00	8.9E-05	3.6E-04	2.4E-02	4E-03	1E-02					
	Thallium	9.7E-02	1.00	3.4E-08	1.4E-07	4.0E-05	8E-04	3E-03					
	TEQ-D/F (ND=1/2 DL)	3.3E-06	1.00	1.2E-12	4.6E-12	2.0E-08	6E-05	2E-04	8.3E-15	6.6E-14	130000	1E-09	9E-09
	Aroclor-1254	6.2E-02	1.00	2.2E-08	8.7E-08	3.0E-05	7E-04	3E-03	1.6E-10	1.2E-09	2	3E-10	2E-09
	Aluminum	1.3E+04	1.00	4.4E-03	1.8E-02	1.0E+00	4E-03	2E-02					
	Arsenic	6.8E+00	0.60	1.4E-06	5.8E-06	3.0E-04	5E-03	2E-02	1.0E-08	8.2E-08	1.5	2E-08	1E-07
12	Chromium	1.6E+01	1.00	5.6E-06	2.2E-05	5.0E-03	1E-03	4E-03	4.0E-08	3.2E-07	0.5	2E-08	2E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.7E-06	3.0E-03	6E-04	2E-03					
	Iron	1.4E+04	1.00	4.8E-03	1.9E-02	7.0E-01	7E-03	3E-02					
	Manganese	1.4E+03	1.00	4.9E-04	1.9E-03	2.4E-02	2E-02	8E-02					
	Thallium	8.1E-02	1.00	2.9E-08	1.1E-07	4.0E-05	7E-04	3E-03					
	TEQ-D/F (ND=1/2 DL)	3.8E-06	1.00	1.3E-12	5.4E-12	2.0E-08	7E-05	3E-04	9.6E-15	7.7E-14	130000	1E-09	1E-08
	Aroclor-1254	5.7E-03	1.00	2.0E-09	8.0E-09	3.0E-05	7E-05	3E-04	1.4E-11	1.1E-10	2	3E-11	2E-10
	Aluminum	1.5E+04	1.00	5.2E-03	2.1E-02	1.0E+00	5E-03	2E-02					
	Arsenic	5.1E+00	0.60	1.1E-06	4.3E-06	3.0E-04	4E-03	1E-02	7.7E-09	6.1E-08	1.5	1E-08	9E-08
13	Chromium	1.2E+01	1.00	4.0E-06	1.6E-05	5.0E-03	8E-04	3E-03	2.9E-08	2.3E-07	0.5	1E-08	1E-07
	Cobalt	6.3E+00	1.00	2.2E-06	8.9E-06	3.0E-03	7E-04	3E-03					
	Iron	1.5E+04	1.00	5.4E-03	2.2E-02	7.0E-01	8E-03	3E-02					
	Manganese	4.8E+02	1.00	1.7E-04	6.7E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.3E-01	1.00	4.7E-08	1.9E-07	4.0E-05	1E-03	5E-03					
	TEQ-D/F (ND=1/2 DL)	2.0E-05	1.00	6.9E-12	2.8E-11	2.0E-08	3E-04	1E-03	4.9E-14	4.0E-13	130000	6E-09	5E-08
	Aroclor-1254	9.9E-02	1.00	3.5E-08	1.4E-07	3.0E-05	1E-03	5E-03	2.5E-10	2.0E-09	2	5E-10	4E-09
	Aluminum	1.0E+04	1.00	3.7E-03	1.5E-02	1.0E+00	4E-03	1E-02					
	Arsenic	4.1E+00	0.60	8.7E-07	3.5E-06	3.0E-04	3E-03	1E-02	6.2E-09	5.0E-08	1.5	9E-09	7E-08
14	Chromium	1.6E+01	1.00	5.6E-06	2.2E-05	5.0E-03	1E-03	4E-03	4.0E-08	3.2E-07	0.5	2E-08	2E-07
	Cobalt	5.1E+00	1.00	1.8E-06	7.2E-06	3.0E-03	6E-04	2E-03					
	Iron	1.6E+04	1.00	5.5E-03	2.2E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.5E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.2E-01	1.00	4.1E-08	1.6E-07	4.0E-05	1E-03	4E-03					
	TEQ-D/F (ND=1/2 DL)	1.4E-06	1.00	4.9E-13	2.0E-12	2.0E-08	2E-05	1E-04	3.5E-15	2.8E-14	130000	5E-10	4E-09
	Aroclor-1254	2.8E-03	1.00	1.0E-09	4.0E-09	3.0E-05	3E-05	1E-04	7.1E-12	5.7E-11	2	1E-11	1E-10
	Aluminum	5.3E+03	1.00	1.8E-03	7.4E-03	1.0E+00	2E-03	7E-03					
	Arsenic	2.2E+00	0.60	4.7E-07	1.9E-06	3.0E-04	2E-03	6E-03	3.4E-09	2.7E-08	1.5	5E-09	4E-08
15	Chromium	1.1E+01	1.00	3.8E-06	1.5E-05	5.0E-03	8E-04	3E-03	2.7E-08	2.2E-07	0.5	1E-08	1E-07
	Cobalt	3.0E+00	1.00	1.0E-06	4.2E-06	3.0E-03	3E-04	1E-03					
	Iron	8.5E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02					
	Manganese	1.8E+02	1.00	6.4E-05	2.6E-04	2.4E-02	3E-03	1E-02					
	Thallium	6.7E-02	1.00	2.3E-08	9.4E-08	4.0E-05	6E-04	2E-03					
	TEQ-D/F (ND=1/2 DL)	5.3E-06	1.00	1.9E-12	7.4E-12	2.0E-08	9E-05	4E-04	1.3E-14	1.1E-13	130000	2E-09	1E-08
	Aroclor-1254	no data	1.00	--	--	3.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.3E+00	0.60	6.9E-07	2.8E-06	3.0E-04	2E-03	9E-03	5.0E-09	4.0E-08	1.5	7E-09	6E-08
16	Chromium	9.2E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2.3E-08	1.8E-07	0.5	1E-08	9E-08
	Cobalt	4.4E+00	1.00	1.5E-06	6.2E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.8E-03	1.5E-02	7.0E-01	5E-03	2E-02					
	Manganese	3.1E+02	1.00	1.1E-04	4.3E-04	2.4E-02	4E-03	2E-02					
	Thallium	1.0E-01	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	4E-03					
	TEQ-D/F (ND=1/2 DL)	2.2E-06	1.00	7.8E-13	3.1E-12	2.0E-08	4E-05	2E-04	5.6E-15	4.4E-14	130000	7E-10	6E-09
	Aroclor-1254	no data	1.00	--	--	3.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03	1.00	3.5E-03	1.4E-02	1.0E+00	3E-03	1E-02					
	Arsenic	4.0E+00	0.60	8.4E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.0E-09	4.8E-08	1.5	9E-09	7E-08
17	Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3.0E-08	2.4E-07	0.5	1E-08	1E-07
	Cobalt	5.0E+00	1.00	1.8E-06	7.0E-06	3.0E-03	6E-04	2E-03					
	Iron	1.3E+04	1.00	4.4E-03	1.8E-02	7.0E-01	6E-03	3E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.5E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.0E-01	1.00	3.6E-08	1.4E-07	4.0E-05	9E-04	4E-03					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
18	TEQ-D/F (ND=1/2 DL)	5.7E-06	1.00	2.0E-12	8.0E-12	2.0E-08	1E-04	4E-04	1.4E-14	1.1E-13	130000	2E-09	1E-08
	Aroclor-1254	5.6E-03	1.00	1.9E-09	7.8E-09	3.0E-05	6E-05	3E-04	1.4E-11	1.1E-10	2	3E-11	2E-10
	Aluminum	1.4E+04	1.00	4.9E-03	1.9E-02	1.0E+00	5E-03	2E-02					
	Arsenic	4.1E+00	0.60	8.6E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.1E-09	4.9E-08	1.5	9E-09	7E-08
	Chromium	1.2E+01	1.00	4.3E-06	1.7E-05	5.0E-03	9E-04	3E-03	3.1E-08	2.5E-07	0.5	2E-08	1E-07
	Cobalt	5.4E+00	1.00	1.9E-06	7.5E-06	3.0E-03	6E-04	3E-03					
	Iron	1.4E+04	1.00	4.9E-03	2.0E-02	7.0E-01	7E-03	3E-02					
	Manganese	4.7E+02	1.00	1.6E-04	6.6E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.3E-01	1.00	4.7E-08	1.9E-07	4.0E-05	1E-03	5E-03					
19	TEQ-D/F (ND=1/2 DL)	2.5E-06	1.00	8.8E-13	3.5E-12	2.0E-08	4E-05	2E-04	6.3E-15	5.0E-14	130000	8E-10	7E-09
	Aroclor-1254	5.0E-03	1.00	1.7E-09	6.9E-09	3.0E-05	6E-05	2E-04	1.2E-11	9.9E-11	2	2E-11	2E-10
	Aluminum	2.2E+04	1.00	7.6E-03	3.1E-02	1.0E+00	8E-03	3E-02					
	Arsenic	4.3E+00	0.60	9.0E-07	3.6E-06	3.0E-04	3E-03	1E-02	6.5E-09	5.2E-08	1.5	1E-08	8E-08
	Chromium	1.5E+01	1.00	5.3E-06	2.1E-05	5.0E-03	1E-03	4E-03	3.8E-08	3.0E-07	0.5	2E-08	2E-07
	Cobalt	6.6E+00	1.00	2.3E-06	9.2E-06	3.0E-03	8E-04	3E-03					
	Iron	1.9E+04	1.00	6.7E-03	2.7E-02	7.0E-01	1E-02	4E-02					
	Manganese	3.8E+02	1.00	1.3E-04	5.4E-04	2.4E-02	6E-03	2E-02					
	Thallium	2.0E-01	1.00	6.8E-08	2.7E-07	4.0E-05	2E-03	7E-03					
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	1.00	5.1E-12	2.1E-11	2.0E-08	3E-04	1E-03	3.7E-14	2.9E-13	130000	5E-09	4E-08
	Aroclor-1254	2.5E-02	1.00	8.8E-09	3.5E-08	3.0E-05	3E-04	1E-03	6.3E-11	5.0E-10	2	1E-10	1E-09
	Aluminum	1.6E+04	1.00	5.5E-03	2.2E-02	1.0E+00	5E-03	2E-02					
	Arsenic	5.4E+00	0.60	1.1E-06	4.6E-06	3.0E-04	4E-03	2E-02	8.2E-09	6.5E-08	1.5	1E-08	1E-07
	Chromium	1.4E+01	1.00	4.9E-06	2.0E-05	5.0E-03	1E-03	4E-03	3.5E-08	2.8E-07	0.5	2E-08	1E-07
	Cobalt	6.3E+00	1.00	2.2E-06	8.9E-06	3.0E-03	7E-04	3E-03					
	Iron	1.7E+04	1.00	5.8E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	4.4E+02	1.00	1.5E-04	6.1E-04	2.4E-02	6E-03	3E-02					
	Thallium	1.5E-01	1.00	5.1E-08	2.0E-07	4.0E-05	1E-03	5E-03					
23	TEQ-D/F (ND=1/2 DL)	6.8E-07	1.00	2.4E-13	9.5E-13	2.0E-08	1E-05	5E-05	1.7E-15	1.4E-14	130000	2E-10	2E-09
	Aroclor-1254	5.0E-03	1.00	1.7E-09	6.9E-09	3.0E-05	6E-05	2E-04	1.2E-11	9.9E-11	2	2E-11	2E-10
	Aluminum	1.7E+04	1.00	5.8E-03	2.3E-02	1.0E+00	6E-03	2E-02					
	Arsenic	5.2E+00	0.60	1.1E-06	4.4E-06	3.0E-04	4E-03	1E-02	7.8E-09	6.2E-08	1.5	1E-08	9E-08
	Chromium	1.3E+01	1.00	4.5E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.2E-08	2.6E-07	0.5	2E-08	1E-07
	Cobalt	7.1E+00	1.00	2.5E-06	9.9E-06	3.0E-03	8E-04	3E-03					
	Iron	1.6E+04	1.00	5.8E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.9E+02	1.00	1.4E-04	5.5E-04	2.4E-02	6E-03	2E-02					
	Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03					

Population Hypothetical Future Construction Workers
Exposure Area Random 20-acre grids across OU2
Medium Surface & Subsurface Soil
Exposure Route Incidental Ingestion

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	1.00	4.8E-12	1.9E-11	2.0E-08	2E-04	1E-03	3.4E-14	2.7E-13	130000	4E-09	4E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	1.00	6.8E-08	2.7E-07				4.9E-10	3.9E-09	2	1E-09	8E-09
	Aluminum	7.4E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02					
	Arsenic	4.8E+00	0.60	1.0E-06	4.0E-06	3.0E-04	3E-03	1E-02	7.1E-09	5.7E-08	1.5	1E-08	9E-08
1	Chromium	1.3E+01	1.00	4.6E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.3E-08	2.6E-07	0.5	2E-08	1E-07
	Cobalt	5.6E+00	1.00	2.0E-06	7.8E-06	3.0E-03	7E-04	3E-03					
	Iron	1.5E+04	1.00	5.2E-03	2.1E-02	7.0E-01	7E-03	3E-02					
	Manganese	6.4E+02	1.00	2.2E-04	8.9E-04	2.4E-02	9E-03	4E-02					
	Thallium	8.3E-02	1.00	2.9E-08	1.2E-07	4.0E-05	7E-04	3E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	1.00	1.9E-12	7.4E-12	2.0E-08	9E-05	4E-04	1.3E-14	1.1E-13	130000	2E-09	1E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	1.00	1.0E-08	4.0E-08				7.1E-11	5.7E-10	2	1E-10	1E-09
	Aluminum	6.6E+03	1.00	2.3E-03	9.2E-03	1.0E+00	2E-03	9E-03					
	Arsenic	3.5E+00	0.60	7.3E-07	2.9E-06	3.0E-04	2E-03	1E-02	5.2E-09	4.2E-08	1.5	8E-09	6E-08
2	Chromium	9.9E+00	1.00	3.5E-06	1.4E-05	5.0E-03	7E-04	3E-03	2.5E-08	2.0E-07	0.5	1E-08	1E-07
	Cobalt	3.6E+00	1.00	1.3E-06	5.1E-06	3.0E-03	4E-04	2E-03					
	Iron	9.5E+03	1.00	3.3E-03	1.3E-02	7.0E-01	5E-03	2E-02					
	Manganese	2.9E+02	1.00	1.0E-04	4.1E-04	2.4E-02	4E-03	2E-02					
	Thallium	9.9E-02	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	3E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.2E-06	1.00	2.2E-12	8.7E-12	2.0E-08	1E-04	4E-04	1.6E-14	1.2E-13	130000	2E-09	2E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	3.7E-08	1.5E-07				2.7E-10	2.1E-09	2	5E-10	4E-09
	Aluminum	1.2E+04	1.00	4.2E-03	1.7E-02	1.0E+00	4E-03	2E-02					
	Arsenic	3.9E+00	0.60	8.1E-07	3.2E-06	3.0E-04	3E-03	1E-02	5.8E-09	4.6E-08	1.5	9E-09	7E-08
4	Chromium	1.0E+01	1.00	3.6E-06	1.4E-05	5.0E-03	7E-04	3E-03	2.6E-08	2.0E-07	0.5	1E-08	1E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.8E-06	3.0E-03	6E-04	2E-03					
	Iron	1.2E+04	1.00	4.4E-03	1.7E-02	7.0E-01	6E-03	2E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.4E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.2E-01	1.00	4.3E-08	1.7E-07	4.0E-05	1E-03	4E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	7.4E+03	1.00	2.6E-03	1.0E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.6E+00	0.60	7.5E-07	3.0E-06	3.0E-04	2E-03	1E-02	5.3E-09	4.3E-08	1.5	8E-09	6E-08
5	Chromium	7.8E+00	1.00	2.7E-06	1.1E-05	5.0E-03	5E-04	2E-03	1.9E-08	1.6E-07	0.5	1E-08	8E-08
	Cobalt	3.8E+00	1.00	1.3E-06	5.3E-06	3.0E-03	4E-04	2E-03					
	Iron	8.9E+03	1.00	3.1E-03	1.3E-02	7.0E-01	4E-03	2E-02					
	Manganese	3.5E+02	1.00	1.2E-04	4.8E-04	2.4E-02	5E-03	2E-02					
	Thallium	2.2E-01	1.00	7.8E-08	3.1E-07	4.0E-05	2E-03	8E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	5.7E-07	1.00	2.0E-13	8.0E-13	2.0E-08	1E-05	4E-05	1.4E-15	1.1E-14	130000	2E-10	1E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	4.8E-04	1.00	1.7E-10	6.7E-10				1.2E-12	9.5E-12	2	2E-12	2E-11
	Aluminum	9.8E+03	1.00	3.4E-03	1.4E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.2E+00	0.60	6.7E-07	2.7E-06	3.0E-04	2E-03	9E-03	4.8E-09	3.8E-08	1.5	7E-09	6E-08
6	Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3.0E-08	2.4E-07	0.5	2E-08	1E-07
	Cobalt	4.3E+00	1.00	1.5E-06	6.0E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.9E-03	1.5E-02	7.0E-01	6E-03	2E-02					
	Manganese	3.6E+02	1.00	1.3E-04	5.1E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.1E-01	1.00	3.7E-08	1.5E-07	4.0E-05	9E-04	4E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	6.2E-06	1.00	2.2E-12	8.7E-12	2.0E-08	1E-04	4E-04	1.6E-14	1.2E-13	130000	2E-09	2E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	1.00	3.7E-08	1.5E-07				2.7E-10	2.1E-09	2	5E-10	4E-09
	Aluminum	1.9E+04	1.00	6.6E-03	2.6E-02	1.0E+00	7E-03	3E-02					
	Arsenic	2.8E+00	0.60	5.9E-07	2.4E-06	3.0E-04	2E-03	8E-03	4.2E-09	3.4E-08	1.5	6E-09	5E-08
7	Chromium	1.3E+01	1.00	4.4E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.1E-08	2.5E-07	0.5	2E-08	1E-07
	Cobalt	6.0E+00	1.00	2.1E-06	8.4E-06	3.0E-03	7E-04	3E-03					
	Iron	1.7E+04	1.00	5.9E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.9E+02	1.00	1.4E-04	5.4E-04	2.4E-02	6E-03	2E-02					
	Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	4.0E-05	1.00	1.4E-11	5.7E-11	2.0E-08	7E-04	3E-03	1.0E-13	8.1E-13	130000	1E-08	1E-07
	Total Non-coplanar PCBs (ND=1/2 DL)	9.7E-01	1.00	3.4E-07	1.4E-06				2.4E-09	1.9E-08	2	5E-09	4E-08
	Aluminum	1.3E+04	1.00	4.5E-03	1.8E-02	1.0E+00	4E-03	2E-02					
	Arsenic	4.7E+00	0.60	9.8E-07	3.9E-06	3.0E-04	3E-03	1E-02	7.0E-09	5.6E-08	1.5	1E-08	8E-08
8	Chromium	3.8E+01	1.00	1.3E-05	5.4E-05	5.0E-03	3E-03	1E-02	9.6E-08	7.6E-07	0.5	5E-08	4E-07
	Cobalt	6.8E+00	1.00	2.4E-06	9.6E-06	3.0E-03	8E-04	3E-03					
	Iron	3.6E+04	1.00	1.3E-02	5.1E-02	7.0E-01	2E-02	7E-02					
	Manganese	4.5E+02	1.00	1.6E-04	6.3E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.5E-01	1.00	5.2E-08	2.1E-07	4.0E-05	1E-03	5E-03					
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	1.00	3.7E-12	1.5E-11	2.0E-08	2E-04	7E-04	2.6E-14	2.1E-13	130000	3E-09	3E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	1.00	1.1E-08	4.6E-08				8.2E-11	6.5E-10	2	2E-10	1E-09
	Aluminum	1.1E+04	1.00	3.8E-03	1.5E-02	1.0E+00	4E-03	2E-02					
	Arsenic	4.1E+00	0.60	8.6E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.2E-09	4.9E-08	1.5	9E-09	7E-08
9	Chromium	1.0E+01	1.00	3.6E-06	1.5E-05	5.0E-03	7E-04	3E-03	2.6E-08	2.1E-07	0.5	1E-08	1E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.8E-06	3.0E-03	6E-04	2E-03					
	Iron	1.2E+04	1.00	4.4E-03	1.7E-02	7.0E-01	6E-03	2E-02					
	Manganese	2.9E+02	1.00	1.0E-04	4.0E-04	2.4E-02	4E-03	2E-02					
	Thallium	1.2E-01	1.00	4.0E-08	1.6E-07	4.0E-05	1E-03	4E-03					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
11	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-06	1.00	1.5E-12	5.9E-12	2.0E-08	7E-05	3E-04	1.1E-14	8.4E-14	130000	1E-09	1E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	1.00	3.5E-08	1.4E-07				2.5E-10	2.0E-09	2	5E-10	4E-09
	Aluminum	8.0E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02					
	Arsenic	2.6E+00	0.60	5.5E-07	2.2E-06	3.0E-04	2E-03	7E-03	3.9E-09	3.1E-08	1.5	6E-09	5E-08
	Chromium	1.1E+01	1.00	3.9E-06	1.5E-05	5.0E-03	8E-04	3E-03	2.8E-08	2.2E-07	0.5	1E-08	1E-07
	Cobalt	4.2E+00	1.00	1.5E-06	5.8E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.9E-03	1.5E-02	7.0E-01	6E-03	2E-02					
	Manganese	2.5E+02	1.00	8.9E-05	3.6E-04	2.4E-02	4E-03	1E-02					
	Thallium	9.7E-02	1.00	3.4E-08	1.4E-07	4.0E-05	8E-04	3E-03					
12	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	1.3E+04	1.00	4.4E-03	1.8E-02	1.0E+00	4E-03	2E-02					
	Arsenic	6.8E+00	0.60	1.4E-06	5.8E-06	3.0E-04	5E-03	2E-02	1.0E-08	8.2E-08	1.5	2E-08	1E-07
	Chromium	1.6E+01	1.00	5.6E-06	2.2E-05	5.0E-03	1E-03	4E-03	4.0E-08	3.2E-07	0.5	2E-08	2E-07
	Cobalt	4.8E+00	1.00	1.7E-06	6.7E-06	3.0E-03	6E-04	2E-03					
	Iron	1.4E+04	1.00	4.8E-03	1.9E-02	7.0E-01	7E-03	3E-02					
	Manganese	1.4E+03	1.00	4.9E-04	1.9E-03	2.4E-02	2E-02	8E-02					
	Thallium	8.1E-02	1.00	2.9E-08	1.1E-07	4.0E-05	7E-04	3E-03					
13	TEQ-D/F/PCBs (ND=1/2 DL)	3.7E-06	1.00	1.3E-12	5.1E-12	2.0E-08	6E-05	3E-04	9.2E-15	7.3E-14	130000	1E-09	1E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.4E-02	1.00	4.9E-09	2.0E-08				3.5E-11	2.8E-10	2	7E-11	6E-10
	Aluminum	1.5E+04	1.00	5.2E-03	2.1E-02	1.0E+00	5E-03	2E-02					
	Arsenic	5.1E+00	0.60	1.1E-06	4.3E-06	3.0E-04	4E-03	1E-02	7.7E-09	6.1E-08	1.5	1E-08	9E-08
	Chromium	1.2E+01	1.00	4.0E-06	1.6E-05	5.0E-03	8E-04	3E-03	2.9E-08	2.3E-07	0.5	1E-08	1E-07
	Cobalt	6.3E+00	1.00	2.2E-06	8.9E-06	3.0E-03	7E-04	3E-03					
	Iron	1.5E+04	1.00	5.4E-03	2.2E-02	7.0E-01	8E-03	3E-02					
	Manganese	4.8E+02	1.00	1.7E-04	6.7E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.3E-01	1.00	4.7E-08	1.9E-07	4.0E-05	1E-03	5E-03					
14	TEQ-D/F/PCBs (ND=1/2 DL)	2.9E-05	1.00	1.0E-11	4.1E-11	2.0E-08	5E-04	2E-03	7.2E-14	5.8E-13	130000	9E-09	8E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	6.3E-02	1.00	2.2E-08	8.9E-08				1.6E-10	1.3E-09	2	3E-10	3E-09
	Aluminum	1.0E+04	1.00	3.7E-03	1.5E-02	1.0E+00	4E-03	1E-02					
	Arsenic	4.1E+00	0.60	8.7E-07	3.5E-06	3.0E-04	3E-03	1E-02	6.2E-09	5.0E-08	1.5	9E-09	7E-08
	Chromium	1.6E+01	1.00	5.6E-06	2.2E-05	5.0E-03	1E-03	4E-03	4.0E-08	3.2E-07	0.5	2E-08	2E-07
	Cobalt	5.1E+00	1.00	1.8E-06	7.2E-06	3.0E-03	6E-04	2E-03					
	Iron	1.6E+04	1.00	5.5E-03	2.2E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.5E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.2E-01	1.00	4.1E-08	1.6E-07	4.0E-05	1E-03	4E-03					
15	TEQ-D/F/PCBs (ND=1/2 DL)	6.8E-07	1.00	2.4E-13	9.5E-13	2.0E-08	1E-05	5E-05	1.7E-15	1.4E-14	130000	2E-10	2E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.2E-03	1.00	4.3E-10	1.7E-09				3.1E-12	2.5E-11	2	6E-12	5E-11
	Aluminum	5.3E+03	1.00	1.8E-03	7.4E-03	1.0E+00	2E-03	7E-03					
	Arsenic	2.2E+00	0.60	4.7E-07	1.9E-06	3.0E-04	2E-03	6E-03	3.4E-09	2.7E-08	1.5	5E-09	4E-08
	Chromium	1.1E+01	1.00	3.8E-06	1.5E-05	5.0E-03	8E-04	3E-03	2.7E-08	2.2E-07	0.5	1E-08	1E-07
	Cobalt	3.0E+00	1.00	1.0E-06	4.2E-06	3.0E-03	3E-04	1E-03					
	Iron	8.5E+03	1.00	3.0E-03	1.2E-02	7.0E-01	4E-03	2E-02					
	Manganese	1.8E+02	1.00	6.4E-05	2.6E-04	2.4E-02	3E-03	1E-02					
	Thallium	6.7E-02	1.00	2.3E-08	9.4E-08	4.0E-05	6E-04	2E-03					
16	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	8.0E+03	1.00	2.8E-03	1.1E-02	1.0E+00	3E-03	1E-02					
	Arsenic	3.3E+00	0.60	6.9E-07	2.8E-06	3.0E-04	2E-03	9E-03	5.0E-09	4.0E-08	1.5	7E-09	6E-08
	Chromium	9.2E+00	1.00	3.2E-06	1.3E-05	5.0E-03	6E-04	3E-03	2.3E-08	1.8E-07	0.5	1E-08	9E-08
	Cobalt	4.4E+00	1.00	1.5E-06	6.2E-06	3.0E-03	5E-04	2E-03					
	Iron	1.1E+04	1.00	3.8E-03	1.5E-02	7.0E-01	5E-03	2E-02					
	Manganese	3.1E+02	1.00	1.1E-04	4.3E-04	2.4E-02	4E-03	2E-02					
	Thallium	1.0E-01	1.00	3.5E-08	1.4E-07	4.0E-05	9E-04	4E-03					
17	TEQ-D/F/PCBs (ND=1/2 DL)	no data	1.00	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	1.00	--	--				--	--	2	--	--
	Aluminum	9.9E+03	1.00	3.5E-03	1.4E-02	1.0E+00	3E-03	1E-02					
	Arsenic	4.0E+00	0.60	8.4E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.0E-09	4.8E-08	1.5	9E-09	7E-08
	Chromium	1.2E+01	1.00	4.2E-06	1.7E-05	5.0E-03	8E-04	3E-03	3.0E-08	2.4E-07	0.5	1E-08	1E-07
	Cobalt	5.0E+00	1.00	1.8E-06	7.0E-06	3.0E-03	6E-04	2E-03					
	Iron	1.3E+04	1.00	4.4E-03	1.8E-02	7.0E-01	6E-03	3E-02					
	Manganese	3.2E+02	1.00	1.1E-04	4.5E-04	2.4E-02	5E-03	2E-02					
	Thallium	1.0E-01	1.00	3.6E-08	1.4E-07	4.0E-05	9E-04	4E-03					
18	TEQ-D/F/PCBs (ND=1/2 DL)	3.7E-07	1.00	1.3E-13	5.1E-13	2.0E-08	6E-06	3E-05	9.2E-16	7.4E-15	130000	1E-10	1E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	2.6E-04	1.00	9.1E-11	3.7E-10				6.5E-13	5.2E-12	2	1E-12	1E-11
	Aluminum	1.4E+04	1.00	4.9E-03	1.9E-02	1.0E+00	5E-03	2E-02					
	Arsenic	4.1E+00	0.60	8.6E-07	3.4E-06	3.0E-04	3E-03	1E-02	6.1E-09	4.9E-08	1.5	9E-09	7E-08
	Chromium	1.2E+01	1.00	4.3E-06	1.7E-05	5.0E-03	9E-04	3E-03	3.1E-08	2.5E-07	0.5	2E-08	1E-07
	Cobalt	5.4E+00	1.00	1.9E-06	7.5E-06	3.0E-03	6E-04	3E-03					
	Iron	1.4E+04	1.00	4.9E-03	2.0E-02	7.0E-01	7E-03	3E-02					
	Manganese	4.7E+02	1.00	1.6E-04	6.6E-04	2.4E-02	7E-03	3E-02					
	Thallium	1.3E-01	1.00	4.7E-08	1.9E-07	4.0E-05	1E-03	5E-03					
19	TEQ-D/F/PCBs (ND=1/2 DL)	4.3E-07	1.00	1.5E-13	6.1E-13	2.0E-08	8E-06	3E-05	1.1E-15	8.6E-15	130000	1E-10	1E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	4.8E-05	1.00	1.7E-11	6.7E-11				1.2E-13	9.6E-13	2	2E-13	2E-12
	Aluminum	2.2E+04	1.00	7.6E-03	3.1E-02	1.0E+00	8E-03	3E-02					
	Arsenic	4.3E+00	0.60	9.0E-07	3.6E-06	3.0E-04	3E-03	1E-02	6.5E-09	5.2E-08	1.5	1E-08	8E-08
	Chromium	1.5E+01	1.00	5.3E-06	2.1E-05	5.0E-03	1E-03	4E-03	3.8E-08	3.0E-07	0.5	2E-08	2E-07
	Cobalt	6.6E+00	1.00	2.3E-06	9.2E-06	3.0E-03	8E-04	3E-03					
	Iron	1.9E+04	1.00	6.7E-03	2.7E-02	7.0E-01	1E-02	4E-02					
	Manganese	3.8E+02	1.00	1.3E-04	5.4E-04	2.4E-02	6E-03	2E-02					
	Thallium	2.0E-01	1.00	6.8E-08	2.7E-07	4.0E-05	2E-03	7E-03					

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	1.00	9.3E-12	3.7E-11	2.0E-08	5E-04	2E-03	6.6E-14	5.3E-13	130000	9E-09	7E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	1.00	3.6E-08	1.4E-07				2.6E-10	2.1E-09	2	5E-10	4E-09
	Aluminum	1.6E+04	1.00	5.5E-03	2.2E-02	1.0E+00	5E-03	2E-02					
	Arsenic	5.4E+00	0.60	1.1E-06	4.6E-06	3.0E-04	4E-03	2E-02	8.2E-09	6.5E-08	1.5	1E-08	1E-07
	Chromium	1.4E+01	1.00	4.9E-06	2.0E-05	5.0E-03	1E-03	4E-03	3.5E-08	2.8E-07	0.5	2E-08	1E-07
	Cobalt	6.3E+00	1.00	2.2E-06	8.9E-06	3.0E-03	7E-04	3E-03					
	Iron	1.7E+04	1.00	5.8E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	4.4E+02	1.00	1.5E-04	6.1E-04	2.4E-02	6E-03	3E-02					
	Thallium	1.5E-01	1.00	5.1E-08	2.0E-07	4.0E-05	1E-03	5E-03					
23	TEQ-D/F/PCBs (ND=1/2 DL)	9.8E-07	1.00	3.4E-13	1.4E-12	2.0E-08	2E-05	7E-05	2.5E-15	2.0E-14	130000	3E-10	3E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	6.6E-03	1.00	2.3E-09	9.3E-09				1.7E-11	1.3E-10	2	3E-11	3E-10
	Aluminum	1.7E+04	1.00	5.8E-03	2.3E-02	1.0E+00	6E-03	2E-02					
	Arsenic	5.2E+00	0.60	1.1E-06	4.4E-06	3.0E-04	4E-03	1E-02	7.8E-09	6.2E-08	1.5	1E-08	9E-08
	Chromium	1.3E+01	1.00	4.5E-06	1.8E-05	5.0E-03	9E-04	4E-03	3.2E-08	2.6E-07	0.5	2E-08	1E-07
	Cobalt	7.1E+00	1.00	2.5E-06	9.9E-06	3.0E-03	8E-04	3E-03					
	Iron	1.6E+04	1.00	5.8E-03	2.3E-02	7.0E-01	8E-03	3E-02					
	Manganese	3.9E+02	1.00	1.4E-04	5.5E-04	2.4E-02	6E-03	2E-02					
	Thallium	1.5E-01	1.00	5.3E-08	2.1E-07	4.0E-05	1E-03	5E-03					

Population	**Hypothetical Future Construction Workers**
Exposure Area	**Random 20-acre grids across OU2**
Medium	**Surface & Subsurface Soil**
Exposure Route	**Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

				Non-Cancer					Cancer				
Grid	COPC	EPC	ABSd	DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
1	TEQ-D/F (ND=1/2 DL)	5.4E-06	0.03	1.2E-13	7.2E-13	2.0E-08	6E-06	4E-05	8.6E-16	1.0E-14	130000	1E-10	1E-09
	Aroclor-1254	1.4E-01	0.14	1.5E-08	8.9E-08	3.0E-05	5E-04	3E-03	1.1E-10	1.3E-09	2	2E-10	3E-09
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	1.1E-07	6.4E-07	3.0E-04	4E-04	2E-03	7.6E-10	9.2E-09	1.5	1E-09	1E-08
	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	5.6E+00				3.0E-03							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				4.0E-05							
2	TEQ-D/F (ND=1/2 DL)	3.5E-06	0.03	7.9E-14	4.7E-13	2.0E-08	4E-06	2E-05	5.6E-16	6.8E-15	130000	7E-11	9E-10
	Aroclor-1254	2.5E-02	0.14	2.6E-09	1.6E-08	3.0E-05	9E-05	5E-04	1.8E-11	2.2E-10	2	4E-11	4E-10
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	7.8E-08	4.7E-07	3.0E-04	3E-04	2E-03	5.6E-10	6.7E-09	1.5	8E-10	1E-08
	Chromium	9.9E+00				1.3E-04					20		
	Cobalt	3.6E+00				3.0E-03							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				4.0E-05							
4	TEQ-D/F (ND=1/2 DL)	1.6E-06	0.03	3.5E-14	2.1E-13	2.0E-08	2E-06	1E-05	2.5E-16	3.0E-15	130000	3E-11	4E-10
	Aroclor-1254	3.1E-02	0.14	3.2E-09	1.9E-08	3.0E-05	1E-04	6E-04	2.3E-11	2.7E-10	2	5E-11	5E-10
	Aluminum	1.2E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	8.6E-08	5.2E-07	3.0E-04	3E-04	2E-03	6.2E-10	7.4E-09	1.5	9E-10	1E-08
	Chromium	1.0E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							
5	TEQ-D/F (ND=1/2 DL)	1.5E-06	0.03	3.3E-14	2.0E-13	2.0E-08	2E-06	1E-05	2.3E-16	2.8E-15	130000	3E-11	4E-10
	Aroclor-1254	2.1E-03	0.14	2.2E-10	1.3E-09	3.0E-05	7E-06	4E-05	1.5E-12	1.9E-11	2	3E-12	4E-11
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	3.6E+00	0.03	8.0E-08	4.8E-07	3.0E-04	3E-04	2E-03	5.7E-10	6.9E-09	1.5	9E-10	1E-08
	Chromium	7.8E+00				1.3E-04					20		
	Cobalt	3.8E+00				3.0E-03							
	Iron	8.9E+03				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	2.2E-01				4.0E-05							
6	TEQ-D/F (ND=1/2 DL)	1.9E-05	0.03	4.2E-13	2.5E-12	2.0E-08	2E-05	1E-04	3.0E-15	3.6E-14	130000	4E-10	5E-09
	Aroclor-1254	4.6E-03	0.14	4.8E-10	2.9E-09	3.0E-05	2E-05	1E-04	3.4E-12	4.1E-11	2	7E-12	8E-11
	Aluminum	9.8E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	7.2E-08	4.3E-07	3.0E-04	2E-04	1E-03	5.1E-10	6.2E-09	1.5	8E-10	9E-09
	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	4.3E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.6E+02				9.6E-04							
	Thallium	1.1E-01				4.0E-05							
7	TEQ-D/F (ND=1/2 DL)	6.0E-07	0.03	1.4E-14	8.2E-14	2.0E-08	7E-07	4E-06	9.7E-17	1.2E-15	130000	1E-11	2E-10
	Aroclor-1254	3.1E-02	0.14	3.2E-09	1.9E-08	3.0E-05	1E-04	6E-04	2.3E-11	2.7E-10	2	5E-11	5E-10
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	4.5E-10	5.4E-09	1.5	7E-10	8E-09
	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	6.0E+00				3.0E-03							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
8	TEQ-D/F (ND=1/2 DL)	8.5E-06	0.03	1.9E-13	1.2E-12	2.0E-08	1E-05	6E-05	1.4E-15	1.6E-14	130000	2E-10	2E-09
	Aroclor-1254	3.9E-01	0.14	4.1E-08	2.5E-07	3.0E-05	1E-03	8E-03	2.9E-10	3.5E-09	2	6E-10	7E-09
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	1.1E-07	6.3E-07	3.0E-04	4E-04	2E-03	7.5E-10	9.0E-09	1.5	1E-09	1E-08
	Chromium	3.8E+01				1.3E-04					20		
	Cobalt	6.8E+00				3.0E-03							
	Iron	3.6E+04				7.0E-01							
	Manganese	4.5E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
9	TEQ-D/F (ND=1/2 DL)	9.0E-06	0.03	2.0E-13	1.2E-12	2.0E-08	1E-05	6E-05	1.4E-15	1.7E-14	130000	2E-10	2E-09
	Aroclor-1254	1.6E-02	0.14	1.7E-09	1.0E-08	3.0E-05	6E-05	3E-04	1.2E-11	1.5E-10	2	2E-11	3E-10
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.2E-08	5.5E-07	3.0E-04	3E-04	2E-03	6.6E-10	7.9E-09	1.5	1E-09	1E-08
	Chromium	1.0E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
		mg/kg		DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
				CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
11	TEQ-D/F (ND=1/2 DL)	2.7E-06	0.03	6.1E-14	3.6E-13	2.0E-08	3E-06	2E-05	4.3E-16	5.2E-15	130000	6E-11	7E-10
	Aroclor-1254	1.3E-02	0.14	1.4E-09	8.4E-09	3.0E-05	5E-05	3E-04	1.0E-11	1.2E-10	2	2E-11	2E-10
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	5.8E-08	3.5E-07	3.0E-04	2E-04	1E-03	4.2E-10	5.0E-09	1.5	6E-10	8E-09
	Chromium	1.1E+01				1.3E-04					20		
	Cobalt	4.2E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.7E-02				4.0E-05							
12	TEQ-D/F (ND=1/2 DL)	3.3E-06	0.03	7.4E-14	4.5E-13	2.0E-08	4E-06	2E-05	5.3E-16	6.4E-15	130000	7E-11	8E-10
	Aroclor-1254	6.2E-02	0.14	6.5E-09	3.9E-08	3.0E-05	2E-04	1E-03	4.7E-11	5.6E-10	2	9E-11	1E-09
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	6.8E+00	0.03	1.5E-07	9.2E-07	3.0E-04	5E-04	3E-03	1.1E-09	1.3E-08	1.5	2E-09	2E-08
	Chromium	1.6E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.4E+04				7.0E-01							
	Manganese	1.4E+03				9.6E-04							
	Thallium	8.1E-02				4.0E-05							
13	TEQ-D/F (ND=1/2 DL)	3.8E-06	0.03	8.6E-14	5.2E-13	2.0E-08	4E-06	3E-05	6.2E-16	7.4E-15	130000	8E-11	1E-09
	Aroclor-1254	5.7E-03	0.14	6.0E-10	3.6E-09	3.0E-05	2E-05	1E-04	4.3E-12	5.1E-11	2	9E-12	1E-10
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.1E+00	0.03	1.1E-07	6.9E-07	3.0E-04	4E-04	2E-03	8.2E-10	9.8E-09	1.5	1E-09	1E-08
	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	6.3E+00				3.0E-03							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.8E+02				9.6E-04							
	Thallium	1.3E-01				4.0E-05							
14	TEQ-D/F (ND=1/2 DL)	2.0E-05	0.03	4.4E-13	2.7E-12	2.0E-08	2E-05	1E-04	3.2E-15	3.8E-14	130000	4E-10	5E-09
	Aroclor-1254	9.9E-02	0.14	1.0E-08	6.2E-08	3.0E-05	3E-04	2E-03	7.4E-11	8.9E-10	2	1E-10	2E-09
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.3E-08	5.6E-07	3.0E-04	3E-04	2E-03	6.6E-10	8.0E-09	1.5	1E-09	1E-08
	Chromium	1.6E+01				1.3E-04					20		
	Cobalt	5.1E+00				3.0E-03							
	Iron	1.6E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							
15	TEQ-D/F (ND=1/2 DL)	1.4E-06	0.03	3.1E-14	1.9E-13	2.0E-08	2E-06	9E-06	2.2E-16	2.7E-15	130000	3E-11	4E-10
	Aroclor-1254	2.8E-03	0.14	3.0E-10	1.8E-09	3.0E-05	1E-05	6E-05	2.1E-12	2.6E-11	2	4E-12	5E-11
	Aluminum	5.3E+03				1.0E+00							
	Arsenic	2.2E+00	0.03	5.0E-08	3.0E-07	3.0E-04	2E-04	1E-03	3.6E-10	4.3E-09	1.5	5E-10	6E-09
	Chromium	1.1E+01				1.3E-04					20		
	Cobalt	3.0E+00				3.0E-03							
	Iron	8.5E+03				7.0E-01							
	Manganese	1.8E+02				9.6E-04							
	Thallium	6.7E-02				4.0E-05							
16	TEQ-D/F (ND=1/2 DL)	5.3E-06	0.03	1.2E-13	7.2E-13	2.0E-08	6E-06	4E-05	8.5E-16	1.0E-14	130000	1E-10	1E-09
	Aroclor-1254	no data	0.14	--	--	3.0E-05	--	--	--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	7.4E-08	4.4E-07	3.0E-04	2E-04	1E-03	5.3E-10	6.4E-09	1.5	8E-10	1E-08
	Chromium	9.2E+00				1.3E-04					20		
	Cobalt	4.4E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				4.0E-05							
17	TEQ-D/F (ND=1/2 DL)	2.2E-06	0.03	5.0E-14	3.0E-13	2.0E-08	2E-06	1E-05	3.6E-16	4.3E-15	130000	5E-11	6E-10
	Aroclor-1254	no data	0.14	--	--	3.0E-05	--	--	--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	9.0E-08	5.4E-07	3.0E-04	3E-04	2E-03	6.4E-10	7.7E-09	1.5	1E-09	1E-08
	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	5.0E+00				3.0E-03							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				4.0E-05							
18	TEQ-D/F (ND=1/2 DL)	5.7E-06	0.03	1.3E-13	7.7E-13	2.0E-08	6E-06	4E-05	9.2E-16	1.1E-14	130000	1E-10	1E-09
	Aroclor-1254	5.6E-03	0.14	5.8E-10	3.5E-09	3.0E-05	2E-05	1E-04	4.2E-12	5.0E-11	2	8E-12	1E-10
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.2E-08	5.5E-07	3.0E-04	3E-04	2E-03	6.6E-10	7.9E-09	1.5	1E-09	1E-08
	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	5.4E+00				3.0E-03							
	Iron	1.4E+04				7.0E-01							
	Manganese	4.7E+02				9.6E-04							
	Thallium	1.3E-01				4.0E-05							
19	TEQ-D/F (ND=1/2 DL)	2.5E-06	0.03	5.7E-14	3.4E-13	2.0E-08	3E-06	2E-05	4.0E-16	4.8E-15	130000	5E-11	6E-10
	Aroclor-1254	5.0E-03	0.14	5.2E-10	3.1E-09	3.0E-05	2E-05	1E-04	3.7E-12	4.4E-11	2	7E-12	9E-11
	Aluminum	2.2E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	9.7E-08	5.8E-07	3.0E-04	3E-04	2E-03	6.9E-10	8.3E-09	1.5	1E-09	1E-08
	Chromium	1.5E+01				1.3E-04					20		
	Cobalt	6.6E+00				3.0E-03							
	Iron	1.9E+04				7.0E-01							
	Manganese	3.8E+02				9.6E-04							
	Thallium	2.0E-01				4.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	0.03	3.3E-13	2.0E-12	2.0E-08	2E-05	1E-04	2.4E-15	2.8E-14	130000	3E-10	4E-09
	Aroclor-1254	2.5E-02	0.14	2.6E-09	1.6E-08	3.0E-05	9E-05	5E-04	1.9E-11	2.2E-10	2	4E-11	4E-10
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	1.2E-07	7.3E-07	3.0E-04	4E-04	2E-03	8.7E-10	1.0E-08	1.5	1E-09	2E-08
	Chromium	1.4E+01				1.3E-04					20		
	Cobalt	6.3E+00				3.0E-03							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
23	TEQ-D/F (ND=1/2 DL)	6.8E-07	0.03	1.5E-14	9.1E-14	2.0E-08	8E-07	5E-06	1.1E-16	1.3E-15	130000	1E-11	2E-10
	Aroclor-1254	5.0E-03	0.14	5.2E-10	3.1E-09	3.0E-05	2E-05	1E-04	3.7E-12	4.5E-11	2	7E-12	9E-11
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	1.2E-07	7.0E-07	3.0E-04	4E-04	2E-03	8.3E-10	1.0E-08	1.5	1E-09	1E-08
	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	7.1E+00				3.0E-03							
	Iron	1.6E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							

Population Hypothetical Future Construction Workers
Exposure Area Random 20-acre grids across OU2
Medium Surface & Subsurface Soil
Exposure Route Dermal Contact

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	0.03	3.1E-13	1.8E-12	2.0E-08	2E-05	9E-05	2.2E-15	2.6E-14	130000	3E-10	3E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	0.14	2.0E-08	1.2E-07				1.5E-10	1.7E-09	2	3E-10	3E-09
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	1.1E-07	6.4E-07	3.0E-04	4E-04	2E-03	7.6E-10	9.2E-09	1.5	1E-09	1E-08
1	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	5.6E+00				3.0E-03							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	0.03	1.2E-13	7.1E-13	2.0E-08	6E-06	4E-05	8.5E-16	1.0E-14	130000	1E-10	1E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	0.14	3.0E-09	1.8E-08				2.1E-11	2.6E-10	2	4E-11	5E-10
	Aluminum	6.6E+03				1.0E+00							
	Arsenic	3.5E+00	0.03	7.8E-08	4.7E-07	3.0E-04	3E-04	2E-03	5.6E-10	6.7E-09	1.5	8E-10	1E-08
2	Chromium	9.9E+00				1.3E-04					20		
	Cobalt	3.6E+00				3.0E-03							
	Iron	9.5E+03				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	9.9E-02				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	6.2E-06	0.03	1.4E-13	8.4E-13	2.0E-08	7E-06	4E-05	1.0E-15	1.2E-14	130000	1E-10	2E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	1.1E-08	6.7E-08				7.9E-11	9.5E-10	2	2E-10	2E-09
	Aluminum	1.2E+04				1.0E+00							
	Arsenic	3.9E+00	0.03	8.6E-08	5.2E-07	3.0E-04	3E-04	2E-03	6.2E-10	7.4E-09	1.5	9E-10	1E-08
4	Chromium	1.0E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.2E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	3.6E+00	0.03	8.0E-08	4.8E-07	3.0E-04	3E-04	2E-03	5.7E-10	6.9E-09	1.5	9E-10	1E-08
5	Chromium	7.8E+00				1.3E-04					20		
	Cobalt	3.8E+00				3.0E-03							
	Iron	8.9E+03				7.0E-01							
	Manganese	3.5E+02				9.6E-04							
	Thallium	2.2E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	5.7E-07	0.03	1.3E-14	7.7E-14	2.0E-08	6E-07	4E-06	9.1E-17	1.1E-15	130000	1E-11	1E-10
	Total Non-coplanar PCBs (ND=1/2 DL)	4.8E-04	0.14	5.0E-11	3.0E-10				3.6E-13	4.3E-12	2	7E-13	9E-12
	Aluminum	9.8E+03				1.0E+00							
	Arsenic	3.2E+00	0.03	7.2E-08	4.3E-07	3.0E-04	2E-04	1E-03	5.1E-10	6.2E-09	1.5	8E-10	9E-09
6	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	4.3E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.6E+02				9.6E-04							
	Thallium	1.1E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	6.2E-06	0.03	1.4E-13	8.4E-13	2.0E-08	7E-06	4E-05	1.0E-15	1.2E-14	130000	1E-10	2E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	0.14	1.1E-08	6.7E-08				7.9E-11	9.5E-10	2	2E-10	2E-09
	Aluminum	1.9E+04				1.0E+00							
	Arsenic	2.8E+00	0.03	6.3E-08	3.8E-07	3.0E-04	2E-04	1E-03	4.5E-10	5.4E-09	1.5	7E-10	8E-09
7	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	6.0E+00				3.0E-03							
	Iron	1.7E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	4.0E-05	0.03	9.1E-13	5.4E-12	2.0E-08	5E-05	3E-04	6.5E-15	7.8E-14	130000	8E-10	1E-08
	Total Non-coplanar PCBs (ND=1/2 DL)	9.7E-01	0.14	1.0E-07	6.1E-07				7.2E-10	8.7E-09	2	1E-09	2E-08
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	4.7E+00	0.03	1.1E-07	6.3E-07	3.0E-04	4E-04	2E-03	7.5E-10	9.0E-09	1.5	1E-09	1E-08
8	Chromium	3.8E+01				1.3E-04					20		
	Cobalt	6.8E+00				3.0E-03							
	Iron	3.6E+04				7.0E-01							
	Manganese	4.5E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	0.03	2.3E-13	1.4E-12	2.0E-08	1E-05	7E-05	1.7E-15	2.0E-14	130000	2E-10	3E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	0.14	3.4E-09	2.1E-08				2.4E-11	2.9E-10	2	5E-11	6E-10
	Aluminum	1.1E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.2E-08	5.5E-07	3.0E-04	3E-04	2E-03	6.6E-10	7.9E-09	1.5	1E-09	1E-08
9	Chromium	1.0E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.2E+04				7.0E-01							
	Manganese	2.9E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-06	0.03	9.4E-14	5.7E-13	2.0E-08	5E-06	3E-05	6.7E-16	8.1E-15	130000	9E-11	1E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	0.14	1.0E-08	6.3E-08				7.5E-11	9.0E-10	2	1E-10	2E-09
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	2.6E+00	0.03	5.8E-08	3.5E-07	3.0E-04	2E-04	1E-03	4.2E-10	5.0E-09	1.5	6E-10	8E-09
11	Chromium	1.1E+01				1.3E-04					20		
	Cobalt	4.2E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	2.5E+02				9.6E-04							
	Thallium	9.7E-02				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	1.3E+04				1.0E+00							
	Arsenic	6.8E+00	0.03	1.5E-07	9.2E-07	3.0E-04	5E-04	3E-03	1.1E-09	1.3E-08	1.5	2E-09	2E-08
12	Chromium	1.6E+01				1.3E-04					20		
	Cobalt	4.8E+00				3.0E-03							
	Iron	1.4E+04				7.0E-01							
	Manganese	1.4E+03				9.6E-04							
	Thallium	8.1E-02				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.7E-06	0.03	8.2E-14	4.9E-13	2.0E-08	4E-06	2E-05	5.9E-16	7.1E-15	130000	8E-11	9E-10
	Total Non-coplanar PCBs (ND=1/2 DL)	1.4E-02	0.14	1.5E-09	8.9E-09				1.1E-11	1.3E-10	2	2E-11	3E-10
	Aluminum	1.5E+04				1.0E+00							
	Arsenic	5.1E+00	0.03	1.1E-07	6.9E-07	3.0E-04	4E-04	2E-03	8.2E-10	9.8E-09	1.5	1E-09	1E-08
13	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	6.3E+00				3.0E-03							
	Iron	1.5E+04				7.0E-01							
	Manganese	4.8E+02				9.6E-04							
	Thallium	1.3E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	2.9E-05	0.03	6.5E-13	3.9E-12	2.0E-08	3E-05	2E-04	4.6E-15	5.6E-14	130000	6E-10	7E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	6.3E-02	0.14	6.6E-09	4.0E-08				4.7E-11	5.7E-10	2	9E-11	1E-09
	Aluminum	1.0E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.3E-08	5.6E-07	3.0E-04	3E-04	2E-03	6.6E-10	8.0E-09	1.5	1E-09	1E-08
14	Chromium	1.6E+01				1.3E-04					20		
	Cobalt	5.1E+00				3.0E-03							
	Iron	1.6E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.2E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	6.8E-07	0.03	1.5E-14	9.1E-14	2.0E-08	8E-07	5E-06	1.1E-16	1.3E-15	130000	1E-11	2E-10
	Total Non-coplanar PCBs (ND=1/2 DL)	1.2E-03	0.14	1.3E-10	7.7E-10				9.2E-13	1.1E-11	2	2E-12	2E-11
	Aluminum	5.3E+03				1.0E+00							
	Arsenic	2.2E+00	0.03	5.0E-08	3.0E-07	3.0E-04	2E-04	1E-03	3.6E-10	4.3E-09	1.5	5E-10	6E-09
15	Chromium	1.1E+01				1.3E-04					20		
	Cobalt	3.0E+00				3.0E-03							
	Iron	8.5E+03				7.0E-01							
	Manganese	1.8E+02				9.6E-04							
	Thallium	6.7E-02				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	8.0E+03				1.0E+00							
	Arsenic	3.3E+00	0.03	7.4E-08	4.4E-07	3.0E-04	2E-04	1E-03	5.3E-10	6.4E-09	1.5	8E-10	1E-08
16	Chromium	9.2E+00				1.3E-04					20		
	Cobalt	4.4E+00				3.0E-03							
	Iron	1.1E+04				7.0E-01							
	Manganese	3.1E+02				9.6E-04							
	Thallium	1.0E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	0.03	--	--	2.0E-08	--	--	--	--	130000	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	0.14	--	--				--	--	2	--	--
	Aluminum	9.9E+03				1.0E+00							
	Arsenic	4.0E+00	0.03	9.0E-08	5.4E-07	3.0E-04	3E-04	2E-03	6.4E-10	7.7E-09	1.5	1E-09	1E-08
17	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	5.0E+00				3.0E-03							
	Iron	1.3E+04				7.0E-01							
	Manganese	3.2E+02				9.6E-04							
	Thallium	1.0E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	3.7E-07	0.03	8.3E-15	5.0E-14	2.0E-08	4E-07	2E-06	5.9E-17	7.1E-16	130000	8E-12	9E-11
	Total Non-coplanar PCBs (ND=1/2 DL)	2.6E-04	0.14	2.7E-11	1.6E-10				2.0E-13	2.3E-12	2	4E-13	5E-12
	Aluminum	1.4E+04				1.0E+00							
	Arsenic	4.1E+00	0.03	9.2E-08	5.5E-07	3.0E-04	3E-04	2E-03	6.6E-10	7.9E-09	1.5	1E-09	1E-08
18	Chromium	1.2E+01				1.3E-04					20		
	Cobalt	5.4E+00				3.0E-03							
	Iron	1.4E+04				7.0E-01							
	Manganese	4.7E+02				9.6E-04							
	Thallium	1.3E-01				4.0E-05							
	TEQ-D/F/PCBs (ND=1/2 DL)	4.3E-07	0.03	9.7E-15	5.8E-14	2.0E-08	5E-07	3E-06	6.9E-17	8.3E-16	130000	9E-12	1E-10
	Total Non-coplanar PCBs (ND=1/2 DL)	4.8E-05	0.14	5.0E-12	3.0E-11				3.6E-14	4.3E-13	2	7E-14	9E-13
	Aluminum	2.2E+04				1.0E+00							
	Arsenic	4.3E+00	0.03	9.7E-08	5.8E-07	3.0E-04	3E-04	2E-03	6.9E-10	8.3E-09	1.5	1E-09	1E-08
19	Chromium	1.5E+01				1.3E-04					20		
	Cobalt	6.6E+00				3.0E-03							
	Iron	1.9E+04				7.0E-01							
	Manganese	3.8E+02				9.6E-04							
	Thallium	2.0E-01				4.0E-05							

Grid	COPC	EPC mg/kg	ABSd	Non-Cancer DAD (mg/kg-d) CTE	Non-Cancer DAD (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME	Cancer DAD (mg/kg-d) CTE	Cancer DAD (mg/kg-d) RME	oSF (mg/kg-d)-1	Risk CTE	Risk RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	0.03	5.9E-13	3.6E-12	2.0E-08	3E-05	2E-04	4.2E-15	5.1E-14	130000	6E-10	7E-09
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	0.14	1.1E-08	6.5E-08				7.7E-11	9.3E-10	2	2E-10	2E-09
	Aluminum	1.6E+04				1.0E+00							
	Arsenic	5.4E+00	0.03	1.2E-07	7.3E-07	3.0E-04	4E-04	2E-03	8.7E-10	1.0E-08	1.5	1E-09	2E-08
	Chromium	1.4E+01				1.3E-04					20		
	Cobalt	6.3E+00				3.0E-03							
	Iron	1.7E+04				7.0E-01							
	Manganese	4.4E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							
23	TEQ-D/F/PCBs (ND=1/2 DL)	9.8E-07	0.03	2.2E-14	1.3E-13	2.0E-08	1E-06	7E-06	1.6E-16	1.9E-15	130000	2E-11	2E-10
	Total Non-coplanar PCBs (ND=1/2 DL)	6.6E-03	0.14	6.9E-10	4.2E-09				5.0E-12	5.9E-11	2	1E-11	1E-10
	Aluminum	1.7E+04				1.0E+00							
	Arsenic	5.2E+00	0.03	1.2E-07	7.0E-07	3.0E-04	4E-04	2E-03	8.3E-10	1.0E-08	1.5	1E-09	1E-08
	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	7.1E+00				3.0E-03							
	Iron	1.6E+04				7.0E-01							
	Manganese	3.9E+02				9.6E-04							
	Thallium	1.5E-01				4.0E-05							

Population	**Hypothetical Future Construction Workers**		
Exposure Area	**Random 20-acre grids across OU2**		
Medium	**Surface Soil**		
Exposure Route	**Inhalation of particulates in air**		

TWFs	CTE	RME
Noncancer	5.66E-02	1.13E-01
Cancer	4.04E-04	1.62E-03

		Csoil		Non-Cancer					Cancer				
Grid	COPC	EPC	PEF	EC (mg/m^3)		RfC	HQ		EC (ug/m^3)		iUR	Risk	
		mg/kg	m^3/kg	CTE	RME	mg/m^3	CTE	RME	CTE	RME	(ug/m^3)$^{-1}$	CTE	RME
	TEQ-D/F (ND=1/2 DL)	5.4E-06	4.4E+08	6.9E-16	1.4E-15	4.0E-08	2E-08	3E-08	4.9E-18	2.0E-17	38	2E-16	7E-16
	Aroclor-1254	1.4E-01	4.4E+08	1.8E-11	3.6E-11				1.3E-13	5.2E-13	0.00057	7E-17	3E-16
	Aluminum	7.4E+03	4.4E+08	9.5E-07	1.9E-06	5.0E-03	2E-04	4E-04	6.8E-09	2.7E-08			
	Arsenic	4.8E+00	4.4E+08	6.1E-10	1.2E-09	1.5E-05	4E-05	8E-05	4.4E-12	1.8E-11	0.0043	2E-14	8E-14
1	Chromium	1.3E+01	4.4E+08	1.7E-09	3.4E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.8E-11	0.084	1E-12	4E-12
	Cobalt	5.6E+00	4.4E+08	7.2E-10	1.4E-09	2.0E-05	4E-05	7E-05	5.1E-12	2.1E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.4E-08			
	Manganese	6.4E+02	4.4E+08	8.2E-08	1.6E-07	5.0E-05	2E-03	3E-03	5.8E-10	2.3E-09			
	Thallium	8.3E-02	4.4E+08	1.1E-11	2.1E-11				7.6E-14	3.1E-13			
	TEQ-D/F (ND=1/2 DL)	3.5E-06	4.4E+08	4.5E-16	9.1E-16	4.0E-08	1E-08	2E-08	3.2E-18	1.3E-17	38	1E-16	5E-16
	Aroclor-1254	2.5E-02	4.4E+08	3.2E-12	6.4E-12				2.3E-14	9.1E-14	0.00057	1E-17	5E-17
	Aluminum	6.6E+03	4.4E+08	8.5E-07	1.7E-06	5.0E-03	2E-04	3E-04	6.0E-09	2.4E-08			
	Arsenic	3.5E+00	4.4E+08	4.5E-10	9.0E-10	1.5E-05	3E-05	6E-05	3.2E-12	1.3E-11	0.0043	1E-14	6E-14
2	Chromium	9.9E+00	4.4E+08	1.3E-09	2.5E-09	3.0E-04	4E-06	8E-06	9.1E-12	3.6E-11	0.084	8E-13	3E-12
	Cobalt	3.6E+00	4.4E+08	4.7E-10	9.3E-10	2.0E-05	2E-05	5E-05	3.3E-12	1.3E-11	0.009	3E-14	1E-13
	Iron	9.5E+03	4.4E+08	1.2E-06	2.4E-06				8.7E-09	3.5E-08			
	Manganese	2.9E+02	4.4E+08	3.8E-08	7.5E-08	5.0E-05	8E-04	2E-03	2.7E-10	1.1E-09			
	Thallium	9.9E-02	4.4E+08	1.3E-11	2.5E-11				9.1E-14	3.6E-13			
	TEQ-D/F (ND=1/2 DL)	1.6E-06	4.4E+08	2.1E-16	4.1E-16	4.0E-08	5E-09	1E-08	1.5E-18	5.9E-18	38	6E-17	2E-16
	Aroclor-1254	3.2E-02	4.4E+08	4.1E-12	8.2E-12				2.9E-14	1.2E-13	0.00057	2E-17	7E-17
	Aluminum	1.1E+04	4.4E+08	1.5E-06	2.9E-06	5.0E-03	3E-04	6E-04	1.1E-08	4.2E-08			
	Arsenic	3.9E+00	4.4E+08	5.0E-10	1.0E-09	1.5E-05	3E-05	7E-05	3.6E-12	1.4E-11	0.0043	2E-14	6E-14
4	Chromium	1.0E+01	4.4E+08	1.3E-09	2.6E-09	3.0E-04	4E-06	9E-06	9.4E-12	3.8E-11	0.084	8E-13	3E-12
	Cobalt	4.8E+00	4.4E+08	6.2E-10	1.2E-09	2.0E-05	3E-05	6E-05	4.4E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.2E+04	4.4E+08	1.6E-06	3.2E-06				1.1E-08	4.5E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.3E-08	5.0E-05	8E-04	2E-03	2.9E-10	1.2E-09			
	Thallium	1.2E-01	4.4E+08	1.6E-11	3.1E-11				1.1E-13	4.5E-13			
	TEQ-D/F (ND=1/2 DL)	1.5E-06	4.4E+08	1.9E-16	3.7E-16	4.0E-08	5E-09	9E-09	1.3E-18	5.4E-18	38	5E-17	2E-16
	Aroclor-1254	2.1E-03	4.4E+08	2.6E-13	5.3E-13				1.9E-15	7.5E-15	0.00057	1E-18	4E-18
	Aluminum	6.2E+03	4.4E+08	8.0E-07	1.6E-06	5.0E-03	2E-04	3E-04	5.7E-09	2.3E-08			
	Arsenic	3.3E+00	4.4E+08	4.3E-10	8.6E-10	1.5E-05	3E-05	6E-05	3.1E-12	1.2E-11	0.0043	1E-14	5E-14
5	Chromium	7.1E+00	4.4E+08	9.1E-10	1.8E-09	3.0E-04	3E-06	6E-06	6.5E-12	2.6E-11	0.084	5E-13	2E-12
	Cobalt	3.4E+00	4.4E+08	4.3E-10	8.7E-10	2.0E-05	2E-05	4E-05	3.1E-12	1.2E-11	0.009	3E-14	1E-13
	Iron	7.8E+03	4.4E+08	1.0E-06	2.0E-06				7.2E-09	2.9E-08			
	Manganese	3.7E+02	4.4E+08	4.7E-08	9.4E-08	5.0E-05	9E-04	2E-03	3.4E-10	1.3E-09			
	Thallium	2.3E-01	4.4E+08	3.0E-11	5.9E-11				2.1E-13	8.5E-13			
	TEQ-D/F (ND=1/2 DL)	2.2E-05	4.4E+08	2.9E-15	5.7E-15	4.0E-08	7E-08	1E-07	2.0E-17	8.2E-17	38	8E-16	3E-15
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	8.9E+03	4.4E+08	1.1E-06	2.3E-06	5.0E-03	2E-04	5E-04	8.1E-09	3.3E-08			
	Arsenic	3.2E+00	4.4E+08	4.1E-10	8.2E-10	1.5E-05	3E-05	5E-05	2.9E-12	1.2E-11	0.0043	1E-14	5E-14
6	Chromium	1.2E+01	4.4E+08	1.6E-09	3.2E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.6E-11	0.084	1E-12	4E-12
	Cobalt	4.0E+00	4.4E+08	5.1E-10	1.0E-09	2.0E-05	3E-05	5E-05	3.7E-12	1.5E-11	0.009	3E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.7E-06				9.7E-09	3.9E-08			
	Manganese	3.5E+02	4.4E+08	4.5E-08	9.1E-08	5.0E-05	9E-04	2E-03	3.2E-10	1.3E-09			
	Thallium	9.0E-02	4.4E+08	1.2E-11	2.3E-11				8.3E-14	3.3E-13			
	TEQ-D/F (ND=1/2 DL)	6.0E-07	4.4E+08	7.8E-17	1.6E-16	4.0E-08	2E-09	4E-09	5.6E-19	2.2E-18	38	2E-17	8E-17
	Aroclor-1254	3.2E-02	4.4E+08	4.1E-12	8.2E-12				2.9E-14	1.2E-13	0.00057	2E-17	7E-17
	Aluminum	1.9E+04	4.4E+08	2.4E-06	4.8E-06	5.0E-03	5E-04	1E-03	1.7E-08	6.9E-08			
	Arsenic	2.8E+00	4.4E+08	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	2.6E-12	1.0E-11	0.0043	1E-14	4E-14
7	Chromium	1.3E+01	4.4E+08	1.6E-09	3.2E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.6E-11	0.084	1E-12	4E-12
	Cobalt	6.0E+00	4.4E+08	7.7E-10	1.5E-09	2.0E-05	4E-05	8E-05	5.5E-12	2.2E-11	0.009	5E-14	2E-13
	Iron	1.7E+04	4.4E+08	2.1E-06	4.3E-06				1.5E-08	6.1E-08			
	Manganese	3.9E+02	4.4E+08	5.0E-08	9.9E-08	5.0E-05	1E-03	2E-03	3.5E-10	1.4E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			
	TEQ-D/F (ND=1/2 DL)	8.8E-06	4.4E+08	1.1E-15	2.3E-15	4.0E-08	3E-08	6E-08	8.1E-18	3.2E-17	38	3E-16	1E-15
	Aroclor-1254	4.1E-01	4.4E+08	5.3E-11	1.1E-10				3.8E-13	1.5E-12	0.00057	2E-16	9E-16
	Aluminum	1.3E+04	4.4E+08	1.6E-06	3.3E-06	5.0E-03	3E-04	7E-04	1.2E-08	4.7E-08			
	Arsenic	4.7E+00	4.4E+08	6.0E-10	1.2E-09	1.5E-05	4E-05	8E-05	4.3E-12	1.7E-11	0.0043	2E-14	7E-14
8	Chromium	4.0E+01	4.4E+08	5.1E-09	1.0E-08	3.0E-04	2E-05	3E-05	3.6E-11	1.5E-10	0.084	3E-12	1E-11
	Cobalt	6.9E+00	4.4E+08	8.9E-10	1.8E-09	2.0E-05	4E-05	9E-05	6.3E-12	2.5E-11	0.009	6E-14	2E-13
	Iron	3.7E+04	4.4E+08	4.8E-06	9.6E-06				3.4E-08	1.4E-07			
	Manganese	4.6E+02	4.4E+08	5.9E-08	1.2E-07	5.0E-05	1E-03	2E-03	4.2E-10	1.7E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			
	TEQ-D/F (ND=1/2 DL)	9.0E-06	4.4E+08	1.2E-15	2.3E-15	4.0E-08	3E-08	6E-08	8.3E-18	3.3E-17	38	3E-16	1E-15
	Aroclor-1254	1.6E-02	4.4E+08	2.1E-12	4.2E-12				1.5E-14	6.0E-14	0.00057	8E-18	3E-17
	Aluminum	1.1E+04	4.4E+08	1.4E-06	2.8E-06	5.0E-03	3E-04	6E-04	9.9E-09	3.9E-08			
	Arsenic	4.1E+00	4.4E+08	5.3E-10	1.1E-09	1.5E-05	4E-05	7E-05	3.8E-12	1.5E-11	0.0043	2E-14	6E-14
9	Chromium	1.0E+01	4.4E+08	1.3E-09	2.7E-09	3.0E-04	4E-06	9E-06	9.5E-12	3.8E-11	0.084	8E-13	3E-12
	Cobalt	4.8E+00	4.4E+08	6.2E-10	1.2E-09	2.0E-05	3E-05	6E-05	4.4E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.2E+04	4.4E+08	1.6E-06	3.2E-06				1.1E-08	4.6E-08			
	Manganese	2.9E+02	4.4E+08	3.7E-08	7.4E-08	5.0E-05	7E-04	1E-03	2.6E-10	1.1E-09			
	Thallium	1.2E-01	4.4E+08	1.5E-11	3.0E-11				1.1E-13	4.2E-13			

Grid	COPC	Csoil EPC mg/kg	PEF m^3/kg	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC (ug/m^3) CTE	Cancer EC (ug/m^3) RME	iUR $(ug/m^3)^{-1}$	Risk CTE	Risk RME
	TEQ-D/F (ND=1/2 DL)	3.1E-06	4.4E+08	3.9E-16	7.9E-16	4.0E-08	1E-08	2E-08	2.8E-18	1.1E-17	38	1E-16	4E-16
	Aroclor-1254	4.8E-03	4.4E+08	6.2E-13	1.2E-12				4.4E-15	1.8E-14	0.00057	3E-18	1E-17
	Aluminum	8.3E+03	4.4E+08	1.1E-06	2.1E-06	5.0E-03	2E-04	4E-04	7.6E-09	3.1E-08			
	Arsenic	2.6E+00	4.4E+08	3.4E-10	6.7E-10	1.5E-05	2E-05	4E-05	2.4E-12	9.6E-12	0.0043	1E-14	4E-14
11	Chromium	1.1E+01	4.4E+08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	4.2E+00	4.4E+08	5.4E-10	1.1E-09	2.0E-05	3E-05	5E-05	3.9E-12	1.6E-11	0.009	3E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.9E-06				1.0E-08	4.1E-08			
	Manganese	2.5E+02	4.4E+08	3.3E-08	6.5E-08	5.0E-05	7E-04	1E-03	2.3E-10	9.3E-10			
	Thallium	9.8E-02	4.4E+08	1.3E-11	2.5E-11				9.0E-14	3.6E-13			
	TEQ-D/F (ND=1/2 DL)	3.4E-06	4.4E+08	4.4E-16	8.7E-16	4.0E-08	1E-08	2E-08	3.1E-18	1.2E-17	38	1E-16	5E-16
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	1.4E+04	4.4E+08	1.9E-06	3.7E-06	5.0E-03	4E-04	7E-04	1.3E-08	5.3E-08			
	Arsenic	7.7E+00	4.4E+08	9.9E-10	2.0E-09	1.5E-05	7E-05	1E-04	7.0E-12	2.8E-11	0.0043	3E-14	1E-13
12	Chromium	1.8E+01	4.4E+08	2.3E-09	4.6E-09	3.0E-04	8E-06	2E-05	1.6E-11	6.5E-11	0.084	1E-12	5E-12
	Cobalt	5.2E+00	4.4E+08	6.6E-10	1.3E-09	2.0E-05	3E-05	7E-05	4.7E-12	1.9E-11	0.009	4E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.5E-08			
	Manganese	1.6E+03	4.4E+08	2.1E-07	4.2E-07	5.0E-05	4E-03	8E-03	1.5E-09	6.0E-09			
	Thallium	9.0E-02	4.4E+08	1.2E-11	2.3E-11				8.2E-14	3.3E-13			
	TEQ-D/F (ND=1/2 DL)	4.0E-06	4.4E+08	5.1E-16	1.0E-15	4.0E-08	1E-08	3E-08	3.7E-18	1.5E-17	38	1E-16	6E-16
	Aroclor-1254	5.7E-03	4.4E+08	7.3E-13	1.5E-12				5.2E-15	2.1E-14	0.00057	3E-18	1E-17
	Aluminum	1.5E+04	4.4E+08	1.9E-06	3.7E-06	5.0E-03	4E-04	7E-04	1.3E-08	5.3E-08			
	Arsenic	5.2E+00	4.4E+08	6.6E-10	1.3E-09	1.5E-05	4E-05	9E-05	4.7E-12	1.9E-11	0.0043	2E-14	8E-14
13	Chromium	1.2E+01	4.4E+08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	6.3E+00	4.4E+08	8.2E-10	1.6E-09	2.0E-05	4E-05	8E-05	5.8E-12	2.3E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	2.0E-06	4.0E-06				1.4E-08	5.6E-08			
	Manganese	4.9E+02	4.4E+08	6.3E-08	1.3E-07	5.0E-05	1E-03	3E-03	4.5E-10	1.8E-09			
	Thallium	1.3E-01	4.4E+08	1.7E-11	3.4E-11				1.2E-13	4.9E-13			
	TEQ-D/F (ND=1/2 DL)	2.1E-05	4.4E+08	2.6E-15	5.3E-15	4.0E-08	7E-08	1E-07	1.9E-17	7.6E-17	38	7E-16	3E-15
	Aroclor-1254	1.0E-01	4.4E+08	1.3E-11	2.7E-11				9.6E-14	3.8E-13	0.00057	5E-17	2E-16
	Aluminum	1.0E+04	4.4E+08	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9.4E-09	3.8E-08			
	Arsenic	4.1E+00	4.4E+08	5.3E-10	1.1E-09	1.5E-05	4E-05	7E-05	3.8E-12	1.5E-11	0.0043	2E-14	7E-14
14	Chromium	1.6E+01	4.4E+08	2.0E-09	4.1E-09	3.0E-04	7E-06	1E-05	1.5E-11	5.8E-11	0.084	1E-12	5E-12
	Cobalt	5.1E+00	4.4E+08	6.5E-10	1.3E-09	2.0E-05	3E-05	7E-05	4.7E-12	1.9E-11	0.009	4E-14	2E-13
	Iron	1.5E+04	4.4E+08	2.0E-06	4.0E-06				1.4E-08	5.7E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.3E-08	5.0E-05	8E-04	2E-03	3.0E-10	1.2E-09			
	Thallium	1.1E-01	4.4E+08	1.5E-11	2.9E-11				1.0E-13	4.2E-13			
	TEQ-D/F (ND=1/2 DL)	1.6E-06	4.4E+08	2.1E-16	4.1E-16	4.0E-08	5E-09	1E-08	1.5E-18	5.9E-18	38	6E-17	2E-16
	Aroclor-1254	2.8E-03	4.4E+08	3.6E-13	7.2E-13				2.6E-15	1.0E-14	0.00057	1E-18	6E-18
	Aluminum	5.1E+03	4.4E+08	6.6E-07	1.3E-06	5.0E-03	1E-04	3E-04	4.7E-09	1.9E-08			
	Arsenic	2.3E+00	4.4E+08	2.9E-10	5.8E-10	1.5E-05	2E-05	4E-05	2.1E-12	8.3E-12	0.0043	9E-15	4E-14
15	Chromium	1.1E+01	4.4E+08	1.5E-09	2.9E-09	3.0E-04	5E-06	1E-05	1.0E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	3.0E+00	4.4E+08	3.9E-10	7.8E-10	2.0E-05	2E-05	4E-05	2.8E-12	1.1E-11	0.009	2E-14	1E-13
	Iron	8.7E+03	4.4E+08	1.1E-06	2.2E-06				8.0E-09	3.2E-08			
	Manganese	2.0E+02	4.4E+08	2.5E-08	5.1E-08	5.0E-05	5E-04	1E-03	1.8E-10	7.2E-10			
	Thallium	6.6E-02	4.4E+08	8.5E-12	1.7E-11				6.1E-14	2.4E-13			
	TEQ-D/F (ND=1/2 DL)	5.3E-06	4.4E+08	6.8E-16	1.4E-15	4.0E-08	2E-08	3E-08	4.9E-18	2.0E-17	38	2E-16	7E-16
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	8.0E+03	4.4E+08	1.0E-06	2.1E-06	5.0E-03	2E-04	4E-04	7.4E-09	2.9E-08			
	Arsenic	3.3E+00	4.4E+08	4.2E-10	8.5E-10	1.5E-05	3E-05	6E-05	3.0E-12	1.2E-11	0.0043	1E-14	5E-14
16	Chromium	9.2E+00	4.4E+08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8.5E-12	3.4E-11	0.084	7E-13	3E-12
	Cobalt	4.4E+00	4.4E+08	5.7E-10	1.1E-09	2.0E-05	3E-05	6E-05	4.0E-12	1.6E-11	0.009	4E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.8E-06				9.9E-09	4.0E-08			
	Manganese	3.1E+02	4.4E+08	3.9E-08	7.9E-08	5.0E-05	8E-04	2E-03	2.8E-10	1.1E-09			
	Thallium	1.0E-01	4.4E+08	1.3E-11	2.6E-11				9.2E-14	3.7E-13			
	TEQ-D/F (ND=1/2 DL)	2.2E-06	4.4E+08	2.9E-16	5.7E-16	4.0E-08	7E-09	1E-08	2.0E-18	8.2E-18	38	8E-17	3E-16
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	9.9E+03	4.4E+08	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9.1E-09	3.6E-08			
	Arsenic	4.0E+00	4.4E+08	5.1E-10	1.0E-09	1.5E-05	3E-05	7E-05	3.7E-12	1.5E-11	0.0043	2E-14	6E-14
17	Chromium	1.2E+01	4.4E+08	1.5E-09	3.1E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.4E-11	0.084	9E-13	4E-12
	Cobalt	5.0E+00	4.4E+08	6.4E-10	1.3E-09	2.0E-05	3E-05	6E-05	4.6E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.3E+04	4.4E+08	1.6E-06	3.3E-06				1.2E-08	4.7E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.2E-08	5.0E-05	8E-04	2E-03	2.9E-10	1.2E-09			
	Thallium	1.0E-01	4.4E+08	1.3E-11	2.7E-11				9.5E-14	3.8E-13			
	TEQ-D/F (ND=1/2 DL)	6.8E-06	4.4E+08	8.7E-16	1.7E-15	4.0E-08	2E-08	4E-08	6.2E-18	2.5E-17	38	2E-16	9E-16
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	1.5E+04	4.4E+08	1.9E-06	3.9E-06	5.0E-03	4E-04	8E-04	1.4E-08	5.5E-08			
	Arsenic	4.4E+00	4.4E+08	5.7E-10	1.1E-09	1.5E-05	4E-05	8E-05	4.0E-12	1.6E-11	0.0043	2E-14	7E-14
18	Chromium	1.3E+01	4.4E+08	1.7E-09	3.3E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.8E-11	0.084	1E-12	4E-12
	Cobalt	5.7E+00	4.4E+08	7.3E-10	1.5E-09	2.0E-05	4E-05	7E-05	5.2E-12	2.1E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.4E-08			
	Manganese	5.3E+02	4.4E+08	6.8E-08	1.4E-07	5.0E-05	1E-03	3E-03	4.8E-10	1.9E-09			
	Thallium	1.4E-01	4.4E+08	1.8E-11	3.6E-11				1.3E-13	5.1E-13			
	TEQ-D/F (ND=1/2 DL)	2.9E-06	4.4E+08	3.8E-16	7.6E-16	4.0E-08	9E-09	2E-08	2.7E-18	1.1E-17	38	1E-16	4E-16
	Aroclor-1254	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	2.3E+04	4.4E+08	2.9E-06	5.8E-06	5.0E-03	6E-04	1E-03	2.1E-08	8.3E-08			
	Arsenic	4.3E+00	4.4E+08	5.5E-10	1.1E-09	1.5E-05	4E-05	7E-05	4.0E-12	1.6E-11	0.0043	2E-14	7E-14
19	Chromium	1.4E+01	4.4E+08	1.8E-09	3.7E-09	3.0E-04	6E-06	1E-05	1.3E-11	5.3E-11	0.084	1E-12	4E-12
	Cobalt	6.7E+00	4.4E+08	8.6E-10	1.7E-09	2.0E-05	4E-05	9E-05	6.2E-12	2.5E-11	0.009	6E-14	2E-13
	Iron	1.9E+04	4.4E+08	2.4E-06	4.8E-06				1.7E-08	6.8E-08			
	Manganese	4.3E+02	4.4E+08	5.5E-08	1.1E-07	5.0E-05	1E-03	2E-03	3.9E-10	1.6E-09			
	Thallium	1.9E-01	4.4E+08	2.4E-11	4.9E-11				1.7E-13	7.0E-13			

Grid	COPC	Csoil EPC mg/kg	PEF m^3/kg	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC (ug/m^3) CTE	Cancer EC (ug/m^3) RME	iUR $(ug/m^3)^{-1}$	Risk CTE	Risk RME
22	TEQ-D/F (ND=1/2 DL)	1.5E-05	4.4E+08	1.9E-15	3.8E-15	4.0E-08	5E-08	9E-08	1.3E-17	5.4E-17	38	5E-16	2E-15
	Aroclor-1254	2.5E-02	4.4E+08	3.2E-12	6.4E-12				2.3E-14	9.2E-14	0.00057	1E-17	5E-17
	Aluminum	1.6E+04	4.4E+08	2.0E-06	4.0E-06	5.0E-03	4E-04	8E-04	1.4E-08	5.7E-08			
	Arsenic	5.4E+00	4.4E+08	7.0E-10	1.4E-09	1.5E-05	5E-05	9E-05	5.0E-12	2.0E-11	0.0043	2E-14	9E-14
	Chromium	1.4E+01	4.4E+08	1.8E-09	3.6E-09	3.0E-04	6E-06	1E-05	1.3E-11	5.2E-11	0.084	1E-12	4E-12
	Cobalt	6.3E+00	4.4E+08	8.1E-10	1.6E-09	2.0E-05	4E-05	8E-05	5.8E-12	2.3E-11	0.009	5E-14	2E-13
	Iron	1.7E+04	4.4E+08	2.1E-06	4.3E-06				1.5E-08	6.1E-08			
	Manganese	4.4E+02	4.4E+08	5.6E-08	1.1E-07	5.0E-05	1E-03	2E-03	4.0E-10	1.6E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.8E-11				1.3E-13	5.4E-13			
23	TEQ-D/F (ND=1/2 DL)	6.9E-07	4.4E+08	8.9E-17	1.8E-16	4.0E-08	2E-09	4E-09	6.4E-19	2.5E-18	38	2E-17	1E-16
	Aroclor-1254	5.0E-03	4.4E+08	6.4E-13	1.3E-12				4.5E-15	1.8E-14	0.00057	3E-18	1E-17
	Aluminum	1.7E+04	4.4E+08	2.1E-06	4.2E-06	5.0E-03	4E-04	8E-04	1.5E-08	6.1E-08			
	Arsenic	5.3E+00	4.4E+08	6.8E-10	1.4E-09	1.5E-05	5E-05	9E-05	4.9E-12	1.9E-11	0.0043	2E-14	8E-14
	Chromium	1.3E+01	4.4E+08	1.7E-09	3.3E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.7E-11	0.084	1E-12	4E-12
	Cobalt	7.1E+00	4.4E+08	9.1E-10	1.8E-09	2.0E-05	5E-05	9E-05	6.5E-12	2.6E-11	0.009	6E-14	2E-13
	Iron	1.6E+04	4.4E+08	2.1E-06	4.2E-06				1.5E-08	6.0E-08			
	Manganese	4.0E+02	4.4E+08	5.2E-08	1.0E-07	5.0E-05	1E-03	2E-03	3.7E-10	1.5E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			

Population | **Hypothetical Future Construction Workers**
Exposure Area | **Random 20-acre grids across OU2**
Medium | **Surface Soil**
Exposure Route | **Inhalation of particulates in air**

TWFs	CTE	RME
Noncancer	5.66E-02	1.13E-01
Cancer	4.04E-04	1.62E-03

Grid	COPC	Csoil EPC mg/kg	PEF m^3/kg	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	RfC mg/m^3	HQ CTE	HQ RME	Cancer EC (ug/m^3) CTE	Cancer EC (ug/m^3) RME	iUR $(ug/m^3)^{-1}$	Risk CTE	Risk RME
	TEQ-D/F/PCBs (ND=1/2 DL)	1.4E-05	4.4E+08	1.8E-15	3.5E-15	4.0E-08	4E-08	9E-08	1.3E-17	5.0E-17	38	5E-16	2E-15
	Total Non-coplanar PCBs (ND=1/2 DL)	1.9E-01	4.4E+08	2.5E-11	5.0E-11				1.8E-13	7.2E-13	0.00057	1E-16	4E-16
	Aluminum	7.4E+03	4.4E+08	9.5E-07	1.9E-06	5.0E-03	2E-04	4E-04	6.8E-09	2.7E-08			
	Arsenic	4.8E+00	4.4E+08	6.1E-10	1.2E-09	1.5E-05	4E-05	8E-05	4.4E-12	1.8E-11	0.0043	2E-14	8E-14
1	Chromium	1.3E+01	4.4E+08	1.7E-09	3.4E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.8E-11	0.084	1E-12	4E-12
	Cobalt	5.6E+00	4.4E+08	7.2E-10	1.4E-09	2.0E-05	4E-05	7E-05	5.1E-12	2.1E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.4E-08			
	Manganese	6.4E+02	4.4E+08	8.2E-08	1.6E-07	5.0E-05	2E-03	3E-03	5.8E-10	2.3E-09			
	Thallium	8.3E-02	4.4E+08	1.1E-11	2.1E-11				7.6E-14	3.1E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	5.3E-06	4.4E+08	6.8E-16	1.4E-15	4.0E-08	2E-08	3E-08	4.9E-18	1.9E-17	38	2E-16	7E-16
	Total Non-coplanar PCBs (ND=1/2 DL)	2.9E-02	4.4E+08	3.7E-12	7.3E-12				2.6E-14	1.0E-13	0.00057	1E-17	6E-17
	Aluminum	6.6E+03	4.4E+08	8.5E-07	1.7E-06	5.0E-03	2E-04	3E-04	6.0E-09	2.4E-08			
	Arsenic	3.5E+00	4.4E+08	4.5E-10	9.0E-10	1.5E-05	3E-05	6E-05	3.2E-12	1.3E-11	0.0043	1E-14	6E-14
2	Chromium	9.9E+00	4.4E+08	1.3E-09	2.5E-09	3.0E-04	4E-06	8E-06	9.1E-12	3.6E-11	0.084	8E-13	3E-12
	Cobalt	3.6E+00	4.4E+08	4.7E-10	9.3E-10	2.0E-05	2E-05	5E-05	3.3E-12	1.3E-11	0.009	3E-14	1E-13
	Iron	9.5E+03	4.4E+08	1.2E-06	2.4E-06				8.7E-09	3.5E-08			
	Manganese	2.9E+02	4.4E+08	3.8E-08	7.5E-08	5.0E-05	8E-04	2E-03	2.7E-10	1.1E-09			
	Thallium	9.9E-02	4.4E+08	1.3E-11	2.5E-11				9.1E-14	3.6E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	4.4E+08	8.4E-16	1.7E-15	4.0E-08	2E-08	4E-08	6.0E-18	2.4E-17	38	2E-16	9E-16
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	4.4E+08	1.4E-11	2.9E-11				1.0E-13	4.1E-13	0.00057	6E-17	2E-16
	Aluminum	1.1E+04	4.4E+08	1.5E-06	2.9E-06	5.0E-03	3E-04	6E-04	1.1E-08	4.2E-08			
	Arsenic	3.9E+00	4.4E+08	5.0E-10	1.0E-09	1.5E-05	3E-05	7E-05	3.6E-12	1.4E-11	0.0043	2E-14	6E-14
4	Chromium	1.0E+01	4.4E+08	1.3E-09	2.6E-09	3.0E-04	4E-06	9E-06	9.4E-12	3.8E-11	0.084	8E-13	3E-12
	Cobalt	4.8E+00	4.4E+08	6.2E-10	1.2E-09	2.0E-05	3E-05	6E-05	4.4E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.2E+04	4.4E+08	1.6E-06	3.2E-06				1.1E-08	4.5E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.3E-08	5.0E-05	8E-04	2E-03	2.9E-10	1.2E-09			
	Thallium	1.2E-01	4.4E+08	1.6E-11	3.1E-11				1.1E-13	4.5E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	6.2E+03	4.4E+08	8.0E-07	1.6E-06	5.0E-03	2E-04	3E-04	5.7E-09	2.3E-08			
	Arsenic	3.3E+00	4.4E+08	4.3E-10	8.6E-10	1.5E-05	3E-05	6E-05	3.1E-12	1.2E-11	0.0043	1E-14	5E-14
5	Chromium	7.1E+00	4.4E+08	9.1E-10	1.8E-09	3.0E-04	3E-06	6E-06	6.5E-12	2.6E-11	0.084	5E-13	2E-12
	Cobalt	3.4E+00	4.4E+08	4.3E-10	8.7E-10	2.0E-05	2E-05	4E-05	3.1E-12	1.2E-11	0.009	3E-14	1E-13
	Iron	7.8E+03	4.4E+08	1.0E-06	2.0E-06				7.2E-09	2.9E-08			
	Manganese	3.7E+02	4.4E+08	4.7E-08	9.4E-08	5.0E-05	9E-04	2E-03	3.4E-10	1.3E-09			
	Thallium	2.3E-01	4.4E+08	3.0E-11	5.9E-11				2.1E-13	8.5E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	8.9E+03	4.4E+08	1.1E-06	2.3E-06	5.0E-03	2E-04	5E-04	8.1E-09	3.3E-08			
	Arsenic	3.2E+00	4.4E+08	4.1E-10	8.2E-10	1.5E-05	3E-05	5E-05	2.9E-12	1.2E-11	0.0043	1E-14	5E-14
6	Chromium	1.2E+01	4.4E+08	1.6E-09	3.2E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.6E-11	0.084	1E-12	4E-12
	Cobalt	4.0E+00	4.4E+08	5.1E-10	1.0E-09	2.0E-05	3E-05	5E-05	3.7E-12	1.5E-11	0.009	3E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.7E-06				9.7E-09	3.9E-08			
	Manganese	3.5E+02	4.4E+08	4.5E-08	9.1E-08	5.0E-05	9E-04	2E-03	3.2E-10	1.3E-09			
	Thallium	9.0E-02	4.4E+08	1.2E-11	2.3E-11				8.3E-14	3.3E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	6.5E-06	4.4E+08	8.4E-16	1.7E-15	4.0E-08	2E-08	4E-08	6.0E-18	2.4E-17	38	2E-16	9E-16
	Total Non-coplanar PCBs (ND=1/2 DL)	1.1E-01	4.4E+08	1.4E-11	2.9E-11				1.0E-13	4.1E-13	0.00057	6E-17	2E-16
	Aluminum	1.9E+04	4.4E+08	2.4E-06	4.8E-06	5.0E-03	5E-04	1E-03	1.7E-08	6.9E-08			
	Arsenic	2.8E+00	4.4E+08	3.6E-10	7.2E-10	1.5E-05	2E-05	5E-05	2.6E-12	1.0E-11	0.0043	1E-14	4E-14
7	Chromium	1.3E+01	4.4E+08	1.6E-09	3.2E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.6E-11	0.084	1E-12	4E-12
	Cobalt	6.0E+00	4.4E+08	7.7E-10	1.5E-09	2.0E-05	4E-05	8E-05	5.5E-12	2.2E-11	0.009	5E-14	2E-13
	Iron	1.7E+04	4.4E+08	2.1E-06	4.3E-06				1.5E-08	6.1E-08			
	Manganese	3.9E+02	4.4E+08	5.0E-08	9.9E-08	5.0E-05	1E-03	2E-03	3.5E-10	1.4E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	4.2E-05	4.4E+08	5.4E-15	1.1E-14	4.0E-08	1E-07	3E-07	3.9E-17	1.5E-16	38	1E-15	6E-15
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E+00	4.4E+08	1.3E-10	2.6E-10				9.3E-13	3.7E-12	0.00057	5E-16	2E-15
	Aluminum	1.3E+04	4.4E+08	1.6E-06	3.3E-06	5.0E-03	3E-04	7E-04	1.2E-08	4.7E-08			
	Arsenic	4.7E+00	4.4E+08	6.0E-10	1.2E-09	1.5E-05	4E-05	8E-05	4.3E-12	1.7E-11	0.0043	2E-14	7E-14
8	Chromium	4.0E+01	4.4E+08	5.1E-09	1.0E-08	3.0E-04	2E-05	3E-05	3.6E-11	1.5E-10	0.084	3E-12	1E-11
	Cobalt	6.9E+00	4.4E+08	8.9E-10	1.8E-09	2.0E-05	4E-05	9E-05	6.3E-12	2.5E-11	0.009	6E-14	2E-13
	Iron	3.7E+04	4.4E+08	4.8E-06	9.6E-06				3.4E-08	1.4E-07			
	Manganese	4.6E+02	4.4E+08	5.9E-08	1.2E-07	5.0E-05	1E-03	2E-03	4.2E-10	1.7E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			
	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-05	4.4E+08	1.3E-15	2.7E-15	4.0E-08	3E-08	7E-08	9.6E-18	3.8E-17	38	4E-16	1E-15
	Total Non-coplanar PCBs (ND=1/2 DL)	3.3E-02	4.4E+08	4.2E-12	8.4E-12				3.0E-14	1.2E-13	0.00057	2E-17	7E-17
	Aluminum	1.1E+04	4.4E+08	1.4E-06	2.8E-06	5.0E-03	3E-04	6E-04	9.9E-09	3.9E-08			
	Arsenic	4.1E+00	4.4E+08	5.3E-10	1.1E-09	1.5E-05	4E-05	7E-05	3.8E-12	1.5E-11	0.0043	2E-14	6E-14
9	Chromium	1.0E+01	4.4E+08	1.3E-09	2.7E-09	3.0E-04	4E-06	9E-06	9.5E-12	3.8E-11	0.084	8E-13	3E-12
	Cobalt	4.8E+00	4.4E+08	6.2E-10	1.2E-09	2.0E-05	3E-05	6E-05	4.4E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.2E+04	4.4E+08	1.6E-06	3.2E-06				1.1E-08	4.6E-08			
	Manganese	2.9E+02	4.4E+08	3.7E-08	7.4E-08	5.0E-05	7E-04	1E-03	2.6E-10	1.1E-09			
	Thallium	1.2E-01	4.4E+08	1.5E-11	3.0E-11				1.1E-13	4.2E-13			

		Csoil		Non-Cancer					Cancer				
Grid	COPC	EPC	PEF	EC (mg/m^3)		RfC	HQ		EC (ug/m^3)		iUR	Risk	
		mg/kg	m^3/kg	CTE	RME	mg/m^3	CTE	RME	CTE	RME	$(ug/m^3)^{-1}$	CTE	RME
11	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	8.3E+03	4.4E+08	1.1E-06	2.1E-06	5.0E-03	2E-04	4E-04	7.6E-09	3.1E-08			
	Arsenic	2.6E+00	4.4E+08	3.4E-10	6.7E-10	1.5E-05	2E-05	4E-05	2.4E-12	9.6E-12	0.0043	1E-14	4E-14
	Chromium	1.1E+01	4.4E+08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	4.2E+00	4.4E+08	5.4E-10	1.1E-09	2.0E-05	3E-05	5E-05	3.9E-12	1.6E-11	0.009	3E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.9E-06				1.0E-08	4.1E-08			
	Manganese	2.5E+02	4.4E+08	3.3E-08	6.5E-08	5.0E-05	7E-04	1E-03	2.3E-10	9.3E-10			
	Thallium	9.8E-02	4.4E+08	1.3E-11	2.5E-11				9.0E-14	3.6E-13			
12	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	1.4E+04	4.4E+08	1.9E-06	3.7E-06	5.0E-03	4E-04	7E-04	1.3E-08	5.3E-08			
	Arsenic	7.7E+00	4.4E+08	9.9E-10	2.0E-09	1.5E-05	7E-05	1E-04	7.0E-12	2.8E-11	0.0043	3E-14	1E-13
	Chromium	1.8E+01	4.4E+08	2.3E-09	4.6E-09	3.0E-04	8E-06	2E-05	1.6E-11	6.5E-11	0.084	1E-12	5E-12
	Cobalt	5.2E+00	4.4E+08	6.6E-10	1.3E-09	2.0E-05	3E-05	7E-05	4.7E-12	1.9E-11	0.009	4E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.5E-08			
	Manganese	1.6E+03	4.4E+08	2.1E-07	4.2E-07	5.0E-05	4E-03	8E-03	1.5E-09	6.0E-09			
	Thallium	9.0E-02	4.4E+08	1.2E-11	2.3E-11				8.2E-14	3.3E-13			
13	TEQ-D/F/PCBs (ND=1/2 DL)	3.8E-06	4.4E+08	4.9E-16	9.8E-16	4.0E-08	1E-08	2E-08	3.5E-18	1.4E-17	38	1E-16	5E-16
	Total Non-coplanar PCBs (ND=1/2 DL)	1.5E-02	4.4E+08	1.9E-12	3.8E-12				1.4E-14	5.4E-14	0.00057	8E-18	3E-17
	Aluminum	1.5E+04	4.4E+08	1.9E-06	3.7E-06	5.0E-03	4E-04	7E-04	1.3E-08	5.3E-08			
	Arsenic	5.2E+00	4.4E+08	6.6E-10	1.3E-09	1.5E-05	4E-05	9E-05	4.7E-12	1.9E-11	0.0043	2E-14	8E-14
	Chromium	1.2E+01	4.4E+08	1.5E-09	3.0E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	6.3E+00	4.4E+08	8.2E-10	1.6E-09	2.0E-05	4E-05	8E-05	5.8E-12	2.3E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	2.0E-06	4.0E-06				1.4E-08	5.6E-08			
	Manganese	4.9E+02	4.4E+08	6.3E-08	1.3E-07	5.0E-05	1E-03	3E-03	4.5E-10	1.8E-09			
	Thallium	1.3E-01	4.4E+08	1.7E-11	3.4E-11				1.2E-13	4.9E-13			
14	TEQ-D/F/PCBs (ND=1/2 DL)	3.0E-05	4.4E+08	3.9E-15	7.8E-15	4.0E-08	1E-07	2E-07	2.8E-17	1.1E-16	38	1E-15	4E-15
	Total Non-coplanar PCBs (ND=1/2 DL)	6.7E-02	4.4E+08	8.6E-12	1.7E-11				6.1E-14	2.4E-13	0.00057	3E-17	1E-16
	Aluminum	1.0E+04	4.4E+08	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9.4E-09	3.8E-08			
	Arsenic	4.1E+00	4.4E+08	5.3E-10	1.1E-09	1.5E-05	4E-05	7E-05	3.8E-12	1.5E-11	0.0043	2E-14	7E-14
	Chromium	1.6E+01	4.4E+08	2.0E-09	4.1E-09	3.0E-04	7E-06	1E-05	1.5E-11	5.8E-11	0.084	1E-12	5E-12
	Cobalt	5.1E+00	4.4E+08	6.5E-10	1.3E-09	2.0E-05	3E-05	7E-05	4.7E-12	1.9E-11	0.009	4E-14	2E-13
	Iron	1.5E+04	4.4E+08	2.0E-06	4.0E-06				1.4E-08	5.7E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.3E-08	5.0E-05	8E-04	2E-03	3.0E-10	1.2E-09			
	Thallium	1.1E-01	4.4E+08	1.5E-11	2.9E-11				1.0E-13	4.2E-13			
15	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	5.1E+03	4.4E+08	6.6E-07	1.3E-06	5.0E-03	1E-04	3E-04	4.7E-09	1.9E-08			
	Arsenic	2.3E+00	4.4E+08	2.9E-10	5.8E-10	1.5E-05	2E-05	4E-05	2.1E-12	8.3E-12	0.0043	9E-15	4E-14
	Chromium	1.1E+01	4.4E+08	1.5E-09	2.9E-09	3.0E-04	5E-06	1E-05	1.0E-11	4.2E-11	0.084	9E-13	4E-12
	Cobalt	3.0E+00	4.4E+08	3.9E-10	7.8E-10	2.0E-05	2E-05	4E-05	2.8E-12	1.1E-11	0.009	2E-14	1E-13
	Iron	8.7E+03	4.4E+08	1.1E-06	2.2E-06				8.0E-09	3.2E-08			
	Manganese	2.0E+02	4.4E+08	2.5E-08	5.1E-08	5.0E-05	5E-04	1E-03	1.8E-10	7.2E-10			
	Thallium	6.6E-02	4.4E+08	8.5E-12	1.7E-11				6.1E-14	2.4E-13			
16	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	8.0E+03	4.4E+08	1.0E-06	2.1E-06	5.0E-03	2E-04	4E-04	7.4E-09	2.9E-08			
	Arsenic	3.3E+00	4.4E+08	4.2E-10	8.5E-10	1.5E-05	3E-05	6E-05	3.0E-12	1.2E-11	0.0043	1E-14	5E-14
	Chromium	9.2E+00	4.4E+08	1.2E-09	2.4E-09	3.0E-04	4E-06	8E-06	8.5E-12	3.4E-11	0.084	7E-13	3E-12
	Cobalt	4.4E+00	4.4E+08	5.7E-10	1.1E-09	2.0E-05	3E-05	6E-05	4.0E-12	1.6E-11	0.009	4E-14	1E-13
	Iron	1.1E+04	4.4E+08	1.4E-06	2.8E-06				9.9E-09	4.0E-08			
	Manganese	3.1E+02	4.4E+08	3.9E-08	7.9E-08	5.0E-05	8E-04	2E-03	2.8E-10	1.1E-09			
	Thallium	1.0E-01	4.4E+08	1.3E-11	2.6E-11				9.2E-14	3.7E-13			
17	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	9.9E+03	4.4E+08	1.3E-06	2.6E-06	5.0E-03	3E-04	5E-04	9.1E-09	3.6E-08			
	Arsenic	4.0E+00	4.4E+08	5.1E-10	1.0E-09	1.5E-05	3E-05	7E-05	3.7E-12	1.5E-11	0.0043	2E-14	6E-14
	Chromium	1.2E+01	4.4E+08	1.5E-09	3.1E-09	3.0E-04	5E-06	1E-05	1.1E-11	4.4E-11	0.084	9E-13	4E-12
	Cobalt	5.0E+00	4.4E+08	6.4E-10	1.3E-09	2.0E-05	3E-05	6E-05	4.6E-12	1.8E-11	0.009	4E-14	2E-13
	Iron	1.3E+04	4.4E+08	1.6E-06	3.3E-06				1.2E-08	4.7E-08			
	Manganese	3.2E+02	4.4E+08	4.1E-08	8.2E-08	5.0E-05	8E-04	2E-03	2.9E-10	1.2E-09			
	Thallium	1.0E-01	4.4E+08	1.3E-11	2.7E-11				9.5E-14	3.8E-13			
18	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	1.5E+04	4.4E+08	1.9E-06	3.9E-06	5.0E-03	4E-04	8E-04	1.4E-08	5.5E-08			
	Arsenic	4.4E+00	4.4E+08	5.7E-10	1.1E-09	1.5E-05	4E-05	8E-05	4.0E-12	1.6E-11	0.0043	2E-14	7E-14
	Chromium	1.3E+01	4.4E+08	1.7E-09	3.3E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.8E-11	0.084	1E-12	4E-12
	Cobalt	5.7E+00	4.4E+08	7.3E-10	1.5E-09	2.0E-05	4E-05	7E-05	5.2E-12	2.1E-11	0.009	5E-14	2E-13
	Iron	1.5E+04	4.4E+08	1.9E-06	3.8E-06				1.4E-08	5.4E-08			
	Manganese	5.3E+02	4.4E+08	6.8E-08	1.4E-07	5.0E-05	1E-03	3E-03	4.8E-10	1.9E-09			
	Thallium	1.4E-01	4.4E+08	1.8E-11	3.6E-11				1.3E-13	5.1E-13			
19	TEQ-D/F/PCBs (ND=1/2 DL)	no data	4.4E+08	--	--	4.0E-08	--	--	--	--	38	--	--
	Total Non-coplanar PCBs (ND=1/2 DL)	no data	4.4E+08	--	--				--	--	0.00057	--	--
	Aluminum	2.3E+04	4.4E+08	2.9E-06	5.8E-06	5.0E-03	6E-04	1E-03	2.1E-08	8.3E-08			
	Arsenic	4.3E+00	4.4E+08	5.5E-10	1.1E-09	1.5E-05	4E-05	7E-05	4.0E-12	1.6E-11	0.0043	2E-14	7E-14
	Chromium	1.4E+01	4.4E+08	1.8E-09	3.7E-09	3.0E-04	6E-06	1E-05	1.3E-11	5.3E-11	0.084	1E-12	4E-12
	Cobalt	6.7E+00	4.4E+08	8.6E-10	1.7E-09	2.0E-05	4E-05	9E-05	6.2E-12	2.5E-11	0.009	6E-14	2E-13
	Iron	1.9E+04	4.4E+08	2.4E-06	4.8E-06				1.7E-08	6.8E-08			
	Manganese	4.3E+02	4.4E+08	5.5E-08	1.1E-07	5.0E-05	1E-03	2E-03	3.9E-10	1.6E-09			
	Thallium	1.9E-01	4.4E+08	2.4E-11	4.9E-11				1.7E-13	7.0E-13			

Grid	COPC	Csoil EPC mg/kg	PEF m^3/kg	Non-Cancer EC (mg/m^3) CTE	Non-Cancer EC (mg/m^3) RME	Non-Cancer RfC mg/m^3	Non-Cancer HQ CTE	Non-Cancer HQ RME	Cancer EC (ug/m^3) CTE	Cancer EC (ug/m^3) RME	Cancer iUR $(ug/m^3)^{-1}$	Cancer Risk CTE	Cancer Risk RME
22	TEQ-D/F/PCBs (ND=1/2 DL)	2.6E-05	4.4E+08	3.4E-15	6.8E-15	4.0E-08	9E-08	2E-07	2.4E-17	9.7E-17	38	9E-16	4E-15
	Total Non-coplanar PCBs (ND=1/2 DL)	1.0E-01	4.4E+08	1.3E-11	2.7E-11				9.5E-14	3.8E-13	0.00057	5E-17	2E-16
	Aluminum	1.6E+04	4.4E+08	2.0E-06	4.0E-06	5.0E-03	4E-04	8E-04	1.4E-08	5.7E-08			
	Arsenic	5.4E+00	4.4E+08	7.0E-10	1.4E-09	1.5E-05	5E-05	9E-05	5.0E-12	2.0E-11	0.0043	2E-14	9E-14
	Chromium	1.4E+01	4.4E+08	1.8E-09	3.6E-09	3.0E-04	6E-06	1E-05	1.3E-11	5.2E-11	0.084	1E-12	4E-12
	Cobalt	6.3E+00	4.4E+08	8.1E-10	1.6E-09	2.0E-05	4E-05	8E-05	5.8E-12	2.3E-11	0.009	5E-14	2E-13
	Iron	1.7E+04	4.4E+08	2.1E-06	4.3E-06				1.5E-08	6.1E-08			
	Manganese	4.4E+02	4.4E+08	5.6E-08	1.1E-07	5.0E-05	1E-03	2E-03	4.0E-10	1.6E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.8E-11				1.3E-13	5.4E-13			
23	TEQ-D/F/PCBs (ND=1/2 DL)	1.0E-06	4.4E+08	1.3E-16	2.6E-16	4.0E-08	3E-09	7E-09	9.3E-19	3.7E-18	38	4E-17	1E-16
	Total Non-coplanar PCBs (ND=1/2 DL)	6.9E-03	4.4E+08	8.9E-13	1.8E-12				6.4E-15	2.5E-14	0.00057	4E-18	1E-17
	Aluminum	1.7E+04	4.4E+08	2.1E-06	4.2E-06	5.0E-03	4E-04	8E-04	1.5E-08	6.1E-08			
	Arsenic	5.3E+00	4.4E+08	6.8E-10	1.4E-09	1.5E-05	5E-05	9E-05	4.9E-12	1.9E-11	0.0043	2E-14	8E-14
	Chromium	1.3E+01	4.4E+08	1.7E-09	3.3E-09	3.0E-04	6E-06	1E-05	1.2E-11	4.7E-11	0.084	1E-12	4E-12
	Cobalt	7.1E+00	4.4E+08	9.1E-10	1.8E-09	2.0E-05	5E-05	9E-05	6.5E-12	2.6E-11	0.009	6E-14	2E-13
	Iron	1.6E+04	4.4E+08	2.1E-06	4.2E-06				1.5E-08	6.0E-08			
	Manganese	4.0E+02	4.4E+08	5.2E-08	1.0E-07	5.0E-05	1E-03	2E-03	3.7E-10	1.5E-09			
	Thallium	1.5E-01	4.4E+08	1.9E-11	3.9E-11				1.4E-13	5.5E-13			

Population **Hypothetical Future Construction Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
Max Across All Grids	TEQ-D/F (ND=1/2 DL)	3.3E-05	1.00	1.2E-11	4.6E-11	2.0E-08	6E-04	2E-03	8.3E-14	6.6E-13	130000	1E-08	9E-08
	Aroclor-1254	1.2E-01	1.00	4.1E-08	1.6E-07	3.0E-05	1E-03	5E-03	2.9E-10	2.3E-09	2	6E-10	5E-09
	Aluminum	2.4E+04	1.00	8.4E-03	3.4E-02	1.0E+00	8E-03	3E-02					
	Arsenic	2.6E+01	0.60	5.5E-06	2.2E-05	3.0E-04	2E-02	7E-02	3.9E-08	3.1E-07	1.5	6E-08	5E-07
	Chromium	3.0E+01	1.00	1.0E-05	4.2E-05	5.0E-03	2E-03	8E-03	7.4E-08	5.9E-07	0.5	4E-08	3E-07
	Cobalt	7.2E+00	1.00	2.5E-06	1.0E-05	3.0E-03	8E-04	3E-03					
	Iron	2.2E+04	1.00	7.8E-03	3.1E-02	7.0E-01	1E-02	4E-02					
	Manganese	1.8E+03	1.00	6.3E-04	2.5E-03	2.4E-02	3E-02	1E-01					
	Thallium	6.2E-01	1.00	2.2E-07	8.6E-07	4.0E-05	5E-03	2E-02					

Population **Hypothetical Future Construction Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Subsurface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
Max Across All Grids	TEQ-D/F (ND=1/2 DL)	5.4E-06	0.03	1.2E-13	7.2E-13	2.0E-08	6E-06	4E-05	8.6E-16	1.0E-14	130000	1E-10	1E-09
	Aroclor-1254	1.4E-01	0.14	1.5E-08	8.9E-08	3.0E-05	5E-04	3E-03	1.1E-10	1.3E-09	2	2E-10	3E-09
	Aluminum	7.4E+03				1.0E+00							
	Arsenic	4.8E+00	0.03	1.1E-07	6.4E-07	3.0E-04	4E-04	2E-03	7.6E-10	9.2E-09	1.5	1E-09	1E-08
	Chromium	1.3E+01				1.3E-04					20		
	Cobalt	5.6E+00				3.0E-03							
	Iron	1.5E+04				7.0E-01							
	Manganese	6.4E+02				9.6E-04							
	Thallium	8.3E-02				4.0E-05							

Population **Hypothetical Future Construction Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Subsurface Soil**
Exposure Route **Incidental Ingestion**

HIFs	CTE	RME
Noncancer	3.50E-07	1.40E-06
Cancer	2.50E-09	2.00E-08

Grid	COPC	EPC	RBA	Non-Cancer					Cancer				
				DI (mg/kg-d)		RfD	HQ		DI (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
Max Across All Grids	TEQ-D/F/PCBs (ND=1/2 DL)	6.7E-06	1.00	2.3E-12	9.4E-12	2.0E-08	1E-04	5E-04	1.7E-14	1.3E-13	130000	2E-09	2E-08
	Total PCBs (ND=1/2 DL)	1.2E-01	1.00	4.3E-08	1.7E-07				3.1E-10	2.5E-09	2	6E-10	5E-09
	Aluminum	2.4E+04	1.00	8.4E-03	3.4E-02	1.0E+00	8E-03	3E-02					
	Arsenic	2.6E+01	0.60	5.5E-06	2.2E-05	3.0E-04	2E-02	7E-02	3.9E-08	3.1E-07	1.5	6E-08	5E-07
	Chromium	3.0E+01	1.00	1.0E-05	4.2E-05	5.0E-03	2E-03	8E-03	7.4E-08	5.9E-07	0.5	4E-08	3E-07
	Cobalt	7.2E+00	1.00	2.5E-06	1.0E-05	3.0E-03	8E-04	3E-03					
	Iron	2.2E+04	1.00	7.8E-03	3.1E-02	7.0E-01	1E-02	4E-02					
	Manganese	1.8E+03	1.00	6.3E-04	2.5E-03	2.4E-02	3E-02	1E-01					
	Thallium	6.2E-01	1.00	2.2E-07	8.6E-07	4.0E-05	5E-03	2E-02					

Population **Hypothetical Future Construction Workers**
Exposure Area **Random 20-acre grids across OU2**
Medium **Subsurface Soil**
Exposure Route **Dermal Contact**

HIFs	CTE	RME
Noncancer	7.49E-07	4.49E-06
Cancer	5.35E-09	6.42E-08

Grid	COPC	EPC	ABSd	Non-Cancer					Cancer				
				DAD (mg/kg-d)		RfD	HQ		DAD (mg/kg-d)		oSF	Risk	
		mg/kg		CTE	RME	mg/kg-d	CTE	RME	CTE	RME	(mg/kg-d)-1	CTE	RME
Max Across All Grids	TEQ-D/F/PCBs (ND=1/2 DL)	6.7E-06	0.03	1.5E-13	9.0E-13	2.0E-08	7E-06	4E-05	1.1E-15	1.3E-14	130000	1E-10	2E-09
	Total PCBs (ND=1/2 DL)	1.2E-01									2		
	Aluminum	2.4E+04				1.0E+00							
	Arsenic	2.6E+01	0.03	5.9E-07	3.5E-06	3.0E-04	2E-03	1E-02	4.2E-09	5.0E-08	1.5	6E-09	8E-08
	Chromium	3.0E+01				1.3E-04					20		
	Cobalt	7.2E+00				3.0E-03							
	Iron	2.2E+04				7.0E-01							
	Manganese	1.8E+03				9.6E-04							
	Thallium	6.2E-01				4.0E-05							

Population **Hypothetical Future Residents**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	1.32E-02	3.46E-02

Well ID	COPC	EPC µg/L	DI (mg/kg-d) CTE	DI (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME
MCSMW1	TEQ	1.0E-06	1.3E-11	3.5E-11	7.0E-10	2E-02	5E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.6E+00	2.1E-05	5.5E-05	3.0E-04	7E-02	2E-01
	Barium	1.5E+02	2.0E-03	5.2E-03	2.0E-01	1E-02	3E-02
	Chromium	ND	--	--	3.0E-03	--	--
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.9E+00	2.5E-05	6.6E-05	4.0E-02	6E-04	2E-03
	Iron	1.4E+02	1.9E-03	4.9E-03	7.0E-01	3E-03	7E-03
	Manganese	8.3E+01	1.1E-03	2.9E-03	2.4E-02	5E-02	1E-01
	Vanadium	2.1E+00	2.8E-05	7.3E-05	5.0E-03	6E-03	1E-02
MW4	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
MW7	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
WFB1	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
NFMW13	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	4.0E+00	5.3E-05	1.4E-04	3.0E-04	2E-01	5E-01
	Barium	2.5E+02	3.3E-03	8.8E-03	2.0E-01	2E-02	4E-02
	Chromium	2.7E-01	3.6E-06	9.3E-06	3.0E-03	1E-03	3E-03
	Cobalt	9.8E-01	1.3E-05	3.4E-05	3.0E-04	4E-02	1E-01
	Copper	2.4E+00	3.2E-05	8.4E-05	4.0E-02	8E-04	2E-03
	Iron	1.5E+03	2.0E-02	5.2E-02	7.0E-01	3E-02	7E-02
	Manganese	1.5E+03	1.9E-02	5.1E-02	2.4E-02	8E-01	**2E+00**
	Vanadium	1.7E+00	2.2E-05	5.8E-05	5.0E-03	4E-03	1E-02
NFMW14	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.1E+00	1.4E-05	3.8E-05	3.0E-04	5E-02	1E-01
	Barium	4.2E+02	5.5E-03	1.4E-02	2.0E-01	3E-02	7E-02
	Chromium	4.5E-01	6.0E-06	1.6E-05	3.0E-03	2E-03	5E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	2.7E+00	3.5E-05	9.2E-05	4.0E-02	9E-04	2E-03
	Iron	1.3E+01	1.7E-04	4.5E-04	7.0E-01	2E-04	6E-04
	Manganese	6.6E+01	8.6E-04	2.3E-03	2.4E-02	4E-02	9E-02
	Vanadium	8.2E-01	1.1E-05	2.8E-05	5.0E-03	2E-03	6E-03

Well ID	COPC	EPC µg/L	DI (mg/kg-d)		RfD mg/kg-d	HQ	
			CTE	RME		CTE	RME
NFMW15	TEQ	2.3E-06	3.0E-11	7.9E-11	7.0E-10	4E-02	1E-01
	Aroclor-1260	8.8E-02	1.2E-06	3.1E-06	--	--	--
	Arsenic	1.4E+01	1.8E-04	4.7E-04	3.0E-04	6E-01	**2E+00**
	Barium	2.1E+02	2.8E-03	7.3E-03	2.0E-01	1E-02	4E-02
	Chromium	1.8E+00	2.3E-05	6.1E-05	3.0E-03	8E-03	2E-02
	Cobalt	1.1E+00	1.4E-05	3.7E-05	3.0E-04	5E-02	1E-01
	Copper	6.7E+01	8.8E-04	2.3E-03	4.0E-02	2E-02	6E-02
	Iron	1.7E+03	2.2E-02	5.8E-02	7.0E-01	3E-02	8E-02
	Manganese	2.8E+03	3.7E-02	9.7E-02	2.4E-02	**2E+00**	**4E+00**
	Vanadium	4.4E+01	5.7E-04	1.5E-03	5.0E-03	1E-01	3E-01
NFMW16	TEQ	2.5E-06	3.3E-11	8.7E-11	7.0E-10	5E-02	1E-01
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	6.3E+00	8.3E-05	2.2E-04	3.0E-04	3E-01	7E-01
	Barium	2.4E+02	3.1E-03	8.2E-03	2.0E-01	2E-02	4E-02
	Chromium	2.8E-01	3.6E-06	9.6E-06	3.0E-03	1E-03	3E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.4E+00	1.8E-05	4.7E-05	4.0E-02	4E-04	1E-03
	Iron	4.2E+01	5.5E-04	1.4E-03	7.0E-01	8E-04	2E-03
	Manganese	2.3E+02	3.0E-03	7.9E-03	2.4E-02	1E-01	3E-01
	Vanadium	1.2E+00	1.5E-05	4.1E-05	5.0E-03	3E-03	8E-03
NFMW17	TEQ	1.0E-06	1.3E-11	3.4E-11	7.0E-10	2E-02	5E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	3.1E+00	4.1E-05	1.1E-04	3.0E-04	1E-01	4E-01
	Barium	1.6E+02	2.1E-03	5.4E-03	2.0E-01	1E-02	3E-02
	Chromium	5.3E-01	6.9E-06	1.8E-05	3.0E-03	2E-03	6E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	9.5E-01	1.3E-05	3.3E-05	4.0E-02	3E-04	8E-04
	Iron	1.6E+01	2.1E-04	5.4E-04	7.0E-01	3E-04	8E-04
	Manganese	7.1E-01	9.3E-06	2.4E-05	2.4E-02	4E-04	1E-03
	Vanadium	2.8E+00	3.6E-05	9.5E-05	5.0E-03	7E-03	2E-02
NFMW18	TEQ	1.7E-06	2.3E-11	6.0E-11	7.0E-10	3E-02	9E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	3.5E+00	4.5E-05	1.2E-04	3.0E-04	2E-01	4E-01
	Barium	1.2E+02	1.6E-03	4.2E-03	2.0E-01	8E-03	2E-02
	Chromium	6.5E-01	8.5E-06	2.2E-05	3.0E-03	3E-03	7E-03
	Cobalt	7.2E-01	9.5E-06	2.5E-05	3.0E-04	3E-02	8E-02
	Copper	6.1E+00	8.0E-05	2.1E-04	4.0E-02	2E-03	5E-03
	Iron	2.2E+02	2.8E-03	7.5E-03	7.0E-01	4E-03	1E-02
	Manganese	3.2E+02	4.2E-03	1.1E-02	2.4E-02	2E-01	5E-01
	Vanadium	3.6E+00	4.7E-05	1.2E-04	5.0E-03	9E-03	2E-02
NFMW5	TEQ	1.6E-06	2.1E-11	5.5E-11	7.0E-10	3E-02	8E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.5E+00	2.0E-05	5.2E-05	3.0E-04	7E-02	2E-01
	Barium	2.8E+02	3.7E-03	9.8E-03	2.0E-01	2E-02	5E-02
	Chromium	1.8E-01	2.4E-06	6.2E-06	3.0E-03	8E-04	2E-03
	Cobalt	4.1E-01	5.4E-06	1.4E-05	3.0E-04	2E-02	5E-02
	Copper	1.0E+00	1.3E-05	3.5E-05	4.0E-02	3E-04	9E-04
	Iron	8.4E+02	1.1E-02	2.9E-02	7.0E-01	2E-02	4E-02
	Manganese	1.1E+03	1.4E-02	3.8E-02	2.4E-02	6E-01	**2E+00**
	Vanadium	6.4E-01	8.4E-06	2.2E-05	5.0E-03	2E-03	4E-03
NFMW6	TEQ	1.5E-06	2.0E-11	5.2E-11	7.0E-10	3E-02	7E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	4.1E-01	5.4E-06	1.4E-05	3.0E-04	2E-02	5E-02
	Barium	3.3E+02	4.3E-03	1.1E-02	2.0E-01	2E-02	6E-02
	Chromium	3.6E-01	4.7E-06	1.2E-05	3.0E-03	2E-03	4E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	8.8E-01	1.2E-05	3.0E-05	4.0E-02	3E-04	8E-04
	Iron	1.2E+03	1.6E-02	4.1E-02	7.0E-01	2E-02	6E-02
	Manganese	2.5E+03	3.3E-02	8.8E-02	2.4E-02	1E+00	**4E+00**
	Vanadium	1.0E+00	1.3E-05	3.5E-05	5.0E-03	3E-03	7E-03
Car Wash Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.1E+00	2.8E-05	7.3E-05	3.0E-04	9E-02	2E-01
	Barium	3.4E+02	4.5E-03	1.2E-02	2.0E-01	2E-02	6E-02
	Chromium	2.6E-01	3.4E-06	9.0E-06	3.0E-03	1E-03	3E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.8E+00	2.4E-05	6.2E-05	4.0E-02	6E-04	2E-03
	Iron	4.8E+02	6.3E-03	1.7E-02	7.0E-01	9E-03	2E-02
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	9.1E-01	1.2E-05	3.1E-05	5.0E-03	2E-03	6E-03

Well ID	COPC	EPC µg/L	DI (mg/kg-d) CTE	DI (mg/kg-d) RME	RfD mg/kg-d	HQ CTE	HQ RME
Cartage Building Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	6.1E+00	8.0E-05	2.1E-04	3.0E-04	3E-01	7E-01
	Barium	1.4E+02	1.8E-03	4.7E-03	2.0E-01	9E-03	2E-02
	Chromium	6.0E-01	7.9E-06	2.1E-05	3.0E-03	3E-03	7E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.4E+01	1.8E-04	4.8E-04	4.0E-02	5E-03	1E-02
	Iron	2.1E+03	2.8E-02	7.3E-02	7.0E-01	4E-02	1E-01
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	7.1E+00	9.3E-05	2.5E-04	5.0E-03	2E-02	5E-02
Hoffman Construction Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.1E+00	2.8E-05	7.3E-05	3.0E-04	9E-02	2E-01
	Barium	1.7E+02	2.3E-03	6.0E-03	2.0E-01	1E-02	3E-02
	Chromium	8.6E-01	1.1E-05	3.0E-05	3.0E-03	4E-03	1E-02
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.3E+00	1.7E-05	4.5E-05	4.0E-02	4E-04	1E-03
	Iron	7.0E+03	9.2E-02	2.4E-01	7.0E-01	1E-01	3E-01
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	2.3E+00	3.0E-05	7.9E-05	5.0E-03	6E-03	2E-02
Log Chipper Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.2E+01	2.9E-04	7.6E-04	3.0E-04	1E+00	**3E+00**
	Barium	1.5E+02	1.9E-03	5.0E-03	2.0E-01	1E-02	3E-02
	Chromium	3.8E+00	5.0E-05	1.3E-04	3.0E-03	2E-02	4E-02
	Cobalt	2.6E+01	3.4E-04	9.0E-04	3.0E-04	1E+00	**3E+00**
	Copper	2.1E+01	2.7E-04	7.2E-04	4.0E-02	7E-03	2E-02
	Iron	4.1E+04	5.4E-01	1.4E+00	7.0E-01	8E-01	**2E+00**
	Manganese	3.0E+03	4.0E-02	1.0E-01	2.4E-02	**2E+00**	**4E+00**
	Vanadium	8.8E+00	1.2E-04	3.0E-04	5.0E-03	2E-02	6E-02
Waste Fuel Boiler Well	TEQ	8.9E-07	1.2E-11	3.1E-11	7.0E-10	2E-02	4E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	8.3E-01	1.1E-05	2.9E-05	3.0E-04	4E-02	1E-01
	Barium	1.9E+02	2.5E-03	6.6E-03	2.0E-01	1E-02	3E-02
	Chromium	8.8E-01	1.2E-05	3.0E-05	3.0E-03	4E-03	1E-02
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	7.4E+00	9.7E-05	2.5E-04	4.0E-02	2E-03	6E-03
	Iron	8.8E+03	1.2E-01	3.0E-01	7.0E-01	2E-01	4E-01
	Manganese	3.0E+01	3.9E-04	1.0E-03	2.4E-02	2E-02	4E-02
	Vanadium	9.7E-01	1.3E-05	3.4E-05	5.0E-03	3E-03	7E-03

NA = not analyzed; NC = not calculated; ND = not detected

Population **Hypothetical Future Residents**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	1.32E-02	3.46E-02

Well ID	**COPC**	**EPC µg/L**	**DI (mg/kg-d) CTE**	**DI (mg/kg-d) RME**	**RfD mg/kg-d**	**HQ CTE**	**HQ RME**
MW4	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.6E+00	2.1E-05	5.5E-05	3.0E-04	7E-02	2E-01
	Barium	1.6E+02	2.1E-03	5.4E-03	2.0E-01	1E-02	3E-02
	Chromium	5.2E-01	6.8E-06	1.8E-05	3.0E-03	2E-03	6E-03
	Cobalt	4.4E-01	5.8E-06	1.5E-05	3.0E-04	2E-02	5E-02
	Copper	8.9E-01	1.2E-05	3.1E-05	4.0E-02	3E-04	8E-04
	Iron	1.4E+01	1.8E-04	4.7E-04	7.0E-01	3E-04	7E-04
	Manganese	1.0E+00	1.3E-05	3.5E-05	2.4E-02	5E-04	1E-03
	Vanadium	1.5E+00	2.0E-05	5.2E-05	5.0E-03	4E-03	1E-02
MW7	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.6E+00	2.1E-05	5.5E-05	3.0E-04	7E-02	2E-01
	Barium	1.2E+02	1.6E-03	4.2E-03	2.0E-01	8E-03	2E-02
	Chromium	5.6E-01	7.4E-06	1.9E-05	3.0E-03	2E-03	6E-03
	Cobalt	4.6E-01	6.0E-06	1.6E-05	3.0E-04	2E-02	5E-02
	Copper	1.5E+00	2.0E-05	5.2E-05	4.0E-02	5E-04	1E-03
	Iron	1.4E+01	1.8E-04	4.7E-04	7.0E-01	3E-04	7E-04
	Manganese	1.4E+00	1.8E-05	4.8E-05	2.4E-02	8E-04	2E-03
	Vanadium	1.4E+00	1.8E-05	4.8E-05	5.0E-03	4E-03	1E-02
WFB1	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.1E+00	1.4E-05	3.8E-05	3.0E-04	5E-02	1E-01
	Barium	3.6E+02	4.8E-03	1.3E-02	2.0E-01	2E-02	6E-02
	Chromium	3.8E-01	5.0E-06	1.3E-05	3.0E-03	2E-03	4E-03
	Cobalt	7.6E-01	1.0E-05	2.6E-05	3.0E-04	3E-02	9E-02
	Copper	2.5E-01	3.3E-06	8.6E-06	4.0E-02	8E-05	2E-04
	Iron	4.9E+02	6.5E-03	1.7E-02	7.0E-01	9E-03	2E-02
	Manganese	4.3E+02	5.7E-03	1.5E-02	2.4E-02	2E-01	6E-01
	Vanadium	4.6E-01	6.0E-06	1.6E-05	5.0E-03	1E-03	3E-03

Population **Hypothetical Future Residents**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Cancer	2.25E-03	1.28E-02
CancerMMOA	2.88E-02	7.61E-02

Well ID	COPC	EPC µg/L	DI (mg/kg-d) CTE	DI (mg/kg-d) RME	SF $(mg/kg\text{-}day)^{-1}$	Risk CTE	Risk RME
MCSMW1	TEQ	1.0E-06	2.3E-12	1.3E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.6E+00	3.6E-06	2.1E-05	1.5E+00	5E-06	3E-05
	Chromium	ND	--	--	5.0E-01	--	--
MW4	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
MW7	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
WFB1	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
NFMW13	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	4.0E+00	9.0E-06	5.1E-05	1.5E+00	1E-05	8E-05
	Chromium	2.7E-01	7.8E-06	2.1E-05	5.0E-01	4E-06	1E-05
NFMW14	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.1E+00	2.5E-06	1.4E-05	1.5E+00	4E-06	2E-05
	Chromium	4.5E-01	1.3E-05	3.5E-05	5.0E-01	7E-06	2E-05
NFMW15	TEQ	2.3E-06	5.1E-12	2.9E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	8.8E-02	2.0E-07	1.1E-06	2.0E+00	4E-07	2E-06
	Arsenic	1.4E+01	3.1E-05	1.7E-04	1.5E+00	5E-05	**3E-04**
	Chromium	1.8E+00	5.1E-05	1.3E-04	5.0E-01	3E-05	7E-05
NFMW16	TEQ	2.5E-06	5.7E-12	3.2E-11	1.3E+05	7E-07	4E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	6.3E+00	1.4E-05	8.1E-05	1.5E+00	2E-05	**1E-04**
	Chromium	2.8E-01	8.0E-06	2.1E-05	5.0E-01	4E-06	1E-05
NFMW17	TEQ	1.0E-06	2.2E-12	1.3E-11	1.3E+05	3E-07	2E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	3.1E+00	7.0E-06	4.0E-05	1.5E+00	1E-05	6E-05
	Chromium	5.3E-01	1.5E-05	4.0E-05	5.0E-01	8E-06	2E-05
NFMW18	TEQ	1.7E-06	3.9E-12	2.2E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	3.5E+00	7.8E-06	4.4E-05	1.5E+00	1E-05	7E-05
	Chromium	6.5E-01	1.9E-05	4.9E-05	5.0E-01	9E-06	2E-05
NFMW5	TEQ	1.6E-06	3.6E-12	2.0E-11	1.3E+05	5E-07	3E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.5E+00	3.4E-06	1.9E-05	1.5E+00	5E-06	3E-05
	Chromium	1.8E-01	5.2E-06	1.4E-05	5.0E-01	3E-06	7E-06
NFMW6	TEQ	1.5E-06	3.4E-12	1.9E-11	1.3E+05	4E-07	3E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	4.1E-01	9.3E-07	5.3E-06	1.5E+00	1E-06	8E-06
	Chromium	3.6E-01	1.0E-05	2.7E-05	5.0E-01	5E-06	1E-05
Car Wash Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.1E+00	4.7E-06	2.7E-05	1.5E+00	7E-06	4E-05
	Chromium	2.6E-01	7.5E-06	2.0E-05	5.0E-01	4E-06	1E-05
Cartage Building Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	6.1E+00	1.4E-05	7.8E-05	1.5E+00	2E-05	**1E-04**
	Chromium	6.0E-01	1.7E-05	4.6E-05	5.0E-01	9E-06	2E-05
Hoffman Construction Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.1E+00	4.7E-06	2.7E-05	1.5E+00	7E-06	4E-05
	Chromium	8.6E-01	2.5E-05	6.5E-05	5.0E-01	1E-05	3E-05
Log Chipper Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.2E+01	4.9E-05	2.8E-04	1.5E+00	7E-05	**4E-04**
	Chromium	3.8E+00	1.1E-04	2.9E-04	5.0E-01	5E-05	**1E-04**
Waste Fuel Boiler Well	TEQ	8.9E-07	2.0E-12	1.1E-11	1.3E+05	3E-07	1E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	8.3E-01	1.9E-06	1.1E-05	1.5E+00	3E-06	2E-05
	Chromium	8.8E-01	2.5E-05	6.7E-05	5.0E-01	1E-05	3E-05

Population **Hypothetical Future Residents**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Cancer	2.25E-03	1.28E-02
CancerMMOA	2.88E-02	7.61E-02

Well ID	COPC	EPC	DI (mg/kg-d)		SF	Risk	
		µg/L	CTE	RME	$(mg/kg\text{-}day)^{-1}$	CTE	RME
MW4	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.6E+00	3.6E-06	2.1E-05	1.5E+00	5E-06	3E-05
	Chromium	5.2E-01	1.5E-05	4.0E-05	5.0E-01	7E-06	2E-05
MW7	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.6E+00	3.6E-06	2.1E-05	1.5E+00	5E-06	3E-05
	Chromium	5.6E-01	1.6E-05	4.3E-05	5.0E-01	8E-06	2E-05
WFB1	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.1E+00	2.5E-06	1.4E-05	1.5E+00	4E-06	2E-05
	Chromium	3.8E-01	1.1E-05	2.9E-05	5.0E-01	5E-06	1E-05

Population **Hypothetical Future Commercial/Industrial Workers**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Noncancer	4.69E-03	1.07E-02

Well ID	COPC	EPC	DI (mg/kg-d)		RfD	HQ	
		μg/L	CTE	RME	mg/kg-d	CTE	RME
MCSMW1	TEQ	1.0E-06	4.7E-12	1.1E-11	7.0E-10	7E-03	2E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.6E+00	7.5E-06	1.7E-05	3.0E-04	3E-02	6E-02
	Barium	1.5E+02	7.0E-04	1.6E-03	2.0E-01	4E-03	8E-03
	Chromium	ND	--	--	3.0E-03	--	--
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.9E+00	8.9E-06	2.0E-05	4.0E-02	2E-04	5E-04
	Iron	1.4E+02	6.7E-04	1.5E-03	7.0E-01	1E-03	2E-03
	Manganese	8.3E+01	3.9E-04	8.9E-04	2.4E-02	2E-02	4E-02
	Vanadium	2.1E+00	9.8E-06	2.2E-05	5.0E-03	2E-03	4E-03
MW4	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
MW7	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
WFB1	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	NA	--	--	3.0E-04	--	--
	Barium	NA	--	--	2.0E-01	--	--
	Chromium	NA	--	--	3.0E-03	--	--
	Cobalt	NA	--	--	3.0E-04	--	--
	Copper	NA	--	--	4.0E-02	--	--
	Iron	NA	--	--	7.0E-01	--	--
	Manganese	NA	--	--	2.4E-02	--	--
	Vanadium	NA	--	--	5.0E-03	--	--
NFMW13	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	4.0E+00	1.9E-05	4.3E-05	3.0E-04	6E-02	1E-01
	Barium	2.5E+02	1.2E-03	2.7E-03	2.0E-01	6E-03	1E-02
	Chromium	2.7E-01	1.3E-06	2.9E-06	3.0E-03	4E-04	1E-03
	Cobalt	9.8E-01	4.6E-06	1.1E-05	3.0E-04	2E-02	4E-02
	Copper	2.4E+00	1.1E-05	2.6E-05	4.0E-02	3E-04	7E-04
	Iron	1.5E+03	7.0E-03	1.6E-02	7.0E-01	1E-02	2E-02
	Manganese	1.5E+03	6.9E-03	1.6E-02	2.4E-02	3E-01	7E-01
	Vanadium	1.7E+00	7.9E-06	1.8E-05	5.0E-03	2E-03	4E-03
NFMW14	TEQ	ND	--	--	7.0E-10	--	--
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.1E+00	5.1E-06	1.2E-05	3.0E-04	2E-02	4E-02
	Barium	4.2E+02	2.0E-03	4.5E-03	2.0E-01	1E-02	2E-02
	Chromium	4.5E-01	2.1E-06	4.9E-06	3.0E-03	7E-04	2E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	2.7E+00	1.2E-05	2.9E-05	4.0E-02	3E-04	7E-04
	Iron	1.3E+01	6.1E-05	1.4E-04	7.0E-01	9E-05	2E-04
	Manganese	6.6E+01	3.1E-04	7.0E-04	2.4E-02	1E-02	3E-02
	Vanadium	8.2E-01	3.8E-06	8.8E-06	5.0E-03	8E-04	2E-03
NFMW15	TEQ	2.3E-06	1.1E-11	2.4E-11	7.0E-10	2E-02	3E-02
	Aroclor-1260	8.8E-02	4.1E-07	9.5E-07	--	--	--
	Arsenic	1.4E+01	6.4E-05	1.5E-04	3.0E-04	2E-01	5E-01
	Barium	2.1E+02	9.9E-04	2.3E-03	2.0E-01	5E-03	1E-02
	Chromium	1.8E+00	8.3E-06	1.9E-05	3.0E-03	3E-03	6E-03
	Cobalt	1.1E+00	5.0E-06	1.1E-05	3.0E-04	2E-02	4E-02
	Copper	6.7E+01	3.2E-04	7.2E-04	4.0E-02	8E-03	2E-02
	Iron	1.7E+03	7.9E-03	1.8E-02	7.0E-01	1E-02	3E-02
	Manganese	2.8E+03	1.3E-02	3.0E-02	2.4E-02	5E-01	1E+00
	Vanadium	4.4E+01	2.0E-04	4.7E-04	5.0E-03	4E-02	9E-02

NFMW16	TEQ	2.5E-06	1.2E-11	2.7E-11	7.0E-10	2E-02	4E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	6.3E+00	3.0E-05	6.7E-05	3.0E-04	1E-01	2E-01
	Barium	2.4E+02	1.1E-03	2.6E-03	2.0E-01	6E-03	1E-02
	Chromium	2.8E-01	1.3E-06	3.0E-06	3.0E-03	4E-04	1E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.4E+00	6.4E-06	1.5E-05	4.0E-02	2E-04	4E-04
	Iron	4.2E+01	2.0E-04	4.5E-04	7.0E-01	3E-04	6E-04
	Manganese	2.3E+02	1.1E-03	2.5E-03	2.4E-02	4E-02	1E-01
	Vanadium	1.2E+00	5.5E-06	1.3E-05	5.0E-03	1E-03	3E-03
NFMW17	TEQ	1.0E-06	4.7E-12	1.1E-11	7.0E-10	7E-03	2E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	3.1E+00	1.5E-05	3.3E-05	3.0E-04	5E-02	1E-01
	Barium	1.6E+02	7.3E-04	1.7E-03	2.0E-01	4E-03	8E-03
	Chromium	5.3E-01	2.5E-06	5.7E-06	3.0E-03	8E-04	2E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	9.5E-01	4.5E-06	1.0E-05	4.0E-02	1E-04	3E-04
	Iron	1.6E+01	7.4E-05	1.7E-04	7.0E-01	1E-04	2E-04
	Manganese	7.1E-01	3.3E-06	7.6E-06	2.4E-02	1E-04	3E-04
	Vanadium	2.8E+00	1.3E-05	2.9E-05	5.0E-03	3E-03	6E-03
NFMW18	TEQ	1.7E-06	8.1E-12	1.9E-11	7.0E-10	1E-02	3E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	3.5E+00	1.6E-05	3.7E-05	3.0E-04	5E-02	1E-01
	Barium	1.2E+02	5.7E-04	1.3E-03	2.0E-01	3E-03	7E-03
	Chromium	6.5E-01	3.0E-06	6.9E-06	3.0E-03	1E-03	2E-03
	Cobalt	7.2E-01	3.4E-06	7.7E-06	3.0E-04	1E-02	3E-02
	Copper	6.1E+00	2.9E-05	6.5E-05	4.0E-02	7E-04	2E-03
	Iron	2.2E+02	1.0E-03	2.3E-03	7.0E-01	1E-03	3E-03
	Manganese	3.2E+02	1.5E-03	3.4E-03	2.4E-02	6E-02	1E-01
	Vanadium	3.6E+00	1.7E-05	3.8E-05	5.0E-03	3E-03	8E-03
NFMW5	TEQ	1.6E-06	7.4E-12	1.7E-11	7.0E-10	1E-02	2E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	1.5E+00	7.0E-06	1.6E-05	3.0E-04	2E-02	5E-02
	Barium	2.8E+02	1.3E-03	3.0E-03	2.0E-01	7E-03	2E-02
	Chromium	1.8E-01	8.4E-07	1.9E-06	3.0E-03	3E-04	6E-04
	Cobalt	4.1E-01	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02
	Copper	1.0E+00	4.8E-06	1.1E-05	4.0E-02	1E-04	3E-04
	Iron	8.4E+02	3.9E-03	9.0E-03	7.0E-01	6E-03	1E-02
	Manganese	1.1E+03	5.2E-03	1.2E-02	2.4E-02	2E-01	5E-01
	Vanadium	6.4E-01	3.0E-06	6.8E-06	5.0E-03	6E-04	1E-03
NFMW6	TEQ	1.5E-06	7.1E-12	1.6E-11	7.0E-10	1E-02	2E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	4.1E-01	1.9E-06	4.4E-06	3.0E-04	6E-03	1E-02
	Barium	3.3E+02	1.5E-03	3.5E-03	2.0E-01	8E-03	2E-02
	Chromium	3.6E-01	1.7E-06	3.9E-06	3.0E-03	6E-04	1E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	8.8E-01	4.1E-06	9.4E-06	4.0E-02	1E-04	2E-04
	Iron	1.2E+03	5.5E-03	1.3E-02	7.0E-01	8E-03	2E-02
	Manganese	2.5E+03	1.2E-02	2.7E-02	2.4E-02	5E-01	1E+00
	Vanadium	1.0E+00	4.7E-06	1.1E-05	5.0E-03	9E-04	2E-03
Car Wash Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.1E+00	9.8E-06	2.2E-05	3.0E-04	3E-02	7E-02
	Barium	3.4E+02	1.6E-03	3.6E-03	2.0E-01	8E-03	2E-02
	Chromium	2.6E-01	1.2E-06	2.8E-06	3.0E-03	4E-04	9E-04
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.8E+00	8.4E-06	1.9E-05	4.0E-02	2E-04	5E-04
	Iron	4.8E+02	2.2E-03	5.1E-03	7.0E-01	3E-03	7E-03
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	9.1E-01	4.3E-06	9.7E-06	5.0E-03	9E-04	2E-03
Cartage Building Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	6.1E+00	2.9E-05	6.5E-05	3.0E-04	1E-01	2E-01
	Barium	1.4E+02	6.4E-04	1.5E-03	2.0E-01	3E-03	7E-03
	Chromium	6.0E-01	2.8E-06	6.4E-06	3.0E-03	9E-04	2E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.4E+01	6.6E-05	1.5E-04	4.0E-02	2E-03	4E-03
	Iron	2.1E+03	9.9E-03	2.3E-02	7.0E-01	1E-02	3E-02
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	7.1E+00	3.3E-05	7.6E-05	5.0E-03	7E-03	2E-02
Hoffman Construction Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.1E+00	9.8E-06	2.2E-05	3.0E-04	3E-02	7E-02
	Barium	1.7E+02	8.1E-04	1.9E-03	2.0E-01	4E-03	9E-03
	Chromium	8.6E-01	4.0E-06	9.2E-06	3.0E-03	1E-03	3E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	1.3E+00	6.1E-06	1.4E-05	4.0E-02	2E-04	3E-04
	Iron	7.0E+03	3.3E-02	7.5E-02	7.0E-01	5E-02	1E-01
	Manganese	ND	--	--	2.4E-02	--	--
	Vanadium	2.3E+00	1.1E-05	2.5E-05	5.0E-03	2E-03	5E-03

Log Chipper Well	TEQ	NA	--	--	7.0E-10	--	--
	Aroclor-1260	NA	--	--	--	--	--
	Arsenic	2.2E+01	1.0E-04	2.3E-04	3.0E-04	3E-01	8E-01
	Barium	1.5E+02	6.8E-04	1.6E-03	2.0E-01	3E-03	8E-03
	Chromium	3.8E+00	1.8E-05	4.1E-05	3.0E-03	6E-03	1E-02
	Cobalt	2.6E+01	1.2E-04	2.8E-04	3.0E-04	4E-01	9E-01
	Copper	2.1E+01	9.7E-05	2.2E-04	4.0E-02	2E-03	6E-03
	Iron	4.1E+04	1.9E-01	4.4E-01	7.0E-01	3E-01	6E-01
	Manganese	3.0E+03	1.4E-02	3.2E-02	2.4E-02	6E-01	1E+00
	Vanadium	8.8E+00	4.1E-05	9.4E-05	5.0E-03	8E-03	2E-02
Waste Fuel Boiler Well	TEQ	8.9E-07	4.2E-12	9.5E-12	7.0E-10	6E-03	1E-02
	Aroclor-1260	ND	--	--	--	--	--
	Arsenic	8.3E-01	3.9E-06	8.9E-06	3.0E-04	1E-02	3E-02
	Barium	1.9E+02	8.9E-04	2.0E-03	2.0E-01	4E-03	1E-02
	Chromium	8.8E-01	4.1E-06	9.4E-06	3.0E-03	1E-03	3E-03
	Cobalt	ND	--	--	3.0E-04	--	--
	Copper	7.4E+00	3.4E-05	7.9E-05	4.0E-02	9E-04	2E-03
	Iron	8.8E+03	4.1E-02	9.4E-02	7.0E-01	6E-02	1E-01
	Manganese	3.0E+01	1.4E-04	3.2E-04	2.4E-02	6E-03	1E-02
	Vanadium	9.7E-01	4.6E-06	1.0E-05	5.0E-03	9E-04	2E-03

NA = not analyzed; NC = not calculated; ND = not detected

Population **Hypothetical Future Workers**
Exposure Area **OU2**
Medium **Groundwater**
Exposure Route **Ingestion as drinking water**

HIFs	CTE	RME
Cancer	6.03E-04	3.82E-03

Well ID	COPC	EPC	DI (mg/kg-d)		SF	Risk	
		µg/L	CTE	RME	$(mg/kg\text{-}day)^{-1}$	CTE	RME
MCSMW1	TEQ	1.0E-06	6.0E-13	3.8E-12	1.3E+05	8E-08	5E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.6E+00	9.6E-07	6.1E-06	1.5E+00	1E-06	9E-06
	Chromium	ND	--	--	5.0E-01	--	--
MW4	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
MW7	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
WFB1	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	NA	--	--	1.5E+00	--	--
	Chromium	NA	--	--	5.0E-01	--	--
NFMW13	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	4.0E+00	2.4E-06	1.5E-05	1.5E+00	4E-06	2E-05
	Chromium	2.7E-01	1.6E-07	1.0E-06	5.0E-01	8E-08	5E-07
NFMW14	TEQ	ND	--	--	1.3E+05	--	--
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.1E+00	6.6E-07	4.2E-06	1.5E+00	1E-06	6E-06
	Chromium	4.5E-01	2.7E-07	1.7E-06	5.0E-01	1E-07	9E-07
NFMW15	TEQ	2.3E-06	1.4E-12	8.7E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	8.8E-02	5.3E-08	3.4E-07	2.0E+00	1E-07	7E-07
	Arsenic	1.4E+01	8.2E-06	5.2E-05	1.5E+00	1E-05	8E-05
	Chromium	1.8E+00	1.1E-06	6.8E-06	5.0E-01	5E-07	3E-06
NFMW16	TEQ	2.5E-06	1.5E-12	9.6E-12	1.3E+05	2E-07	1E-06
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	6.3E+00	3.8E-06	2.4E-05	1.5E+00	6E-06	4E-05
	Chromium	2.8E-01	1.7E-07	1.1E-06	5.0E-01	8E-08	5E-07
NFMW17	TEQ	1.0E-06	6.0E-13	3.8E-12	1.3E+05	8E-08	5E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	3.1E+00	1.9E-06	1.2E-05	1.5E+00	3E-06	2E-05
	Chromium	5.3E-01	3.2E-07	2.0E-06	5.0E-01	2E-07	1E-06
NFMW18	TEQ	1.7E-06	1.0E-12	6.6E-12	1.3E+05	1E-07	9E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	3.5E+00	2.1E-06	1.3E-05	1.5E+00	3E-06	2E-05
	Chromium	6.5E-01	3.9E-07	2.5E-06	5.0E-01	2E-07	1E-06
NFMW5	TEQ	1.6E-06	9.6E-13	6.1E-12	1.3E+05	1E-07	8E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	1.5E+00	9.0E-07	5.7E-06	1.5E+00	1E-06	9E-06
	Chromium	1.8E-01	1.1E-07	6.9E-07	5.0E-01	5E-08	3E-07
NFMW6	TEQ	1.5E-06	9.1E-13	5.8E-12	1.3E+05	1E-07	7E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	4.1E-01	2.5E-07	1.6E-06	1.5E+00	4E-07	2E-06
	Chromium	3.6E-01	2.2E-07	1.4E-06	5.0E-01	1E-07	7E-07
Car Wash Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.1E+00	1.3E-06	8.0E-06	1.5E+00	2E-06	1E-05
	Chromium	2.6E-01	1.6E-07	9.9E-07	5.0E-01	8E-08	5E-07
Cartage Building Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	6.1E+00	3.7E-06	2.3E-05	1.5E+00	6E-06	3E-05
	Chromium	6.0E-01	3.6E-07	2.3E-06	5.0E-01	2E-07	1E-06
Hoffman Construction Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.1E+00	1.3E-06	8.0E-06	1.5E+00	2E-06	1E-05
	Chromium	8.6E-01	5.2E-07	3.3E-06	5.0E-01	3E-07	2E-06
Log Chipper Well	TEQ	NA	--	--	1.3E+05	--	--
	Aroclor-1260	NA	--	--	2.0E+00	--	--
	Arsenic	2.2E+01	1.3E-05	8.4E-05	1.5E+00	2E-05	**1E-04**
	Chromium	3.8E+00	2.3E-06	1.5E-05	5.0E-01	1E-06	7E-06
Waste Fuel Boiler Well	TEQ	8.9E-07	5.3E-13	3.4E-12	1.3E+05	7E-08	4E-07
	Aroclor-1260	ND	--	--	2.0E+00	--	--
	Arsenic	8.3E-01	5.0E-07	3.2E-06	1.5E+00	7E-07	5E-06
	Chromium	8.8E-01	5.3E-07	3.4E-06	5.0E-01	3E-07	2E-06