FINAL FEASIBILITY STUDY REPORT
MARCH 2017

United States Environmental Protection Agency
Peninsula Boulevard Groundwater Contamination Superfund Site
Operable Unit 2 Source Delineation
Village of Hewlett, Town of Hempstead
Nassau County, New York

Contract No. EP-W-09-009
Work Assignment No. 027-RICO-02TV

458521

EPA WORK ASSIGNMENT NUMBER: 027-RICO-02TV

EPA CONTRACT NUMBER: EP-W-09-009

HDR

RAC 2 PROGRAM

FINAL FEASIBILITY STUDY REPORT
PENINSULA BOULEVARD GROUNDWATER CONTAMINATION SUPERFUND SITE
OPERABLE UNIT 2 SOURCE DELINEATION
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

March 2017

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	area of concern
ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparging
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BOD	biological oxygen demand
CCP	coal combustion products
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
COPC	Contaminant of potential concern
CPVC	chlorinated polyvinyl chloride
CSIA	Compound Specific Isotope Analysis
CSM	Conceptual Site Model
CVOC	Chlorinated Volatile Organic Compound
DCE	Dichloroethene
DER	Data Evaluation Report
°C	Degree Celsius
°F	Degree Fahrenheit
3-D	3-dimensional
DNAPL	Dense Non-aqueous Phase Liquid
DO	dissolved oxygen
DPE	Dual phase extraction
DVI	Dual-valent Iron
EAB	enhanced aerobic biodegradation
EC	Electrical Conductivity
ELCR	Excess lifetime cancer risk
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
ERH	electrical resistivity heating
EVO	emulsified vegetable oil
ft/ft	Feet per Feet
FS	Feasibility Study
GAC	Granular Activated Carbon
gpm	Gallons per Minute
GQS	groundwater quality standard
GRA	General Response Action
GWRTAC	Ground-Water Remediation Technologies Analysis Center
HDR	Henningson, Durham & Richardson Architecture and Engineering, P.C. in association with HDR Engineering, Inc.
HEPA	Heat Enhanced Plume Attenuation
HHRA	Human Health Risk Assessment
hp	horse power
HI	Hazard index
HQ	Hazard quotient

IC	Institutional Control
ISCO	In situ chemical oxidation
ISCR	In situ chemical reduction
ISV	In situ vitrification
K	Hydraulic Conductivity
LIRR	Long Island Rail Road
LNAPL	Light Non-aqueous Phase Liquids
Lockheed Martin	Lockheed Martin Information Systems & Global Solutions
LTM	Long Term Monitoring
MCL	Maximum Contaminant Level
mg/kg	Milligrams per Kilogram
MiHPT	Membrane Interface Probe with Hydraulic Profiling Tool
MIP	Membrane Interface Probe
MNA	Monitored Natural Attenuation
MW	Monitoring Well
NAPL	Non-Aqueous Phase Liquid
NCDH	Nassau County Department of Health
NCP	National Contingency Plan
ND	none detected
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NYAW	New York American Water
NYCRR	New York Code of Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	operations and maintenance
OU	Operable Unit
OSHA	Occupational Health and Safety Administration
PCE	Tetrachloroethylene
PCU	power control unit
PDB	passive diffusion bags
PDI	Pre-Design Investigation
PID	Photoionization Detector
POTW	Publicly Owned Treatment Works
PRB	Permeable Reactive Barrier
PRG	Preliminary Remediation Goal
PVC	polyvinyl chloride
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation

ROD	Record of Decision
ROI	Radius of Influence
ROW	right-of-way
RSL	Regional Screening Level
scfm	standard cubic feet per minute
SERAS	Lockheed Martin Scientific, Engineering, Response & Analytical Services
SCOs	Soil Cleanup Objectives
SLERA	Screening Level Ecological Risk Assessment
S/S	Solidification/stabilization
SG	Soil Gas
Site	Peninsula Boulevard Groundwater Contamination Superfund Site
SPDES	State Pollutant Discharge Elimination System
s.f.	square feet
SSL	soil screening level
SVE	Soil Vapor Extraction
TBC	To Be Considered
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
Tetra Tech	TetraTech EC, Inc.
TMP	temperature monitoring point
TOC	total organic carbon
TOGS	Technical & Operational Guidance Series
UCL	Upper Confidence Limit
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
$\mu g/m^3$	Micrograms per Cubic Meter
µV	Micro Volts
UGA	Upper Glacial Aquifer
UIC	Underground Injection Control
URSCO	Unrestricted Use Soil Cleanup Objective
UV	Ultraviolet
VFA	volatile fatty acid
VOC	Volatile Organic Compound
XSD	halogen-specific detector
ZVI	Zerovalent Iron

1.0 INTRODUCTION

This Final Feasibility Study (FS) for the Peninsula Boulevard Groundwater Contamination Superfund Site (site), Operable Unit (OU) 2 Source Delineation, for potential source areas, has been prepared by Henningson, Durham & Richardson Architecture and Engineering, P.C. (HDR) in association with HDR Engineering, Inc. under United States Environmental Protection Agency (EPA) Region 2 Contract Number EP-W-09-009, EPA Work Assignment Number 027-RICO-02TV. This Final FS report was prepared in accordance with the Final Work Plan for the above assignment, dated January 2014 (HDR, 2014) and comments received from EPA on August 29, 2016 and November 16, 2016.

The EPA has divided the site into two OUs to address contamination associated with dry cleaning fluid and associated chlorinated volatile organic compounds (CVOCs). The site-wide contaminated groundwater plume area constitutes OU1, and the potential source areas constitute OU2. The remedial action (RA) for OU1 is being carried out by others. Information pertaining to the preliminary remedial design (RD) for the in-situ and ex-situ groundwater treatment at OU1 was reviewed by HDR and considered for the development of this FS. The focus of this FS is for the OU2 potential source areas.

The Remedial Investigation (RI) for OU2 was performed by EPA, and related information was provided to HDR to perform this FS.

1.1 Document Review

RI data, maps, and other source files were received from EPA and used to complete this FS Report. The below-listed documents were the main sources of information used in the preparation of this document.

- February 2012 Soil Gas and Groundwater Sampling Trip Report, Peninsula Boulevard Site, Hewlett, New York. Lockheed Martin. March 29, 2012.
- Preliminary Design (30%) for Ex-Situ Groundwater Treatment, Operable Unit 1, Hempstead, New York. Tetra Tech EC, Inc. March 2014.
- Basis of Design (50%) for In-Situ Groundwater Treatment at the Peninsula Boulevard Groundwater Plume Superfund Site, Operable Unit 1, Hempstead, New York. Tetra Tech EC, Inc. March 2014.
- Site Field Activities during 2012 to 2014, Technical Memorandum, Peninsula Boulevard Site, Hewlett, New York, Lockheed Martin. July 9, 2014.
- Operable Unit 2 Remedial Investigation Activities conducted during 2012 to 2016, Technical Memorandum, Peninsula Boulevard Site, Hewlett, New York, Lockheed Martin. May 11, 2016 and August 10, 2016.
- Mining Visualization System and Earth Volumetric Studio Model, Cedarwood Cleaners, Lockheed Martin/West Central Environmental Consultants, Inc. May 2016.

1.2 Purpose and Organization of the Report

The purpose of the FS is to identify, develop, screen, and evaluate remedial alternatives for potential contaminated source areas and to provide sufficient data to select feasible, safe, and cost-effective remedies that protect public health and the environment from potential risks associated with the source areas that have been identified and assessed. This FS report has been prepared in accordance with EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (EPA, 1988) and other applicable guidance as included in the list of references.

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, more commonly called the National Contingency Plan (NCP) (EPA 1992a), the relative performance of each alternative is evaluated using the nine criteria of the NCP as the basis for comparison. The purpose of the evaluation process is to determine which alternatives meet the threshold criteria of (1) overall protection of human health and the environment over both the long-term and short-term and (2) attainment of Applicable or Relevant and Appropriate Requirements (ARARs), unless a waiver is appropriate.

Section 121 of CERCLA requires that remedial actions completed under Section 104 or Section 106 of CERCLA be protective of human health and the environment and attain the levels or standards of control for hazardous substances, pollutants, or contaminants specified by ARARs (i.e., cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental, state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a National Priorities List [NPL] site) found in federal and state statutes, unless waivers are obtained. Non-promulgated "to be considered" (TBC) criteria or guidelines must also be considered.

Once the threshold criteria have been met, the remedial alternatives are evaluated in terms of their ability to provide the best balance with respect to the five NCP balancing criteria, including:

- Long-term effectiveness and permanence, to address how well a remedy protects human health and the environment after Remedial Action Objectives (RAOs) have been met, including an assessment of residual risk, and the adequacy and long-term reliability of management controls.

- Toxicity, mobility, or volume reduction, to assess the amounts of chemicals destroyed or treated and that remain at the site.

- Short-term effectiveness in the protection of human health and the environment during construction and remedial actions, including the length of time required to achieve protection, short-term reliability of remedial technologies, protection of workers and the community during construction, and disruption of neighboring areas.

- Implementability, considering the technical and administrative feasibility of each alternative, and availability of the products and services needed to execute the remedy. This also considers the ability to construct and operate remedial facilities, ease of undertaking

additional remedial actions, ability to monitor remedial effectiveness, and ability to obtain approvals and permits.

- Cost evaluation of remedial alternatives, including both total long-term (operational) and short-term (construction) costs.

The modifying criteria, namely state and community acceptance of the remedial alternatives, are evaluated based on formal comments received during the remedial project's comment period. Issues and concerns presented by stakeholders (e.g., government agencies, property owners, community groups) will be addressed after the public comment period concludes.

The development and screening of each alternative includes the following six general steps:

- Develop RAOs;
- Develop General Response Actions (GRAs);
- Identify volumes and areas where GRAs will be applied;
- Identify and screen technologies applicable to each GRA;
- Identify and evaluate technology process options to select representative process options for each technology; and
- Assemble combinations of selected process options into remedial alternatives.

Once the alternatives were assembled, a detailed evaluation was completed. The purpose of the evaluation was to identify the advantages and disadvantages of each alternative as well as key trade-offs among the alternatives. The detailed evaluation of alternatives consists of an individual analysis of each alternative against the evaluation criteria and a comparative analysis among the alternatives to assess the relative performance of each alternative with respect to the evaluation criteria. This analysis is designed to provide decision makers with sufficient information to adequately compare the alternatives, select an appropriate remedy for a particular source area, and demonstrate satisfaction of the CERCLA remedy selection process in the Record of Decision (ROD).

This report is comprised of ten sections, summarized below.

- **Section 1 – Introduction**; provides general information on the purpose and organization of the FS Report, and the criteria and process involved in evaluating and selecting the remedial alternative(s) to be implemented.

- **Section 2 – Site Description and History**; includes a summary of background information, description, history, and physical characteristics of the site and potential source areas / areas of concern (AOCs) used in the FS.

- **Section 3 – Summary of Remedial Investigations**; provides a summary of the OU2 remedial investigation (RI) sampling results; information on OU2 geology, hydrogeology,

and the nature and extent of contamination; and results of human health risk assessment screening.

- **Section 4 - Remedial Goals and Remedial Action Objectives**; develops a list of remedial action objectives (RAOs) and preliminary remediation goals (PRGs) that consider the contaminant characterization, results from the human health risk assessment screening, and compliance with ARARs and TBCs.

- **Section 5 – General Response Actions**; identifies the GRAs for each medium.

- **Section 6 - Identification and Screening of Remedial Technologies and Process Options**; provides an evaluation of the GRAs against the NCP criteria, based on what is most appropriate to the source area-specific conditions and contamination, and a description of which approaches are technically implementable and capable of achieving source area-specific RAOs. Screening of technologies and process options for the AOCs are also included.

- **Section 7 – Evaluation of Process Options**; describes and evaluates the various soil and groundwater remediation process options assembled from the remedial technologies retained after screening.

- **Section 8 - Development and Screening of Remedial Action Alternatives;** provides a detailed development and description of the individual remedial alternatives for each OU2 source site / AOC. This section also provides the preliminary design assumptions associated with the alternatives that were retained and that were used to develop costs for each alternative.

- **Section 9 - Detailed Evaluation of Remedial Action Alternatives;** provides a detailed description of the NCP criteria and evaluation of the individual remedial alternatives against the criteria. A comparison between the various remedial alternatives for each AOC is also provided.

- **Section 10 - References;** provides a list of references used to prepare the FS.

2.0 SITE DESCRIPTION

2.1 Location and Description

The Peninsula Boulevard Groundwater Plume Superfund Site (the site), CERCLIS ID NYN000204407, consists of the area within and around a groundwater contaminant plume, located in the Village of Hewlett, Town of Hempstead, Nassau County, New York. A series of investigations and removal actions from 1991 to 1999 (see Section 2.2 below) on behalf of the owner of the former Grove Cleaners and the New York State Department of Environmental Conservation (NYSDEC) revealed an extensive groundwater contaminant plume extending both to the north and south of Peninsula Boulevard, primarily consisting of tetrachloroethylene (PCE).

John F. Kennedy International Airport is located approximately three miles to the west of the site. A Site Location Map is provided as Figure 2-1. The area consists of a mix of commercial and residential properties, with most commercial properties located along Mill Road, Peninsula Boulevard, Broadway, and West Broadway. Single-family residences are also present. Portions of Motts Creek, Doxey Brook Drain, and an unnamed tributary leading to Motts Creek are located within the OU1 site area (north of the OU2 potential source sites). All residences and commercial buildings are connected to the public water supply. Land use at the site is not expected to change from existing conditions in the future.

2.2 Site History

Information provided in this Section was obtained from the July, 2014 Technical Memorandum by Lockheed Martin Information Systems & Global Solutions (Lockheed Martin, 2014). OU1 historical information is presented below, as background and reference for the OU2 FS. More detailed information on OU1 can be found in HDR's July 2011 RI Report.

In March 1991, the Nassau County Department of Health (NCDH) cited Grove Cleaners, located at 1274 Peninsula Boulevard for discharging hazardous waste into on-site dry wells. PCE was detected in soil and sludge samples collected at Grove Cleaners, and in other media at and near the property. In 1992, NYSDEC became involved with the property. A series of investigations and removal actions from 1991 to 1999 on behalf of the owner of Grove Cleaners and the NYSDEC revealed an extensive groundwater contaminant plume extending both to the north and south of Peninsula Boulevard, primarily consisting of PCE. The investigation revealed that operations at Grove Cleaners, from 1987 to 1992 resulted in the disposal of hazardous waste, including PCE and trichloroethylene (TCE) to the environment. The results of the investigation suggested the potential for additional source areas other than the Grove Cleaners property. Following the implementation of interim remedial measures, which consisted of the removal of impacted soils related to solvent discharged to a dry well, a No Further Action (NFA) remedy was selected by NYSDEC in March 2003 for the Grove Cleaners property.

On March 7, 2004, EPA proposed inclusion of the Peninsula Boulevard Site on the NPL and on July 22, 2004, EPA placed the site on the NPL. EPA conducted a RI at the site from 2005 through 2010 to assess dissolved-phase chlorinated volatile organic compound (CVOC) contamination at the site in the OU1 plume area. Environmental sampling of groundwater (in the upper glacial aquifer [UGA]), surface water, soil and sediment was performed, and a Data

Evaluation Report (DER) presenting the results of the environmental sampling was prepared in October 2008. Supplemental RI work was conducted in 2010 to address data gaps, including hydrogeological sampling and analyses, and to develop a baseline human health risk assessment (HHRA) and screening-level ecological risk assessment (SLERA). A DER Addendum was issued in December 2010 presenting the results of this sampling. An RI report (OU1) was released by EPA in June 2011. The OU1 RI identified groundwater plumes contaminated with PCE, PCE breakdown products and low levels of other VOCs. An OU1 FS (HDR, July 2011) was developed to address the OU1 dissolved-phase CVOC groundwater plume. However, the source(s) of the PCE groundwater contamination were not confirmed during the OU1 RI/FS. A ROD for OU1 was issued in September 2011. Currently, the OU1 RD is underway and will include in-situ and ex-situ elements to address the CVOC dissolved-phase groundwater contamination.

EPA initiated an OU2 RI in 2012 to delineate and characterize the source(s) of groundwater contamination at the site. The primary objective of the OU2 RI was to gather sufficient information about the locations of potential source contamination to support informed risk management decision-making and to select the remedy that is most appropriate for each source area. Properties of interest during the OU2 RI were identified as Cedarwood Cleaners (1244 West Broadway), Piermont Cleaners (1309 Broadway), the former Vogue French Cleaners (1245 Broadway), and Mill Road Cleaners (401 Mill Road), all located in Hewlett, New York and shown on Figure 2-2. A summary of surface features at each potential source area addressed in this FS is presented below based on a review of existing information and property reconnaissance's conducted in May 2014 and December 2015. The OU2 RI report is expected to be released by EPA in 2016.

Cedarwood Cleaners

Cedarwood Cleaners, an active dry cleaning establishment, is located at the northwestern intersection of West Broadway and Hewlett Parkway. Commercial properties – including a parcel that is currently vacant (known herein as the vacant lot at 1255 West Broadway; see Figure 2-2) – are located along the south side of West Broadway. Based on OU2 RI findings (Section 3.0), the vacant lot is included within the Cedarwood Cleaners AOC for this FS. Railroad tracks are located further south and east of Cedarwood Cleaners and the vacant lot; residential properties are located immediately to the north and west of Cedarwood Cleaners; and commercial properties are located east of the property, across Hewlett Parkway.

The Cedarwood Cleaners property (approximately 9,010 square feet [s.f.]) is developed with a 1-story building. An asphalt alleyway is located on the north side of the building and the remaining portion of the property consists of asphalt parking areas. The vacant lot portion of this AOC encompasses an area of approximately 500 s.f. West Broadway separates the Cedarwood Cleaners and the vacant lot portions of the AOC.

Piermont Cleaners

Piermont Cleaners, also an active dry cleaning establishment, is located within a commercial strip mall at the northeastern intersection of Broadway and Piermont Avenue (refer to Figure 2-2). The immediate vicinity of this property is occupied by active commercial uses. The property,

which includes Piermont Cleaners and other commercial facilities, is developed with an attached 1-story multi-use building (approximately 30,000 s.f.), and consists of an asphalt parking lot in the front and rear of the building.

Former Vogue Cleaners

Former Vogue Cleaners is located on Broadway, to the southeast of Cedarwood Cleaners and to the southwest of Piermont Cleaners (see Figure 2-2).There are predominantly commercial properties in the immediate vicinity of this property. The property is developed with a 2-story multi-use building (approximately 5,000 s.f.), and consists of an asphalt covered parking lot to the east and north of the building. The property is currently occupied by Crazy Hair Spa, Inc. and is not used for dry cleaning operations.

Mill Road Cleaners

Mill Road Cleaners, an active dry cleaning establishment, is located at the southwestern intersection of Mill Road and Waverly Street. Residential properties exist in the immediate vicinity of this property. The property is developed with a 1-story multi-use building (approximately 8,000 s.f.), and consists of an asphalt covered parking lot to the east and south of the building.

OU2 Investigations performed by Lockheed Martin Scientific, Engineering, Response & Analytical Services (SERAS) in consultation with EPA at one or more of the potential source sites included the following:

- 2012: Installing and sampling exterior and sub-slab soil gas monitoring points and temporary groundwater monitoring wells with analysis for VOCs at Cedarwood Cleaners, Mill Road Cleaners, Piermont Cleaners, and the former Vogue French Cleaners;

- 2013: Membrane Interface Probe with Hydraulic Profiling Tool (MiHPT) logging for characterizing subsurface geologic and hydrogeologic conditions and the presence of VOCs at Cedarwood Cleaners, Piermont Cleaners, and the former Vogue French Cleaners;

- 2014: Soil sampling and analysis for VOCs at Cedarwood Cleaners, Piermont Cleaners, and the former Vogue French Cleaners;

- Early 2015: Soil sampling and/or groundwater profiling with sample analysis for VOCs at Cedarwood Cleaners, Piermont Cleaners, the vacant lot at 1255 West Broadway, and the public-rights-of-way (ROWs) adjacent to Long Island Railroad (LIRR) Substation F01 on West Broadway and 1245 West Broadway, and the ROW south of 1255 West Broadway (refer to Figure 2-2);

- Late 2015 and Early 2016: Monitoring well installation, and soil and groundwater sampling with analysis for VOCs. Selected soil samples were also analyzed for total organic carbon (TOC) and grain size. In addition, a subset of the soil and groundwater samples were submitted for Compound Specific Isotope Analysis (CSIA) by EPA. The

soil and groundwater sampling during this time period was conducted at Cedarwood Cleaners, Piermont Cleaners, the vacant lot at 1255 West Broadway, the ROW at LIRR Substation F01, and in the northbound lane of Hewlett Parkway near the intersection with West Broadway.

A summary of the historical investigation results is provided in Section 3 of this report.

2.3 Geology and Hydrogeology

This section presents the geology and hydrogeology in the Site area to put the local conditions into perspective within the larger regional geologic and hydrogeologic framework. The information presented in this Section is based on published data from Cartwright (2002), Misut and Feldman (1996), Smolensky and Feldman (1995), Isbister (1966), Perlmutter and Geraghty (1963), Fuller (1914), Fenneman (1938), Todd (1980), various USGS reports and site-specific data collected during the OU2 RI.

The Site is located in the Atlantic Coastal Plain physiographic province. This region is bordered to the south and east by the Atlantic Ocean and to the north and west by the Piedmont and New England physiographic provinces (Fenneman, 1938).

Four distinct major geologic units lie beneath the site, including glacial deposits composed of the Ronkonkoma and/or Harbor Hill glacial outwash (Glacial), the Magothy Formation and Matawan Group (Magothy), a clay member of the Raritan Formation (Raritan Clay), and the Lloyd Sand Member of the Raritan Formation (Lloyd) (Figure 2-3). However, PCE from the source area has been documented to only impact the Glacial deposits at the site. The Glacial deposit at the site can be divided into four hydrogeologic units including; the shallow glacial outwash deposits (shallow UGA), the 20-Foot Clay, the deep glacial outwash deposits (deep UGA), and the Gardiners Clay.

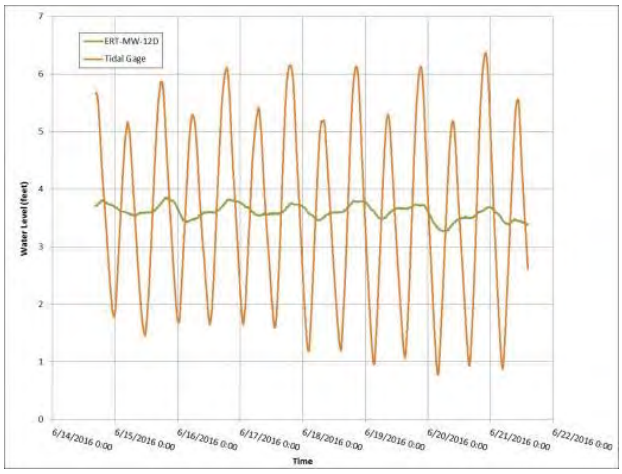
The shallow glacial outwash deposits (shallow UGA) consist of yellow to brown stratified sand and gravel glacial outwash. It is exposed at land surface throughout most of southern Nassau County extending roughly 35 feet in the vicinity of the site. Thin beds of silt and clay and interbedded silty sand and gravel are present in these deposits. This is consistent with OU2 RI logs.

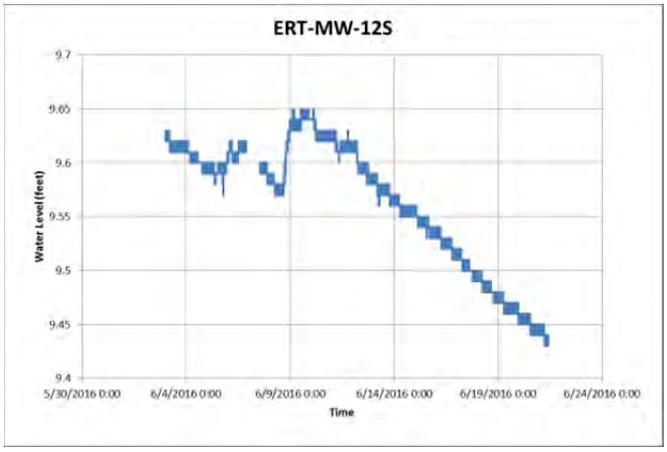
Although groundwater recharge takes place across most of the land surface of Long Island, it occurs in the center of Nassau County north of the site, which serves as a groundwater divide (Figure 2-4). In general, regional groundwater flows to south-southwest of this recharge area toward the coastal areas where it eventually discharges to the Atlantic Ocean.

The site is located on an area of land between Jamaica Bay (Head of Bay) and the Broad Channel (including Brosewere Bay and Hewlett Bay). Local groundwater flow conditions on this peninsula of land are different from mainland Nassau County, as this land is almost completely surrounded by sea water. This creates a separate groundwater flow system that has a localized recharge area where groundwater recharged to the UGA is centered in the Cedarhurst area and groundwater flows radially to the surrounding discharge areas. This localized affect can be seen on the USGS water table map shown as Figure 2-5, where the site is located north of the

recharge area shown. Therefore, groundwater flow will migrate to the north ultimately discharging to Jamaica Bay.

Groundwater levels were measured at the site by EPA during 2016 (Figure 2-6a and 2-6b). A transducer study was completed to document possible transient affects to the groundwater flow direction in the shallow and deep UGA such as tidal effects and effects from local pumping. The results show that changes in the tides are not affecting the groundwater flow direction in the shallow and deep UGA. The results show that the shallow UGA is being affected by recharge from precipitation. The results also show that local pumping does affect the deep UGA groundwater at the site; however, local pumping is not changing the overall groundwater flow direction in the deep UGA.





The saturated portions of the shallow UGA are very permeable and contain an average hydraulic conductivity of 130 to 200 feet per day with an average of 170 feet per day (Isbister, 1966). The average hydraulic gradient at the site is approximately 0.0025 feet/foot. The average effective porosity is approximately 0.3. Conservatively using the low hydraulic conductivity, equates to an average groundwater flow velocity of one foot per day (Todd, 1980).

The 20-foot clay consists of relatively thin beds of marine clay that occur at about 20 feet below mean sea level in the southern portion of Nassau County. The clay consists of fossiliferous grayish-green silt and clay deposited in shallow marine and lagoon environments during inter-

glacial periods. The deposits contain thin layers of sand or interbedded silty sand. The 20-foot clay is roughly 20-25 feet thick at the site, and reportedly acts as a confining or semi-confirming unit. This is consistent with OU2 RI logs.

Glacial outwash deposits underlie the 20-foot clay. These glacial outwash deposits are similar to the glacial outwash deposits described above. The saturated portions of the deep Upper Glacial deposits (UGA) are also very permeable. The groundwater flow direction in the deep UGA is also to the north-northwest; however, the groundwater flow direction at the site appears to be to the southeast as shown on Figure 2-7a and 2-7b based on the groundwater levels measured at the site during 2016. These deposits likely have an average hydraulic conductivity of 130 to 200 feet per day with an average of 170 feet per day (Isbister, 1966). The average hydraulic gradient flow north is approximately 0.00004. The average effective porosity is approximately 0.3 (Todd, 1980). Conservatively using the low hydraulic conductivity, equates to an average groundwater flow velocity of 0.17 feet per day or 63 feet per year.

The Gardiners clay consists mainly of gray to greenish grey clay and silt locally containing lenses of sand and silty sand deposited in shallow bays, estuaries, and lagoons. The surface ranges from about 50 to 120 feet below mean sea level with the greatest depths in southern Queens County. The Gardiners clay is fairly continuous across Nassau and Queens Counties. The thickness ranges from zero to 65 feet in Nassau County and extends up to 140 feet in Queens County. The Gardiners Clay generally has a very low permeability and serves as an effective confining unit. The maximum depth of contamination addressed in this FS is assumed to be the top of the Gardiners clay which is at about 80 feet below ground surface (bgs).

3.0 SUMMARY OF REMEDIAL INVESTIGATIONS

3.1 Regulatory History, Previous Investigations and Inspections

The following narrative summarizes the State- and Federal-lead remedial investigations that have been performed at the Peninsula Boulevard OU1 site and potential source areas.

3.1.1 EPA OU1 RI Activities (2006 – 2007)

The background information provided in this section is generally summarized from HDR, 2011b and Tetra Tech, 2014a,b reports.

The EPA assumed responsibility for the site-wide plume in September 2002, and the site was placed on the NPL in August 2004. The site-wide plume is identified as OU1 and the potential source areas are identified as OU2.

Between August 2006 and November 2007, Tetra Tech conducted initial RI field activities including environmental sampling and hydrogeological analyses at OU1. Activities performed under EPA direction for the RI in 2006 included a site and ecological resource reconnaissance; site survey and sewer trench investigation (including soil sampling along pipe corridor locations); evaluation of potential RI sample locations; and geophysical survey. Subsurface direct push soil sampling was also performed in 2006, with a total of 39 subsurface soil samples collected. Surface and subsurface soil sampling including on-site and background locations was also performed. A Membrane Interface Probe (MIP) investigation and Hydropunch® groundwater sampling were also conducted and included the collection of 160 groundwater samples from 61 locations.

A second MIP investigation was conducted in 2007, to develop a better understanding of the nature and extent of the groundwater plume. This investigation included collection of data to evaluate the potential for monitored natural attenuation (MNA) at the site and to target additional groundwater sampling locations. Subsurface direct push soil sampling was also conducted, with 35 direct-push borings installed. Hydropunch® groundwater sampling of deep UGA groundwater was performed in 2007. Twenty monitoring wells were also installed and sampled during the RI work.

Surface water sampling was completed in 2007 from the unnamed tributary, Doxey Brook Drain, the northern portion of Motts Creek, and from a background location. Sediment sampling was completed, with sample point co-located with the surface water samples. Interstitial water sampling to assess the potential groundwater-to-surface water interaction was also performed. A resulting DER was submitted in October 2008 (Tetra Tech, 2008).

The Agency for Toxic Substances and Disease Registry (ATSDR), in cooperation with the New York State Department of Health (NYSDOH), prepared a Public Health Assessment for the site in April 2007. Based on available data, ATSDR concluded there was no present health risk from the plume, due to the treatment of water produced from the New York American Water (NYAW) Plant #5 wells and engineering controls limiting access to the unnamed tributary.

3.1.2 EPA OU1 Supplemental RI Activities (2010-2011)

HDR completed supplemental RI activities in 2010 and 2011 under EPA's direction to address data gaps remaining from earlier work. The focus of this work was further characterization of the contamination in the UGA, identification of additional potential sources, and completion of human health and ecological risk evaluations (HDR, 2011a). The OU1 RI Report (HDR, 2011b) indicated the following:

- Chlorinated compounds were detected in both shallow and deep UGA groundwater. A "20-foot clay" layer bisected the UGA across most of the site area, but pinches out north of Peninsula Boulevard. The "shallow" and "deep" portions of the UGA were identified as being above and below the "20-foot clay" layer, respectively, to facilitate identification and evaluation of remedial alternatives based on the nature and extent of contamination.

- The shallow UGA (0 to 30 feet bgs) was characterized by a 3,500-foot long VOC plume oriented in a north-south direction, with an area of PCE concentrations exceeding 1,000 µg/l extending approximately 2,000 feet from West Broadway to 200 feet north of Peninsula Boulevard. South of Peninsula Boulevard (upgradient), the plume was approximately 1,000 feet wide. North of Peninsula Boulevard (downgradient), the VOC plume was approximately 400 feet wide. The greater width of the plume south of Peninsula Boulevard may be the result of comingling of contaminant plumes from multiple upgradient source area(s), subsurface disturbance due to infrastructure placement, or the relatively flat groundwater surface.

- The deep UGA (40 to 75 feet bgs) was characterized by a 1,100-foot long VOC plume oriented in a northeast-southwest direction. PCE was detected at concentrations greater than 10,000 µg/l at three RI locations (HDR, 2011b).

- Surface water, sediment, and, to a lesser degree, soils also had been impacted by the plume-related VOCs, specifically PCE and its breakdown products.

- Screening for the potential for anaerobic biodegradation of chlorinated solvents in the area of the site was performed. On a scale from inadequate (score of "0") to adequate (score of "15"), only one well received a screening score of "15", which was the upper limit of the adequate evidence category. Specific to biodegradation of PCE, the screening scored "0" in all wells (Tetra Tech, 2008).

- The source area(s) of the plume were not identified during the RI, although the plume characteristics (areal extent and relative concentrations) appeared to indicate a potential source area at Cedarwood Cleaners.

The HHRA concluded, under current exposure scenarios, that risks to human health and the environment were largely controlled through engineering and institutional controls, i.e., the continued monitoring and treatment of groundwater extracted through the NYAW Plant #5 well field; restrictions on the use of private wells in the county; fencing around surface water areas on-site; and EPA's continuing investigation and mitigation of vapor intrusion impacts in the area of the plume. However, in a future use scenario assuming direct use of impacted groundwater

(i.e., assuming that engineering controls are not in place at Plant #5), risks existed from groundwater (ingestion, dermal contact, and inhalation exposure routes) resulting from site-related VOCs exceeding acceptable levels for carcinogenic and non-carcinogenic effects. The risk assessments indicated that concentrations of plume-related VOCs in other on-site media do not pose unacceptable risks to either human health or ecological resources.

In July 2011, the FS Report was prepared and preliminary RAOs and PRGs were developed for OU1 (HDR, 2011b). The FS developed, screened, and evaluated potentially applicable remedial alternatives to provide sufficient data to select a feasible and cost-effective remedy that would protect public health and the environment from potential site-related risks.

3.1.3 EPA OU1 Remedial Design (2011-Present)

In September 2011, EPA published the OU1 ROD, which documented the selection of a remedy for the groundwater contamination at OU1. In November 2011, Tetra Tech was tasked by USACE, under an interagency agreement with EPA Region 2, to perform the necessary pre-design and remedial design (RD) activities to develop the components required to perform remedial action and meet the RAOs established for OU1. The selected OU1 remedy will consist of:

- Groundwater extraction and treatment, with MNA for groundwater downgradient of the capture zone of the extraction wells, as part of the ex-situ groundwater remedy; and
- In situ chemical reduction (ISCR) in the form of a permeable reactive barrier (PRB) and enhanced bioremediation (with LactOil injections), as part of the in-situ groundwater remedy.

The OU1 RD has been completed and the Final Design (100%) for ex-situ groundwater treatment and the Basis of Design (100%) for in-situ groundwater treatment were reviewed during the OU2 FS to identify and select remedial alternatives for OU2 in parallel with the OU1 remedy. A brief summary of each design is provided below:

The ex-situ treatment will include groundwater extraction and treatment to remove contaminant mass from areas of the aquifer with elevated VOC concentrations, downgradient of the suspected source area. Pumping from wells will provide hydraulic control of the contaminated groundwater and reduce contaminant levels downgradient from capture area. Contamination in the groundwater downgradient of the capture zone of the extraction wells will be monitored during the operation of the treatment system. Based on aquifer testing and modeling, the groundwater influent to the treatment plant is expected to have an anticipated operational average flow rate of approximately 125 gallons per minute (gpm) and will be sourced from six 6-inch diameter extraction wells. The maximum design operating capacity of the treatment system will be 250 gpm, to accommodate potential future expansion of the extraction well network. The treatment plant will consist of a groundwater extraction system, equalization system, metals removal system, sludge handling system, ultraviolet/hydrogen peroxide oxidation system, particulate filtration system, liquid-phase granular activated carbon (LGAC) adsorption system, and discharge system. A final determination as to the location of the treatment building has not been made. Based on the potential building location, plant effluent will be discharged to surface water,

with an alternate discharge branch in the event discharge to the sanitary sewer is required in the future.

The general focus of in-situ treatment is to address PCE and TCE levels in groundwater exceeding 10,000 ug/l. The targeted treatment area is approximately 650 feet long, by 150 feet wide, by 40 feet in thickness. The in-situ remedy involves enhanced in-situ bioremediation (EISB), which is a form of in-situ chemical reduction (ISCR). A microcosm bench-scale study will initially be performed using Site groundwater to determine conditions required for complete degradation of PCE to ethane. Several different amendment formulations (substrate, nutrients, additives, and bacterial cultures) will be tested. The microcosm testing results will be used to refine any specific design parameters such as the selected electron donor, nutrients, additives, and dechlorinating bacteria cultures.

The in-situ component of the design consists of injecting ISCR slurry into closely-spaced points at two areas followed by post injection monitoring. One ISCR barrier "A" will be installed across the plume axis at an approximate location about halfway between the two areas selected for injection of amendments. The length of this ISCR barrier will be approximately 154 feet and will traverse at least one residential property and Hewlett Parkway. The barrier will address the deep UGA plume characterized by PCE concentrations approaching or exceeding 10,000 µg/l. The ISCR barrier "A" injection points are to be spaced 7 feet apart and generally lie in a straight line and perpendicular to the 10,000 ug/l PCE isoconcentration contour for the deep UGA. Approximately 23 injection points will be required for ISCR barrier "A". Near the eastern end of this ISCR barrier, one new, deep temporary PVC well will be installed, following the installation of this ISCR barrier, to monitor groundwater quality within the targeted treatment area. The second ISCR barrier ("B") will extend from the existing 70-foot barrier along Westervelt Place. The extended barrier will be about 220 feet long and located downgradient of one of the two areas targeted for amendment injections and will be perpendicular to the deep PCE plume. The extension will add roughly 30 feet to the west and 120 feet to the northeast of the existing barrier. The configuration of the ISCR barrier "B" points will be relatively straight line along Westervelt Place after accounting for utilities. The injection points are to be spaced 7 feet apart. About 22 injection points will be required for ISCR barrier "B".

The EHC™ slurry for the ISCR barriers will consist of solid organic carbon, micro ZVI, plant fiber, guar, and water. The injections will start at approximately 80 feet bgs and will advance up to the bottom of the "20-foot clay" (estimated at 50 feet bgs). Slurry will not be introduced into the "20-foot clay" layer if it is present. The injection intervals within a well will be evenly spaced every 4 feet. The total number of intervals at an individual injection point will depend on the distance between the Gardiners Clay and the "20-foot clay" (if present) at the specific injection location. Each interval will receive approximately 75 lbs of dry EHC™ (or approved equal) powder blended with 28 gallons of water.

Amendments will be distributed initially in two small areas (~6,000 ft^2 each area) across the plume via short-term recirculation. Amendment distribution will be performed in two phases: bio-stimulation (Phase I) and bio-augmentation (Phase II). During Phase I, emulsified vegetable oil substrate (such as LactOil™ or similar) with proper additives (nutrients, yeast, vitamin B12, etc.) will be recirculated to stimulate biological activity and create strongly reducing

groundwater conditions characterized by negative ORP measurements. Phase II will include bio-augmentation with *Dehalococcoides* after anaerobic conditions are created. Five new extraction/injection wells will be installed for substrate distribution and will complement one existing well. There will be six wells oriented in two rows. Each row will consist of three wells spaced approximately 50 feet apart. In each row, a central well will be used for extracting groundwater and the two periphery wells will be employed as injection wells. Groundwater recirculation will take the form of a closed loop configuration. The amendments will be distributed along each row. Based on a 40-foot treatment zone thickness for the deep UGA and 20% effective porosity, the pore volume within each recirculation row (or targeted treatment area) is 360,000 gallons. Additional temporary PVC wells may be installed at the Site to better determine the lateral distribution of injected materials.

The biobarriers in conjunction with the injection of substrate at two areas will reduce the mass flux of plume contaminants. The PRBs and injections will focus on the deep UGA. The ISCR barriers will be installed prior to the distribution of biological amendments to help minimize generation of cis-1,2-DCE and vinyl chloride concentrations within the amendment distribution zones since levels of these contaminants are expected to increase from biological degradation activity. Groundwater contamination in the shallow UGA is not being addressed by the in situ remedy at this time due to low CVOC concentrations in the shallow UGA when compared to the deep UGA.

3.1.4 EPA OU2 RI Data Summary (2012 - 2016)

Lockheed Martin Scientific, Engineering, Response & Analytical Services (SERAS) and EPA personnel conducted OU2 RI field activities from 2012 through 2016 to delineate the source(s) of groundwater contamination. Properties of interest during the OU2 RI included Mill Road Cleaners; Cedarwood Cleaners, including the vacant lot south of the Cedarwood Cleaners property; Piermont Cleaners; and the former Vogue French Cleaners (refer to Figure 2-2). A summary of the work completed and results of the investigation provided in this Section was obtained from Lockheed Martin (July 2014), Lockheed Martin (Draft Technical Memorandum May 2016), and figures and data provided by EPA in 2016. During the OU2 RI, soil gas, soil, and groundwater were sampled and MiHPT logging was performed, as discussed in the sections below. The OU2 RI report is expected to be released by EPA in 2016. Figures 3-1 through 3-13 of the FS are referenced in the below OU2 RI data summaries. For reference, and to supplement the FS report figures, Appendix C of this FS provides figures and data summaries of additional OU2 RI findings. Several of the Figures referenced in the sections that follow can be found in Appendices C1 (data collected in 2012) and C2 (data collected from 2014 to 2016).

3.1.4.1 Soil Gas Sampling

SERAS personnel installed a total of 32 exterior (i.e., outside of the building footprints) soil gas well points in February 2012. Fourteen wells were installed at Cedarwood Cleaners, eight were installed at Mill Road Cleaners, six were installed at Piermont Cleaners and four were installed at the former Vogue French Cleaners. In addition, a total of ten sub-slab soil gas wells were installed on the first floor of Cedarwood Cleaners and nine sub-slab soil gas wells were installed in the basement of Piermont Cleaners. All soil gas samples were analyzed for VOCs via EPA

Method TO-15. Table 3-1 provides the range of VOCs detected in the exterior soil gas and Table 3-2 provides the range of VOCs detected in subslab soil vapor.

Exterior Soil Gas Sampling Results

PCE was detected in each exterior soil gas sample. PCE and TCE were detected in the exterior soil gas samples from Cedarwood Cleaners ranging up to 110,000 micrograms per cubic meter ($\mu g/m^3$) and 4,500 $\mu g/m^3$, respectively in soil gas (SG) sample SG10B. as shown on Figure C1-1 of Appendix C. Two sets of results are reported for SG10B to represent a sample collected using a Summa Canister and another collected using a Tedlar bag. Very low concentrations of PCE were detected in the exterior soil gas samples from Mill Road Cleaners ranging up to 750 $\mu g/m^3$ in SG3 as shown on Figure C1-2 2. No TCE was detected in the exterior soil gas samples collected from Mill Road Cleaners. Low concentrations of PCE and TCE were detected in the exterior soil gas samples from Piermont Cleaners ranging up to 10,000 $\mu g/m^3$ and 1,100 $\mu g/m^3$, respectively in SG3 as shown on Figure C1-3. Two sets of results are reported for SG3 and SG5 to represent a sample collected using a Summa Canister and the other collected using a Tedlar bag. Relatively low concentrations of PCE and TCE were detected in the exterior soil gas samples from former Vogue French Cleaners ranging up to 560 $\mu g/m^3$ and 4.2 $\mu g/m^3$, respectively, in SG2 as shown on Figure C1-4.

Sub-Slab Soil Gas Sampling Results

PCE and TCE were detected in each sub-slab soil gas sample. PCE concentrations detected in the sub-slab samples from Cedarwood Cleaners ranged up to 5,500,000 $\mu g/m^3$ in SS3 and TCE concentrations detected in the samples ranged up to 36,000 $\mu g/m^3$ in SS2 as shown on Figure C1-5. PCE and TCE concentrations detected in the sub-slab samples from Piermont Cleaners ranged up to 21,000 $\mu g/m^3$ and 2,600 $\mu g/m^3$, respectively, in SS7 as shown on Figure C1-6. Sub-slab soil gas samples were not collected at Mill Road Cleaners and former Vogue French Cleaners.

3.1.4.2 MiHPT Logging

Lockheed Martin contracted S2C2, Inc. to delineate the vertical and horizontal extent of chlorinated VOCs using Geoprobe®'s combination MiHPT and electrical conductivity (EC) technologies on Cedarwood Cleaners, Piermont Cleaners, and former Vogue French Cleaners in June 2013. A total of 21 MiHPT pushes were advanced to a depth of approximately 50 feet bgs where a very low hydraulic conductivity (K) clay was encountered. Based on previous samples results at Mill Road Cleaners, no additional OU2 RI work was conducted at that location after 2012.

Photoionization detector (PID) and halogen-specific detector (XSD) responses were consistently elevated in the interbedded materials indicating the presence of VOCs at various depths between approximately 30 and 40 feet beneath the source areas. The highest responses (approximately $1x10^7$ to $2x10^7$ micro volts [μV]) were measured by the PID and XSD during logging at Cedarwood Cleaners. The PID and XSD responses recorded during logging at Piermont Cleaners and former Vogue French Cleaners were generally one or two orders of magnitude less than

$1x10^6$ µV.

3.1.4.3 Soil Sampling

Figures 3-1 through 3-13 of the FS are referenced in the below OU2 RI data summaries. Appendix C of this FS provides figures and data summaries of additional OU2 RI findings. Several of the Figures referenced in the sections that follow can be found in Appendices C1 (2012 data) and C2 (2014-2016 data). OU2 RI exhibits in Appendix C2 were received from EPA and are sorted to match the order of the below OU2 RI text summaries.

March to April 2014

During the RI investigation from March to April 2014, fifteen boreholes (ERT-01 through ERT-14, and ERT-31) were installed at Cedarwood Cleaners as shown on Figure 3-1, with depths ranging from 0.5 foot bgs up to 44.5 feet bgs; 10 boreholes (ERT-15 through ERT-20, and ERT-27 through ERT-30) were installed at Piermont Cleaners as shown on Figure 3-2, with depths ranging from 0.5 foot bgs up to 38.5 feet bgs; and six boreholes (ERT-21 through ERT-26) were installed at former Vogue French Cleaners shown on Figure 14 (Appendix C2), depths ranging from 0.5 foot bgs up to 9.5 feet bgs (as indicated in the boring logs). Soil samples were collected from 0 to 2 feet bgs and 2 to 10 feet bgs for risk assessment purposes, and from greater depths for additional contaminant delineation at select borings. Soil samples were analyzed for target compound list (TCL) VOCs.

February 2015
Eight soil borings (ERT-32 through ERT-39) were installed inside Piermont Cleaners (locations shown on Figure 3-2) and sampled intermittently to a depth of approximately 6.5 feet bgs.

April 2015
Two soil borings (ERT-40 and ERT-41) were installed on the vacant lot at 1255 West Broadway and sampled from 19.5 up to 44 feet bgs. Sample locations are shown on Figure 3-3

November 2015 and January 2016 - February 2016
Six soil borings (ERT-42 through ERT-47) were installed on the vacant lot at 1255 West Broadway. Borehole ERT-48 was installed in the sidewalk in front of the building at 1245 West Broadway, and boreholes ERT-49 and ERT-50 were installed in the ROW at the LIRR property (Figure 3-3). Soil samples were obtained from these borings at depths ranging from approximately 5.5 feet bgs to 79 feet bgs.

Five additional soil borings (ERT-51 through ERT-55) were installed in the range from 10.5 feet bgs to 79.75 feet bgs at Cedarwood Cleaners and sampled. Borehole ERT-56 was installed in Hewlett Parkway and sampled from 27 feet bgs to 74 feet bgs during this OU2 RI work (refer to Figure 3-1). Two additional soil borings (ERT-57 and ERT-58, shown on Figure 3-2) were installed at Piermont Cleaners and sampled in the range from approximately 19.5 feet bgs to 94 feet bgs.

OU2 RI Soil Sampling Results

At Cedarwood Cleaners, PCE was detected at varying depths in the soil samples collected from interior and exterior boring locations. Three (ERT-12, ERT-13, and ERT-14) of the 21 soil borings were installed to depths ranging from 6.5 to 7.5 feet bgs inside the building. PCE was found at concentrations ranging from non-detect (ND) to a maximum of 1,200 micrograms per kilogram (µg/kg). PCE was also detected in vadose zone soil (from approximately 0.5 to 8 feet bgs) in the range from ND to a maximum of 370 µg/kg, in exterior soil borings ERT-02, ERT-03, ERT-04, ERT-05, ERT-07, ERT-08, ERT-10, and ERT-12. TCE was not detected in any of the vadose soil samples that were analyzed. PCE was detected in saturated soils from approximately 30 feet bgs up to 79.5 feet bgs in exterior soil borings at Cedarwood Cleaners. The highest PCE concentration of 1,350,000 µg/kg was detected at a depth of 33 feet bgs in ERT-55 and the highest TCE concentration of 1,800 µg/kg was detected at a depth of 67.5 feet bgs in ERT-53; both borings are located in the eastern portion of the parking lot. No saturated soil samples were obtained from inside the building. Figures 9 and 10, Appendix C2 show soil sampling results for Cedarwood Cleaners.

In the soil samples that were obtained south of Cedarwood Cleaners (i.e., the vacant lot, outside the building located at 1245 W Broadway, and the LIRR ROW), PCE was detected in saturated soils from approximately 34.5 feet bgs to 76 feet bgs. The highest PCE concentration of 11,100,000 µg/kg and highest TCE concentration of 1,100 µg/kg was detected at a depth of 41.5 feet bgs in ERT-48. Figure 11, Appendix C2 shows the soil boring results.

Oil In Soil™ test results indicate Dense Non-Aqueous Phase Liquid (DNAPL) was present at a depth of 34.75 feet in ERT-51 located in the southwestern portion of the Cedarwood Cleaners parking lot, and at depths between 33 and 35.5 feet in ERT-44 located in the western portion of the vacant lot at 1245 West Broadway; and. The test results also indicate that Light Non-Aqueous Phase Liquid (LNAPL) was present at depths between 17 and 17.75 feet in ERT-45 located along the northern property boundary of the vacant lot at 1245 West Broadway. No petroleum hydrocarbons were detected in any of the soil samples.

TOC concentrations in soil samples ranged up to 1,300 mg/kg from the shallow UGA, up to 8,800 mg/kg from the 20-Foot Clay, up to 2,500 mg/kg from the deep UGA, and 8,400 mg/kg in the Gardiners Clay beneath 1245/1255 West Broadway and the LIRR Substation ROW properties. At Piermont Cleaners, PCE concentrations were detected at varying depths in the soil samples from interior and exterior soil borings. PCE was detected in the range from ND to a maximum of 13 µg/kg in vadose zone soil that was sampled from ground surface to 6.5 feet bgs in interior borings ERT-32 through ERT-37. PCE and TCE were detected at concentrations of 2,700 and 6.7 µg/kg, respectively, at 35.5 feet bgs in exterior soil boring ERT-58. Figures 12 and 13, Appendix C2 shows the soil boring results.

At the former Vogue French Cleaners, PCE was detected in soil from ND to 6.3 µg/kg at 0.5 feet bgs, north of the building. No TCE was detected in the soil samples that were analyzed. Figure 14, Appendix C2 shows the soil boring results.

Table 3-3 provides a range of VOCs detected in soil.

3.1.4.4 Groundwater Sampling

February 2012

SERAS personnel installed seven temporary groundwater monitoring wells in February 2012. Three wells (GW1, GW2, and GW3) were installed at Cedarwood Cleaners shown on Figure C1-7, one well (GW1) was installed at Mill Road Cleaners shown on Figure 8, two wells (GW1, and GW2) were installed at Piermont Cleaners shown on Figure 9, and one well (GW1) was installed at the former Vogue French Cleaners shown on Figure 10. Upon completion of groundwater sampling, the temporary monitoring wells were decommissioned by retracting the polyvinyl chloride (PVC) riser and casing. Two temporary monitoring wells were converted into soil gas wells, and the remaining wells were backfilled using sand and granular bentonite. Table 3-4 provides a range of VOCs detected in the groundwater.

At Cedarwood Cleaners, groundwater samples were collected from GW1 at 18 feet bgs, GW2 at 15 feet bgs, GW3 at 15 feet bgs. A grab sample was also obtained from an underground storage tank located north of the building. All samples were analyzed for VOCs. The highest contaminant concentrations detected in the groundwater at Cedarwood Cleaners were in GW1, with PCE at 266 µg/l, and TCE at 13.8 µg/l, located north of the building as shown on Figure 7. No detections above the reporting limit were noted in the sample from the tank.

At Mill Road Cleaners, a groundwater sample was collected from GW1 at six feet bgs and analyzed for VOCs. PCE and TCE were not detected in the groundwater sample collected at Mill Road Cleaners as shown on Figure 8. As indicated above, based on this and prior OU2 RI data,, Mill Road Cleaners is not considered further as a potential source site in OU2.

At Piermont Cleaners, groundwater samples were collected from GW1 at 20 feet bgs, and from GW2 at 25 feet bgs and analyzed for VOCs. The highest concentration detected in the groundwater at Piermont Cleaners was in GW2 with PCE at 4,260 µg/l, and TCE at 3.28 µg/l, located along the western property boundary as shown on Figure 9.

At former Vogue French Cleaners, a groundwater sample was collected from GW1 at 19 feet bgs and analyzed for VOCs. PCE was detected in the groundwater sample at 2.66 µg/l, and no TCE was detected in the groundwater as shown on Figure 10.

September - October 2014 Groundwater Sampling

One groundwater probe ERTGW-22 was installed along the southern property boundary at Cedarwood Cleaners. Groundwater samples were obtained at depths of 24, 31, and 36 feet bgs. PCE was detected at a concentration of 65,000 µg/l and TCE was detected at a concentration of 670 µg/l at 36 feet bgs in ERTGW-22 as shown on Figure 15, Appendix C2.

A total of 17 groundwater probes (ERTGW-01 through ERTGW-17) were installed at Piermont Cleaners. Groundwater samples were obtained in the range from 20 to 38 feet bgs. The highest PCE concentration of 2,300 µg/l and the highest TCE concentration of 21 µg/l were detected at 38 feet bgs in sample ERTGW-03, located west of the building as shown on Figure 18, Appendix C2.

Four groundwater probes ERTGW-18 through ERTGW-21 were installed at former Vogue French Cleaners. Groundwater samples were obtained at depths of 23, 33, and 38 feet bgs. No PCE or TCE contamination was detected in the groundwater at former Vogue French Cleaners, as shown on Figure 20, Appendix C2. Based on this and other OU2 RI data, former Vogue French Cleaners is not considered further as a potential source site in OU2.

February - April 2015 Groundwater Sampling

Groundwater profile samples were collected from four boreholes (ERTGW-23, ERTGW-24, ERTGW-38, and ERTGW-39) in the ROW adjacent to 1245/1255 West Broadway and the LIRR substation; four boreholes (ERTGW-25, ERTGW-26, ERTGW-29, and ERTGW-30) on Cedarwood Cleaners; seven boreholes (ERTGW-31 through ERTGW-37) on the vacant lot at 1255 West Broadway; and two boreholes on the ROW south of the vacant lot (ERTGW-40 and ERTGW-41). The highest PCE concentration of 800,000 µg/l was detected at 38 feet bgs in ERTGW-38, located in the LIRR Substation ROW south of Cedarwood Cleaners as shown on Figure 15, Appendix C2. The highest TCE concentration of 29,000 µg/l was detected at 43 feet bgs in ERTGW-38, however, the laboratory qualified the results as rejected data.

Two groundwater probes (ERTGW-27 and ERTGW-28) were installed along the western property boundary at Piermont Cleaners as shown on Figure 18, Appendix C2. No PCE and TCE concentrations were detected in these samples.

January - February 2016 and June 2016 Monitoring Well Installation and Sampling

One shallow monitoring well (ERT-MW-01S), one deep monitoring well (ERT-MW-02D), and three nested monitoring wells (ERT-MW-03S/D, ERT-MW-04S/D, and ERT-MW-05S/D) were installed at 1245 West Broadway, the vacant lot and the LIRR substation ROW as shown on Figure 16 and 17, Appendix C2. One shallow monitoring well ERT-MW-06S, and four nested monitoring wells ERT-MW-07S/D, ERT-MW-08S/D, ERT-MW-09S/D, and ERT-MW-10S/D were installed at Cedarwood Cleaners.

The wells were developed at least 24 hours after installation. During January 19 to 22, 2016, passive diffusion bags (PDBs) were deployed in the newly installed monitoring wells. Generally, two PDBs were suspended in the screen interval of each monitoring well. On May 9, 2016, PDBs were also deployed in 10 monitoring wells located in the surrounding neighborhood.

On February 22 to 23, and May 31 to June 1, 2016, groundwater samples were collected by ERT from the newly installed monitoring wells. The PDBs were removed from the wells. The highest PCE concentration of 46,000 µg/l was detected in the groundwater at 66.5 feet bgs in ERT-MW-08D, in the southeastern corner of the Cedarwood Cleaners parking lot. The highest TCE concentration of 5,000 µg/l was detected in the groundwater at 65.5 feet bgs in ERT-MW-09D, in the northeastern corner of the Cedarwood Cleaners parking lot. Refer Figure 16 and 17, Appendix C2.

Two nested monitoring wells ERT-MW-11S/D and ERT-MW-12S/D were installed at Piermont Cleaners as shown on Figure 19, Appendix C2. The wells were subsequently developed and

sampled by EPA in February 2016. The highest PCE concentration of 1,200 µg/l was detected in groundwater at 31.5 feet bgs in ERT-MW-12S, in the parking lot, west of Piermont Cleaners.

Table 3-4 provides a range of VOCs detected in groundwater at Cedarwood Cleaners and Piermont Cleaners.

Ten existing monitoring wells in the commercial/residential area were also sampled on June 1, 2016. PCE was detected in groundwater samples from MW-18S (7.1 µg/l) and PZ-08 (87 µg/l) (Figure 33, Appendix C2). These wells are located approximately 900 feet northwest of Cedarwood Cleaners.

Transducer Study

On June 2, 2016, transducers were installed in monitoring wells ERT-MW-3S/D, ERT-MW-7S/D, ERT-MW-12S/D, MW-15S/D (Figures 7 and 8, Appendix C2) and a stilling well in Macy Channel (Figure 33, Appendix C2). The transducers were programmed to measure water levels (recorded in feet above the transducer), pressure (in psi) and temperature (in degrees Celsius) every minute between June 2 and July 6, 2016. HDR evaluated the results of a transducer study performed by ERT and provided a Memo to EPA on August 2, 2016. Findings of the study are discussed in Section 3.2.1. Figures 7a/b and Figures 8a/b in Appendix C2 provide the groundwater elevations measured in the shallow UGA and deep UGA in April and May/June 2016.

3.1.4.5 Compound Specific Isotope Analysis (CSIA)

A subset of the soil and groundwater samples collected during late 2015 and early 2016 were submitted for compound-specific isotope analysis (CSIA). The soil and groundwater sampling was conducted at Cedarwood Cleaners, Piermont Cleaners, the vacant lot at 1255 West Broadway, the LIRR Substation ROW, and in the northbound lane of Hewlett Parkway near the intersection with West Broadway. The purpose of the CSIA evaluation was to provide supplemental information for the OU2 conceptual site model (to be discussed in EPA's OU2 RI Report, and evaluated with hydrogeological analysis and modeling) to define common or different specific source locations that may be present. Based on preliminary data, the contamination at Cedarwood Cleaners is common to that at the vacant lot to the south, and separate sources of contamination appear to exist at Cedarwood Cleaners /vacant lot and at Piermont Cleaners. These assumptions were carried forward in the FS.

The information provided below is from a draft analysis performed by EPA and provided to HDR in an email correspondence dated April 7, 2016.

Isotopes Results – PCE – Groundwater

- PCE in all groundwater samples are from the same parental PCE stock (i.e., cleaners in close proximity typically buy their cleaning solvents from the same vendor) – One PCE source originates near MW-12 (Piermont Cleaners) then travels toward MW-04, MW-08

and MW-02 and finally toward MW-09 (Cedarwood Cleaners). It is inferred that an additional PCE source area is indicated (Cedarwood Cleaners);

- Kinetic isotope effect is present and indicates biodegradation is occurring; and
- Isotope results corroborate inferred groundwater flow patterns from groundwater potentiometric surface.

Isotopes Results – PCE – Soil

- PCE in all samples are from the same parental PCE stock (i.e., cleaners in close proximity typically buy their cleaning solvents from the same vender), but there appear to be two (2) source areas: 1) One PCE source area originates near MW-12 (Piermont Cleaners) then travels West toward MW-04, MW-08 & MW-02 and finally toward MW-09 (Cedarwood Cleaners); and, 2) another PCE source area originates near ERT-54, ERT-53 (Cedarwood Cleaners) and/or ERT-48 then moves southeast toward ERT-47, ERT-53 and ERT-51;
- Kinetic isotope effect is present and indicates biodegradation is occurring; and
- Isotope results corroborate groundwater PCE results and inferred groundwater flow patterns from groundwater potentiometric surface.

Isotopes Results – TCE – Groundwater

- TCE in all groundwater samples are from the same source – TCE source originates near MW-09 (Cedarwood Cleaners) then travels toward MW-07 and MW-08 and finally toward MW-02;
- Kinetic isotope effect is present and indicates biodegradation is occurring; and
- Isotope results corroborate inferred groundwater flow patterns from groundwater potentiometric surface.

3.2 Nature and Extent of Contamination

The evaluation of the nature and extent of contamination focuses on contaminants that exceeded RI screening criteria, and that were found at significant distributions in soil and groundwater at each of the OU2 potential source sites. The OU2 RI activities identified PCE, and to some extent its degradation product TCE, in soil and groundwater at the AOCs. The PCE contamination is likely to have resulted from dry cleaning operations at the AOCs. PCE and TCE will be referred to as the contaminants of concern (COCs) in this FS. The OU2 FS focuses on the soil and groundwater contamination identified at the AOCs, and will later present alternatives to address these source media. Soil gas is not considered as a medium of concern for this FS, and will not be discussed further. Potential soil vapor intrusion is being addressed by EPA under a separate program.

The NYSDEC Part 375-6 Protection of Groundwater Soil Cleanup Objectives (SCOs) were used as the RI screening criteria for soil. SCOs for PCE and TCE are 1,300 µg/kg and 470 µg/kg,

respectively. Groundwater sampling results were compared to EPA maximum contaminant levels (MCL), New York State (NYS) drinking water quality standards and NYSDEC groundwater quality standards (GQS) for PCE and TCE which is 5 µg/l for each contaminant. OU2 RI data exceeding these RI screening criteria are presented in Tables 3-3 and 3-4.

Groundwater beneath the OU2 Study Area has been impacted by PCE and TCE, and other breakdown products as a result of a release of dry cleaning fluids from one or more potential locations. Based on the above OU2 RI data, two potential source sites were identified and are addressed in the FS: Cedarwood Cleaners (including the vacant lot at 1255 West Broadway) and Piermont Cleaners. For purposes of this FS will here after be referred to as AOCs:

AOC1: Cedarwood Cleaners
AOC2: Piermont Cleaners

Based on the RI findings (Section 3), the vacant lot at 1255 West Broadway and select areas of 1245 West Broadway and the LIRR Substation, the section of West Broadway that runs adjacent to Cedarwood Cleaners, and part of Hewlett Parkway are all considered a part of AOC1 and have been evaluated as such through the remaining sections of this FS. PCE concentrations exceeding the SCO were found predominantly in saturated soil samples collected at Cedarwood Cleaners (ERT-01, ERT-02, ERT-06, ERT-07, ERT-08, ERT-10, ERT-11, ERT-51 through ERT-55), in Hewlett Parkway (ERT-56), the vacant lot at 1255 West Broadway (ERT-40, ERT-41, ERT-42, ERT-45, and ERT-47), and in front of 1245 West Broadway (ERT-48). No OU2 RI data was collected from within West Broadway.

At AOC1, PCE concentrations ranging from 1,300 to 11,100,000J µg/kg were detected in saturated soil, exceeding the SCO from depths between 26 and 79.5 feet bgs. TCE concentrations ranging from 630 to 1,800 µg/kg were detected in saturated soil (exceeding the SCO) from depths between 33.75 and 79.5 feet bgs (Figures 9 and 10, Appendix C2). The highest concentrations of COCs are located at Cedarwood Cleaners and along the south side of West Broadway. The highest AOC1 PCE concentration of 11,100,000J µg/kg was found in the boring installed in front of 1245 West Broadway (ERT-48), at a depth of 41.5 feet bgs. The highest TCE concentration of 1,800 µg/kg was found in the boring installed in the southeastern corner of Cedarwood Cleaners parking lot (ERT-53), at a depth of 41.5 feet bgs.

DNAPL was identified at a depth of 34.75 feet in ERT-51 located in the southwestern portion of the Cedarwood Cleaners parking lot, and at depths between 33 and 35.5 feet in ERT-44 located in the western portion of the vacant lot at 1245 West Broadway; and LNAPL was present at depths between 17 and 17.75 feet in ERT-45 located along the northern property boundary of the vacant lot at 1245 West Broadway. No petroleum hydrocarbons were detected in any of the soil samples.

A PCE concentration of 2,700 µg/kg was detected in a saturated soil sample (ERT-58) collected in front (north side) of Piermont Cleaners (AOC2) at a depth of 35.5 feet bgs. No TCE was detected in the soils that were sampled at AOC2. Soil sampling within the saturated zone at AOC2 is not extensive and some assumptions have been made for purposes of the FS.

Based on the OU2 RI findings and an assessment of the data, the zone of soil contamination is assumed to be from 26 to approximately 80 feet bgs at AOC1, and at approximately 36 feet bgs at AOC2. The groundwater table (UGA) exists between approximately 12 and 15 feet bgs at AOC1 and at approximately 17 to 18 feet bgs at AOC2. DNAPL is likely present between 33 and 36 feet bgs at AOC1. Saturated soil and groundwater are evaluated as "source media" at AOC1 and AOC2 later in the FS.

PCE concentrations exceeding GQS were detected in the range from 5.2 to 800,000 µg/l in the groundwater at AOC1. TCE concentrations exceeding GQS were detected in the range from 9.3 to 29,000R µg/l in the groundwater at AOC1. The highest PCE concentration of 800,000 µg/l was detected at 38 feet bgs, and the highest TCE concentration of 29,000R µg/l was detected at 43 feet bgs in the groundwater profile sample from ERTGW-38 installed south of West Broadway in the ROW at the LIRR Substation (data quality will be discussed in the OU2 RI Report; the TCE concentration reported at ERTGW-38 was noted earlier in the FS to have been qualified as a "rejected" value by the analytical laboratory). It is assumed that groundwater east, west, and south of the vacant lot meets GQS based on the data from MW-01S and other samples. Based on available data, it is assumed that groundwater under the residential properties immediately north and west of Cedarwood Cleaners is contaminated, and being addressed by the OU1 remedy. For purposes of the FS, the depth of groundwater contamination at AOC1 is assumed up to approximately 80 feet bgs.

PCE concentrations exceeding GQS were detected in the range from 5.1 to 4,260 µg/l in the groundwater at AOC2. TCE concentrations exceeding GQS were detected in the range from 5.6 to 21 µg/l. The highest PCE concentration of 4,260 µg/l was detected in the groundwater profile sample from GW-2 at 25 feet bgs, installed along the western property boundary of Piermont Cleaners. The highest TCE concentration of 21 µg/l was detected in ERTGW-03 at a depth of 38 feet bgs. ERTGW-03 is located along the building at AOC2, north of Piermont Cleaners. Based on available data, it is assumed that groundwater is contaminated beneath the building and is assumed to be impacted beneath the immediately adjacent tenants on either side of Piermont Cleaners, in the strip mall. For purposes of the FS, the depth of groundwater contamination at AOC2 is assumed to a depth of 38 feet bgs. Dilute groundwater contamination exists to a depth of 86.5 feet bgs.

The source media focus in the FS will be to reduce groundwater contamination and to prevent off-site migration of contaminants which contribute to the OU1 plume. Saturated soils will be addressed in combination with groundwater remediation approaches for the OU2 FS. The approximate extents of saturated soil and groundwater contamination at AOC1 (in terms of isoconcentration maps and modeling) are depicted in Figure 3-11 and 3-12. The approximate extents of saturated soil and groundwater contamination at AOC2 are depicted in Figures 3-13 and 3-14. Any data gaps will be addressed during the Pre-Design Investigation (PDI) phase.

3.2.1 Contaminant Fate and Transport

A localized 3-dimensional (3-D) model of the PCE plumes in soil and groundwater at AOC1 was developed by WCEC Environmental Consultants for the OU2 RI, on behalf of EPA. Cross sections and 2-D/3-D views of the PCE plumes were extracted from the model and are provided in Appendix C2 (Figures 21 through 29 of the appendix). In addition, the model estimated PCE mass in soil and groundwater for each stratigraphic layer sampled (also provided in Appendix C2). No modeling was performed for AOC2.

The locations of cross section lines A-A', B-B', and C-C' are shown on Figure 3-4. Model results for the stratigraphy and elevations of the groundwater table logged during OU2 RI drilling along line A-A' is illustrated in Figure 3-5 and along lines B-B' and C'C' are illustrated in Figure 3-8. Review of the cross sections indicates that the 20-ft clay is relatively thin and unlikely to prevent the downward migration of PCE into the underlying silts and sand in the area of Cedarwood Cleaners and 1245/1255 West Broadway. Review of the cross section line A-A' between Cedarwood Cleaners, West Broadway and the vacant lot (Figure 3-5), indicates that the top of the 20-ft clay appears to slope downwards when moving from north to south, from about 30 feet bgs at ERT-53 (Cedarwood Cleaners) to 33 feet bgs at ERT-47 (on the vacant lot) until about 35 feet bgs at ERT-40 (vacant lot).

The PCE plume in soil as modeled along cross sections A-A', B-B', and C-C' is shown on Figures 3-6, 3-9, and 3-10. Although the PCE plume is shown to be split in the 20-Foot upper silt and silty sand beneath West Broadway (i.e., along A-A'; refer to Figure 3-6, and Figures 11 and 31 in Appendix C2) it is noted that sampling was not conducted in the street and the PCE plume is likely to be continuous within those stratigraphic units beneath the section of the street between Cedarwood Cleaners and 1245/1255 West Broadway. The majority of the PCE mass in soil likely exists within the 20-foot clay upper silt and silty sand (Figure 28 in Appendix C2).

At AOC1, the concentration of PCE in the shallow UGA ranges from ND to 370,000 µg/l. The maximum concentration exceeds the solubility of PCE (150,000 µg/l) indicating the likely presence of PCE in the form of a DNAPL. The highest concentration of PCE and likely presence of DNAPL is located in saturated soil samples and groundwater samples collected from a series of borings drilled at Cedarwood Cleaners and along the south side of West Broadway. Based on the modeling, the PCE DNAPL appears to be partitioning (mass flux) into groundwater creating a dissolved phase PCE plume that ranges from ND to 370,000 µg/l and is advectively migrating with groundwater flow in the shallow UGA to the north-northeast (see Figure 2-6). High concentrations of PCE likely in the form of a DNAPL have migrated vertically into the 20-foot clay that underlies the shallow UGA.

PCE in the porewater of the 20-foot clay is diffusing out from the bottom of the unit and has impacted the groundwater in the deep UGA, where PCE ranges from ND to 800,000 µg/l in groundwater in AOC1. Artifacts on the water level data show that groundwater could be migrating to the east-southeast; however, these data appear to be anomalous as the concentration of PCE in groundwater samples collected to the east-southeast are very low (140 µg/l). Some data indicate groundwater in the deep UGA is flowing to the north-northeast and not flowing to the east-southeast (refer to Figure 2-7).

The PCE plume in groundwater as modeled along cross sections A-A', B-B', and C-C' is shown on Figures 3-7, 3-9, and 3-10. The PCE plume appears to be laterally and vertically continuous in groundwater extending down from the top of the shallow UGA to the bottom of the deep UGA in the area of Cedarwood Cleaners and 1245/1255 West Broadway (Figure 3-12, and Figure 32 in Appendix C2). The bulk of the PCE mass in groundwater is within the 20-ft clay upper silt and silty sand (Figure 28 in Appendix C2). PCE mass and volume estimates calculated for incremental changes in groundwater concentration are provided in Figure 30, Appendix C2.

HDR evaluated the results of a transducer study performed by ERT from June 2 to July 6, 2016 and provided a Technical Memo to EPA on August 2, 2016. Groundwater levels were monitored in four shallow wells (ERT-MW-3S, ERT-MW-7S, ERT-MW-12S, and MW-15S), four deep wells (ERT-MW-3D, ERT-MW-7D, ERT-MW-12D, and MW-15D) and surface water levels in a stilling well at Hewlett Bay.

The possibility of a groundwater flow divide has not been confirmed (and would not appear as a distinct contour line). Groundwater flow directions in the shallow UGA and deep UGA were found to be consistent with previous data. Groundwater elevation figures for the shallow UGA indicate a steeper gradient and more conclusive indication of flow than the deeper UGA. The groundwater gradient amongst the subset of deep wells is extremely flat. Based on the monitoring well locations and measurements, an easterly gradient was noted in the deep UGA groundwater between the Cedarwood Cleaners / Vacant Lot area and Piermont Cleaners area. Data indicate that contamination from the OU2 source sites is flowing mainly to the North-Northwest (i.e., the general gradient observed for the shallow UGA groundwater). Groundwater flow paths in the deep UGA appear to be less defined based on the OU2 RI hydrogeological evaluations conducted so far.

3.3 Risk Assessment Screening Summary

The OU1 RI included a HHRA that concluded an excess lifetime cancer risk of 2×10^{-1} for the future adult and child resident and 2×10^{-2} for the future commercial worker. The calculated noncancer hazard quotients (HQs) were also elevated, with a HQ of 300 for a future adult resident, HQ of 600 for a future child resident and HQ of 50 for a future commercial worker. These cancer risks and noncancer health hazards indicate that there is significant potential risk to

potentially exposed populations from direct exposure to groundwater from cis-1,2-DCE, PCE, TCE and vinyl chloride (HDR 2011b).

A risk assessment screening was performed for this FS to evaluate the available OU2 soil and groundwater data for samples collected during seven OU2 RI sampling events from 2012 to 2016. An additional groundwater sampling event in May/June 2016 was completed after the risk assessment screening was concluded. Data from this event are not included, but would not be expected to modify the overall findings of the screening. Soil gas data from the February 2012 sampling event also were not included. The risk assessment screening includes groundwater analytical data from the OU1 Remedial Design treatability study; during three sampling events (July 2012, May 2013 and December 2013) where groundwater samples were collected at locations MW-27D and MW-27S (located near Cedarwood Cleaners).

The completed risk assessment screening is included in Appendix D and a summary is below.

3.3.1 Methodology

The OU2 human health risk assessment screening developed exposure point concentrations (EPCs) for soil and groundwater and compared them to risk-based screening levels, i.e., EPA May 2016 Regional Screening Levels (RSLs, EPA 2016c) at a target risk of 1×10^{-6} and target HQ of 1 to calculate AOC-specific cancer risks and noncancer HQs.

The EPCs are the lower of the maximum detected concentration and the calculated 95% upper confidence limit (UCL) of the arithmetic mean for a given data set and contaminant of potential concern (COPC). Calculation of the 95% UCL is conducted in accordance with EPA guidance (EPA 2002a, 2015a and b) and using ProUCL software, version 5.1.00 (EPA 2016b).

The RSLs incorporate assumptions on potential exposure scenarios and human receptors, along with contaminant-specific toxicological information. Contaminants that were identified in the OU1 HHRA as COPCs are included in this OU2 risk assessment screening: cis-1,2-DCE, PCE, TCE and vinyl chloride.

The risk assessment screening's conceptual site model (CSM) identifies exposure to COPCs in soil via the ingestion, dermal contact and inhalation pathways for a current/future resident (adult and child), current/future commercial/industrial worker and current/future construction worker. The resident and commercial/industrial worker are expected to contact surface soil (0 to 2 ft bgs), while a construction worker is expected to contact soil with a depth of 0 to 10 ft bgs. The CSM also includes a future resident's exposure to CVOCs in groundwater via ingestion, dermal contact and inhalation of tap water (where groundwater is an untreated source of tap water). Currently, treated groundwater is supplied via public wells for use; private wells are not used for potable water. See Figure 3-15.

The cancer risk and noncancer HQ for each COPC were determined using the following equations, where the target risk is $1x10^{-6}$ and target HQ is 1 for the RSL:

$$Risk = \frac{EPC \times Target\ Risk}{RSL_{cancer}} \quad \text{and} \quad HQ = \frac{EPC \times Target\ HQ}{RSL_{noncancer}}$$

The cumulative cancer risk from exposure to the combination of contaminants in an environmental medium and also across all media for a receptor is summed. EPA considers acceptable exposure levels to generally be concentration levels that represent an excess lifetime cancer risk (ELCR) to an individual of between one in ten thousand ($1x10^{-4}$) and one in a million ($1x10^{-6}$). The cumulative noncancer hazard index (HI) from exposure to the combination of COPCs in an environmental medium and across all media for a receptor was also estimated. When the HI for a COPC exceeds unity (one), there may be concern for potential noncancer effects from that COPC.

3.3.2 Results

A summary of the risk assessment screening results by medium and receptor for Cedarwood Cleaners/Vacant Lot is presented in Table 3-5 and the results for Piermont Cleaners are in Table 3-6.

For Cedarwood Cleaners/Vacant Lot, the ELCR and HI are within the acceptable limits for current/future resident's, current/future commercial/industrial worker's and current/future construction worker's exposures to COPCs in soil. A future resident's exposure to COPCs in groundwater results in a cancer risk of 1.9×10^{-2} and HI of 4.6×10^{3} with PCE as the primary contributor.

Since a future resident's exposure to COPCs in groundwater results in a cancer risk of 1.9×10^{-2} and HI of 4.6×10^{3} based on the data collected from both Cedarwood Cleaners and Vacant Lot, a sensitivity analysis was performed to evaluate the risks from each part of AOC1 (namely, considering data collected at the Cedarwood Cleaners property separately from groundwater data collected from the Vacant Lot area). The analysis indicates a cancer risk of 6.2×10^{-3} and HI of 9.2×10^{2} for the Cedarwood Cleaners property, and a cancer risk of 3.0×10^{-2} and HI of 7.7×10^{3} for the Vacant Lot area (based on the groundwater data groupings). PCE is noted to be the main contributor of cancer risk at the Vacant Lot area while PCE, TCE and vinyl chloride all contribute to the cancer risk at the Cedarwood Cleaners property.

For Piermont Cleaners, the ELCR and HI are within the acceptable limits for current/future resident's, current/future commercial/industrial worker's and current/future construction worker's exposures to COPCs in soil. A future resident's exposure to COPCs in groundwater results in a cancer risk of 1.5×10^{-4} and HI of 1.8×10^{1} with PCE and vinyl chloride as the primary contributors.

3.3.3 Conclusions

Based on the screening-level risk assessment of the OU2 RI data available, the risks and hazards calculated for the two OU2 AOCs (Cedarwood Cleaners and Piermont Cleaners) for the groundwater medium are above the cancer and noncancer target thresholds for a future residential receptor. The COPCs that were identified to contribute to elevated cancer risks and/or noncancer hazards are 1,2-DCE, PCE, TCE and vinyl chloride.

4.0 REMEDIAL GOALS AND REMEDIAL ACTION OBJECTIVES

For the purposes of the FS and as discussed in Section 3.2, AOC1 Cedarwood Cleaners consists of the Cedarwood Cleaners property, 1245/1255 West Broadway, the LIRR substation ROW, the section of West Broadway between Cedarwood Cleaners and the vacant lot at 1255 West Broadway. AOC2 Piermont Cleaners consists of the Piermont Cleaners space, the asphalt lots to the north and south of the cleaners, and adjacent commercial operations in the strip mall.

AOC1 and AOC2 are often collectively referred to as the OU2 “site” in the following sections of this report.

4.1 Identification of ARARs

CERCLA requires that on-site remedial actions attain or waive federal environmental ARARs, or more stringent state environmental ARARs, upon completion of the remedial actions. Along with the protection of human health, attainment of ARARs is considered a threshold criterion under CERCLA. The purpose of ARARs is to define the minimum level of protection that must be provided by a remedy selected and implemented. Additional protection may be required, if necessary, to protect human health and the environment.

ARARs are designated as either “applicable” or “relevant and appropriate,” according to the NCP. A requirement under CERCLA, as amended, may be either “applicable” or “relevant and appropriate” to a site-specific remedial action, but not both. The distinction is critical to understanding the constraints imposed on remedial alternatives by environmental regulations other than CERCLA. “Applicable” and “relevant and appropriate” requirements are defined in the NCP, at 40 CFR 300.5 – Definitions.

If a state or federal environmental law is determined to be either applicable or relevant and appropriate, compliance with the substantive requirements of that ARAR are mandatory under CERCLA and the NCP. Compliance with ARARs is a threshold criterion that any selected remedy must meet, unless a legal waiver as provided by CERCLA Section 121(d)4 is invoked.

Applicable requirements are standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance. For example, the performance standards for the release of VOCs to the atmosphere, under 6 New York Code of Rules and Regulations (NYCRR) Part 257 would be "applicable" to a response action involving air discharging from a Soil Vapor Extraction (SVE) System.

Relevant and appropriate requirements are standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state

laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, or other circumstances at a CERCLA Site, address problems or situations sufficiently similar to those encountered at the CERCLA Site that their use is well suited to the particular Site. For example, while Resource Conservation and Recovery Act (RCRA) regulations are not applicable to in-place closure of hazardous waste that was discarded before 1980, RCRA regulations for closure with waste in place may be deemed relevant and appropriate. In some circumstances, a requirement may be relevant to the particular site-specific situation but will not be appropriate due to differences in the purpose of the requirements, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address.

A requirement that is judged to be relevant and appropriate must be complied with to the same degree as if it were applicable. Relevant and appropriate requirements that are more stringent than applicable requirements take precedence.

4.1.1 Other Criteria or Guidance To Be Considered

These requirements pertain to Federal and State criteria, advisories, guidelines, or proposed standards that are not generally enforceable but are advisory and that do not have the status of potential ARARs. Guidance documents or advisories TBC in determining the necessary level of remediation for protection of human health or the environment may be used where no specific ARARs exist for a chemical or situation, or where such ARARs are not sufficient to be protective.

In addition to the requirements established as ARARs, any Federal and State programs that have developed criteria, advisories, guidelines, or proposed standards may provide useful information or recommended procedures if no ARARs address a particular situation or if existing ARARs do not provide desired protection. In such situations, these TBC criteria or guidelines could be used to set remedial action goals.

4.1.2 ARARs and Other Criteria To Be Considered

The remedial actions developed in this FS were analyzed for compliance with potential ARARs and TBCs guidance or criteria. The remedial actions analysis involves the initial identification of potential requirements for the alternative, the detailed evaluation of the potential requirements for applicability or relevance and appropriateness, and a determination of the ability of the remedial alternatives to achieve the ARARs. The analysis is found in Section 9 of this FS Report. The following sections describe the types of requirements.

- ***Chemical-Specific Requirements**:* Chemical-specific requirements set risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants.
- ***Location-Specific Requirements**:* Location-specific requirements are design requirements or activity restrictions based on the geographical or physical position of the Site and its surrounding area.
- ***Action-Specific Requirements***: Action-specific requirements generally set performance, design, technology, or other similar controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants.

4.1.3 ARARs AND TBCs Applicable to the AOCs

The following is a list of ARARs and TBCs identified for the AOCs.

- RCRA: Identification and Listing of Hazardous Waste (40 CFR 261); Standards Applicable to Generators of Hazardous Waste (40 CFR 262); Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities (40 CFR 264) (ARAR)
- Hazardous Materials Transportation Regulations (49 CFR 107, 171, 172, 177, and 179) (ARAR)
- RCRA Standards Applicable to Transporters of Hazardous Waste (40 CFR 263) (ARAR)
- RCRA Land Disposal Restrictions (40 CFR 268) (ARAR)
- Federal Clean Water Act- National Pollutant Discharge Elimination System (40 CFR 100); Effluent Guidelines and Standards for the Point Source Category (40 CFR 414); Ambient Water Quality Criteria (40 CFR 131.36); National Primary Drinking Water Standards (40 CFR 141); (ARAR)
- Federal Safe Drinking Water Act- Underground Injection Control Program (40 CFR 144, 146) (ARAR)
- Clean Air Act, National Ambient Air Quality Standards (40 CFR 50); National Emission Standards for Hazardous Air Pollutants (40 CFR 61) (ARAR)
- Control of Air Emissions from Superfund Air Strippers (OSWER Directive 9355.0-28) (ARAR)
- New York State Soil Cleanup Guidance (CP-51) (ARAR)
- 6 NYCRR Part 375 Environmental Remediation Programs (Subparts 375-1 to 375-4 & 375-6) (ARAR)
- NYSDOH Drinking Water Standards (10 NYCRR Part 5) (ARAR)
- New York Solid Waste Management Regulations (6 NYCRR Part 360) (ARAR)

- Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (6 NYCRR Part 372) (ARAR)
- Waste Transporter Permit Program (6 NYCRR Part 364) (ARAR)
- Land Disposal Restrictions (6 NYCRR Part 376) (ARAR)
- New York State Pollutant Discharge Elimination System (SPDES) (Part 750-757) (ARAR)
- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 NYCRR Part 703) (ARAR)
- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Technical & Operational Guidance Series (TOGS 1.1.1) (ARAR)
- New York Air Quality Standards (6NYCRR Part 257) (ARAR)
- New York State Department of Environmental Conservation Air Guide 1, Guidelines for the Control of Toxic Ambient Contaminants (ARAR)
- New York State Regulations for Prevention and Control of Air Contamination and Air Pollution (6 NYCRR Part 200) (ARAR)
- Occupational Safety and Health Administration (OSHA) Worker Protection (29 CFR 1904, 1910, 1926) (TBC)
- Nassau County Ordinance on Well Drilling. New York State Environmental Conservation Law Article 15, Title 15 (ECL 15-1527) requires any well, other than a public water supply well (which are regulated by the NYSDOH) to obtain a permit before withdrawing water from anywhere on Long Island. This program is implemented in cooperation with the county Departments of Health.

4.2 Preliminary Remediation Goals

Saturated soils and groundwater are the contaminated media to be remediated under OU2. Saturated soils will be addressed in combination with groundwater remediation approaches for the OU2 FS. NYS GQS are the applicable chemical-specific ARARs for groundwater. Federal and NYS drinking water standards are also relevant and appropriate requirements. PRGs, which are the media cleanup goals, have been derived from these chemical-specific ARARs for the site.

For each of the groundwater COCs, NYS GQS are the most stringent promulgated standards, and were used to develop the PRGs. Table 4-1 provides the PRGs for groundwater COCs.

Even though PRGs are the ultimate concentration goals for site cleanup, site-specific situations and limitations may prevent the remedial action from achieving the PRGs in a reasonable time frame. These constraints are further discussed in Section 8.

4.3 PRINCIPAL THREAT WASTE

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes an expectation that EPA will use treatment to address the principal threats posed by a Site wherever practicable (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

4.4 Remedial Action Objectives

RAOs are media specific goals for protecting human health and the environment. They serve as the basis for developing remedial action alternatives and specify what the cleanup action will accomplish. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics; evaluation of exposure pathways, contaminant migration pathways and exposure limits to receptors. The RAOs are based on regulatory requirements and risk based evaluation, which may apply to the various remedial alternatives being considered for a site.

The following presents RAOs that have been developed based on the results of the OU2 RI and risk assessment screening, and additional comments provided by EPA. It is understood that the site-wide plume is being addressed as a separate operable unit (OU1) by others. The specific RAOs developed for each AOC are as follows:

4.4.1 AOC1- Cedarwood Cleaners

Based on the OU2 risk assessment screening and other site-specific information, exposure pathways may include:

- Saturated Soil: VOCs, based on potential impact to groundwater.
- Groundwater: VOCs are identified as risk drivers in a direct contact exposure pathway.

- Vapor Exposure: Any elevated VOCs in soil in AOC1 are beneath asphalt and concrete. Therefore, there is no direct risk due to direct vapor exposure to ambient (outdoor) conditions. Soil vapor mitigation is outside the scope of this FS, and is being addressed by EPA under a separate program. Remedial measures to address soil concerns in AOC1 will mitigate the potential impact of vapor migration along existing utility corridors and potentially into buildings.

The following RAOs for contaminated groundwater at AOC1 were identified to address potential risk to human health and the environment:

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion and dermal contact with VOC-contaminated groundwater that exceeds PRGs;
- Restore the impacted aquifer to beneficial use as a source of drinking water by reducing contaminant levels to the Federal and State MCLs; and
- Reduce or eliminate the potential for off-site migration of groundwater with VOCs exceeding PRGs.

4.4.2 AOC2- Piermont Cleaners

Based on the risk assessment screening and other site-specific information, exposure pathways may include:

- Saturated Soil: VOCs, based on potential impact to groundwater.
- Groundwater: VOCs are identified as risk drivers in a direct contact exposure pathway.
- Vapor Exposure: Any elevated VOCs in soil in AOC1 are beneath asphalt and concrete. Therefore, there is no direct risk due to direct vapor exposure to ambient (outdoor) conditions. Soil vapor mitigation is outside the scope of this FS, and is being addressed by EPA under a separate program. Remedial measures to address soil concerns in AOC1 will mitigate the potential impact of vapor migration along existing utility corridors and potentially into buildings.

The following RAOs for contaminated groundwater at AOC2 were identified to address potential risk to human health and the environmental concerns:

- Prevent or minimize potential, current, and future human exposures including inhalation, ingestion and dermal contact with VOC-contaminated groundwater that exceeds PRGs;
- Restore the impacted aquifer to beneficial use as a source of drinking water by reducing contaminant levels to the Federal and State MCLs; and
- Reduce or eliminate the potential for off-site migration of groundwater with VOCs exceeding PRGs.

5.0 GENERAL RESPONSE ACTIONS

GRAs are broad types of activities that will potentially satisfy the RAOs. PCE and TCE are the most widely detected contaminants in the saturated soil and groundwater at AOC1 and AOC2 ("source media") at concentrations greater than their respective PRGs. These two contaminants were also detected with highest concentrations and are, therefore, used as the indicator contaminants for technology evaluation.

GRAs were identified for the two AOCs considering the physical area-specific conditions, contaminant characteristics, and the RAOs. Soil and groundwater GRAs are presented separately in this section for the two AOCs. Following the development of GRAs, one or more remedial technologies and process options are identified for each GRA category. The technologies and process options remaining after screening in Section 6 and Section 7 will be assembled into alternatives that are discussed in Section 8. The alternatives will focus on remediating OU2 source media (i.e., addressing soil and groundwater in combination when possible and appropriate).

5.1 Saturated Soil

The GRAs for impacted soil include:

- No Action – The no action option is included as a basis for comparison with other soil remediation technologies. If no action is taken, the contaminants will remain in place and the RAOs will not be met.

- Institutional Controls (ICs) – Restricting the property use through ICs would not reduce the contamination or prevent contaminant migration. Long-term monitoring (LTM) would be required in conjunction with the maintenance of existing and /or implementation of additional institutional controls or remedial technologies.

- Monitoring/Inspection and Maintenance – Monitoring includes activities such as sampling and analysis in order to track the fate and transport of the contaminants (e.g., LTM) and to assess the risks of exposure. These measures are generally used in conjunction with other remedial technologies and are not effective in achieving the PRGs by themselves.

- Treatment – Treatment of contaminants can be achieved either in-situ or ex-situ and includes several types of technologies that encompass biological, thermal, and physical/chemical treatment approaches.

    - Biological – Bioremediation consists of stimulation of microorganisms to promote degradation of contaminants. Biological treatment is generally effective for organic contaminants.

    - Thermal – Thermal treatment processes can be viable strategies to mobilize and remove or destroy contaminants in soil.

- Physical/Chemical – Physical/Chemical treatment processes can be used to destroy, separate or immobilize contaminants in soil.

5.2 Groundwater

The GRAs for impacted groundwater include:

- No Action – The no action option is included as a basis for comparison with the active groundwater remediation technologies. If no action is taken, the contaminants will remain in place and the RAOs will not be met.

- ICs – Restricting the property or resource use through ICs would not reduce the volume or eliminate the need for active remediation of groundwater to restore the impacted resource and meet RAOs. LTM would be required in conjunction with the maintenance of existing and /or implementation of additional institutional controls.

- MNA - MNA makes use of naturally occurring bioremediation processes where dilution, volatilization, biodegradation, adsorption, and/or chemical reactions with subsurface materials reduce contaminant concentrations to acceptable levels over time. In accordance with EPA guidance (EPA, 1998d), MNA is always to be used in combination with source control and LTM to assure the effectiveness and protectiveness of the process.

- Containment – Containment options are often implemented to prevent, or significantly reduce, the migration of contaminants in groundwater. They can be used in conjunction with treatment technologies where restoration of the resource has been identified as an objective, as is the case for the site. Containment solutions often require long-term groundwater monitoring. The AOCs are largely covered with asphalt and hard surfaces.

- Extraction – Groundwater extraction provides hydraulic control to prevent migration of dissolved contaminants. Groundwater extraction is typically combined with ex-situ treatment and discharge response actions to achieve the RAOs. Groundwater extraction response actions provide reduction in mobility and mass of contaminants by removing the contaminants from the subsurface using groundwater extraction wells.

- Treatment – Treatment of contaminants can be achieved either in-situ or ex-situ and includes several types of technologies that encompass biological, thermal, and physical/chemical treatment approaches.

  Biological – Bioremediation consists of stimulation of microorganisms to promote degradation of contaminants. Biological treatment is generally effective for organic contaminants.

  Thermal – Thermal treatment processes can be viable strategies to mobilize and remove or destroy contaminants in groundwater.

Physical/Chemical – Physical/Chemical treatment processes can be used to destroy, separate or immobilize contaminants in groundwater.

- Discharge – Disposal options for extracted groundwater can include discharge to a publicly owned treatment works (POTW), surface or groundwater after treatment of the effluent to meet applicable discharge standards.

6.0 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

This section identifies potential remedial technologies for each AOC. As discussed in Section 3.0, the following types of contamination have been detected at concentrations greater than PRGs for each AOC.

- AOC1-Cedarwood Cleaners: PCE and TCE in saturated soil and groundwater
- AOC2-Piermont Cleaners: PCE in saturated soil; and PCE and TCE in groundwater

This section identifies and screens remedial technologies and process options potentially capable of addressing soil and groundwater contamination at the AOCs. The screening process serves to identify feasible technology categories and technology process options that have the potential to achieve the goal of the GRAs. Remedial technologies that are clearly not implementable at the AOC or that would not be effective in treating contamination detected in each medium are not retained for further consideration. Remedial technologies presented in this FS may also be applied to other PCE sources that could (hypothetically) be identified.

Remedial technologies are grouped by GRA (e.g., containment, treatment). Specific technologies and process options for each of the GRAs, including No Action, ICs, MNA/LTM, Containment, Treatment and Disposal/Discharge are initially screened to identify those that appear to be:

- Most effective in achieving area-specific RAOs and appropriate to the area-specific conditions and contamination;
- Technically implementable; and
- Cost-effective, providing the same level of protection to human health and the environment.

The initial screening considered effectiveness of the technologies for treating the contaminants present at the AOCs, implementability of the technology given AOC-specific conditions, and cost. Remedial technologies that were deemed to be impracticable or cost-prohibitive were removed from further consideration, in accordance with EPA guidance (EPA, 1988).

AOC-specific conditions, including contamination type, concentration, location (areal extent and depth), and estimated quantity were incorporated into the analyses performed during the initial screening process.

Treatability studies and a PDI will be used when needed to refine the assumptions for design used in this document. The most promising technologies were combined into remedial alternatives designed to optimize the ability to achieve RAOs, and are described in Section 8.0.

Remedy selection and/or design tier treatability studies will establish whether the technology can meet RAOs, and then determine the design and operating parameters to help optimize the effectiveness of the remedy. These types of studies are designed to quantify the extent of

remediation that can be expected, and either estimate or refine the estimates of the remedial timeframe and associated costs. They supply the data necessary to assure, as best as can be predicted prior to implementation, that the remedy selected can satisfy the threshold and balancing criteria of the NCP (EPA, 1993a).

6.1 Identification and Screening of Technologies for Saturated Soil

Table 6-1 summarizes the technology identification and screening process for saturated soil at AOC1 and AOC2. The table is grouped by the GRA (i.e., in situ treatment, ex situ treatment, containment). Technologies that may be appropriate for addressing the contaminants were retained for further evaluation and are identified on the last columns of Table 6-1. Technologies that were screened out and not retained for further analysis are designated as "no" in the last column of Table 6-1. Remedial technologies that were deemed to be impracticable or cost-prohibitive were removed from further consideration, in accordance with EPA guidance (EPA, 1988) and are not discussed further in this Section.

The most promising technologies were combined into remedial alternatives, which are described in the development of alternatives section of this report (Section 8).

Based on the OU2 RI data, the following assumptions were made for the FS:

- *Due to the unknown nature of the release at AOC1 and AOC2 and the presence of contaminated groundwater on the properties, it is assumed that release(s) occurred historically from within the building footprints, and that data gaps in the unsaturated zone soils exists.*

- *Saturated zone soils are contaminated across AOC1, including the Cedarwood Cleaners property and the vacant lot to the south. Based on CSIA and other OU2 RI analyses, the contamination is likely from a single source at the Cedarwood Cleaners property. Based on the intermittent soil horizons that were sampled, and a review of the OU2 RI data, saturated zone soil contamination exists from approximately 26 to 80 feet bgs across the area.*

- *It is assumed that the saturated horizon under West Broadway, 1245/1255 West Broadway and the LIRR Substation ROW is also contaminated.*

- *Based on the intermittent soil horizons that were sampled, and a review of the OU2 RI data, saturated zone soil contamination at AOC2 is at approximately 36 feet bgs.*

6.1.1 No Action

The no action remedial option has been retained as a basis for comparison with other soil remediation technologies, as required by the NCP. This option includes no future activities to contain or remediate contaminants at the AOCs, provides no treatment for contaminants, and provides no legal or administrative mechanisms of protection of human health or the environment beyond establishing cleanup criteria and recognizing those mechanisms that are in place (e.g., restrictions on well installation) under other state and federal environmental regulatory program (non-Superfund) authority. This option assumes that physical conditions at the AOCs remain unchanged.

6.1.2 ICs

ICs are non-engineering measures, such as administrative and/or legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy by limiting access or future use of the AOCs. EPA guidance on choosing and implementing ICs (EPA, 2000a) provides that:

- If the cleanup does not result in unrestricted use at a site, an IC may be appropriate.
- Consider life-cycle strengths, weaknesses and costs for implementation, monitoring and enforcement.
- Provide for early coordination with state and local governments that may be responsible for ICs.
- ICs are to be assessed as carefully as any other remedial alternative.
- Place ICs in ways to increase their reliability.
- Clearly state IC objectives in decision documents.
- Get written assurances from those responsible for implementing, monitoring, and enforcing ICs; select the best ICs available to protect human health and the environment.

ICs do not reduce the toxicity, mobility, and volume of contamination, but can be implemented to reduce to probability of exposure to contaminants. ICs are generally used in conjunction with, not in lieu of, engineering measures such as treatment or containment; they can be used during all stages of the cleanup process to accomplish remedial objectives; and they should be used or implemented in series to provide overlapping protection from contamination.

Examples include deed restrictions, and building permit requirements. ICs could also include health and safety policies and procedures to limit exposure to soil contaminants during construction activities via local construction permit programs.

Performance monitoring would include a description of the ICs implemented or planned, verify IC implementation and discuss the IC's ability to meet performance objectives going forward. Actual or pending changes in land or resource use/ownership that may impact the effectiveness of the ICs should also be included in a performance monitoring report.

ICs have been retained for further evaluation for use with another remedial technology, as site conditions make its use independent of another remedial action unlikely.

6.1.3 Monitoring/Inspection and Maintenance

LTM usually includes an inspection and maintenance program which involves periodic sampling and analysis of soils, inspection of engineering control systems, and performance of repairs, as necessary. LTM alone would not be effective in reducing contamination levels. LTM must be implemented in conjunction with other remedial technologies to confirm that contaminant degradation is proceeding at rates consistent with meeting cleanup objectives.

LTM has been retained for further evaluation for use with another remedial technology, as site conditions make its use independent of another remedial action unlikely.

6.1.4 Treatment

6.1.4.1 In Situ Biological Treatment

Implementation of in situ treatment does not require the excavation of contaminated media. In situ technologies can minimize potential worker exposure to contaminants. In situ technologies generally require a longer period of time to meet remedial objectives and can result in high operations and maintenance (O&M) requirements compared to ex situ technologies.

Bioventing

Bioventing stimulates the natural in situ biodegradation of aerobically degradable compounds in soil by providing oxygen to existing soil microorganisms. Oxygen is delivered to contaminated unsaturated soils by forced air movement (either extraction or injection of air, or a combination of both). Bioventing uses relatively low air flow rates to provide only enough oxygen to sustain microbial activity.

Based on AOC conditions and saturated zone contamination, bioventing has been screened out and will not be evaluated further.

Enhanced Bioremediation

Enhanced bioremediation is a process in which indigenous or inoculated microorganisms degrade (metabolize) organic contaminants found in soil and/or groundwater, converting the contaminants to innocuous end products. Nutrients, oxygen, or other amendments may be used to enhance bioremediation and contaminant desorption from subsurface materials. Enhanced bioremediation of soil typically involves the percolation or injection of groundwater or uncontaminated water mixed with nutrients and/or saturated with dissolved oxygen. An

infiltration gallery or spray irrigation is typically used for shallow contaminated soils, and injection wells are used for deeper contaminated soils. A surface treatment system, such as air stripping or carbon adsorption, may be required to treat extracted water prior to re-injection or disposal.

Bioremediation is most effective for remediating low-level residual organic contamination in conjunction with source removal and is generally lower in cost than other treatment technologies. However, bioremediation cannot degrade inorganic contaminants.

Distribution of water-based reagents may be effective in heterogeneous subsurface environments. However, the presence of preferential flow paths (as caused by fill material and buried debris, or by the 20 foot clay layer in the subsurface) may severely decrease contact between injected fluids and contaminants throughout the treatment zones. Circulation of water-based reagents through the soil may increase contaminant mobility impacting the underlying groundwater. Enhanced bioremediation has been retained and will be evaluated further.

Phytoremediation

Phytoremediation is a process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment. This technology is limited to shallow soils. For treatment of organic contaminants, a longer remediation time is required, and difficulties to implement exist since AOC1 is within the commercial zone. Therefore, phytoremediation has been screened out and will not be evaluated further.

6.1.4.2 In Situ Physical/Chemical Treatment

Chemical Oxidation

In situ chemical oxidation (ISCO) is a process where powerful oxidizing chemicals are injected into the subsurface to chemically convert contaminants to less toxic compounds. In addition, contaminants may become more stable, less mobile, and/or inert. Chemical oxidant delivery systems may include vertical or horizontal injection wells and sparge points, with forced advection to rapidly move the oxidant into the subsurface. Oxidizing agents that are commonly used to address contaminants include ozone, hydrogen peroxide, potassium permanganate, hypochlorites, chlorine, and chlorine dioxide.

ISCO is a viable remediation technology for mass reduction of organic contaminants in source areas. Chemical oxidation can have a relatively rapid treatment time, and can be implemented with readily available equipment. Limitations associated with chemical oxidation include: requirements to handle and administer large quantities of hazardous oxidizing chemicals; and,

naturally occurring organic material in the formation can consume large quantities of oxidant. Due to the potential of ISCO to interfere with the effectiveness of the downgradient OU1 remediation system, and the potential for limited success in the silty site soils, chemical oxidation has been screened out and will not be evaluated further.

Fracturing

Fracturing is an enhancement technology designed to increase the efficiency of other in situ technologies in certain types of subsurface conditions (i.e., very low permeability soils/rock). Cracks are created in the media of interest by fracturing (pneumatically or hydraulically) to create new passageways or channels. Fracturing can thus increase the effectiveness of many in situ processes and enhance extraction efficiencies. Fracturing is not highly amenable to AOC1 because existing soil consists of sufficient sandy material that would not require fracturing. This technology has been screened out and will not be retained for further evaluation.

Soil Flushing

Soil flushing is a process where contaminants are extracted from the soil by passing uncontaminated water (or water containing an additive to enhance contaminant solubility) through in-place soils. Contaminants are leached into the water, which is then extracted and treated.

In general, sites with shallow water tables are difficult to treat via soil flushing. In addition, there is a potential for contaminant migration if contaminants are flushed beyond the capture zone. Further, ex situ treatment costs for recovered fluids can add significantly to remedial costs associated with this process. This technology has therefore not been retained for further analysis.

SVE

SVE is an in situ unsaturated (vadose) zone soil remediation technology where a vacuum is applied to the subsurface soil to induce air flow through the soil medium and remove volatile (and some semi-volatile) contaminants. Contaminants captured in the extracted soil vapor are typically treated above grade, via activated carbon or other process. The effectiveness of an SVE system may be enhanced by applying surficial capping over the active remediation areas to prevent short-circuiting from drawing in ambient air to the subsurface. SVE is an effective remediation technology for the removal of VOCs. SVE will be an effective remediation technology for the AOCs because of its effectiveness in removing VOCs. In addition, the existing asphalt parking areas and other hard surfaces that provides a cap at the majority of AOC1 and AOC2 will enhance the SVE system effectiveness. It is noted that an asphalt cap or hard surface can be installed at the vacant lot. The cap will prevent the infiltration of ambient air

near the SVE system and help prevent short circuiting of the desired air flow pathway. Although no vadose soil contamination has been identified, SVE has been retained for further evaluation to be used in combination with air sparging.

Solidification/Stabilization

Solidification/stabilization (S/S) reduces the mobility of hazardous substances and contaminants in the environment through both physical and chemical means. Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).

Auger/caisson and reagent/injector systems are techniques where S/S agents can be added to soils to trap or immobilize contaminants. These systems have limited effectiveness for VOCs.

In situ vitrification (ISV) is another in situ S/S process that uses an electric current to heat soil or other earthen materials to extremely high temperatures. Inorganic pollutants are immobilized within the resulting vitrified/crystalline mass. The vitrification product is a chemically stable, leach-resistant, glass and crystalline material similar to obsidian or basalt rock. The ISV process destroys and/or removes organic materials. Vapors and combustion products need to be captured and treated to remove particulates and other pollutants from the off gases. In addition to the high energy consumption, ISV may result in a decrease in soil volume and the solidified material may hinder future site use.

In situ S/S has not been retained for further analysis.

6.1.4.3 In Situ Thermal Treatment

Thermal Treatment

Steam/hot air injection or heating via electrical resistance, fiber optics, radio frequency, or other means can be utilized to increase the volatilization rate of VOCs and facilitate extraction. The process is otherwise similar to conventional SVE but requires heat resistant extraction wells.

Thermal treatment heats soil to enhance SVE in the followings ways: VOC volatility is increased by heating; the soil permeability is increased by drying; water vapor converted to steam can facilitate stripping of volatile contaminants in the overburden; and heating may cause a decrease in contaminant viscosity which improves contaminant mobility. In situ thermal treatment may also enhance biological activity at the site, and at the in-situ OU1 remedy that is under design.

Hot air or steam can be injected below the contaminated zone to heat the impacted soils and release contaminants from the soil matrix, where they are collected and transferred to the surface through SVE. Extracted vapor can then be treated by a variety of existing technologies (i.e., granular activated carbon).

Thermal treatment will be retained for further evaluation.

6.1.4.4 Ex Situ Biological/ Physical/Chemical/ Thermal Treatment

Ex situ treatment technologies have been screened out since unsaturated soil contamination has not been identified.

This technology is not applicable since excavation has not been retained.

6.2 Identification and Screening of Technologies for Groundwater

As discussed in Section 3.0, PCE and TCE were detected in groundwater at AOC1 and AOC2 at concentrations greater than their respective PRGs. Table 6-2 summarizes the technology identification and screening process for groundwater at AOC1 and AOC2. The table is grouped by the GRA (i.e., in situ treatment, ex situ treatment, containment). Remedial technologies that would address contaminants in saturated soils and groundwater ("source media") were identified. Technologies that may be appropriate for addressing the contaminants at each AOC were retained for further evaluation and are identified on the last columns of Table 6-2. Technologies that were screened out and not retained for further analysis are designated as "no" in the last column of Table 6-2. Remedial technologies that were deemed to be impracticable or cost-prohibitive were removed from further consideration, in accordance with EPA guidance (EPA, 1988) and are not discussed further in this Section.

Based on the OU2 RI data, the following assumptions were made for the FS:

- *Groundwater data from AOC1 show groundwater contamination to a depth of 71.5 feet bgs. Based on CSIA and other OU2 RI analyses, the contamination is likely from a single source at the Cedarwood Cleaners property. It is assumed that groundwater under the Cedarwood Cleaners building, West Broadway, 1245/1255 West Broadway, and the LIRR substation ROW is also contaminated.*

- *Groundwater under the residential properties immediately north and west of Cedarwood Cleaners is assumed to be contaminated, as OU2 RI data shows contamination at these property boundaries of Cedarwood Cleaners. It is assumed that these off-site areas may*

be further characterized / addressed in the future; however, FS remedial quantities do not include these areas.

- *Based on available data, it is assumed that groundwater at Piermont Cleaners is contaminated up to 38 feet bgs. It is also assumed that groundwater beneath the building is contaminated. Dilute groundwater contamination was detected at a maximum depth of 86.5 feet bgs in the rear parking lot.*

- *Based on available data, groundwater is assumed to be impacted beneath the immediately adjacent tenants (at the strip mall) on either side of Piermont Cleaners.*

- *The depth of OU2 groundwater contamination assumed for the FS is at the interface of the Gardiners Clay, approximately 70 feet to 80 feet bgs.*

- *It is assumed that dissolved groundwater contamination beyond the source area boundaries will be captured by the OU1 remedy.*

The most promising technologies were combined into remedial alternatives, which are described in the development of alternatives section of this report.

6.2.1 No Action

The no action remedial option has been retained as a basis for comparison with other groundwater remediation technologies, as required by the NCP. This option includes no future activities to contain or remediate contaminants at the AOCs, provides no treatment for contaminants, and provides no legal or administrative mechanisms of protection of human health or the environment beyond establishing cleanup criteria and recognizing those mechanisms that are in place (e.g., restrictions on well installation) under other state and federal environmental regulatory program (non-Superfund) authority. This option assumes that physical conditions at the site remain unchanged.

6.2.2 ICs

ICs are non-engineering measures, such as administrative and/or legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy by limiting site or resource use. EPA guidance on choosing and implementing ICs (EPA, 2000a) provides that:

- If the cleanup does not result in unrestricted use at a site, an IC may be appropriate.
- Consider life-cycle strengths, weaknesses and costs for implementation, monitoring and enforcement.

- Provide for early coordination with state and local governments that may be responsible for ICs.
- ICs are to be assessed as carefully as any other remedial alternative.
- Place ICs in ways to increase their reliability.
- Clearly state IC objectives in decision documents.
- Get written assurances from those responsible for implementing, monitoring, and enforcing ICs; select the best ICs available to protect human health and the environment.

ICs are generally to be used in conjunction with, not in lieu of, engineering measures such as treatment or containment; they can be used during all stages of the cleanup process to accomplish remedial objectives; and they should be used or implemented in series to provide overlapping protection from contamination.

Examples include easements, well drilling prohibitions, zoning restrictions, and building permit requirements. ICs could also include health and safety policies and procedures to limit exposure to groundwater contaminants during construction activities via local construction permit programs.

Performance monitoring would include a description of the ICs implemented or planned, verify IC implementation and discuss the IC's ability to meet performance objectives going forward. Actual or pending changes in land or resource use/ownership that may impact the effectiveness of the ICs should also be included in a performance monitoring report.

ICs have been retained for further evaluation for use with another remedial technology, as site conditions make its use independent of another remedial action unlikely.

6.2.3 MNA with LTM

MNA relies on naturally occurring attenuation processes to achieve AOC-specific RAOs within a reasonable time frame. Natural processes include dilution, dispersion, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials are allowed to reduce contaminant concentrations to acceptable levels over time. MNA is always used in combination with LTM to assess the effectiveness and protectiveness of the process.

Regulatory approval of this option usually requires modeling and evaluation of contaminant degradation rates and pathways, and predicting contaminant concentrations at potential downgradient receptor points over time (ITRC, 2007).

Modeling is performed to evaluate whether natural processes of contaminant degradation could reduce contaminant concentrations below PRGs before potential exposure pathways are completed or to identify where additional measures (e.g., institutional controls) may be necessary to protect public health. In addition, LTM must be conducted throughout the process to confirm that degradation is proceeding at rates consistent with meeting cleanup objectives and the longer remedial timeframe associated with its use.

Due to the lack of sufficient evidence for the potential of MNA at the site, MNA has not been retained for further evaluation.

LTM includes periodic sampling and analysis of groundwater. The monitoring program provides an indication of the progress of remedial activities and contaminant migration post active treatment. Data collected by the LTM program is generally used in five-year reviews.

LTM alone would not be effective in reducing contamination. However, natural processes such as dilution, dispersion, biodegradation, and volatilization would decrease groundwater contaminant concentrations over time. A comprehensive monitoring network would need to be installed for the LTM program.

LTM has been retained for further evaluation for use with another remedial technology, as site conditions make its use independent of another remedial action unlikely.

6.2.4 Containment

Containment barriers are structures installed to reduce contaminant mobility but do not directly impact contaminant toxicity or volume. These barriers are filled with impermeable, semi-permeable or permeable materials, depending on the contaminants at a site.

Wastes can also be “contained” via their sequestration into a geological formation through deep well injection. Alternately, hydraulic containment, accomplished by installing a line of extraction wells and pumping out and then treating the groundwater can be employed to stop contaminated groundwater from migrating past a certain point in the subsurface. Once treated, the clean water can be put back in the subsurface, sent to a public sewer, or discharged to surface water.

6.2.4.1 Physical Barriers

Physical barriers (e.g., slurry walls, grout curtains, sheet pile walls) are used to slow groundwater flow, minimize migration of contaminated groundwater, divert contaminated groundwater from a drinking water intake and/or provide a hydrodynamic barrier to enhance the efficacy of a groundwater pump & treat system. Physical barriers often are used where the waste mass is too large for treatment and where soluble and mobile constituents pose an imminent threat to a sensitive receptor (EPA, 1998a).

As an example, one type of physical barrier, the slurry wall, has been implemented at numerous sites, often in conjunction with capping. Slurry walls can be constructed up to 100 feet in depth, and are usually two to four feet thick. To be most effective, the slurry wall should be keyed into a clay or bedrock layer (EPA, 1984).

It is sometimes advantageous to restrict lateral movement of groundwater with vertical cutoff walls. Sheet piling can be used for this application. Examples of when vertical cutoff walls could be used include when groundwater seepage or flow needs to be controlled; to provide a "seal" into a low-permeability stratum, to isolate a contaminated area from locations where

groundwater is being pumped and treated; and to serve as a long-term barrier to impede contaminant movement.

The actual use, design and construction of physical barriers of any kind are based on site-specific factors. The localized hydrogeology, land use patterns and avoidance of impacts to nearby potable water supply sources would likely rule out, or simply make unnecessary the use of any of the barrier technologies. Table 6-1 provides the individual screening comments for slurry walls, grout curtain, funnel & gate, and block displacement barriers. Physical barriers are not retained for further consideration.

6.2.4.2 Hydraulic Barrier - Groundwater Pump & Treat

Groundwater pumping from an aquifer to remove dissolved phase contaminants and/or achieve hydraulic containment of contaminated groundwater to prevent migration is a potentially applicable remedial technology. Pump & treat consists of wells pumping contaminated groundwater to the surface for treatment. The treatment train is typically a series of physical, chemical, or biological processes, with ultimate discharge or disposal of the treated water (FRTR, 2002; EPA, 1994).

Processes typically evaluated or used in pump & treat systems can include, but are not limited to:

- Air stripping
- Ion Exchange
- Precipitation/Coagulation/Flocculation
- Adsorption
- Separation

Treatment and monitoring of extracted groundwater is required in conjunction with a pump & treat option where restoration of the resource is a RAO, as is the case for the AOCs. The pump & treat approach is an established technology with known design standards and performance. System design is straightforward, as extraction well positions and flow rates can be determined using groundwater modeling methods. Water treatment requirements are also well-established. The materials and labor needed for water treatment system operation may be higher compared to other technologies. Contaminant mass removal may be slow due to the low solubility of organic compounds and slow desorption of contaminants, therefore, pump & treat may take longer to achieve remedial goals than other options. While a pump & treat system can help prevent plume migration and remove free product, costs for remediation of an entire plume can be prohibitive. The pump & treat alternative will be evaluated such that it can be used in conjunction with the OU1 pump & treat system.

These systems can require long durations to reduce contamination, but there are techniques to increase their efficiency and to help in overcoming what is known as “tailing” or the gradual decrease in removal of contamination over time, with concentrations remaining above the target cleanup levels (EPA, 2002b).

Technologies such as in-situ flushing may be used in conjunction with a pump & treat system to enhance contaminant recovery. Chemical processes may also be used to overcome tailing. If physical processes contribute to the tailing, chemical enhancement may be unsuccessful in improving efficiency of the system. Specific information about the chemical processes contributing to the tailing is needed to choose agents that can be used to improve the system's effectiveness. Other factors, such as delivery of the reactive agent where needed and ability of the agent to remove target contaminants must be considered carefully (EPA, 2002b).

Further site characterization beyond what is normally completed in a RI, treatability testing and pilot studies may be necessary. Additional capital and O&M costs for wells and treatment facilities can be incurred. Contingency and/or alternate remedies may need to be included in the decision documents to provide for the transition to other technologies, should residual contamination remain after use of pump & treat alone, or if tailing off occurs.

Groundwater pumping is normally most effective in aquifers with high hydraulic conductivities. Data related to the hydraulic conductivity, concentration and areal extent of contamination, contaminant and soil properties, depth and seasonal fluctuation of the water table, ground/surface water interaction, and the depth, location and pumping rates of any wells that are likely to be influenced by remedial activities at the site are required in designing the pump & treat system (EPA, 1996).

Groundwater pump & treat has not been retained for further analysis due to the reasonably long timeframes associated with this technology in achieving RAOs.

6.2.4.3 Deep Well Injection

Deep well injection and sequestration is a liquid waste disposal technology that uses injection wells to place and sequester treated or untreated liquid waste into geologic formations that have little potential to allow migration of contaminants (FRTR, 2002).

Deep well injection would likely face regulatory hurdles under the Underground Injection Control (UIC) Program. Compliance with other environmental programs, including the Safe Drinking Water Act, Clean Water Act and RCRA may also be required, depending on the remedy chosen and waste characteristics. There are likely to be community acceptance issues related to implementing this remedy as well, due to the presence of a Sole Source Aquifer and other factors. Deep well injection has not been retained for further analysis.

6.2.5 Treatment

Available groundwater treatment technologies include in-situ biological treatment, including enhanced bioremediation, phytoremediation and natural attenuation. Natural attenuation is discussed separately, as it is not an active remedial technology and is included as part of MNA/LTM. Thermal and physical/chemical treatment options are also available.

6.2.5.1 In Situ Biological Treatment

Enhanced Bioremediation

Generally, in situ bioremediation technologies employ engineered systems to heighten the effects of naturally occurring degradation mechanisms. The engineered systems are designed to enhance bioremediation and accelerate the natural biodegradation process by introducing nutrients, electron acceptors, heat, and/or contaminant-degrading microorganisms to the subsurface. Various bioremediation technologies can be used in situ to treat soils and groundwater without removing it from the ground. This approach reduces the cost of handling and associated environmental impacts. Ex situ processes require removal of contaminated soil or groundwater to be treated (EPA, 2000a).

Depending on the COC and the media, bioremediation may work through aerobic or anaerobic metabolism. In selecting a bioremediation technology, the COC, media, biological pathways of degradation and site conditions must all be considered.

Technologies that involve the addition of supplemental microbes to the subsurface are referred to as bioaugmentation technologies. Microorganisms able to degrade specific contaminants (e.g., as *Dehalococcoides* bacteria can degrade chlorinated solvents) are added where their type or numbers are insufficient to remediate the contamination. Microorganisms may be "seeded" from populations already present or be introduced from cultivated strains of bacteria designed to degrade specific contaminants. The addition of key nutrients (e.g., nitrogen and phosphorus) is used to supplement other bioremediation methods, so the availability of nutrients does not limit the effectiveness of the in-situ bioremediation. Supplemental electron donors are added as a reductant in the redox reaction used by the degrading microorganisms, for example, hydrogen-containing or generating compounds. Electron acceptors add oxygen (for aerobic processes) or an anaerobic oxidant (e.g., nitrate) to support microbial processes that degrade the contamination (EPA, 1996).

The components of in-situ bioremediation technologies can be implemented in different general configurations, including direct injection, groundwater recirculation, PRBs, thermal heating, and bioventing. The configurations include vertical and horizontal wells, and trenches for both injection and extraction of groundwater, or to inject amendments to support the biodegradation processes. Any of these systems is used to enhance degradation through the addition of microbes, nutrients, oxidants, or reductants into the aquifer or soil.

The rate of bioremediation can be enhanced by increasing the concentration of oxygen (creating an aerobic condition) or adding a carbon substrate (under anaerobic conditions) to the groundwater. Oxygen enhancement can be achieved by either sparging air below the water table or circulating chemically bound oxygen (i.e., hydrogen peroxide or other oxygen releasing compound) throughout the contaminated groundwater zone. Air sparging is typically used in conjunction with SVE or bioventing to introduce supplemental oxygen and enhance removal of the volatile component of the subsurface contamination (EPA, 1996).

Under anaerobic conditions, a carbon nutrient or electron source is circulated throughout the groundwater contamination zone to enhance the natural rate and process of bioremediation. In co-metabolism, the COC is degraded as a result of a side reaction. For example, microorganisms

may be provided with a fuel source and just so happen to degrade other contaminants at the same time (e.g., TCE).

Factors that may limit the applicability and effectiveness of these processes at the site include the time needed to remediate the plume, which may require years; air injection that may result in vapor generation and accumulation in buildings; and the potential incomplete degradation of CVOCs to toxic by-products (e.g., vinyl chloride). Some type of vapor collection and treatment system is likely to be required. Other technologies (e.g., in-well flushing) may be used to increase the efficacy of these options.

Enhanced bioremediation has been retained for further evaluation for the AOC.

Phytoremediation

Phytoremediation uses plants to remove, transfer, stabilize and destroy organic/inorganic contamination in groundwater. Plants are selected based on their ability to extract or degrade the COCs, local growing conditions, biomass, root depth and structure, growth rate, water uptake and other factors.

Plant mechanisms that enable phytotechnologies to remove, destroy, or otherwise treat or contain contaminants include the following. Phytoextraction involves contaminant uptake by plant roots, with subsequent accumulation or transformation in plant tissue. Periodic harvesting and disposal is needed to avoid recontaminating the soil when plants die. Organic contaminants are usually transformed rather than accumulated within the plant tissue. Phytodegradation also involves the uptake of contaminants; with metabolic processes within the plant breaking them down. Phytodegradation can be used to process organic contaminants, including chlorinated solvents.

Phytovolatilization is the uptake, transformation or phytodegradation of a contaminant into a plant with subsequent transpiration to the atmosphere. It is used for groundwater and soluble soil contaminants. Transformation or degradation of TCE may produce vinyl chloride, which can be degraded by sunlight.

Rhizodegradation works by utilizing microbial activity in the root zone, enhancing the breakdown of chlorinated solvents and other contaminants. It can be considered "plant-assisted bioremediation" and has been shown to be effective in degrading chlorinated solvents.

Phytosequestration or phytostabilization immobilizes contaminants within the root zone, limiting their migration. Contaminants are retained in the soil, therefore plant harvesting and disposal is unnecessary. Monitoring of the system to verify that contaminants are not migrating to plant tissue and plant viability is necessary. It can also help prevent migration of soil contaminants with erosion, soil dispersion, and leaching.

Phytohydraulics is the control of water movement through evapotranspiration by plants.

Generally, the use of phytoremediation is limited to shallow groundwater with lower contaminant concentrations, and requires a large surface area of land for remediation (ITRC, 2009).

Because of the nature and extent of contamination and the developed nature of the site, phytoremediation technology for groundwater remediation will not be considered further.

6.2.5.2 In-Situ Physical/Chemical Treatment

Physical treatment technologies are those that employ air, water or other means to oxygenate, agitate or flush contamination through the subsurface to enhance its removal. Chemical treatment options use various processes (e.g., ultraviolet [UV] radiation) to degrade contaminants. These physical and chemical treatment technologies are described below.

Air Sparging

Air sparging (AS) is a physical treatment that involves injecting air directly into the subsurface to volatilize contaminants from the liquid phase to the vapor phase for treatment or removal, and to enhance biodegradation of contaminants via the introduction of oxygen. It is effective in treating chlorinated solvent contamination.

Air sparging uses commercially available equipment and is a relatively simple, lower cost technology. The equipment can be readily installed and may require minimal oversight, as no waste streams are generated and the technology is compatible with other technologies (e.g., SVE and bioventing). It does require careful design and operation and is best suited to sites with sandy soils and aquifer depths less than 50 feet bgs.

Injected air traverses horizontally and vertically in channels through the soil column, creating a subsurface “air stripper” effect that removes contaminants through volatilization. The injected air helps to flush, or sparge the contaminants upward into the unsaturated zone where a SVE system is usually implemented in conjunction with air sparging to remove the generated vapor phase contamination in soil.

The lateral and vertical placement of the air injection wells and screened intervals are determined to maximize operational efficiency. The homogeneity and coarseness of subsurface materials, length of screened interval and other factors are used to place wells, based on the radius of influence that can be expected as a result of the site and system characteristics (Marley, et al 1992).

Sites treated with air sparging technology have shown significant rebound of contaminants after treatment, possibly due to poor monitoring, untreated residuals of the influence of preferential pathways in the subsurface. These result in the incorrect conclusion that contamination levels were truly trending downward when that may not be the case. It has been recommended that sites continue to be sampled for at least one year after air sparging is stopped.

Air sparging increases the rate of contaminant volatilization, and therefore may result in the potential for migration of VOC-impacted vapor to receptors at potential levels of concern. An SVE system can be used to reduce this problem, but proximity to buildings or other structures should be considered to avoid inducing vapor intrusion. This technology is not suitable for treating sites having significant geological stratification or heterogeneity, as these prevent uniform air flow and reduce effectiveness.

Air sparging has been retained for further evaluation for the AOC.

Bioslurping

Bioslurping is another physical treatment option that combines the two remedial approaches of bioventing and vacuum-enhanced free product recovery to address LNAPL contamination. Bioventing stimulates the aerobic bioremediation of hydrocarbon-contaminated groundwater. Vacuum-enhanced free-product recovery extracts LNAPL from the capillary fringe and the water table without extracting large quantities of groundwater.

A bioslurping system consists of a well with an adjustable length "slurp tube" that is connected to a vacuum pump is lowered into the LNAPL and pumped to remove LNAPL and groundwater. The vacuum-induced negative pressure zone in the well moves LNAPL toward the well; when the LNAPL level declines in response to the pumping, the slurp tube draws and extracts vapors, increasing air movement, increasing oxygen flow and thereby enhancing aerobic bioremediation. LNAPL and groundwater removed via the slurp tube are sent to an oil/water separator, and vapors to a liquid/vapor separator. Bioslurping can achieve greater recovery rates than either skimming or dual-pump methods. It can have lower costs and result in less aquifer "smearing", where movement of contaminants (e.g., with water table fluctuations) increases the area of soil impacted, therefore increasing the volume of contaminated groundwater. However, it may induce biofouling of well screens due to active aeration (Ground-Water Remediation Technologies Analysis Center (GWRTAC), 1996).

Conditions that may limit the applicability of this technology include that it can be less effective in tight (low-permeability) soils; aerobic biodegradation of chlorinated compounds may not be effective; and collected vapor and/or groundwater generally requires treatment.

Separate phase LNAPL was observed in the groundwater at the vacant lot. Bioslurping is not practicable to this Site due to the depth of majority of contamination and the silty/clay layer nature of the soils. Therefore, bioslurping has not been retained for further evaluation.

In-situ Chemical Oxidation/Reduction

ISCO chemically converts contaminants to less toxic compounds that are more stable, less mobile, and/or inert. It involves injecting a solution of oxidizing agent into the subsurface via an injection well to treat dissolved-phased contaminants. The oxidizing agents most commonly used are ozone, hydrogen peroxide, potassium permanganate, hypochlorites, zero valent iron (ZVI), chlorine, and chlorine dioxide. Newer reagents (i.e., alkaline activated persulfate, nanoscale ZVI) may also be considered. Matching the oxidant and in-situ delivery system to the COCs and the site conditions is a key factor in successful implementation and achieving performance goals.

ISCO can be a viable remediation technology as it is effective for mass reduction of organic compounds in groundwater, has a relatively rapid treatment time, and is implementable with commercially available equipment. There are safety requirements for handling and administering large quantities of hazardous oxidizing chemicals; a need to monitor the fate and transport of the chemicals in the aquifer; and naturally occurring organic material in the formation that can consume large quantities of oxidant.

The effective distribution of reagents in the treatment zone and the reactivity of a particular oxidant with the COCs are critical to the success of this technology. Robust site characterization, screening, and feasibility testing is required, particularly related to understanding subsurface heterogeneities or preferential flow paths. The reagents consume natural organic matter in the subsurface, some of it contaminated. As the organic matter is depleted, this contamination can be released to groundwater, especially in highly permeable soils. The amount of natural organic matter content and site-specific hydrogeology can impact this technology's effectiveness, making it challenging to achieve mixing of groundwater and oxidants.

Advantages of ISCO include faster remedial timeframe. However, both the concentration and distribution of contamination in the vapor, liquid, and sorbed phases can be disturbed and must be monitored (Adventus, 2007; Huling, 2006).

Chemical oxidation has been used for more than 50 years to treat wastewater ex-situ and is being applied to in-situ remediation of groundwater. The injected solution can have a tendency to displace groundwater, react with natural organic matter and only then react with contaminated groundwater. It also has potential to displace the plume, increasing chemical migration. There are certain safety hazards involved in the use of the reagents, particularly in a densely developed area, including heat generation from the exothermic reaction generated in the treatment process, and the resulting potential for damage due to fire and explosion if not carefully managed.

Chlorinated solvents can also be degraded via reductive processes. In-situ chemical reduction (ISCR) can utilize either ZVI or dual-valent iron (DVI) to facilitate the chemical reduction of these contaminants through the creation of low redox potential and production of hydrogen. ISCR can minimize the formation of "daughter products", such a vinyl chloride and can overcome the "dichloroethene (DCE) stall", where further dechlorination to ethane does not occur, or does so very slowly during solvent remediation.

In a hypoxic (low Eh; low oxygen) subsurface environment, ISCR is particularly advantageous. Before implementing the ISCR technology, analysis of the treatment area (e.g., use for source removal or plume control), contaminant characteristics, presence of non-aqueous phase liquid (NAPL), remedial timeframe, potential environmental impacts (i.e, secondary plumes) and health & safety issues is required (Adventus, 2007).

Chemical oxidation/reduction has not been retained for further analysis as a remedial option and enhancement technology due to the potential for interfering with the effectiveness of the OU1 remedial system.

Dual Phase Extraction

Dual-phase extraction (DPE), also known as multi-phase extraction or vacuum-enhanced extraction, utilizes a vacuum system to physically remove various combinations of contaminated groundwater, separate-phase product (LNAPL), and soil vapor from the subsurface. Extracted liquids and vapor are treated and collected for disposal or discharge, under applicable State regulations.

DPE systems are utilized in low permeability or heterogeneous formations. The vacuum extraction well includes a screened section in the zone crossing contaminated soils and groundwater, removing contaminants from above and below the water table. The system lowers the water table around the well, exposing more of the impacted formation. Contaminants in the newly exposed vadose zone are then more amenable to vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and groundwater are separated and treated (EPA, 2004d).

DPE has not been retained for further analysis because the contamination is relatively deep at the AOCs.

Thermal Treatment

In-situ thermal treatment methods mobilize chemicals through soil and groundwater by heating them. The chemicals then move through soil and groundwater toward wells to be collected and piped to the surface for treatment. The heat can destroy or vaporize certain chemicals.

Thermal methods can be used to separate contaminants from soil or groundwater matrices. They can be used in-situ and employ steam, hot air or hot water injection; electrical resistance and radio frequency heating that converts groundwater to steam. Ex-situ thermal desorption technologies include direct-fired methods, that apply flame to contaminated media (usually soil); indirect-fired, using heated air for desorption; and indirect-heated systems, using an externally fired heat source to desorb contaminants.

Thermal treatment can use steam forced into an aquifer through injection wells to vaporize volatile and semi-volatile organic contaminants. Injected steam condenses and raises the temperature of the soil and pore water, inducing a steam front in the subsurface. This process mobilizes both liquids and vapors towards recovery wells. The steam front is characterized by high contaminant concentrations in both the vapor and aqueous phase. Air may also be injected along with the steam. This approach promotes in-situ oxidation of contaminants.

As an example, electrical resistivity heating (ERH) is an in situ thermal remediation technology that uses the heat generated by the resistance of the soil matrix to the flow of electrical current to raise subsurface temperatures up to the boiling point of water (100°C). ERH applies electricity into the ground through electrodes and current flows between them within the treatment volume. Heat causes the underground contaminants and water to evaporate, creating in situ steam and vapor. Contaminated vapor and steam are extracted using vacuum extraction wells and treated above ground. This technology is very successful in areas with low permeability soils.

A steam injection system consists of injection and extraction wells. For small areas, injection wells in a clean zone may surround a central extraction well near the middle of a source area to minimize the risk of spreading contaminants. In larger areas, multiple arrays of injection and extraction wells are used to heat and capture mobilized contaminants.

Thermal treatment has been retained for further analysis.

In-Well Air Stripping

With in-well air stripping, a physical treatment technology, air is injected into a vertical well that has been screened at two depths. The lower screen is set in the groundwater saturated zone, and the upper screen is set in the unsaturated zone. Pressurized air is injected into the well below the water table, aerating the water. The aerated water rises in the well and flows out of the system at the upper screen, inducing localized movement of groundwater into (and up) the well as contaminated groundwater is drawn into the system at the lower screen. VOCs vaporize within the well at the top of the water table, where the air bubbles are out of the water. The air injection removes volatiles and establishes a circulation pattern of oxygen-saturated water in the aquifer that may also enhance the biodegradation rate.

The contaminated vapors accumulating in the wells are collected via vapor extraction contained within the well. Vapor phase treatment typically occurs above grade. The partially treated groundwater is never brought to the surface; it is forced into the unsaturated zone, and the process is repeated as water follows a hydraulic circulation pattern or cell that allows continuous cycling of groundwater. As groundwater circulates through the treatment system in-situ, and vapor is extracted and treated, contaminant concentrations are reduced.

For effective in-well treatment, the contaminants must be adequately soluble and mobile so they can be transported by the circulating groundwater. In general, in-well air strippers are more effective at sites containing high concentrations of dissolved contaminants with high Henry's Law constants. The radius of influence and groundwater flow regime around the well requires careful consideration in design and operation of the system (FRTR, 2002). Site and system characteristics to be considered are similar to those for air sparging, described above.

In-well air stripping is effective for the removal of organics in aquifers with relatively high permeability or in larger “plume” sites as opposed to the OU2 source site AOCs. In-well air stripping has not been retained for further evaluation.

Passive/Reactive Treatment Barriers

These are treatment barriers that combine physical and chemical treatment. They allow the passage of impacted groundwater while causing the degradation or removal of contaminants. One example, a PRB is a passive in-situ treatment zone that degrades contaminants as groundwater flows through it. The reactions within the PRB are dependent on pH, redox potential, contaminant concentrations, and other factors. The hydrogeology must be conductive and a relatively shallow confining layer is needed to “key” into and thereby contain the system. Most PRBs are installed as either a funnel-and-gate or continuous trench.

A PRB is installed across the flow path of a contaminant plume, allowing the water portion of the plume to passively move through the wall. PRBs may combine a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include ZVI, nanoscale ZVI, chelators, sorbents, or microbes. The contaminants will either be degraded or retained in a concentrated form by the barrier material. The barrier could provide permanent containment for relatively benign residues or provide a decrease volume of the more toxic contaminants for subsequent treatment.

The passive/reactive treatment technology may be an efficient and effective technology for addressing groundwater contaminants given the developed nature of the AOC and the concentrations and configuration of the groundwater plume. However, due to the limited space available at these AOCs, PRB technology has not been retained for further analysis.

In-situ Flushing

The process involves the injection of an aqueous solution, commonly through vertical wells, into a contaminated zone. This may be within the vadose zone (the soil above the water table), the saturated zone, or both. The solution then flows through the contaminated zone and the resulting effluent is extracted downgradient where it is treated and discharged or re-injected. The aqueous solution injected may contain surfactants or co-solvents.

In-situ flushing has been used with conventional pump & treat and other methods of remediation to enhance the solubility or mobility of the contaminants, thus accelerating the remediation process. This technology was developed to treat chemicals with low solubility, such as DNAPL, that can remain in the soil for decades, slowly dissolving into the groundwater plume. By increasing the solubility or mobility of these contaminants at the source, in-situ flushing can provide a faster, more efficient method for soil and groundwater remediation (GWRTAC, 1997).

Although separate phase liquid were not identified in the UGA contaminant plumes, DNAPL is a potential concern in still unidentified source areas. In-situ flushing with water (which is effective as the flushing agent for dissolved PCE/TCE in groundwater) or co-solvents can be considered as an enhancement to be used in concert with another technology to increase contaminant recovery. However, it may potentially interfere with the effectiveness of the OU1 remedial system and has therefore not been retained for further analysis.

6.2.5.3 Ex-Situ Biological Treatment

The following ex-situ treatment technologies assume the pumping of impacted groundwater at the site, prior to treatment.

Bioreactors

Contaminants in extracted groundwater are put into contact with microorganisms in attached or suspended growth biological reactors. Contaminated groundwater is circulated in suspended media, such as activated sludge, within an aeration basin. In attached systems, such as rotating biological contractors and trickling filters, microorganisms are established on an inert support matrix.

Given the dilute nature of the contamination and low biological oxidant demand (BOD) in the groundwater, this technology will not readily support a microbial population density adequate for remedial purposes. Therefore, bioreactors have been screened out and will not be evaluated further.

Constructed Wetlands

The constructed wetlands-based treatment technology uses natural geochemical and biological processes inherent in a wetland ecosystem to accumulate and fixate/remove metals and other contaminants from influent waters. The wetland technology can utilize filtration or the degradation process for CVOCs, although removal of high concentrations of CVOCs has not been well-established with these systems.

Typically, large tracts of land are needed to establish adequate treatment wetlands, and are not readily available in this highly developed area. The wetland components would also need to be monitored and maintained (FRTR, 2002). For these reasons, constructed wetlands technology has not been retained for further evaluation.

6.2.5.4 Ex-Situ Physical / Chemical Treatment

The following ex-situ treatment technologies are considered in conjunction with pump & treat technology, as they require the pumping of impacted groundwater to the surface prior to treatment.

Adsorption

The adsorption process consists of passing contaminated groundwater through a sorbent media. Contaminants are adsorbed onto the media, reducing their concentration in the bulk liquid phase. Adsorption mechanisms are generally categorized as physical, chemical, or electrostatic adsorption. The most common adsorbent used is granular activated carbon (GAC).

Liquid phase GAC adsorption is a process where groundwater is pumped through a series of canisters or columns containing activated carbon to which dissolved organic contaminants adsorb. When the concentration of contaminants in the effluent from the bed exceeds a certain level, the carbon can be regenerated in place; removed and regenerated at an off-site facility; or removed and disposed of off-site. Vapor phase GAC adsorption is a similar process used for removing VOCs from vapor/air streams resulting from treatment such as SVE, in-situ thermal treatment and in-well air stripping (FRTR, 2002).

It should be noted that if concentrations of vinyl chloride are detected in liquid or vapor phase treatment processes that cannot be handled by adsorption, alternate methods to handle vinyl chloride (e.g., clay materials; oxidation) may need to be employed as an adjunct technology to GAC adsorption.

Adsorption is a viable technology for VOC treatment of extracted groundwater and vapors. Therefore adsorption via GAC has been retained for further evaluation.

Advanced Oxidation Processes

Advanced oxidation processes, including the use of UV radiation, catalytic oxidation, ozone, and/or hydrogen peroxide can destroy organic contaminants in groundwater. Chlorinated hydrocarbons (e.g., TCE, PCE, and vinyl chloride) are rapidly destroyed in UV/oxidation

processes. However, pretreatment of the water stream may be needed to minimize maintenance requirements of the oxidation treatment component.

If ozone is used as the oxidizer, an ozone destruction unit(s) may be required to treat off-gases resulting from treatment and where ozone gas may accumulate or escape, to avoid a safety hazard. Advanced oxidation technology is also associated with high energy requirements (FRTR, 2002). Advanced oxidation has been screened out as a stand alone technology as having higher cost with no improvement in effectiveness. It will be considered as an enhancement if deemed useful for recalcitrant residual contamination.

Ex-situ Air Stripping

Ex-situ air stripping has been used in conjunction with pump-and-treat systems to enhance performance; it separates volatile organics from groundwater by increasing the surface area of the contaminated water exposed to air. Methods include packed towers, diffused, tray and spray aeration. The process as conducted in a packed tower involves spraying contaminated water over the packing in the column, with a fan moving air against the water flow, with a sump under the tower to collect decontaminated water. Modifying packing configurations can increase VOC removal efficiency. For example, a low-profile air stripper packs a number of trays in a very small chamber to maximize air to water contact while minimizing space. Because of the significant space saved, these units enhance the practicability of ex situ air stripping.

It can take decades to reach RAOs using pump & treat with an air stripping system. Successful implementation of this technology is largely dependent on the capture of the entire plume. Issues limiting the practicability and effectiveness of ex situ air stripping include: biological fouling, requirements for pumping and treatment of large volumes of water; moderate to high energy demands; and off-gases that require collection and treatment.

Ex situ air stripping, particularly using a low-profile air stripper has not been retained for further evaluation as an enhancement to pump & treat technology.

Groundwater Pump & Treat

Groundwater pump & treat to remove dissolved phase contaminants from the aquifer and bring them to the surface for treatment is a potentially applicable remedial technology. Treatment is typically a series of physical, chemical, or biological processes, with ultimate discharge or disposal of the treated water to surface water, groundwater or a POTW.

Treatment and monitoring of extracted groundwater is required where restoration of the resource is a RAO, as it is here. The pump & treat approach is an established technology with known design standards and performance. System design is straightforward; water treatment requirements are also well-established. Due to the high CVOC concentrations in the groundwater, the presence of NAPL, and the presence of silt and clay at depth, it is anticipated that this technology will take a relatively long period of time to reach RAOs at the source areas.

Pump & treat technology has not been retained and will not be evaluated further.

6.2.6 Discharge/Disposal

Discharge technology options address the means of disposal and/or discharge of groundwater that has undergone some sort of remedial processing and is either safe to discharge to the environment as is, or requiring further treatment to protect human health and the environment prior to release to the air, water or a sewer system. There is specific guidance and numerous regulatory requirements related to the disposal or discharge of CERCLA wastes or emissions

The CERCLA Compliance with Other Laws Manual, Parts I and II (EPA 1988, 1989) provides an analysis of ARARs for Superfund Site discharges, including those related to compliance with the Clean Water Act and National Pollutant Discharge Elimination System (NPDES) program, for surface water and POTW discharges; the Safe Drinking Water Act and its drinking water (i.e., MCLs), UIC and Sole Source Aquifer programs, as well as RCRA and air quality programs. These may all relate directly to the RAOs for the AOCs.

6.2.6.1 On-Site Discharge

Surface Water

This option consists of discharging extracted and treated groundwater to surface water. This approach can be an effective and implementable discharge method where surface water standards can be met. However, on-site discharge has not been retained for further evaluation since “pump & treat” has not been retained.

Groundwater

On-site discharge to an infiltration basin consists of discharging treated groundwater to the subsurface via wet wells. This can be an effective and implementable discharge method where UIC and other regulatory requirements can be met. On-site discharge to an infiltration gallery has not been retained for further evaluation since pump & treat or other ex situ technologies have not been retained.

6.2.6.2 Off-Site Discharge

POTW

Off-site discharge to a POTW consists of discharging treated groundwater directly to a sanitary sewer line or transporting the water to and off-site POTW via tanker trucks. This approach can be an effective and implementable discharge method, where CERCLA aqueous waste discharge requirements can be met (EPA, 1990b, EPA 1991). In evaluating the potential discharge to a POTW, the waste stream proposed must be characterized qualitatively and quantitatively, to assure the ability to treat the waste stream and maintain compliance with the candidate POTW’s permit requirements, and that treatment capacity is available. The POTW’s compliance status, whether the conveyance to be used is a combined or separate sanitary sewer system and other factors are also to be considered. Off-site discharge to the POTW has not been retained for further evaluation.

6.3 Retained Remedial Technologies for AOCs

For the purposes of the FS, AOC1 is assumed to consist of Cedarwood Cleaners, 1245/1255 West Broadway, the LIRR substation ROW and the section of West Broadway between Cedarwood Cleaners and 1245/1255 West Broadway. AOC2 consists of Piermont Cleaners.

AOC1 & AOC2 - Groundwater and saturated soils

- No action
- ICs
- LTM
- Treatment – Air Sparging, In Situ Thermal, Enhanced Bioremediation, and Adsorption

7.0 EVALUATION OF PROCESS OPTIONS

An evaluation of the retained process options was completed relative to the AOCs identified in Section 3.0. Process options were evaluated based on effectiveness, implementability and cost. The groundwater process options were evaluated based on effectiveness to treat both groundwater and soils in the saturated zone. Process options that cannot be effectively implemented within an AOC due to current use restrictions and/or topography were eliminated from further consideration. The saturated soil and groundwater at AOC1 is predominantly characterized by the presence of PCE and TCE contamination. The saturated soil and groundwater at AOC2 is characterized by the presence of PCE and to some extent TCE contamination. The evaluation was applied to process options based on the characteristics of the AOC. A summary of the saturated soil process option evaluation is included in Table 6-1 and the groundwater process option evaluation is included in Table 6-2 and discussed in greater detail below.

7.1 Common Process Options to Soil and Groundwater

Common process options that were retained for both saturated soil and groundwater include in situ thermal remediation, and SVE/air sparging. The no action option, ICs, and LTM were also included for evaluation.

No Action – The no action option will not meet the RAOs for AOC1 and AOC2 and will not be acceptable to the local community or the state. There is no cost associated with this option. The no action option has been retained to provide a basis for comparison with other active remedial process options.

Deed Restrictions – Deed restrictions will not reduce the mass of contamination at AOC1 and AOC2 but are effective in protecting human health by restricting future site uses or activities that may result in direct contact with contamination. Future land use must be restricted via legal restrictions that require continued implementation to remain effective. LTM, including site inspections, is generally required. These measures, however, would not reduce the toxicity and migration of contaminants or the extent of environmental impacts and would not reduce site contaminant concentrations to protective levels. The implementation cost is generally low. Deed restrictions can be used in conjunction with other remedial process options and have been retained for further consideration.

In-Situ Thermal Remediation – Thermal treatment transfers heat into the subsurface soil and contaminants, causing groundwater and the contaminants to vaporize or evaporate, increasing diffusion rate and solubility of contaminants, and potentially enhancing abiotic degradation or even biological degradation of contaminants. The advantage of thermal treatment compared to other in-situ technologies is that thermal treatment can effectively treat low permeability soils. Heat can be delivered by direct conduction of heat away from heaters in wells (thermal conductive heating); by passing electrical currents through the subsurface (ERH); steam

injection; or by propagating radio frequency energy into the soil from source transmitters (radio frequency heating). Contaminants transferred into the vapor phase rise to the unsaturated zone where they are captured by vacuum extraction and then treated above ground. In-situ thermal remediation has been successfully applied to remove contamination sources in silty or clayey soils. Due to the evaporation of groundwater, water levels within the treatment zone decrease, thus creating a hydraulic gradient toward the treatment zone and acting as a hydraulic control. The contaminant vapor can be effectively captured in the vadose zone using vertical or horizontal SVE system and treated above ground.

Toxicity, mobility, and/or volume of contaminants are reduced by thermal processes. Because heat can be generated and conducted through soil regardless of permeability, thermal treatment may be more effective in clayey soils than technologies that depend on flow pathways for removal of contaminants. Depending upon the available footprint at the site and current use, the process is implementable in vadose soils and in groundwater. High capital and low to medium O&M costs (over a relatively short timeframe) are typically associated with thermal treatment systems. This process option has been retained for further evaluation.

SVE – SVE is used to eliminate offsite migration of vapors in conjunction with groundwater air sparging. SVE wells would be installed above the water table and a vacuum would be applied to mobilize soil gas and removes VOCs in the vadose zone by vaporization and volatilization. The VOCs stripped from the groundwater via air sparging would rise along with air into the unsaturated zone where they would be captured by the SVE wells. An off-gas treatment system using vapor phase GAC adsorption may be necessary to limit the release of contaminants to the atmosphere. The ability of the SVE wells to capture the contaminants forced into the unsaturated zone is an important component due to the potential risk of VOC migration into basements located within the area of contaminated groundwater. Most components of the system are easy to implement. Medium capital and medium O&M costs are involved. This process option is retained for further analysis.

Air Sparging (AS) – AS is a technique in which air is injected into the groundwater for the purpose of removing organic contaminants by volatilization. It is typically used in conjunction with SVE to eliminate offsite migration of vapors. As air moves up through the groundwater, VOCs partition into the gas phase and are transported to the vadose zone. The VOCs stripped from the groundwater would rise along with the air into the unsaturated zone where they would be captured by the SVE system. AS/SVE has been shown to be effective in removing VOCs from the groundwater. This process is dependent upon how well the injected air permeates into the groundwater from the injection point. Most components of the system are fairly easy to implement. Medium capital and medium O&M costs are involved. Therefore, this process option has been retained for further analysis.

LTM – LTM includes periodic sampling and analysis of groundwater (and perhaps soils). An LTM program provides an indication of the movement of contaminants and/or of progress of

remedial activities. LTM alone would not be effective in meeting the RAOs. It would not alter the effects of contamination on human health and the environment. LTM could be easily implemented, particularly given the existing monitoring well network that exists. LTM involves low capital and medium O&M costs. Therefore, LTM has been retained for further analysis.

7.2 Groundwater Process Options

Additional retained groundwater process options include well drilling restrictions, in-situ anaerobic bioremediation, and carbon adsorption.

Well Drilling Restrictions – Well drilling restrictions may effectively meet RAOs from a human health standpoint through restriction of future site uses or activities which may result in direct contact with contaminated groundwater. The migration and environmental impact of the contaminated groundwater will not be reduced. Implementation would be easy via the existing permitting process. The cost to implement is low. Well drilling restrictions can be used in conjunction with other remedial process options and have been retained for further consideration.

In-situ Bioremediation – Bioremediation biologically transforms chlorinated VOCs into non toxic compounds over a wide range of concentrations in groundwater. Enhanced anaerobic biodegradation (EAB) involves the injection of an electron donor, nutrients, and/or dechlorinating microorganisms as necessary into the subsurface. The electron donors considered for the AOCs include lactate, whey, and emulsified vegetable oil (EVO) Lactate and whey generally last three to six months in the subsurface, while EVO may last for two or three years. In situ bioremediation has been successfully applied at many sites. The effective delivery of the amendment into the contaminated soil matrix would be critical for success. As described above, in situ thermal technology may be able to be utilized as an enhancement for bioremediation. Bioremediation is implementable, and the equipment and materials are readily available. Medium to high capital and low O&M costs are involved. In-situ bioremediation has been retained for further analysis.

Vapor Phase Activated Carbon Adsorption – Carbon adsorption can be used to treat vapor phase contamination. The contaminated effluent from an SVE or thermal treatment system is drawn through vessel(s) containing GAC to which contaminants are adsorbed and are, thereby, removed from the waste stream. When the concentration of contaminants in the effluent exceeds a breakthrough concentration, the GAC is removed for regeneration or disposal. Carbon adsorption can effectively treat TCE and PCE. Carbon adsorption is not effective in removing vinyl chloride, a degradation product of TCE and PCE, however, vinyl chloride has not been detected in any of the OU2 RI samples to date. Activated carbon adsorption is implementable and a proven technology. The equipment and materials are readily available. This technology involves medium capital and medium O&M costs. This process option has been retained for further analysis.

8.0 DEVELOPMENT AND SCREENING OF REMEDIAL ACTION ALTERNATIVES

In Sections 6 and 7, a screening and evaluation of potentially effective remedial action technologies and process options, respectively was performed. In this section, remedial action alternatives are assembled by combining the retained remedial technologies and process options.

Technologies and process options that were retained for remediation of saturated soil and groundwater at the AOCs include:

- No action
- Deed Restrictions
- Well Drilling Restrictions
- LTM
- AS
- SVE
- In-situ Thermal Remediation
- In situ Bioremediation
- Carbon Adsorption

To develop remedial action alternatives for the AOCs, representative process options were selected from the same groups of remedial technologies, as appropriate. However, other process options may still be applicable and should be considered during the RD stage of the project.

Based on available OU2 RI data, saturated soil and groundwater are contaminated at both AOCs. A PDI will be conducted as discussed in Section 8.1.1 and will be used to refine these assumptions and target treatment zones and areas during the RD.

8.1 Description of Remedial Alternatives

The following alternatives were developed for the AOCs:

- Alternative 1 - No Action
- Alternative 2 - SVE, Air Sparging, LTM, and ICs
- Alternative 3 - In Situ Thermal Treatment, LTM, and ICs
- Alternative 4A - In Situ Bioremediation, LTM, and ICs
- Alternative 4B - In Situ Bioremediation with heat enhanced plume attenuation (HEPA), LTM, and ICs

For the purposes of the FS, AOC1 is assumed to consist of Cedarwood Cleaners, 1245/1255 West Broadway, the LIRR substation ROW and the section of West Broadway between Cedarwood Cleaners and 1245/1255 West Broadway. AOC2 consists of Piermont Cleaners.

For the FS, all OU2 RI data were evaluated for purposes of identifying, screening, and evaluating viable technologies and remedial options. As discussed in Section 3.2, based on available data saturated zone soils are contaminated at AOC1 up to approximately 80 feet bgs. Due to intermittent sampling at Piermont Cleaners, it is assumed that saturated zone soils are contaminated at AOC2 up to approximately 38 feet bgs. It is assumed in this FS that saturated soil contamination will be addressed via groundwater remediation technologies and process options.

Based on available data, it is assumed that groundwater contamination (PCE concentration ≥ 100 µg/l) exists throughout AOC1 up to a depth of approximately 80 feet bgs. Groundwater contamination (PCE concentration ≥ 100 µg/l) exists at AOC2 up to a depth of 38 feet bgs; dilute groundwater contamination exists up to approximately 87 feet bgs. It is assumed that dilute groundwater contamination (i.e, PCE concentration ≤ 100 µg/l) at and beyond the source area boundaries will be captured by the downgradient OU1 groundwater extraction and treatment system (Section 3).

This section also provides a detailed description and preliminary design assumptions for each alternative identified above. These descriptions are conceptual in nature and outline potential and relevant technologies and processes that could be utilized in each alternative. These details are used to complete alternative evaluations and to estimate costs. The preliminary design assumptions are based on information available at the time this FS was prepared. Data gaps will be addressed during a PDI for purposes of developing the design. The implementation of the final remedial action will be determined during the RD phase. Common elements included in two or more alternatives are discussed in the first section below followed by the detailed description of each alternative.

8.1.1 Common Elements- Alternatives 2, 3, and 4

PDI

Based on existing analytical data, saturated soil and groundwater are contaminated at both AOCs. Assumptions have been made in the FS for areas that were not fully investigated during the RI, specifically, the western interior sections of the building and select areas of the parking lot at Cedarwood Cleaners, the portion of West Broadway between Cedarwood Cleaners and the vacant lot, the interior of the building and select areas of the parking lot at Piermont Cleaners. Additional borings are therefore required to verify these assumptions, address data gaps and obtain design parameters for the completion of a RD at AOC1 and AOC2. All of the alternatives except for Alternative 1 will include a PDI. A PDI would typically include soil sampling, groundwater screening, well installation and sampling.

As feasible, additional soil sampling beneath the Cedarwood Cleaners and Piermont Cleaners building is recommended (vertical or angled drilling). Test pits may also be considered at locations beneath the buildings and in the adjacent parking areas for purposes of identifying historic infrastructure (piping, drains) that may help in pinpointing PCE release locations and mechanisms. Sample results from the PDI will be compared to PRGs to better define the extents of remediation and volumes needing treatment. The below paragraphs provide a conceptual framework of PDI work that may be conducted.

At AOC1, groundwater (shallow UGA) is encountered at approximately 12 to 15 feet bgs. For the AOC1 PDI, it is assumed that soil borings will be installed up to a depth of 15 feet bgs or the water table, whichever is deeper. For costing purposes, it is assumed that soil samples will be collected at five feet intervals from zero up to 15 feet bgs and analyzed for VOCs. However, it should be noted that during the PDI, samples will be collected at depths and in locations for which analytical data is currently not available. Samples will be characterized and field logged. For purposes of this FS, it was estimated that a total of 30 soil borings will be installed and approximately 90 soil samples will be collected for laboratory analysis during the PDI at AOC1. Test pits maybe installed during the PDI at the Cedarwood Cleaners property (soils will be logged in terms of indications of contamination, NAPL, or historic infrastructure; no or limited laboratory analysis). A total of five temporary 2-inch PVC groundwater monitoring points are assumed to be installed to varying depths from 15 feet bgs up to 80 feet bgs, in or adjacent to the residential properties north and west of AOC1, and groundwater samples will be collected at depths for which analytical data is currently not available. For purposes of this FS, it was estimated that groundwater samples will be collected at five feet intervals for a total of 70 groundwater samples and sent for laboratory analysis during the PDI at AOC1. A total of five permanent 2-inch PVC monitoring wells to 80 feet bgs can be installed at or downgradient from AOC1 during the PDI in order to monitor remedial progress and supplement data from the 10 existing monitoring wells. For purposes of this FS, it was estimated that groundwater samples will be collected from 15 monitoring wells during the PDI to serve as a baseline. The actual number of samples and borings will be determined during the RD.

Depth to groundwater is approximately 17 to 18 feet bgs at AOC2. Borings will be installed to a depth of 18 feet bgs at AOC2 or the water table, whichever is deepest, and soil samples are assumed to be collected at depths for which analytical data is currently not available. It is assumed that soil samples will be collected at five feet intervals from zero to 18 feet bgs (vadose zone soils) and analyzed for VOCs. Samples will be characterized and field logged, and visual signs of contamination will be noted. For purposes of this FS, it was estimated that a total of eight soil borings will be installed and 32 soil samples will be collected for laboratory analysis during the PDI at AOC2. A total of five temporary 2-inch PVC groundwater monitoring points will be installed to varying depths from 18 feet bgs to 38 feet bgs, in or adjacent to Piermont Cleaners at AOC2, and groundwater samples will be collected at depths for which analytical data is currently not available. For purposes of this FS, it was estimated that groundwater samples

will be collected at five feet intervals for a total of 25 groundwater samples (with laboratory analysis for VOCs) during the PDI at AOC2. A total of five permanent 2-inch PVC monitoring wells to 38 feet bgs will be installed at or downgradient from AOC2 during the PDI in order to monitor remedial progress and supplement data from the two existing monitoring wells. For purposes of this FS, it was estimated that groundwater samples will be collected from seven monitoring wells during the PDI to serve as a baseline. The actual number of samples and borings will be determined during the RD.

It is understood that the OU2 transducer study and additional rounds of synoptic water level elevations will continue for a period of time (months) as part of the PDI to capture variations in the local groundwater flow at the AOCs.

LTM

This alternative will be considered as a contingency and/or adjunct remedy after implementation of an active remediation technology to address contamination that does not respond to continued treatment. It may also be considered for implementation in areas of existing lower level contamination that cannot be cost-effectively remediated with the selected active source remediation technology and where doing so maintains the protectiveness of the remedy. LTM involves monitoring over time for CVOCs to confirm progress in contaminant reduction to achieve RAOs.

Soil monitoring would consist of implementing a soil sampling program within the most contaminated areas and along the perimeter of the AOC boundary. For cost estimating purposes, it is assumed that 10 soil borings will be installed at each AOC semi-annually for the first five years and annually thereafter as applicable to the alternative. The selection of the soil sampling locations will depend on the selected alternative for the AOC and can be adjusted during the treatability study and/or RD phase of the project and as determined necessary in the future, during implementation based on reviews of the remedy's effectiveness.

Groundwater monitoring would consist of a network of wells located within and downgradient of the AOC boundary. Groundwater LTM may be coordinated with OU1 monitoring, and data collected as part of the OU2 monitoring will be used to inform the remediation of the OU1 plume (i.e., confirm that optimization is occurring in OU1 by documenting OU2 RAOs are being achived). It is assumed that this well network will generally include the existing and newly installed monitoring wells located within the OU2 AOCs and downgradient of the plume area. For cost estimating purposes, it is assumed that 15 monitoring wells at AOC1 and seven monitoring wells at AOC2 will be sampled semi-annually for the first five years and annually thereafter as applicable to the alternative. The selection of specific wells will depend on the selected alternative for the AOC and can be adjusted during the treatability study and/or RD phase of the project and as determined necessary in the future, during implementation based on reviews of the remedy's effectiveness.

Monitoring program changes might be necessary should contaminant concentrations (e.g., toxic daughter products or mobilized contaminants from the source zone) increase or spread to new locations (in the case of groundwater). Changes in subsurface geochemistry that have an impact on contaminant degradation could also be criteria to modify the site long-term monitoring program. Once the AOC's remedial goals are met, the need for verification monitoring and appropriateness of terminating the performance monitoring would be decided.

Institutional Controls

Because of contaminated groundwater, well drilling restrictions would be placed on AOC1 and AOC2 to restrict future intrusive activities that would expose users to contaminants at levels that may pose human health risk. These controls do not reduce the subsurface contamination or promote restoration of the resource. New York State Environmental Conservation Law Article 15, Title 15 (ECL 15-1527) requires any well, other than a public water supply well (which are regulated by the NYSDOH) to obtain a permit before withdrawing water from anywhere on Long Island. This program is implemented in cooperation with the Nassau County Department of Health.

The effectiveness of ICs will be assessed over the course of the site remedial action. Performance monitoring of the ICs and contaminant concentrations is necessary to support decisions regarding the continuation and/or revisions to the monitoring program or ICs, the need and timing of implementation of identified contingency or alternative remedy options, and/or verifying remedial goals have been met and termination of performance monitoring. AOC-specific criteria are to be developed to define what will trigger changes to or termination of the monitoring, a need for additional site characterization, changes in ICs and/or implementation of a contingency or alternative remedy.

Five Year Review

While the Site is on the NPL, a review of site conditions would be conducted every five years using data collected through the long term inspection and maintenance program to ensure protection of human health and the environment.

Green Remediation Practices

"Green Remediation" is the practice of considering all environmental effects of the implementation of a remedy and incorporating option to maximize the net environmental benefit of cleanup actions. During the RD, compliance with EPA Region 2's "Clean & Green" policy and other applicable guidance, and implementing additional green remediation strategies will be considered. The following green remediation objectives (EPA, 2008; 2010; 2016) are provided as a guideline:

- Achieve remedial action goals,

- Support use and reuse of remediated parcels,
- Increase operational efficiencies,
- Reduce total pollutant and waste burdens on the environment,
- Minimize degradation or enhance ecology of the site and other affected areas,
- Reduce air emissions and greenhouse gas production,
- Minimize impacts to water quality and water cycles,
- Conserve natural resources,
- Achieve greater long-term financial return from investments, and
- Increase sustainability of site cleanups.

The following green practices may be implemented for the selected remedial alternative, as applicable, and will be evaluated further for the selected OU2 remedy during the RD:

Energy

- Look for energy efficient equipment and maintain equipment at peak performance to maximize efficiency.
- Consider installing renewable energy systems to replace or offset electricity requirements otherwise met by the utility.

Fuel and Air Emissions

- Cleaner fuel such as ultra-low sulfur diesel can be used for all construction vehicles.
- Minimize equipment idling time during construction to reduce fuel consumption.
- Minimize dust export of contaminants.

Land and ecosystem impacts

- Minimize soil and habitat disturbance.
- Reduce noise and lighting disturbance.

Material Re-Use and Recycling

- Use technologies designed to minimize waste generation.
- Re-use materials whenever possible- Soils excavated during trenching can be used as backfill material rather than importing new material from offsite.
- Coal Combustion Products (CCP) in Concrete- Instead of traditional cement, consider the use of CCP materials such as fly ash.
- Asphalt- Demolition asphalt from trenching can be transported off-site for recycling. Asphalt using recycled materials can be used to restore the asphalt that is demolished.

Long-term actions

- Install renewable energy systems to power long-term cleanup and future activities on redeveloped land.
- Use passive sampling devices for long-term monitoring, where feasible.
- Solicit community involvement to increase public acceptance and awareness of long-term activities and restrictions.

8.1.2 Alternative 1 - No Action

The No Action alternative is required by the NCP to be carried through the screening process. The No Action alternative serves as a basis for comparison with active remediation technologies. Under this alternative, no action would be taken to remediate or monitor the contaminated saturated soil and groundwater at AOC1 and AOC2. This alternative would also not involve ICs. Contaminants present in the saturated soil will remain in place. Groundwater will continue to migrate and the contaminants would continue to attenuate through natural processes such as dilution and dispersion.

Detailed Description

The No Action alternative provides a baseline for comparison with other active remedial alternatives. Because no remedial activities would be implemented under the No Action alternative, long term human health and environmental risks for AOC1 and AOC2 essentially would be the same as those identified in the OU2 risk assessment screening or continue to impact the underlying groundwater. This alternative would not reduce or prevent the potential human exposure to contaminated groundwater. There are no capital, O&M, or monitoring costs associated with this alternative. There are no permitting or institutional legal restrictions needed for this alternative. This alternative will not meet any of the RAOs for AOC1 and AOC2 and is unlikely to be accepted by the state and/or local community.

8.1.3 Alternative 2 – AS, SVE and LTM, ICs

This alternative includes AS in combination with SVE, LTM, and ICs.

Under this alternative, AS/SVE would be implemented at AOC1 and AOC2, including the saturated soils beneath the building in order to reduce the concentrations of contaminants in saturated soil and groundwater at each AOC and thereby reduce the remedial timeframe of the OU1 extraction and treatment system. LTM and ICs would be implemented to monitor contaminant concentrations in the plume.

A PDI would be conducted as discussed in Section 8.1.1 to address data gaps that are necessary to complete the RD. A pilot study would be conducted to obtain design parameters (power needs, air flow rates, and vacuum pressures) for a full scale application.

The AS/SVE system consists of a network of air injection or sparging wells installed into the saturated zone and a network of vapor extraction wells installed into the vadose zone. An air compressor or blower will be used to deliver a stream of air under pressure to the subsurface via the sparging well, and vacuum pumps or blowers will be utilized for the removal of contaminants in the vapor phase through the vacuum extraction well. VOCs in the vapor phase are collected from each vacuum extraction well and pumped via a vacuum extraction blower to a treatment system. For the purposes of evaluation, comparison, and costing in the FS, vertical extraction wells are used as the representative process option. However, horizontal extraction wells may also be considered during the RD to access the area under the building and West Broadway.

For cost estimating purposes, GAC is assumed as the vapor phase treatment option for the treatment system. At the treatment area, the collected vapors containing VOCs are passed through the GAC medium, adsorbed, and the clean air is vented to the atmosphere. Air emissions must meet the substantive requirements of NYSDEC's air emissions regulations. High relative humidity of the treated vapor (i.e., above about 50%) reduces the adsorption efficiency of the GAC. In addition, moisture and condensate can accumulate within the vapor extraction piping. To address these issues, vacuum extraction blowers will be specified so that sufficient heat is imparted to the vapor stream and the relative humidity is maintained within satisfactory limits. When the GAC is spent (i.e., saturated with VOCs), it will be transported off-site and replaced with fresh material. For cost estimating purposes, it is assumed that replacement of the GAC will be required twice a year depending on actual mass removal rates achieved. The ultimate configuration of the entire vapor recovery/treatment system, including GAC usage rates over time, should be based on the results from the pilot study. Air monitoring and inspection of the vapor treatment system after startup may also determine system requirements.

A typical AS/SVE Process Schematic is shown on Figure 8-4. A temporary treatment structure at each AOC will house the blowers, air compressors, moisture separators, controls, and GAC vapor treatment units. It is currently assumed that a treatment building will be constructed at each AOC; one in the front parking lot of Cedarwood Cleaners and one in the rear parking lot of Piermont Cleaners. The exact location of the treatment building will be confirmed with the property owner during the design stage. A part-time operator will be needed to maintain and operate the system. O&M costs are assumed to include electricity to operate the system; periodic repair and replacement of system parts and components; routine inspection; system monitoring; replacement of GAC units; and performance and compliance sampling.

It is assumed that the property at AOC1 and the active remedial area at AOC2 will be fenced to restrict access during construction. Due to the limited space available on the AOC1 property, it is also assumed that a portion of Hewlett Parkway, immediately adjacent to Cedarwood Cleaners will be closed one-way and used as a contractor staging area during construction for AOC1. The back parking lot at Piermont Cleaners is assumed to be used as a contractor staging area for AOC2 during construction. These assumptions will be refined further during the RD.

It is estimated that approximately 3,510 linear feet of trenching will be required at AOC1 and 760 linear feet of trenching will be required at AOC2 for the installation of the AS/SVE piping system. It is assumed that the AS and SVE piping will be placed within the same trench. It is estimated that 3,510 linear feet of asphalt will be excavated and require off-site disposal from the installation of the AS/SVE system. It is assumed that any nonhazardous soil that is excavated from within the trench will be reused as backfill.

The entire footprint of Cedarwood Cleaners and Piermont Cleaners is covered with asphalt and concrete pavement and a slab on-grade building which combined act as a cap over the contaminated soil area. The existing pavement and building cap will improve the effectiveness of the SVE system by minimizing short circuiting of air flow from the ground surface. An asphalt cap will be installed at the vacant lot to improve effectiveness of the AS/SVE system.

For the purpose of this FS, a preliminary assessment of the AS/SVE system configuration, radius of influence (ROI), and air flow rates have been made based on a typical application and available site geology and hydrogeology data.

AOC1:

The SVE system will be sized to maintain a vacuum over the approximately 48,570 square feet of area which includes Cedarwood Cleaners, the properties at 1244/1245 West Broadway, a portion of West Broadway and the LIRR Substation ROW as shown on Figure 8-1a. As shown in Figure 8-4, 53 vacuum extraction wells will be installed at AOC1. Wells will be installed on either side of West Broadway. Each vacuum extraction well will be flush mounted with the existing ground surface and installed to a depth of approximately 10 feet bgs since depth to water is expected at 15 feet bgs at AOC1. Each well will be 4 inches in diameter, and constructed of schedule 40 PVC. The extraction wells will have a 5 feet screen length from 5 to 10 feet. Based on the site geology, each well is expected to have an ROI of approximately 25 feet. However, pilot testing and field measurements in the pre-design phase of the work will determine the number of vacuum extraction points, placement, and depth of each well. All conveyance piping will be installed below grade and used to connect the wells to a centrally located blower/treatment system. A vacuum will be generated by a blower, and collected vapor will be treated via GAC units.

A conceptual design includes 59 AS wells at AOC1 as shown in Figure 8-1a. The AS wells will be placed in the saturated zone to a depth of approximately 80 feet bgs. The total number of AS wells was determined based on a total plume area of approximately 48,570 square feet and ROI of approximately 15 feet in each sparge well.

AOC2:

The SVE system will be sized to maintain a vacuum over the approximately 7,400 square feet of area at Piermont Cleaners. As shown in Figure 8-1b, 10 vacuum extraction wells will be installed at AOC2.

Each vacuum extraction well will be flush mounted with the existing ground surface and installed to a depth of approximately 12 feet bgs since depth to water is expected at approximately 17 to 18 feet bgs. Each well will be 4 inches in diameter, and constructed of schedule 40 PVC. The extraction wells will have a 5 feet screen length from 5 to 10 feet. Based on the site geology, each well is expected to have a ROI of approximately 25 feet. However, pilot testing and field measurements in the PDI will determine the number of vacuum extraction points, placement, and depth of each well. All conveyance piping will be installed below grade and used to connect the wells to a centrally located blower/treatment system. Collected vapor will be treated via GAC units.

A conceptual design includes 14 AS wells at AOC2 as shown in Figure 8-1b. The AS wells will be placed in the saturated zone to a depth of approximately 38 feet bgs. The total number of AS wells was determined based on a total plume area of approximately 7,400 square feet and ROI of approximately 15 feet in each sparge well.

ICs and LTM:

The time for remediation may be relatively on the order of 30 years. For cost estimating purposes, it is assumed that the RAOs for the AOCs will be met in 30 years. The active treatment time is assumed as 10 years. To confirm that the AS/SVE system is achieving RAOs, soil and groundwater samples will be collected for system performance monitoring and analyzed for VOCs. The results of these analyses will be used to determine whether RAOs are being satisfied, and whether changes in the system design, configuration, and operation are required.

ICs such as deed restrictions would be implemented to eliminate the exposure pathways of contaminated soil and groundwater to receptors.

LTM will be conducted on a periodic basis to determine if RAOs are being met. For cost estimating purposes, it is assumed that the LTM will be performed for 30 years. LTM would involve annual groundwater sampling and periodic reviews to monitor and evaluate the migration and changes of contaminant concentrations at AOC1 and AOC2. Soil samples can be collected from the area of highest contamination and from the perimeter of the contaminated area. The LTM will include new and previously installed monitoring wells. For cost estimating purposes, it was assumed that 10 soil borings and 15 monitoring wells will be sampled during the LTM at AOC1. For cost estimating purposes, it was assumed that 10 soil borings and 7 monitoring wells will be sampled during the LTM at AOC2. For cost estimating, it was assumed that LTM will be conducted twice per year for 5 years beyond remediation system startup and annually thereafter.

8.1.4 Alternative 3 – In situ Thermal Remediation, LTM and ICs

This alternative includes in Situ Thermal Remediation. LTM, and ICs will be maintained for the residual plume outside the active treatment area.

Under this alternative, in situ thermal treatment would be implemented at AOC1 and AOC2, including the soils beneath the building in order to reduce the concentrations of contaminants in saturated soil and groundwater at each AOC and thereby reduce the remedial timeframe of the OU1 extraction and treatment system.

For the purposes of evaluation, comparison, and costing in the FS, ERH is used as the representative process option. Other thermal remediation options would be evaluated during the design. A PDI would be conducted as described in Section 8.1.1 to address data gaps that are necessary to complete the RD. Bench scale testing during the PDI phase of the work will provide additional information about the subsurface.

ERH is an in situ thermal remediation technology that uses the heat generated by the resistance of the soil matrix to the flow of electrical current between electrodes to raise subsurface temperatures up to 100°C or the boiling point of water, which may be higher at increased depths below the water table.

Based on information provided by vendors, electricity (3-phase) is connected from the existing utility power source at high or low voltage to a power control unit (PCU). ERH applies electricity into the ground using heavy cables that connect the PCU and electrodes. Electricity flows evenly between electrodes within the treatment volume. The water in the subsurface conducts electricity between electrodes. The electrodes can be installed either vertically to depth or horizontally underneath the building via directional drilling. The final method of installation will be determined during the PDI and RD phases.

Soil is naturally resistant to the flow of electrical current, thereby heating the soil and groundwater. Heat causes the underground contaminants and water to evaporate, creating in situ steam and vapor. Loss of heat at ground surfaces will be minimized by the existing cap at both AOCs. Contaminated vapor and steam are extracted using vacuum recovery wells and treated above ground. The electrodes maybe co-located with the recovery wells. Vapor and steam conveyance piping is made of chlorinated polyvinyl chloride (CPVC) plastic pipe that can withstand design temperatures. All conveyance piping and completion of electrodes will be below grade. Each recovery well is connected to the conveyance pipe that routes the steam and vapors to the condenser.

Temperature monitoring points (TMPs) are installed at 5 foot intervals to monitor the subsurface temperature data continuously. A steam condenser separates the vapors from steam. The resulting condensate is circulated in a cooling tower. The cooled condensate is used as makeup water for the equipment and as drip water for the electrodes to maintain moisture in the soil-electrode interface. The condensate is clean and is reused or discharged to the sewer following treatment with liquid GAC. Vapors are treated prior to discharge to atmosphere via vapor GAC.

A vacuum blower provides continuous subsurface negative pressure vacuum during ERH operations to ensure complete capture of vapors and steam including under operating facilities.

Low permeability areas higher in clay or silt such as at AOC1 are more conductive or are low resistance pathways. These areas attract the electricity first and heat up slightly quicker than the surrounding formation. It should be noted that there is flexibility to turn off some areas that have cleaned up quicker and redirect that energy to other areas that are slower to clean up.

AOC1:

For the purpose of this FS, approximately 221 electrodes co-located with 221 vacuum extraction wells are estimated to be necessary to address removal of VOCs in approximately 48,570 square feet of VOC-contaminated area which includes Cedarwood Cleaners, the properties at 1244/1245 West Broadway, a portion of West Broadway and the LIRR Substation ROW. This includes the saturated soil and groundwater beneath the building. During the PDI, the areal extent of the contaminated plume will be further refined which can be used to tailor this alternative during the RD to address high contaminant zones and be more cost effective.

Each electrode boring will be 12-inch in diameter and installed vertically from 1 to 81 feet bgs and will address saturated zone contamination. Each vacuum recovery well will be co-located with an electrode and installed to a depth of 10 feet bgs as groundwater is anticipated between 12 and 15 feet bgs. The average distance between electrodes will be approximately 16 feet. Twenty TMPs with average 15 sensors each will be installed to monitor the temperature. A conceptual layout of the heating electrodes and recovery wells for the ERH system at AOC1 is shown on Figure 8-2a.

The recovery wells will be connected to a centrally located blower/treatment system. A vapor recovery air flow rate of 2,210 scfm using a 60 horse power (hp) vapor recovery blower is estimated and collected vapor would be treated via GAC units. It is estimated that two- 2,000 pound GAC units in series will be used each month. A schematic of a typical ERH system with vacuum extraction is shown in Figure 8-5.

A temporary building or treatment trailer will be constructed to house the treatment equipment. It is currently assumed that the treatment building/trailer will be constructed in the front parking lot of Cedarwood Cleaners. The exact location of the treatment building will be confirmed with the property owner during the design stage.

Due to space restrictions, temporary closure of tenant operations and the section of West Broadway between Cedarwood Cleaners and the vacant lot is anticipated during drilling and construction of the system at AOC1. It is assumed that the property at Cedarwood Cleaners will be fenced to restrict access for the active duration of the project. Since the saturated zone is being treated at AOC1, it is anticipated that the properties can be occupied during active treatment.

It is assumed that a portion of Hewlett Parkway, immediately adjacent to Cedarwood Cleaners will be closed and used as a contractor staging area for AOC1. System monitoring can be

performed remotely. O&M costs are assumed to include electricity to operate the system, repair and replacement of system parts/components, routine inspection, performance monitoring, compliance sampling and replacement of GAC units.

AOC2:

For the purpose of this FS, approximately 33 electrodes co-located with 33 vacuum extraction wells are estimated to be necessary to address removal of VOCs in approximately 7,400 square feet of VOC-contaminated groundwater beneath the building.

Each electrode boring will be 12-inch in diameter and installed vertically from 1 to 39 feet bgs. Each vacuum recovery well will be co-located with an electrode and installed to a depth of 12 feet bgs as groundwater is anticipated between 12 and 15 feet bgs. The average distance between electrodes will be approximately 16 feet. A conceptual layout of the heating electrodes and recovery wells for the ERH system at AOC2 is shown on Figure 8-2b. All conveyance piping and completion of electrodes will be below grade. The recovery wells will be connected to a centrally located blower/treatment system. A vapor recovery air flow rate of 1,370 scfm using a 40-hp vapor recovery blower is estimated and collected vapor would be treated via GAC units. It is estimated that two- 2,000 pound GAC units in series will be used each month. Twenty eight TMPs with average 6 sensors each will be installed to monitor the temperature. A schematic of a typical ERH system with vacuum extraction is shown in Figure 8-5.

A temporary building or treatment trailer will be constructed to house the treatment equipment. It is currently assumed that the treatment building/trailer will be constructed in the rear parking lot of Piermont Cleaners. The exact location of the treatment building will be confirmed with the property owner during the design stage.

Temporary closure of tenant operations is anticipated during drilling and construction of the system at AOC2. It is assumed that a portion of the property at AOC2 will be fenced to restrict access during construction. Since the saturated zone is being treated at AOC2, it is anticipated that the properties can be occupied during active treatment.

The rear parking lot at Piermont Cleaners is assumed to be used as a contractor staging area for AOC2 during construction. System monitoring can be performed remotely. O&M costs are assumed to include electricity to operate the system, repair and replacement of system parts/components, routine inspection, performance monitoring, compliance sampling and replacement of GAC units.

ICs and LTM:

The time for remediation may be relatively on the order of 22 to 24 months. For cost estimating purposes, it is assumed that the RAOs for the AOCs will be met in 5 years and the active heating time is 2 years. Confirmatory soil and groundwater sampling will be necessary to determine if

the RAOs are achieved. Samples can be collected from the area of highest PCE contamination and from the perimeter of the contaminated area. The residual heat remaining after the cessation of active thermal operations would potentially enhance biological degradation of remaining low concentration contaminants in the vicinity of treatment.

ICs such as deed restrictions and well drilling restrictions would be implemented for areas that are beyond the active treatment area to eliminate the exposure pathways of contaminated soil and groundwater to receptors.

A LTM program would be implemented to ensure that any remaining contaminants within the treatment area would not be pose risks to human receptors. LTM will be conducted on a periodic basis to determine if RAOs are being met. For cost estimating purposes, it is assumed that the LTM will be performed for 5 years. LTM would involve groundwater sampling and periodic reviews to monitor and evaluate the migration and changes of contaminant concentrations at AOC1 and AOC2. The LTM will include new and previously installed monitoring wells. For cost estimating purposes, it was assumed that 10 soil borings and 15 monitoring wells will be samples during the LTM at AOC1. For cost estimating purposes, it was assumed that 10 soil borings and 7 monitoring wells will be sampled during the LTM at AOC2. For cost estimating, it was assumed that LTM will be conducted twice per year for 5 years beyond remediation system startup.

8.1.5 Alternative 4A–In-Situ Bioremediation, LTM, and ICs

Under this alternative, in situ bioremediation would be implemented at AOC1 (Cedarwood Cleaners, the properties at 1244/1245 West Broadway, a portion of West Broadway and the LIRR Substation ROW) as shown on Figure 8-3b and AOC2 (Piermont Cleaners) as shown on Figure 8-3c in order to reduce the concentrations of contaminants in saturated soils and groundwater at AOC1 and AOC2 and thereby reduce the remedial timeframe of the OU1 extraction and treatment system. LTM would be implemented to monitor contaminant concentrations in the AOC1 and AOC2 plume. ICs will be maintained for the residual plume outside the active treatment area.

A PDI would be conducted as described in Section 8.1.1 to address data gaps that are necessary to complete the RD.

For the purposes of evaluation, comparison, and costing in the FS, anaerobic bioremediation via EVO (i.e LactOil™ soy microemulsion) is used as the representative process option. The final remedial action implementation strategy will be developed during the design. A soy microemulsion is a complex mixture of solute and solution present as reversed water-in-oil microemulsion which together comprises a homogenous transparent liquid that is easy to handle and provides greater subsurface distribution.

Anaerobic biodegradation transforms CVOCs into innocuous compounds, such as carbon dioxide, ethene, ethane, and chloride. EVO is known to last longer than some other soluble or solid substrates and requires fewer rounds of injections. EVO is relatively immobile and relies on advection and dispersion for effective delivery throughout the aquifer. Lactate/whey or other

amendments may also be considered and tested in comparison with EVO, in order to select the most cost-effective amendment(s) for AOC1 and AOC2. A pilot study and treatability study would be conducted prior to RD to confirm a suitable site-specific amendment and to obtain site-specific engineering parameters, such as ROI, dosage, and frequency of injections.

EVO is a stable, concentrated, buffered, micro-emulsion of controlled-release, food grade carbon designed for on-site dilution with cold water. EVO creates strong reducing conditions, degrading chloroethanes and chloroethenes through reductive dechlorination with the substrate being fermented to produce hydrogen. The addition of soluble carbon to the subsurface supports the growth of indigenous microbes in groundwater. As bacteria feed on the soluble carbon, they consume dissolved oxygen (DO) and other electron acceptors (contaminants), thereby reducing the redox potential in groundwater. As bacteria ferment the organic portion of the oil, they release various volatile fatty acids (VFAs), which diffuse and serve as electron donors for other bacteria (e.g., Dehalogenators) [Tetra Tech, 2014b]. Some products available in the market right now are designed to distribute further in the subsurface than standard emulsions. These products have micron to sub-micron particle sizes and a low zeta potential so they can move further than a standard emulsion.

Injection wells or direct push technology in a grid configuration would be considered for delivery of amendment into the treatment areas. The emulsion mixture is injected into injection wells or direct push points using a system of pumps, flow meters, control valves, and pressure gauges. Injection into multiple wells may be accomplished using an injection manifold to expedite the injection process (U.S. Air Force, 2007).

The conceptual layout for bioremediation at Cedarwood Cleaners will consist of a grid of injection wells. A typical ROI of 20 feet has been assumed. For cost estimating purposes, the thickness of the treatment zone is assumed to be from 15 feet bgs to 80 feet bgs. It should be noted that based on the PDI results, the injection point layout and quantities will be adjusted to bias high in areas with high contaminant concentrations. The thickness of the treatment zone will also vary in accordance with contaminant distribution.

A total of 23 injection wells are estimated to be installed at Cedarwood Cleaners. A total of 2,650 gallons of EVO solution has been estimated to be injected per well. A total of 40 injection wells were estimated to be installed for the rest of AOC1 with 1,060 gallons of solution injected per well.

Figure 8-3b provides the conceptual enhanced bioremediation injection locations within the AOC1 plume area. For cost estimating purposes two rounds of injections are assumed at AOC1. Based on the results of the LTM, it will be determined if additional rounds are required.

Since it will be difficult and impracticable to install injection wells beneath Piermont Cleaners, for the FS it is assumed that a grid of injection wells will be installed along the front of the building, near the area of highest groundwater contamination. Alternately, during the RD, it maybe determined that a row of injection wells could be installed in the front of the building and a row of injection wells installed in the back. A typical ROI of 20 feet has been assumed for the injection wells. A total of 7 injection wells are estimated to be installed at AOC2 with 1,813

gallons of solution injected per well. Figure 8-3c provides the conceptual enhanced bioremediation injection locations within the AOC2 plume area. For cost estimating purposes one round of injections is assumed at AOC2. Based on the results of the LTM, it will be determined if additional rounds are required.

A pilot study to determine the most appropriate substrate, microbial sufficiency and pre-design parameters on injection well spacing, substrate loading rate, injection frequency, and substrate amendments (e.g., pH buffering compounds, contaminant degrading microorganisms) is required. A pump test would be conducted to obtain site-specific hydrogeological parameters. A permanent monitoring well network described in Section 8.2.1 would be used to monitor remedial progress. The actual selection of the amendment(s) and layout of the pilot study would be developed during the design stage. The final recommended amendment(s) for the remedial action would be selected during the RD.

ICs and LTM:

The time for remediation, including LTM, may be long, on the order of 30 years. For cost estimating purposes, it is assumed that the active treatment time is in excess of 10 years at AOC1 and up to 10 years at AOC2 and RAOs will be met for the AOCs in 30 years. Confirmatory soil and groundwater sampling will be necessary to determine if the RAOs are achieved. Samples can be collected from the area of highest PCE contamination and from the perimeter of the contaminated area.

ICs such as deed restrictions and well drilling restrictions would be implemented to eliminate the exposure pathways of contaminated groundwater to receptors.

LTM will be conducted on a periodic basis to determine if RAOs are being met. LTM would involve annual groundwater sampling and periodic reviews to monitor and evaluate the migration and changes of contaminant concentrations in groundwater at AOC1 and AOC2. The LTM will include new and previously installed monitoring wells. For cost estimating purposes, it was assumed that 10 soil borings and 15 monitoring wells will be sampled during the LTM at AOC1. For cost estimating purposes, it was assumed that 10 soil borings and 7 monitoring wells will be samples during the LTM at AOC2. For cost estimating, it was assumed that LTM will be conducted twice per year for 5 years beyond remediation system startup and annually thereafter.

8.1.6 Alternative 4B –In-Situ Bioremediation with heat enhanced plume attenuation (HEPA), LTM, and ICs

It is likely that multiple rounds of bioremediation injections will be required to meet RAOs at AOC1 due to the elevated CVOC concentrations and the silty-clay layers present in the subsurface. Due to the long remedial timeframes (on the order of 30 years) associated with the traditional in-situ bioremediation alternative, a hybrid approach has been evaluated for AOC1 to improve long term effectiveness and reduce the remedial time. For cost estimating purposes, one round of bioremediation injection followed by gently heating the plume with HEPA to enhance the bioremediation rates was evaluated for AOC1. LTM would be implemented to monitor contaminant concentrations in the AOC1 plume. ICs will be maintained for the residual plume

outside the active treatment area.

This Alternative will not be cost effective at AOC2 due to the lower contaminant concentrations at Piermont Cleaners and therefore has not been evaluated further.

A PDI would be conducted as described in Section 8.1.1 to address data gaps that are necessary to complete the RD.

Based on information provided by vendors, the success of this approach is based on the hypothesis that the microbial community thrives in the heated environment. For the purposes of evaluation, comparison, and costing in the FS, ERH is used as the representative process option for the HEPA element.

By maintaining the subsurface temperature in the range of 37 to 45^0C, an increase in the bioremediation reaction kinetics by about five times has been observed, potentially reducing the remedial time by that factor. Further, elevated temperatures increase the mass transfer of residual DNAPL to the aqueous phase. Elevated temperatures will also increase the hydrolysis rate of the total organic carbon and increase the dissolved organic carbon by up to two orders of magnitude. The HEPA technology is similar to the thermal treatment described in Section 8.1.4, except that the subsurface is maintained at a much lower temperature. Based on information provided by vendors, electricity (3-phase) is connected from the existing utility power source at high or low voltage to a PCU. ERH applies electricity into the ground using heavy cables that connect the PCU and electrodes. For cost estimating purposes, it is assumed that the subsurface at AOC1 will be heated to 37^0C. The system will be monitored to determine the proper voltage/power required to maintain temperature. After the site is at temperature, the PCU can be demobilized and a permanent transformer can be installed and operated to maintain temperature for the remainder of the treatment period. Due to the lower heating temperatures, no vacuum recovery and vapor treatment is required under this Alternative.
The bioremediation element of this alternative will be the same as discussed in Section 8.1.5 (Alternative 4A). For cost estimating purposes, it is assumed that one round of bioremediation injections will be followed by HEPA at AOC1.

HEPA at AOC1:

Approximately 91 electrodes are estimated to be necessary to address AOC1. Each electrode boring will be 12-inch in diameter and installed vertically to 81 feet bgs. The average distance between electrodes will be approximately 25 feet. A conceptual layout of the heating electrodes for the ERH system at AOC1 is shown on Figure 8-3b. All conveyance piping and completion of electrodes will be below grade. The electrodes will be connected to the existing power supply. Twenty TMPs with average 14 sensors each will be installed to monitor the temperature.

Temporary closure of tenant operations and the section of West Broadway between Cedarwood Cleaners and the vacant lot is anticipated during drilling and construction of the system at AOC1. It is assumed that the property at Cedarwood Cleaners will be fenced to restrict access for the active duration of the project. Due to the limited space available on-site, it is assumed that a portion of Hewlett Parkway, immediately adjacent to Cedarwood Cleaners will be closed one-

way and used as a contractor staging area for AOC1. These assumptions will be verified during the PDI and RD phases to minimize disruption to tenant operations and traffic.

ICs and LTM:

The time for remediation, including LTM, may be long, on the order of 25 years. For cost estimating purposes, it is assumed that the active treatment time is 5 years and RAOs will be met for AOC1 in 25 years. Confirmatory soil and groundwater sampling will be necessary to determine if the RAOs are achieved. Samples can be collected from the area of highest PCE contamination and from the perimeter of the contaminated area. The gentle heating would potentially enhance biological degradation of contaminants in the vicinity of treatment.

ICs such as deed restrictions and well drilling restrictions would be implemented to eliminate the exposure pathways of contaminated groundwater to receptors.

LTM will be conducted on a periodic basis to determine if RAOs are being met. LTM would involve annual groundwater sampling and periodic reviews to monitor and evaluate the migration and changes of contaminant concentrations in groundwater at AOC1. The LTM will include new and previously installed monitoring wells. For cost estimating purposes, it was assumed that 10 soil borings and 15 monitoring wells will be sampled during the LTM at AOC1. For cost estimating, it was assumed that LTM will be conducted twice per year for 5 years beyond remediation system startup and annually thereafter.

8.2 Screening of Remedial Alternatives

Since only a limited number of remedial alternatives were developed, all alternatives will be carried forward for detailed analysis. Screening of remedial alternatives will not be performed.

9.0 DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES

This section presents the detailed evaluation of the remedial alternatives described in Section 8.0. The purpose of the evaluation is to identify the advantages and disadvantages of each alternative as well as key trade-offs among the alternatives. The detailed evaluation of alternatives consists of an individual analysis of each alternative against the evaluation criteria and a comparative analysis among the alternatives to assess the relative performance of each alternative with respect to the evaluation criteria.

9.1 Evaluation Criteria

The evaluation was based on criteria established under *Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988b). The nine evaluation criteria have been developed to address CERCLA requirements and to address the additional technical and policy considerations that have proven to be important for selecting among remedial alternatives. The evaluation criteria are as follows:

Overall Protection of Human Health and the Environment: This criterion is an evaluation of the alternative's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure identified in the human health risk assessment are eliminated, reduced or controlled through removal, treatment, engineering controls or institutional controls. The alternative's ability to achieve each of the RAOs is evaluated.

Compliance with ARARs: This criterion evaluates how the alternative complies with the ARARs, if an ARAR waiver is required and the justification for a waiver, if needed.

Long Term Effectiveness and Permanence: Each alternative is evaluated for its long-term effectiveness after implementation. If contamination or treated residuals remain after the selected remedy has been implemented, the following items are evaluated:

- The magnitude of the remaining risks (i.e., will there be any significant threats, exposure pathways, or risks to the community and environment remaining);
- The adequacy of the engineering and institutional controls intended to mitigate the risk;
- The reliability of these controls, and

The ability of the remedy to continue to meet RAOs in the future.

Should the results of this evaluation indicate concerns with the risks or reliability of the remedy, the utilization of technological enhancement, contingency and/or alternative remedies may need to be considered.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment: The alternative's ability to reduce the toxicity, mobility and/or volume of site contamination is

evaluated. Preference should be given to remedies that permanently and significantly reduce the toxicity, mobility, or volume of the contamination at the site.

Short Term Impacts and Effectiveness: The potential short-term adverse impacts and risks of the remedy upon the community, workers, and the environment during the construction and/or implementation are evaluated. A discussion of how the identified potential adverse impacts to the community or workers at the site will be controlled, and the effectiveness of the controls, should be presented. A discussion of engineering controls that could be used to mitigate short term impacts (e.g., dust control measures) is provided. The length of time needed to achieve the remedial objectives is also estimated.

Implementability: The technical and administrative feasibility of implementing each alternative is evaluated for this criterion. Technical feasibility includes such things as the difficulties associated with construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in for example, obtaining specific operating approvals or access for construction and implementation of the remedy.

Relative Cost: This criterion evaluates the estimated capital, operations, maintenance, and monitoring costs for each alternative. Relative costs are estimated and presented on a present worth basis.

State Acceptance: NYSDEC's comments, concerns and overall perception of the remedy are evaluated in a format that responds to all questions that are raised (i.e., a responsiveness summary).

Community Acceptance: The public's comments, concerns and overall perception of the remedy are evaluated in a responsiveness summary.

The eighth and ninth criteria, State and Community acceptance, will be evaluated following comment on the RI/FS report and the proposed plan and will be addressed in preparing the ROD.

9.2 Individual Analysis of Remedial Alternatives

The individual analysis of the remedial alternatives with respect to the first seven criteria is presented below. A comparative analysis of the remedial alternatives is provided within Table 9-1.

9.2.1 Alternative 1 - No Action

Overall Protection of Human Health and the Environment – Alternative 1 provides no control of exposure to contaminated saturated soil and groundwater and no reduction in risk to human health and environmental impacts. The alternative allows for the potential continued migration of contaminated groundwater downgradient and further degradation of the groundwater quality at the AOCs.

Compliance with ARARs – Because no action is being taken, ARARs (non-residential direct contact and impact-to-groundwater soil cleanup standards for soil, and federal and state MCLs for groundwater) will not be met. Under the No Action alternative, chemical-specific ARARs would continue to be exceeded in the area being considered for active groundwater remediation.

Long Term Effectiveness and Permanence – No long term management or controls for exposure are included in Alternative 1. Long term potential risks would remain unchanged under this alternative.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – Alternative 1 will provide no reduction in toxicity, mobility, or volume of the contaminated saturated soil and groundwater.

Short Term Impacts and Effectiveness – Alternative 1 does not result in disruption of the AOCs and therefore no additional risks are posed to the community, workers, or the environment as no remedial actions will occur at the Site.

Implementability – There are no implementability concerns posed by this remedy as no remedial actions are being implemented.

Relative Cost – Because this is a no action alternative, the capital, O&M, and net present worth costs are estimated to be $0. The estimated cost for Alternative 1 is summarized in Table 9-1 and Appendix A1 and B1 for AOC1 and AOC2, respectively. Details of the cost estimate for Alternative 1 are provided in Appendix A2 and B2 for AOC1 and AOC2, respectively.

9.2.2 Alternative 2 – AS/SVE, LTM and ICs

Overall Protection of Human Health and the Environment –Alternative 2 will protect human health and the environment at AOC1 and AOC2 through implementation of an AS/SVE system throughout the remediation area, and ICs for any contaminated areas that may remain after SVE. LTM would be implemented outside and inside the active remediation areas and if needed after the AS/SVE system is no longer active. Alternative 2 will protect human health and the environment at the AOCs through a combination of AS/SVE system implementation throughout the remediation area, ICs, and LTM for any diluted residual plume that may remain after AS/SVE. Operation of the OU1 groundwater extraction and treatment system will protect human health and the environment at the AOCs by capturing any diluted residual plume that may be present beyond the boundaries of active remediation.

Compliance with ARARs – Alternative 2 is expected to achieve compliance with ARARs. Remedial activities for Alternative 2 will be continued until the PRGs are met. LTM will be conducted in areas with diluted residual contamination after the AS/SVE is no longer active to monitor the progress of natural processes to achieve the PRGs. This alternative is expected to meet the ARARs at AOC1 and AOC2, within 30 years.

Long Term Effectiveness and Permanence –AS/SVE has been demonstrated to be effective and reliable at numerous sites for groundwater treatment for VOCs. Soil grain size distribution, soil moisture, and the distribution of contaminants within various soil types are primary factors influencing SVE effectiveness [U.S. Air Force, June 2001]. Due to the clay-silty soils at the site, the effectiveness of an AS/SVE system in desorbing contaminants from such low permeability soils is limited and will be challenging at both AOCs. ICs and LTM, implemented and maintained, will provide adequate protection of human health from a residual diluted plume.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – The SVE system will reduce the volume of contamination by extracting the volatilized contaminants for vapor phase GAC treatment. Extraction of VOCs from the contaminated soil will effectively reduce their mobility, toxicity, and volume. AS/SVE system will reduce the volume of contamination present by injecting air into sparging wells, volatilizing VOCs from the groundwater to the unsaturated zone, and extracting the volatilized contaminants for vapor phase GAC treatment. Extraction of VOCs from the contaminated groundwater will effectively reduce their mobility, toxicity, and volume in the underlying aquifer.

Short Term Impacts and Effectiveness – Implementation of Alternative 2 will result in minimal impacts to human health or the environment. However, normal business operations may temporarily be impacted during installation and startup, and increased traffic and noise during well installation is expected. Based on the magnitude of contamination at Cedarwood Cleaners, it is likely that this Alternative may not be implemented without affecting the existing business operations. AS/SVE could be effectively implemented without significant disruptions of operations at Piermont Cleaners (i.e., construction during weekends or after hours; considering remedy elements to be installed off the front and rear of the building). Since Piermont Cleaners is part of an active strip mall with multiple businesses, efforts would be taken during the RD to implement measures that would cause minimal disruptions to businesses.

The AS/SVE system will consist of a network of wells and piping over the approximately 48,570 square feet of AOC1 which includes Cedarwood Cleaners, the properties at 1244/1245 West Broadway, a portion of West Broadway and the LIRR Substation ROW. Based on the magnitude of contamination at Cedarwood Cleaners, it is likely that the existing business operations will require temporary closure during construction of the system at the Cedarwood Cleaners property for approximately 3 months. The implementation of this alternative will also require street closings (full or partial closing of West Broadway) during construction and access to a portion of the LIRR Substation ROW and properties at 1244/1245 West Broadway as shown on Figure 8-4. Efforts will be made to minimize traffic disruption. A traffic plan will be developed and implemented to re-route the traffic through alternate streets during the RD. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the

design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents.

Implementability – An AS/SVE system is a well-established technology and the equipment and services to install and operate the AS/SVE system are commercially available. AS/SVE technology has been demonstrated successfully in full scale applications. Performance can be easily monitored using saturated-zone and vadose-zone monitoring points.

Successful implementation of this technology at this site depends on an adequate understanding of site geology and its effects on system design. Based on the available subsurface information, the fine grained clay/silt layer is expected to affect the performance of the AS/SVE system by limiting the migration of air and thereby limiting the effectiveness of air delivery and vapor recovery. Extracted vapor could be trapped within the remediation area if the clay/silt layer is continuous. PDI and pilot testing would be necessary to demonstrate effectiveness and to establish the site-specific design parameters. The pilot testing results will be used to determine the optimal well placement, flow rates and additional treatment that may be necessary.

The implementation of this alternative will require street closings (full or partial) during construction. Efforts will be made to minimize traffic disruption. A traffic plan will be developed and implemented to re-route the traffic through alternate streets during the RD. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents. Information provided by EPA indicates that a Building Permit has been issued for the vacant lot space at 1255 West Broadway, but at this time there are no specific plans available for the design or construction on that lot. For cost estimating purposes, it is assumed that a cap will be installed at the vacant lot to prevent any short circuiting. Assuming a commercial building is constructed on grade, it will provide an additional cap to the AS/SVE system and improve its effectiveness. However, if the remedial action is performed prior to building construction, depending on building foundation plans, disruption to the AS/SVE wells and piping is anticipated.

Relative Cost – The present worth cost of Alternative 2 for AOC1 is estimated to be $10,492,429. The capital cost is estimated to be $2,899,086 and the total present value of O&M costs is estimated to be $7,211,883. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 2, AOC1 is summarized in Table 9-1 and Appendix A1. Details of the cost estimate for Alternative 2, AOC1 are provided in Appendix A3.

The present worth cost of Alternative 2 for AOC2 is estimated to be $6,399,321. The capital cost is estimated to be $1,736,759 and the total present value of O&M costs is estimated to be

$4,422,318. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 2, AOC2 is summarized in Table 9-1 and Appendix B1. Details of the cost estimate for Alternative 2, AOC2 are provided in Appendix B3.

9.2.3 Alternative 3 – In situ Thermal Remediation, LTM and ICs

Overall Protection of Human Health and the Environment – Alternative 3 provides overall protection of human health and the environment by actively reducing VOC contaminant levels in AOC1 and AOC2 soils and groundwater through in-situ thermal treatment. Also, Alternative 3 will prevent impact to groundwater because it will remove the VOC contamination from the soils and will prevent further downward migration of VOC contamination to groundwater.

ICs and LTM would be implemented inside and outside of the active remediation areas and if needed after the thermal treatment is no longer active. Alternative 3 will control further spread of the contaminant plume.

Compliance with ARARs – Alternative 3 will achieve compliance with chemical specific ARARs for VOCs. Thermal treatment for VOC contaminated saturated soil and groundwater will continue until the PRGs are met. This alternative is expected to meet the ARARs at AOC1 and AOC2, within 5 years.

Long Term Effectiveness and Permanence – Alternative 3 provides a high degree of long-term effectiveness and permanence. Remedial activities for VOC contaminated saturated soil and groundwater will continue until PRGs are met. Long term potential risks will be removed.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – Alternative 3 will provide reduction in toxicity, mobility, and volume of VOC contamination in saturated soils and groundwater. Contamination migrating to the surface will be collected via a vapor recovery system and treated with GAC. Spent GAC will be regenerated resulting in destruction of the contamination.

Short Term Impacts and Effectiveness – Implementation of Alternative 3 will result in some disruption of AOC1 and AOC2 and construction related risks will be imposed to the community, workers, and the environment. The additional risks will be generated from drilling activities to install the heating /vacuum extraction wells and construction of the treatment system. These risks will be mitigated by the development and implementation of a Remedial Action Work Plan including a Health and Safety Plan and Community Air Monitoring Plan. These plans will provide measures to prevent exposure of workers to the contamination, air sampling to protect the workers and the surrounding community, protection of workers from construction activities, create exclusion zones to protect the public from entering work areas and noise mitigation to prevent impacting the surrounding community. Also, standard industry protocols will be used to prevent dust generation during intrusive work and to provide for traffic control for all equipment on-site and off-site.

For purposes of this FS, it is assumed that regular business activities at AOC1 and AOC2 will be disrupted for 24 months from start to finish during construction. The active heating time is assumed to be 24 months. Since the saturated zone is being treated, it is anticipated that the properties can be occupied during active treatment. These assumptions will be refined during the RD so as to cause minimal disruption to owners/tenants.

The presence and locations of underground utilities needs to be further investigated during PDI work and heating needs to be evaluated for short term impacts to subsurface utilities or structures because the temperature will reach about 100ºC. Temperature rise near utilities will be monitored during remediation. The implementation of this alternative will require streets closings (full or partial) for long periods of time. Efforts will be made to minimize traffic disruption. A traffic plan will be developed and implemented to re-route the traffic through alternate streets during the RD. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents. For purposes of this FS, Alternative 3 is assumed to achieve RAOs in 5 years and the active project duration is assumed as 2 years at AOC1 and 1 year at AOC2.

Implementability – Alternative 3 is implementable with available equipment and material. In-situ thermal treatment is implemented on a number of field remediation projects; however, additional measures will need to be implemented while installing heating wells near the building and underground utilities. Heating sensors will be installed near the utilities to monitor the temperature rise near the utilities which can automatically shut off the heating input for the wells nearby. The existing clay/silt layer present within the remediation area is not expected to affect the rate of heat flux throughout the treatment zone as thermal conductivity value does not vary much between most soil types. The vapor extraction system components of the in-situ thermal technology are more widely used and there is sufficient trained staff to perform the installation, and O&M.

Information provided by EPA indicates that a Building Permit has been issued for the vacant lot space at 1255 West Broadway, but at this time there are no specific plans available for the design or construction on that lot. Assuming a commercial building is constructed, it will provide an additional cap to the thermal treatment system and improve its effectiveness. However, implementability may be adversely affected by future development on the vacant lot considering the high number of electrodes required and high remedial temperatures generated in the subsurface. Implementability will depend on size, location, and type of development that may occur on the vacant lot. If the remedial action is performed prior to construction, disruption to the thermal electrodes, recovery wells, TMPs and piping is anticipated.

Cost – The present worth cost of Alternative 3 for AOC1 is estimated to be $41,048,610. The capital cost is estimated to be $21,632,524 and the total present value of O&M costs is estimated to be $18,722,129. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 3, AOC1 is summarized in Table 9-1 and Appendix A1. Details of the cost estimate for Alternative 3, AOC1 are provided in Appendix A4.

The present worth cost of Alternative 3 for AOC2 is estimated to be $13,548,991. The capital cost is estimated to be $7,256,345 and the total present value of O&M costs is estimated to be $6,015,498. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 3, AOC2 is summarized in Table 9-1 and Appendix B1. Details of the cost estimate for Alternative 3, AOC2 are provided in Appendix B4.

9.2.4 Alternative 4A –In-Situ Bioremediation, LTM and ICs

Overall Protection of Human Health and the Environment – Alternative 4A would protect human health since ICs would be implemented to eliminate exposure pathways to site contaminants. The alternative would also provide protection to the environment by remediating the groundwater contamination source. LTM would assess the changes in contaminant concentrations over time. Enhanced bioremediation treatment of groundwater would reduce concentrations of contaminants in groundwater at the source and would be expected to achieve RAOs and risk reduction in groundwater within the active remediation area. Risks to workers and the public would be controlled during implementation of enhanced bioremediation activities through monitoring and site-specific health and safety plans. LTM and ICs would be implemented to maintain or further reduce CVOCs concentrations in groundwater in areas where active remediation is not being carried out.

Compliance with ARARs –This alternative is expected to meet the ARARs, Federal and State MCLs, for the active groundwater remediation area at AOC1 and AOC2, within 30 years. It is expected that the remaining low contamination in the groundwater outside the remediation areas would gradually decrease to meet the PRGs through natural processes in the overburden in the long term. The action-specific ARARs would be met. Permits would be obtained and permit requirements would be followed for the injection of amendment. A comprehensive health and safety plan would be developed and executed to cover every remedial activity. This alternative would involve shipment of a large quantity of amendment. Applicable New York State Department of Transportation (NYSDOT) requirements for transporting and storing material for the remedial action would be followed. There are no location-specific ARARs for this site.

Long Term Effectiveness and Permanence – Enhanced bioremediation has been demonstrated to be effective and reliable at numerous sites for groundwater treatment for CVOCs. However, the success of the technology is dependent on delivery which is a challenge at the site due to the clay-silt lenses.

This alternative would have long-term effectiveness and permanence for treating the source area contamination and for reducing contamination mass in the source areas but would not be effective in meeting PRGs in a reasonable timeframe. Remaining contamination outside the

active treatment area would be further degraded by natural processes.

ICs would prevent exposure of receptors to contaminated groundwater before the groundwater quality is restored. The LTM and 5-year review would assess the contaminant conditions over time.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – ICs and LTM provide no reduction in the toxicity, mobility or volume of contaminants, and will likely require long periods to reach RAOs through natural processes alone. Enhanced bioremediation uses biological processes to degrade contaminants in groundwater to less harmful compounds. Enhanced bioremediation would reduce the toxicity and volume of contaminants in groundwater but not their mobility.

Short Term Impacts and Effectiveness – Based on the magnitude of contamination at Cedarwood Cleaners, it is likely that this Alternative may not be implemented without affecting the existing business operations. In situ bioremediation could be effectively implemented without significant disruptions of operations at Piermont Cleaners (i.e., construction during weekends or after hours; considering remedy elements to be installed off the front and rear of the building). Since Piermont Cleaners is part of an active strip mall with multiple businesses, efforts would be taken during the RD to implement measures that would cause minimal disruptions to businesses.

Exposure of workers, the surrounding community and the local environment to contaminants during implementation of ICs, enhanced bioremediation, and LTM would be minimal. Construction risk to workers will be minimized by following the Health and Safety and Site Management plans. No difficulties are foreseen with managing the required quantity of the bioremediation injection material, as it is non-hazardous. Temporary disruption and relocation of the business at the AOCs is anticipated during the drilling and injection activities. The implementation of this alternative will require streets closings for long periods of time. A traffic plan will be developed and implemented to re-route the traffic through alternate streets. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents. Experienced vendors would be available to implement this work successfully and safely. Site workers would wear appropriate PPE to minimize exposure to contamination and as protection from physical hazards.

It is anticipated that the active treatment would be in excess of 10 years to complete at AOC1 and up to 10 years at AOC2. The overall duration of the alternative would be determined by the

time required for the contamination to attenuate naturally to PRGs. For costing purposes, it is assumed that the long-term monitoring would last for 30 years.

Implementability – Enhanced bioremediation is a well-established technology and the equipment and services to install and operate the treatment injection system and to sample groundwater monitoring wells are commercially available. Enhanced bioremediation on its own is most effective in contaminant plume areas (OU1). In contamination source areas (OU2), the contaminant concentrations are too high for removal by biological processes alone. PRGs may not be achieved in reasonable remedial timeframes.

Biological amendments such as EVO must be delivered, dispersed, and distributed throughout the formation in order for in-situ bioremediation to proceed. Effective mixing of amendments with the contaminant plume is one of the most difficult design challenges for enhanced anaerobic bioremediation. Groundwater velocity at the site is very slow and thus it could be several years before amendments are adequately distributed by groundwater flow within the source areas. Therefore, instead of PRBs, in situ injections in a grid like pattern will be more effective for OU2. Additionally, there appears to be a very flat gradient in the deep UGA between Cedarwood Cleaners and Piermont Cleaners. This flat gradient may be beneficial to amendment delivery and allow a longer residence time in the silty – clayey matrices at the site.

There are challenges in completing this work related to limited space availability. The construction contractor will have limited space and will need to coordinate road closings. Scheduling and coordination will be considered in detail during the design to minimize impact to the local community.

Information provided by EPA indicates that a Building Permit has been issued for the vacant lot space at 1255 West Broadway, but at this time there are no specific plans available for the design or construction on that lot.

Relative Cost – The present worth cost of Alternative 4A for AOC1 is estimated to be $5,866,084. The capital cost is estimated to be $3,798,403 and the annual O&M cost is estimated to be $1,783,220. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 4A, AOC1 is summarized in Table 9-1 and Appendix A1. Details of the cost estimate for Alternative 4A are provided in Appendix A5.

The present worth cost of Alternative 4A for AOC2 is estimated to be $3,186,371. The capital cost is estimated to be $1,589,854 and the total present value of O&M costs is estimated to be $1,382,456. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 4A, AOC2 is summarized in Table 9-1 and Appendix B1. Details of the cost estimate for Alternative 4A, AOC2 are provided in Appendix B5.

9.2.5 Alternative 4B –In-Situ Bioremediation with HEPA, LTM and ICs

This Alternative is only applicable to AOC1 due to the elevated source area concentrations present in saturated soil and groundwater and the areal extent of the contamination. Under this alternative, in situ bioremediation would be the same technology as described in Alternative 4A and followed by gentle heating using HEPA. The heat generated by HEPA operations would potentially enhance biological degradation of the contaminants within the active treatment area.

Overall Protection of Human Health and the Environment – Alternative 4B would provide protection of human health and the environment. The HEPA and bioremediation treatment would remediate the contaminated plume at AOC1 and reduce contaminant mass. The low contaminant concentrations outside the active area of treatment would be reduced through natural processes in the subsurface. LTM would assess the changes in contaminant concentrations over time. ICs would eliminate potential exposure pathways for local receptors before the groundwater achieves PRGs. This alternative would protect the environment, as contaminated water would be treated. This alternative would meet the RAOs. Risks to workers and the public would be controlled during implementation of all remedial activities through monitoring and site-specific health and safety plans.

Compliance with ARARs – This alternative would meet chemical-specific ARARs by reducing contaminant concentrations to meet PRGs over time (25 years). The contaminant mass and concentrations would be reduced within the active treatment area through HEPA and in situ bioremediation. Low concentrations in the plume outside the active treatment area would be reduced through natural processes. The action-specific ARARs would be met. Permits would be obtained and permit requirements would be followed for the injection of amendment and the HEPA treatment. A comprehensive health and safety plan would be developed and executed to cover every remedial activity. Remedial operations would be inspected and documented regularly. This alternative would involve shipment of a large quantity of amendment and electrodes. Applicable NYSDOT requirements for transporting and storing material for the RA would be followed. There are no location-specific ARARs for this Site.

Long Term Effectiveness and Permanence – This alternative would have long-term effectiveness and permanence. The contaminated groundwater would be remediated through in-situ bioremediation, HEPA and natural processes in the subsurface. In-situ thermal remediation would have high certainty of achieving 99 percent mass decreases in tight soils like the clayey silt encountered at AOC1. Eventually, the treated aquifer would be restored to achieve the PRGs over the long term. This alternative would provide adequate control of risk to human health. ICs would prevent exposure to contaminated groundwater before the groundwater quality is restored. The LTM program, in combination with the five-year review, would assess groundwater contamination conditions and determine the approximate time frame that would be required to meet the PRGs. Enhanced bioremediation has been demonstrated to be effective and reliable at numerous sites for groundwater treatment for CVOCs and is expected to be effective at AOC1 and AOC2. Enhanced bioremediation followed by HEPA could significantly degrade CVOCs in contaminated areas.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment – This alternative would reduce the toxicity and volume of the contaminants in the treatment areas

through a combination of HEPA and biological treatment. The low concentration contaminants in the plume outside the active treatment areas would be reduced through naturally occurring dispersion and dilution processes. Enhanced bioremediation uses biological processes to degrade contaminants in groundwater to less harmful compounds. It is expected that this alternative would achieve the PRGs over time (25 years) at AOC1.

Short Term Impacts and Effectiveness – A significant amount of site work would be involved for this alternative and could have moderate impact to the local community. This alternative would include installation of electrodes and TMPs for HEPA treatment and installation of injection wells for bioremediation. The implementation of this alternative will require some street closings for long periods of time during construction. A traffic plan will be developed and implemented to re-route the traffic through alternate streets. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents. This alternative would also include groundwater sampling, which would have a minimal short-term impact to the community and workers. Use of PPE by workers during the site investigations, groundwater sampling, and construction would minimize their exposure. Construction risk to workers will be minimized by following the Health and Safety and Site Management plans.

The in-situ HEPA operation would be completed in approximately one year, and the in-situ bioremediation would be completed in five years. Assuming the thermal and bioremediation operation would be performed simultaneously, the construction duration is assumed to be five years. The overall duration of this alternative would be determined by the time required for the groundwater contamination in the treatment area to attenuate naturally to meet the PRGs. For costing purposes, it is assumed that the long-term monitoring would last for 25 years.

Implementability – This alternative would be technically implementable. Enhanced bioremediation on its own is most effective in contaminant plume areas (OU1). In contamination source areas (OU2), the contaminant concentrations are too high for removal by biological processes alone. PRGs may not be achieved in reasonable remedial timeframes. This alternative therefore uses a hybrid approach by combining in-situ bioremediation injections with HEPA treatment. Heat enhancement for the OU2 alternative will increase the kinetics of the bacteria and will also help in the delivery of amendment to the less permeable soil matrices which need to be targeted.

Biological amendments such as EVO must be delivered, dispersed, and distributed throughout the formation in order for in-situ bioremediation to proceed. Effective mixing of amendments

with the contaminant plume is one of the most difficult design challenges for enhanced anaerobic bioremediation. Groundwater velocity at the site is very slow and thus it could be several years before amendments are adequately distributed by groundwater flow within the source areas. Therefore, instead of PRBs, in situ injections in a grid like pattern will be more effective for OU2.

There are challenges in completing this work related to limited space availability. The construction contractor will have limited space, and will need to coordinate road closings. Efforts will be made to minimize disruption to traffic. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. Enhanced bioremediation is a well-established technology and the equipment and services to install and operate the treatment injection system and to sample groundwater monitoring wells are commercially available. Installation of sheet pile electrodes and TMPs and in-situ thermal remediation of groundwater have been implemented at many other sites. Pilot studies would be implemented to obtain more Site-specific information for the full scale remediation. Services and materials for implementation of this alternative would be readily available. Competitive bids would be obtained from a limited number of equipment vendors and remediation contractors. No problems would be anticipated for the implementation and enforcement of the ICs. The same groundwater sampling procedures approved by EPA during the RI would be followed. The equipment would be readily available.

Information provided by EPA indicates that a Building Permit has been issued for the vacant lot space at 1255 West Broadway, but at this time there are no specific plans available for the design or construction on that lot. Assuming a commercial building is constructed, it will provide an additional cap to the HEPA thermal treatment system and improve its effectiveness. However, if the remedial action is performed prior to building construction, disruption to the injection wells, thermal electrodes, TMPs and piping is anticipated.

Relative Cost – The present worth cost of Alternative 4B for AOC1 is estimated to be $21,552,450. The capital cost is estimated to be $15,768,864 and the annual O&M cost is estimated to be $5,332,620. The capital cost is primarily the cost of system construction. The estimated cost for Alternative 4B, AOC1 is summarized in Table 9-1 and Appendix A1. Details of the cost estimate for Alternative 4B are provided in Appendix A6.

No costs are included under Alternative 4B for AOC2.

9.3 Comparative Remedial Alternative Analysis

Table 9-1 summarizes the comparison of the four alternatives against the seven criteria.

Overall Protection of Human Health and the Environment

Alternative 1 would not meet RAOs and would not be protective of human health and the environment since no action will be taken. Contamination would remain in the groundwater for a long time in the future, while no mechanisms would be implemented to prevent exposure to contaminated groundwater, or to reduce the T/M/V of contamination except through natural processes which, however, would not be monitored to assess the effectiveness to predict the duration of this alternative.

Alternatives 2 through 4A/B would meet RAOs over time and would provide similar degrees of protection to human health and the environment through in-situ treatment processes, ICs, and LTM.

Compliance with ARARs

Alternative 1 would not achieve chemical-specific ARARs established for soil and groundwater. Action-specific ARARs do not apply to this alternative since no remedial action would be conducted.

Alternatives 2, 3, and 4A/B would meet the PRGs within the active treatment areas in AOC1 and AOC2 over the long term. Alternatives 2 and 3 would meet the PRGs by extraction and treatment of contaminants to eliminate the exposure pathways to human receptors and as a continued source to the groundwater plume. Implementation of in-situ treatment processes would significantly reduce contaminant concentrations in the saturated treatment area. The areas outside the active treatment area would gradually reduce to meet PRGs through natural processes in the long-term. Contaminant concentrations would not reduce within a reasonable timeframe at AOC1 in Alternative 4A due to the elevated CVOC concentrations and silty-clay layers present at AOC1. Alternatives 2, 3, and 4A/B would meet the action-specific ARARs by following the health and safety regulations and waste handling and disposal regulations, as applicable.

There are no location-specific ARARs associated with OU2.

Long-Term Effectiveness and Permanence

Alternative 1 would not be effective or permanent since there would be no mechanisms to prevent exposure to contaminated soil and groundwater.

Alternatives 2 through 4A/B would provide long-term effectiveness and permanence by using in-situ treatment processes to reduce the contaminant mass in the treatment area. Remaining low concentration contaminants outside the active remediation area would be further degraded through natural processes in the long term. Additionally, ICs would ensure continued protection of human health receptors in the long-term under Alternatives 2, 3, and 4A/B.

Among Alternatives 2 through 4A/B, Alternative 3 using in-situ thermal remediation would provide the highest mass reduction of groundwater contamination at the AOCs in the shortest period of time, followed by Alternative 4B using bioremediation and HEPA (*not applicable for AOC2*). Alternative 4A using bioremediation alone would enhance degradation of contaminants

but over a longer remedial timeframe.

Alternative 2 using AS/SVE would provide the least mass reduction of groundwater contamination in the source areas due to its limitations in low permeability clay-silty soils. .

Alternatives 2 through 4A/B would provide adequate control of risk to human health by implementing ICs and engineering controls until the aquifer is restored to PRGs. Alternative 3 using in-situ thermal remediation would be the most reliable mass reduction technology followed by Alternative 4B using in-situ bioremediation and HEPA, followed by Alternative 4A using in-situ bioremediation. Alternative 2 using AS/SVE system would be the least reliable mass reduction technology due to the limitations of this technology in clay-silty soils.

Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative 1 would not provide any reduction of toxicity, mobility or volume of contaminants since no remedial action would be conducted. The total volume of contaminated groundwater might increase if natural processes are unable to contain the plume.

Alternatives 2, 3, and 4A/B would provide reduction of toxicity, mobility, and volume through treatment and removal of contaminants. Alternative 3 using in-situ thermal remediation would be the most effective in reducing toxicity and volume of contamination in soil and groundwater through treatment, followed by Alternative 4B using in-situ bioremediation and HEPA, Alternative 4A using in-situ bioremediation, and finally Alternative 2 using AS/SVE system.

Short-Term Effectiveness

Alternative 1 would not have short-term impacts since no action would be implemented.

There would be significant short-term impacts to the local community and workers for Alternatives 2 through 4A/B due to the active remedial actions undertaken and associated construction, operation and/or treatment activities.

Based on the magnitude of contamination at Cedarwood Cleaners / Vacant Lot and the relatively small size of the work area, it is likely that Alternatives 2 through 4A/B may not be implemented without affecting the existing business operations.

Alternative 2 through 4A could be effectively implemented without significant disruptions of operations at Piermont Cleaners (i.e., construction during weekends or after hours; considering remedy elements to be installed off the front and rear of the building). Since Piermont Cleaners is part of an active strip mall with multiple businesses, efforts would be taken during the RD to implement measures that would cause minimal disruptions to adjacent businesses.

Since the saturated zone is being treated at AOC1 and AOC2, it is anticipated that the properties can be occupied during active treatment in Alternative 3.

The implementation of each alternative will require streets closings (full or partial) for long periods of time. Efforts will be made to minimize traffic disruption. A traffic plan will be developed and implemented to re-route the traffic through alternate streets during the RD. Coordination and access would be required from Nassau County Department of Public Works and Town of Hempstead for work conducted within West Broadway and for any closures of roads and sidewalks for staging or remedial action purposes. Permits would be required for restoration of road pavement surfaces disturbed by the remedy. The traffic plan will be developed during the design and discussed with owners and local police for traffic control routes and agreeable working schedule to minimize the inconvenience to local businesses and residents. Air monitoring, engineering controls and appropriate PPE would be used to protect the community and workers for Alternatives 2 through 4A/B.

Implementability

All five alternatives are implementable. Alternative 1 would be easiest both technically and administratively to implement as no additional work would be performed at AOC1 and AOC2. Alternatives 2 through 4A/B would be equally implementable.

Alternatives 2 through 4A/B would be technically implementable since services, materials and experienced vendors would be readily available. Pilot studies would be implemented to obtain site-specific design parameters for Alternatives 2 and 4A/B. A permit would be required to inject bioremediation amendment into the subsurface and/or to discharge treated vapor to the atmosphere under the thermal alternative.

Implementability of Alternatives 2 through 4 in the vicinity of West Broadway will depend on traffic re-routing and management since this is a high traffic area. In AOC1, the EPA has reported that the property owner of the vacant lot has obtained a Building Permit from the local municipality. Although no details of future development on that lot are available, implementability can be adversely affected for Alternatives 2, 3, and 4A/B by future construction.

Technological implementability of Alternatives 2 through 4A/B is established at many other Superfund Sites and their success rate depends on site specific conditions. Based on the conditions at this Site, with high levels of contamination in clay/silty layers, Alternative 3 using in-situ thermal remediation, will have the highest success rate followed by Alternative 4B using in-situ bioremediation via HEPA and then Alternative 4A using in-situ bioremediation. Due to the limitations of AS/SVE in clay/silty layers and source area concentrations, Alternative 2 is likely to have the least success rate.

Cost

A comparative summary of the cost estimates for each alternative is presented in Table 9-1, and Appendix A1 for AOC1. In summary, Alternative 1 has no cost. Alternative 3 using in situ thermal treatment has the highest cost followed by Alternative 4B using in situ bioremediation and HEPA, and Alternative 2 using AS/SVE. The cost of Alternative 4A using in situ

bioremediation alone is the lowest.

A comparative summary of the cost estimates for each alternative is presented in Table 9-1, and Appendix B1 for AOC2. In summary, Alternative 1 has no cost. Alternative 3 using in situ thermal treatment has the highest cost, followed by Alternative 2 using AS/SVE. The cost of Alternative 4A using in situ bioremediation is the lowest.

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TABLES

Table 3-1
Range of VOCs in Exterior Soil Gas
Peninsula Boulevard Superfund Site, OU2

Analytes	Concentration Range Detected (µg/m^3) Low - High				No Criteria Available for Exterior Soil Gas
	Cedarwood Cleaners	Piermont Cleaners	Vogue Cleaners	Mill Road Cleaners	
1,1-Dichloroethene	ND	ND	ND	ND	NA
cis-1,2-Dichloroethene	ND - 2,300	3.3 - 950	ND	ND	NA
Tetrachloroethene	22 - 110,000	1,000 - 10,000	75 - 560	5.5 - 750	NA
trans-1,2-Dichloroethene	ND - 48	ND - 14	ND	ND	NA
Trichloroethene	ND - 4,500	11 - 1,100	ND - 4.2	ND	NA
Vinyl chloride	ND	ND - 7.2	ND	ND	NA

Notes:
Results presented are from the 2012 Soil Gas Sampling Investigation conducted by EPA.

Acronyms:
EPA - United States Environmental Protection Agency
ND - not detected
NA - not available
VOCs - volatile organic compounds
µg/m^3 - microgram per cubic meter

Table 3-2
Range of VOCs in Subslab Soil Vapor
Peninsula Boulevard Superfund Site, OU2

Detected Constituents	Concentration Range Detected ($\mu g/m^3$) Low - High				No Criteria Available for Subslab Soil Vapor
	Cedarwood Cleaners	Piermont Cleaners	Vogue Cleaners	Mill Road Cleaners	
1,1-Dichloroethene	ND - 33	ND	NS	NS	NA
cis-1,2-Dichloroethene	ND - 35,000	11 - 2,300	NS	NS	NA
Tetrachloroethene	6,820 - 5,500,000	950 - 21,000	NS	NS	NA
trans-1,2-Dichloroethene	ND - 170	ND - 27	NS	NS	NA
Trichloroethene	50.3 - 36,000	34 - 2,600	NS	NS	NA
Vinyl chloride	ND - 7,700	ND	NS	NS	NA

Notes:
Results presented are from the 2012 Subslab Sampling Investigation conducted by EPA.

Acronyms:
ND - not detected
NS - not sampled
NA - not available
VOCs - volatile organic compounds
$\mu g/m^3$ - microgram per cubic meter

Table 3-3
Range of VOCs in Soil
Peninsula Boulevard Superfund Site, OU2

	Concentration Range Detected (µg/kg) Low – High						Protection of Groundwater Soil Cleanup Objectives (µg/kg)
	Cedarwood Cleaners*		Piermont Cleaners		Vogue Cleaners		
Depth bgs (feet)	**0 - 2**	**2 - 80**	**0-2**	**2 - 36**	**0 - 2**	**> 2****	
Detected Constituents							
cis-1,2-Dichloroethene	ND - 6.6	ND	ND	ND	ND	ND	250
Tetrachloroethene	ND - 1,200	ND - 11,100,000J	ND - 13	ND – 2,700	ND - 6.3	ND	1,300
Toluene	ND - 4.4	ND - 3.5	ND - 2.7	ND	ND	ND	700
Trichloroethene	ND	ND - 1,800	ND – 0.66J	ND – 6.7	ND	ND	470
Acetone	ND	ND - 190	ND	ND	ND	ND	50
cis-1,3-Dichloropropene	ND	ND – 170	ND	ND	ND	ND	-
Methyl Acetate	ND	ND – 180	ND	ND	ND	ND	-
Methylene Chloride	ND	ND – 16	ND	ND	ND	ND	50

Notes:
Results presented are from the OU2 Remedial Investigation Activities conducted by EPA. Analytical data can be found in EPA's RI report.
Highlights show exceedances
* includes the properties south of Cedarwood Cleaners, i.e, 1245/1255 West Broadway and the LIRR Substation ROW
** includes saturated soils

Acronyms:
bgs - below grade surface
ND - not detected
J - estimated value
N/A - not applicable
VOCs - volatile organic compounds
> - greater than
µg/kg - microgram per kilogram
ROW - Right of Way
RI - Remedial Investigation
OU - Operable Unit

Table 3-4
Range of VOCs in Groundwater
Peninsula Boulevard Superfund Site, OU2

Detected Constituents	Concentration Range Detected (µg/L) Low - High				6 NYCRR Part 703 and TOGS 1.1.1 Standard/Guidance Value (µg/L)
	Cedarwood Cleaners*	Piermont Cleaners	Vogue Cleaners	Mill Road Cleaners	
1,1-Dichloroethene	ND	ND	ND	ND	0.7
cis-1,2-Dichloroethene	ND - 13.3	2.39 - 5.76	ND	ND	5
Tetrachloroethene	ND – 800,000	ND - 4,260	ND - 2.66	ND	5
trans-1,2-Dichloroethene	ND	ND	ND	ND	5
Trichloroethene	ND – 29,000R	ND - 21	ND	ND	5
Vinyl Chloride	ND	ND	ND	ND	2

Notes:
Results presented are from OU2 Remedial Investigation Activities conducted by EPA. Analytical data can be found in EPA's RI report.
Guidance value was used if no Standard available.
Highlights show exceedances.
* includes the properties south of Cedarwood Cleaners, i.e, 1245/1255 West Broadway and the LIRR Substation ROW

Acronyms:
EPA - United States Environmental Protection Agency
ND - not detected
NYCRR - New York Codes, Rules and Regulations
TOGS - Technical and Operational Guidance Series
VOCs - volatile organic compounds
µg/L - microgram per liter
ROW – Right of Way
RI – remedial investigation
OU - Operable Unit

Table 3-5
Cancer Risks and Noncancer HQs for Cedarwood Cleaners/Vacant Lot
Peninsula Boulevard Superfund Site, OU2

COPC	Resident		Commercial / Industrial Worker	Construction Worker
	Surface Soil 0-2ft	Groundwater	Surface Soil 0-2ft	All Soil 0-10ft
Cancer				
cis-1,2-DCE	No RSL	No RSL	No RSL	No RSL
PCE	5.0E-08	1.6E-02	1.2E-08	1.3E-09
TCE	ND	1.6E-03	ND	ND
Vinyl Chloride	ND	8.8E-04	ND	ND
Total	5.0E-08	**1.9E-02**	1.2E-08	1.3E-09
Noncancer				
cis-1,2-DCE	4.1E-05	6.2E+00	2.9E-06	9.7E-07
PCE	1.5E-02	4.3E+03	3.1E-03	2.6E-03
TCE	ND	2.8E+02	ND	ND
Vinyl Chloride	ND	3.8E-01	ND	ND
Total	1.5E-02	**4.6E+03**	3.1E-03	2.6E-03

Table 3-6
Cancer Risks and Noncancer HQs for Piermont Cleaners
Peninsula Boulevard Superfund Site, OU2

COPC	Resident		Commercial / Industrial Worker	Construction Worker
	Surface Soil 0-2ft	Groundwater	Surface Soil 0-2ft	All Soil 0-10ft
Cancer				
cis-1,2-DCE	No RSL	No RSL	No RSL	No RSL
PCE	1.6E-10	6.1E-05	3.7E-11	1.9E-11
TCE	6.2E-10	5.7E-06	9.7E-11	1.6E-11
Vinyl Chloride	ND	8.0E-05	ND	ND
Total	7.8E-10	**1.5E-04**	1.3E-10	3.5E-11
Noncancer				
cis-1,2-DCE	2.0E-06	1.7E-01	1.4E-07	4.7E-08
PCE	4.6E-05	1.6E+01	9.6E-06	3.6E-05
TCE	1.4E-04	1.0E+00	3.1E-05	1.4E-04
Vinyl Chloride	ND	3.4E-02	ND	ND
Total	1.9E-04	**1.8E+01**	4.0E-05	1.8E-04

Table 4-1
Preliminary Remediation Goals For Groundwater
Peninsula Boulevard Superfund Site, OU2

Contaminants of Concern	EPA National Primary Drinking Water Standards[1] MCLs (µg/L)	NYS Drinking Water Quality Standards (µg/L)	NYS Groundwater Quality Standards (µg/L)	PRGs[2] (µg/L)	Maximum Detected Concentrations at AOC1[3] (µg/L)	Maximum Detected Concentrations at AOC2[4] (µg/L)
Tetrachloroethene	5	5	5	5	800,000 (ERTGW-38)	4,260 (GW-02)
Trichloroethene	5	5	5	5	29,000R (ERTGW-38)	21 (ERTGW-03)

Notes:

1. EPA National Primary Drinking Water Standards (web page), http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.
2. Lowest of the available standards.
3. The maximum concentrations detected at AOC1 during OU2 RI sampling events. AOC1 refers to Cedarwood Cleaners, 1245/1255 West Broadway, and the LIRR Substation ROW.
4. The maximum concentrations detected at AOC2 during OU2 RI sampling events. AOC2 refers to Piermont Cleaners, front parking lot, and its immediately adjacent commercial businesses in the strip mall.
5. Highlights show exceedances.

Acronyms:

EPA - United States Environmental Protection Agency
MCLs - Maximum Contaminant Levels
NYS - New York State
PRGs - Preliminary Remediation Goals
µg/L - microgram per liter
AOC - Area of Concern
OU - Operable Unit
ROW - Right of Way
RI - Remedial Investigation

Table 6-1
Saturated Soil Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
No Action	Not Applicable	Not Applicable	No action.	Required for consideration by NCP.	Yes
Institutional Controls	Access Restrictions	Deed Restrictions	Does not reduce contamination. Deeds for property in the area of influence.	Potentially applicable.	Yes
Monitoring/Inspection and	Not Applicable	Not Applicable	Includes sampling and analysis to track fate and transport of contaminants. Does not reduce contamination.	Potentially applicable.	Yes
~~Containment~~	~~Capping~~	~~Impermeable Liner Cap~~	Impermeable capping systems can range from a one-layer system of vegetated soil to a complex multi-layer system of soils and geosynthetics and is readily implementable and practicable way to manage potential leaching of soil contaminants at large solid waste facilities.	Not feasible due to the commercial nature of this AOC.	No
		~~Clay and Soil~~	Compacted clay covered with soil over areas of contamination.	Not feasible since this AOC is an active commercial property and vehicle traffic would damage the cap.	No
		~~Asphalt~~	Application of a layer of asphalt over areas of contamination.	Potentially applicable.	No
		~~Concrete~~	Installation of concrete slab over areas of contamination.	Similar effectiveness and protection as asphalt cap. Screened out due to relative cost compared to asphalt cap.	No
	~~Cap Enhancement~~	~~Vegetative Permeable Soil Cap~~	Reduce or eliminate contaminant migration. Vegetation promotes protection from soil erosion.	Not applicable as difficult to maintain soil cap because this AOC is an active commercial property .	No
Treatment	In Situ Biological Treatment	~~Bioventing~~	Stimulates the natural in situ biodegradation of aerobically degradable compounds in soil by providing oxygen to existing soil microorganisms.	Screened out since level of effectiveness is highly dependent upon specific contaminant and its application/design.	No
		Enhanced Bioremediation	Process in which indigenous or inoculated micro-organisms degrade (metabolize) organic contaminants found in soil, converting the contaminants to innocuous end products.	Screened out due to relative cost and longer timeframes compared to other alternative technologies.	Yes
		~~Phytoremediation~~	Process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment.	Not effective. It requires longer remediation time and difficult to implement since this AOC is within the commercial zone.	No

Legend/Notes

~~Bioventing~~ - Technology and process options that are screened out from further evaluation.

Table 6-1
Saturated Soil Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
Treatment (Cont'd)	In Situ Physical/Chemical Treatment	~~Chemical Oxidation~~	Process where powerful oxidizing chemicals are injected into the subsurface to chemically convert contaminants to less toxic compounds.	Not applicable because of the potential to interfere with the effectiveness of the downgradient OU1 remediation system.	No
		~~Fracturing~~	Enhancement technology designed to increase the efficiency of other in situ technologies in certain types of subsurface conditions (i.e., very low permeability soils / rock).	Not applicable because existing soil consists of silty sand and silty clay material that would not require this technology improvement.	No
		~~Soil Flushing~~	Process where contaminants are extracted from the soil by passing uncontaminated water (or water containing an additive to enhance contaminant solubility) through in-place soils, contaminants leach into the water, which is then extracted and treated.	Difficult to implement as substantial amount of water will require treatment . May interfere with OU2 source treatment by mobilizing contaminants.	No
		Soil Vapor Extraction	Vacuum is applied to the subsurface soil to induce air flow through the soil medium and remove volatile (and some semivolatile) contaminants.	Potentially applicable.	Yes
		~~Solidification/Stabilization~~	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Not feasible because VOCs are generally not immobilized.	No
Treatment (Cont'd)	In Situ Thermal Treatment	Thermal Treatment	Heats soil to enhance SVE in the following ways: VOC volatility is increased by heating; the soil permeability is increased by drying; water vapor converted to steam can facilitate stripping of volatile contaminants in the overburden; and heating may cause a decrease in contaminant viscosity which improves contaminant mobility. RAOs may be achieved within a relatively shprt timeframe with this technology, as compared with other technologies. Thermal treatment may enhance biological activity at the site, and at the in-situ OU1 remedy that is under design.	Potentially applicable	Yes

Legend/Notes

~~Landfarming~~ - Technology and process options that are screened out from further evaluation.

Table 6-2
Groundwater Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
No Action	Not Applicable	Not Applicable	No remedial action.	Required for consideration by NCP.	Yes
Institutional Controls	Not Applicable	Not Applicable	Continuation of existing and implementation of additional institutional controls in addition to active remedial alternative(s).	Will be considered and developed in conjunctionwith all active remedial alternatives.	Yes
Monitored Natural Attenuation with Long Term Monitoring	Not Applicable	Not Applicable	Natural subsurface processes (e.g., dilution, volatilization, biodegradation, adsorption, and chemical reactions) with subsurface materials reduce contaminant concentrations to acceptable levels. Monitoring to assess performance and risk mitigation. Does not reduce contamination.	MNA will not be considered since sufficient data is not available that would support the potential for MNA at the AOCs. However, LTM will be considered and developed in conjunction with active remedial alternatives as contingency/alternative remedy.	Yes
Containment	Physical Barriers	~~Slurry Wall~~	Trench around areas of contamination is filled with a soil (or cement) bentonite slurry.	Not practicable because of constructability in urban area limiting the practicability of implementing this technology at the AOCs.	No
		~~Grout Curtain~~	Pressure injection of grout in a regular pattern of drilled holes.	Not practicable - constructability in urban area limiting practicability of implementing this technology at the AOCs.	No
		~~Funnel & Gate~~	Sheet piles with injection of slurry as beam is withdrawn. Impermeable sheet pile wall (funnel) to direct water to a permeable reactive barrier (gate) for treatment.	Potentially practicable in conjunction with permeable reactive barrier technology. Limited space available at the AOCs.	No
		~~Block Displacement~~	In conjunction with vertical barriers, injection of slurry in notched injection holes.	Constructability in urban area is limiting practicability of implementing technology at the AOCs.	No
	Hydraulic Barrier	~~Groundwater Pump & Treat~~	Groundwater is pumped from aquifer and treated ex-situ with discharge to surface water or POTW.	Not Practicable because of longer remedial timeframe than other alternatives.	No
	~~Deep Well Injection~~	~~Geologic Sequestration~~	Waste disposal technology using injection wells to place treated or untreated liquid waste into geologic formations that have little potential to allow migration of contaminants.	Regulatory hurdles under the Underground Injection Control (UIC) and other environmental programs, community acceptance issues, due to Sole Source Aquifer and other factors not practicable for the AOCs.	No

Legend/Notes

~~Geologic Sequestration~~ - Process options that are screened out from further evaluation.

Table 6-2
Groundwater Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
Treatment	In-Situ Biological Treatment	Enhanced Bioremediation	Process to accelerate the natural biodegradation process by introducing nutrients, electron acceptors, and/or competent contaminant-degrading microorganisms to the subsurface.	Effective in treating contaminants of concern, can be implemented at AOCs.	Yes
		~~Phytoremediation~~	Set of processes that use plants to remove, transfer, stabilize and / or destroy contamination in groundwater.	Not practicable - limited to treating shallow groundwater with lower contaminant concentrations, requires a large area of land for remediation.	No
Treatment (Cont'd)	In Situ Physical/Chemical Treatment	Air Sparging	Injected air traverses horizontally and vertically in channels through the soil column, creating a subsurface "air stripper" that removes contaminants by volatilization.	Effective in treating contaminants of concern, can be implemented at AOCs.	Yes
		~~Bioslurping~~	Combines the two remedial approaches of bioventing and vacuum-enhanced free-product recovery.	Not practicable due to the depth of majority of contamination and the silty/clay layer nature of the soils	No
		~~ISCO/ISCR~~	Chemically converts contaminants to less toxic compounds that are more stable, less mobile, and/or inert.	May potentially interfere with the effectiveness of the OU1 remedial system.	No
		~~Dual Phase Extraction~~	Technology that utilizes a high vacuum system to remove various combinations of contaminated groundwater, separate-phase product (NAPL), and soil vapor from the subsurface.	Not practicable due to the depth of majority of contamination and the silty/clay layer nature of the soils	No

Legend/Notes

~~Dual Phase Extraction~~ - Process options that are screened out from further evaluation.

Table 6-2
Groundwater Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
Treatment (Cont'd)	In Situ Physical/Chemical Treatment	Thermal Treatment	Heat is forced into an aquifer through injection wells to vaporize volatile contaminants.RAOs can be achieved in a relatively shprt timeframe as compared to other technologies. Thermal treatment may enhance biological activity at the site, and at the in-situ OU1 remedy that is under design.	Potentially applicable.	Yes
		~~In Well Air Stripping~~	Air is injected into a vertical well that has been screened at two depths.	Potentially applicable, but application is typically for larger-scale plume remediation as opposed to the OU2 source area AOCs.	No
		~~Passive / Reactive Treatment Barriers~~	Use of PRBs consisting of iron with a bulking agent to treat groundwater contaminated with chlorinated solvents. A PRB is installed across the flow path of a contaminant plume, allowing the water portion of the plume to passively move through the wall. Use of horizontal wells could also deliver reagents to contaminated areas.	Limited space available at the AOCs for implementation.	No
		~~In Situ Flushing~~	In-situ flushing involves the injection of chemicals like surfactants into a subsurface contaminated zone. The solution then flows through the contaminated zone and the resulting effluent is extracted downgradient where it is treated and discharged.	Potentially applicable as an enhancement to other remedy (such as pump and treat or in-well air stripping). However, may potentially interfere with the effectiveness of the OU1 remedial system.	No
	Ex Situ Biological Treatment	~~Bioreactors~~	Contaminants in extracted groundwater are put into contact with microorganisms in attached or suspended growth biological reactors.	The dilute nature of the contamination in on-site groundwater may not support an adequate microbial population density in an ex-situ environment. More costly than the in-situ biological treatment.	No
		~~Constructed Wetlands~~	The constructed wetlands-based treatment technology uses natural geochemical and biological processes inherent in an artificial wetland ecosystem to accumulate and fixate / remove metals and other contaminants from influent waters.	Not practicable - requires a large area of land for remediation.	No

Legend/Notes

~~Bioreactors~~ - Process options that are screened out from further evaluation.

Table 6-2
Groundwater Technologies and Process Options
Peninsula Boulevard Superfund Site, OU2

General Response Action	Remedial Technology	Process Option	Description	Screening Comments	Retained
Treatment (Cont'd)	Ex Situ Physical/Chemical Treatment	Adsorption	Contaminants are adsorbed onto treatment media, reducing their concentration in the aqueous phase.	Potentially applicable.	Yes
		~~Advanced Oxidation Processes~~	Ultraviolet (UV) radiation, ozone, and/or hydrogen peroxide are used to destroy organic contaminants as impacted water is pumped into a treatment vessel.	High energy costs with no increase in effectiveness.	No
		~~Ex Situ Air Stripping~~	Mass transfer of volatile contaminants from water to air.	Not applicable. Requires groundwater pump & treat.	No
		~~Groundwater Pump & Treat~~	Consists of pumping groundwater from an aquifer to remove dissolved phase contaminants and/or achieve hydraulic containment of contaminated groundwater to prevent migration, with subsequent treatment and disposal/discharge.	Not Practicable due to longer remedial timeframes than other alternatives.	No
Discharge / Disposal	On-Site Discharge	~~Surface Water~~	Extracted water treated and/or discharged to Doxey Brook Drain and Motts Creek.	Not applicable. Requires groundwater pump & treat.	No
		~~Groundwater~~	Extracted water treated and/or discharged into injection well or infiltration basin.	Not applicable. Requires groundwater pump & treat.	No
	Off-Site Discharge	~~POTW~~	Extracted water pre-treated and/or discharged to POTW.	Not applicable. Requires groundwater pump & treat.	No

Legend/Notes

~~Air Stripping~~ - Process options that are screened out from further evaluation.

Table 9-1
Comparative Analysis of Remedial Alternatives
Peninsula Boulevard Superfund Site, OU2

Alt. No.	Alternative Name	Overall Protection of Public Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, mobility or Volume of Contamination thru Treatment	Short Term Impacts and Effectiveness	Implementability	Cost Effectiveness	AOC 1- Cedarwood Cleaners	AOC 2- Piermont Cleaners
1	**No Action**	- Will not meet any of the RAOs.	- Will not comply.	- Contaminants remain in the environment and may transform into other compounds. - Magnitude of potential risks will be unchanged.	- Does not reduce toxicity, mobility or volume of contamination present in the contaminated soils.	- Does not result in disruption of AOC1 and AOC2 operations or pose a short term threat to public health or the environment. - No remedial timeframe is associated with this alternative.	- No technical or administrative difficulties or constraints.	Capital Cost: Average Annual O&M: Total Present Value Cost:	$ - $ - $ -	$ - $ - $ -
2	**Air Sparging (AS) with Soil Vapor Extraction (SVE), Long Term Monitoring (LTM), and Institutional Controls (ICs)**	- Reduces and eventually eliminates concentrations of VOCs in the source. - Contaminated groundwater beyond the active remediation area will be handled by the remedy for the OU1, Site-wide groundwater. This alternative will also include LTM and ICs to monitor the remedial progress.	- Will comply with ARARs and PRGs will be achieved.	- Permanent reduction of source contaminants from active remediation.	- SVE will reduce the volume of volatile contaminants that will be generated during the air sparging process and treat the vapors prior to discharge to air. - Air sparging will reduce the volume of contaminated groundwater migrating off-site from AOC1 and AOC2. - Extraction of volatile contaminants from the groundwater outside the active remedial area by operation of the OU1 system will reduce their toxicity, mobility, and volume.	- Can be implemented with temporary disruption of current site operations during construction of the AS/SVE system. - Will generate noise and traffic during construction. - Dust control and health and safety measures will need to be implemented. - Remedial timeframe – Active treatment time assumed 10 years. Total time to achieve RAOs assumed 30 years.	- The clay/silt layer beneath the remediation area may affect the performance of the system. - Existing building and pavement cap should increase the effectiveness of the SVE system. An asphalt cap can be installed at the vacant lot. Implementability may be adversely affected by future development on vacant lot (AOC1). - Requires limited excavation for construction. - Minimal administrative difficulties or constraints.	Capital Cost: Total O&M Cost: Total Periodic Cost: Total Present Worth Cost:	$ 2,899,086 $ 7,211,883 $ 381,460 $ 10,492,429	$ 1,736,759 $ 4,422,318 $ 240,245 $ 6,399,321

Table 9-1
Comparative Analysis of Remedial Alternatives
Peninsula Boulevard Superfund Site, OU2

Alt. No.	Alternative Name	Overall Protection of Public Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, mobility or Volume of Contamination thru Treatment	Short Term Impacts and Effectiveness	Implementability	Cost Effectiveness	AOC 1- Cedarwood Cleaners	AOC 2- Piermont Cleaners
3	**In-Situ Thermal Treatment, LTM, and ICs**	- Mitigates the potential for inhalation of volatilized contaminants for site workers and visitors.	- Will comply with ARARs and PRGs will be achieved.	- Will permanently remove volatile contaminants in soil and groundwater.	- Will remove the volume of VOCs in soil by hastening the transferring of contaminants to the vapor phase and treating. Will reduce toxicity, mobility, and volume of contaminants in groundwater.	- Temporary disruption to current tenant operations during system construction. Due to the assumption of contaminated vadose soils beneath the building and the high heat generated close to the surface, relocation of tenants at Cedarwood Cleaners and Piermont Cleaners is expected.	- Existing building and pavement cap at Cedarwood Cleaners and AOC2 property should increase the effectiveness of the SVE component of the thermal system. An asphalt cap can be installed at the vacant lot (AOC1). However, implementability may be adversely affected by future development on the vacant lot considering the high number of electrodes required and high remedial temperatures generated in the subsurface. Implementability will depend on size, location, and type of construction.	Capital Cost:	$ 21,632,524	$ 7,256,345
		- Eliminates concentrations of VOCs in the source.				- Will generate noise and traffic during construction. Temporary street closure and re-routing of traffic and utilities during construction.	- Existing sand/silt layer is not expected to affect the rate of heat flux throughout the treatment zone as thermal conductivity value does not vary much between most soil types.	Total O&M Cost:	$ 18,722,129	$ 6,015,498
		- Contaminated groundwater beyond the active remediation area will be handled by the remedy for the OU1, Site-wide groundwater.				- Dust control measures will need to be implemented.	- Temporary street closure and re-routing of traffic and utilities around West Broadway during construction. Hewlett Parkway will need to be closed adjacent to AOC1.	Total Periodic Cost:	$ 693,956	$ 277,148
		- This alternative will also include LTM and ICs to monitor the remedial progress for groundwater beyond the active treatment area.				Remedial timeframe – Active heating time assumed 2 years at AOC1, 1 year at AOC2. Total time to achieve RAOs assumed 5 years.		Total Present Worth Cost:	$ 41,048,610	$ 13,548,991

Table 9-1
Comparative Analysis of Remedial Alternatives
Peninsula Boulevard Superfund Site, OU2

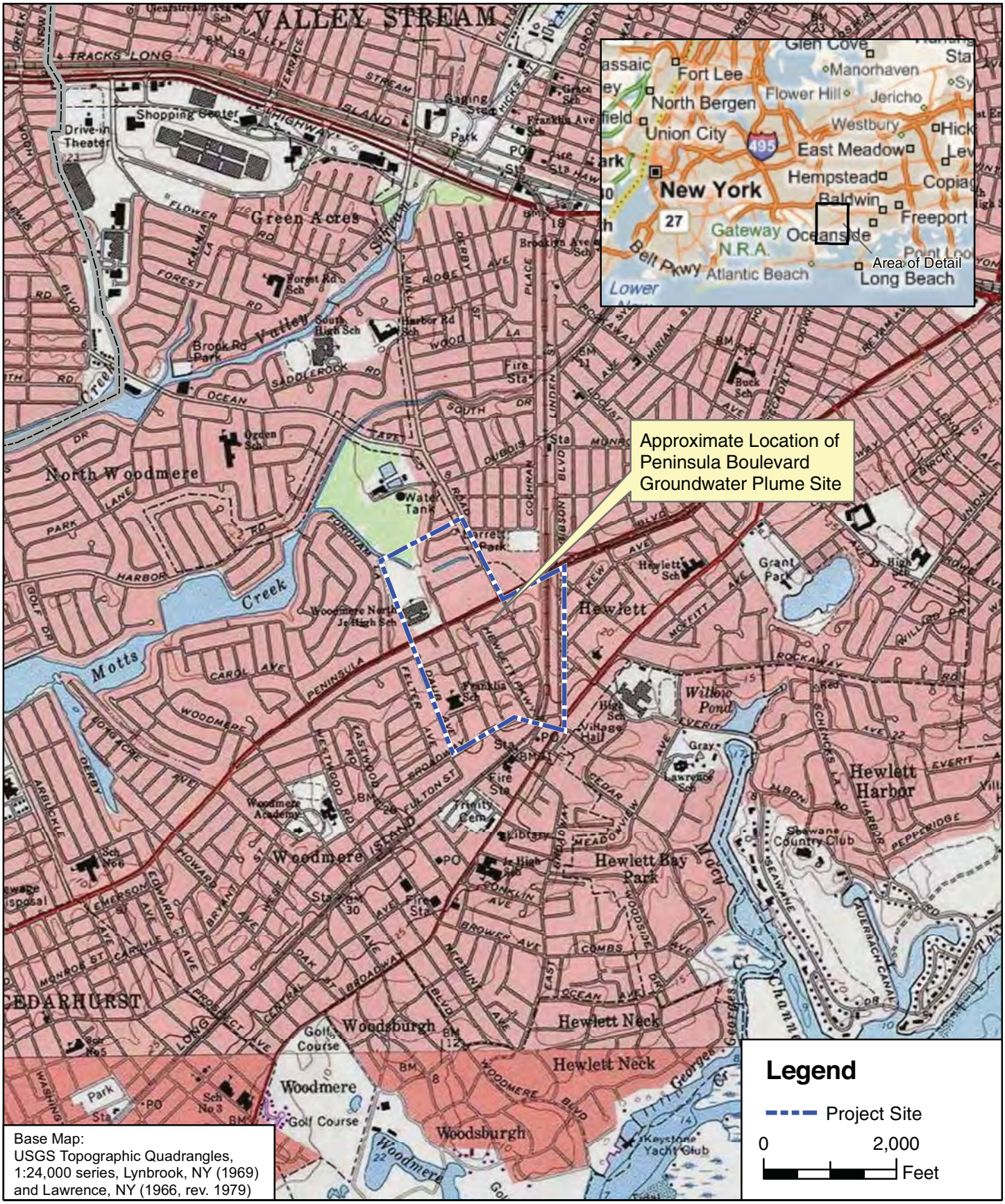
Alt. No.	Alternative Name	Overall Protection of Public Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, mobility or Volume of Contamination thru Treatment	Short Term Impacts and Effectiveness	Implementability	Cost Effectiveness	AOC 1- Cedarwood Cleaners	AOC 2- Piermont Cleaners
4A	**In-Situ Bioremediation, LTM, and Ics**	- Will result in a reduction of VOC concentrations in the saturated soils and groundwater which further reduces groundwater impacts. - Contaminated groundwater beyond the active remediation area will be handled by the remedy for the OU1, Site-wide groundwater. - This alternative will also include LTM and ICs to monitor the remedial progress for groundwater beyond the active treatment area.	- Will comply with ARARs and PRGs will be achieved.	- Permanent reduction of groundwater contaminants from active groundwater remediation. - May require multiple injections to achieve long term effectiveness.	- Will reduce the toxicity and volume of contaminants at AOC1 and AOC2.	- Temporary disruption of current site operations. - Will generate noise and traffic during construction. - Dust control and health and safety plan measures will be needed. - Remedial timeframe – Active treatment time assumed in excess of 10 years at AOC1 and up to 10 years at AOC2. Total time to achieve RAOs assumed 30 years.	- Minimal administrative difficulties. - Challenges in completing the work due to limited space available. - Constraints include limited space, and overhead power wires. - Temporary street closure and re-routing of traffic and utilities around West Broadway during construction. Hewlett Parkway will need to be closed adjacent to AOC1. - Installation for the Bioremediation system is similar to monitoring wells. However, implementability may be adversely affected by future development on the vacant lot (AOC1).	Capital Cost: Total O&M Cost: Total Periodic Cost: Total Present Worth Cost:	$ 3,798,403 $ 1,783,220 $ 284,462 $ 5,866,084	$ 1,589,854 $ 1,382,456 $ 214,060 $ 3,186,371

Table 9-1
Comparative Analysis of Remedial Alternatives
Peninsula Boulevard Superfund Site, OU2

Alt. No.	Alternative Name	Overall Protection of Public Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, mobility or Volume of Contamination thru Treatment	Short Term Impacts and Effectiveness	Implementability	Cost Effectiveness	AOC 1- Cedarwood Cleaners	AOC 2- Piermont Cleaners
4B	**In-Situ Bioremediation, HEPA, LTM, and ICs**	- Will result in a reduction of VOC concentrations in the saturated soils and groundwater which further reduces groundwater impacts. - Contaminated groundwater beyond the active remediation area will be handled by the remedy for the OU1, Site-wide groundwater. - This alternative will also include LTM and ICs to monitor the remedial progress for groundwater beyond the active treatment area.	- Will comply with ARARs and PRGs will be achieved.	- Permanent reduction of groundwater contaminants from active groundwater remediation. - May require multiple injections to achieve long term effectiveness.	- Will reduce the toxicity and volume of contaminants at AOC1	- Temporary disruption of current site operations. - Will generate noise and traffic during construction. - Dust control and health and safety plan measures will be needed. - Remedial timeframe – Active treatment time assumed 5 years for AOC1. Total time to achieve RAOs assumed 25 years.	- Minimal administrative difficulties. - Challenges in completing the work due to limited space available. - Constraints include limited space, and overhead power wires. - Temporary street closure and re-routing of traffic and utilities around West Broadway during construction. Hewlett Parkway will need to be closed adjacent to AOC1. - Installation for the Bioremediation system is similar to monitoring wells. However, implementability may be adversely affected by future development on the vacant lot (AOC1).	Capital Cost: Total O&M Cost: Total Periodic Cost: Total Present Worth Cost:	$ 15,768,864 $ 5,332,620 $ 450,966 $ 21,552,450	$ - $ - $ - $ -

Notes:
AOC- Area of Concern
AOC1 includes the properties south of Cedarwood Cleaners, i.e, 1245/1255 West Broadway and the LIRR Substation ROW
AOC2 includes Piermont Cleaners, front parking lot and its immediately adjacent commercial businesses in the strip mall

FIGURES

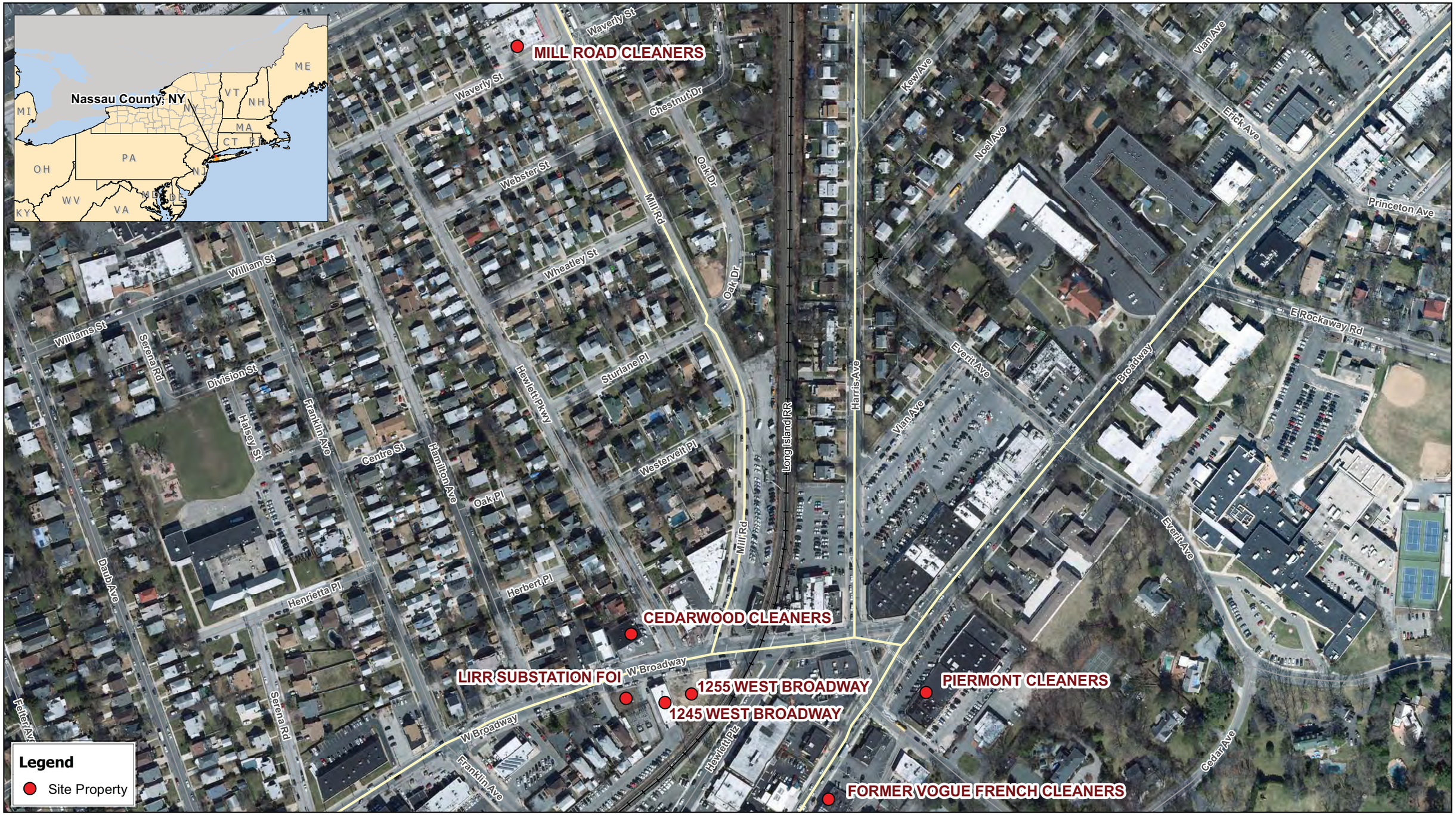


SITE LOCATION

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-1



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360 0 360
Feet

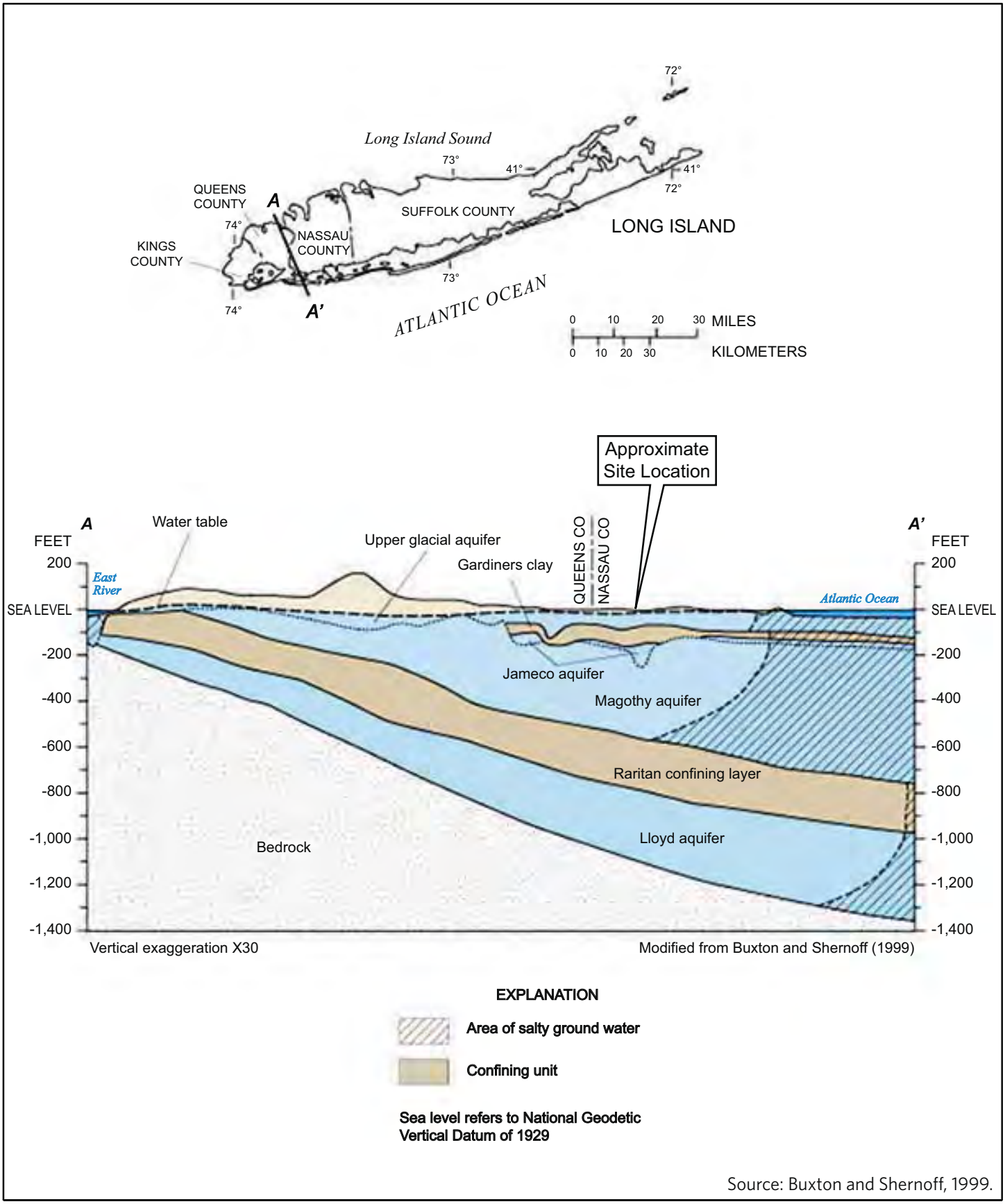
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

PROPERTY LOCATION MAP

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-2



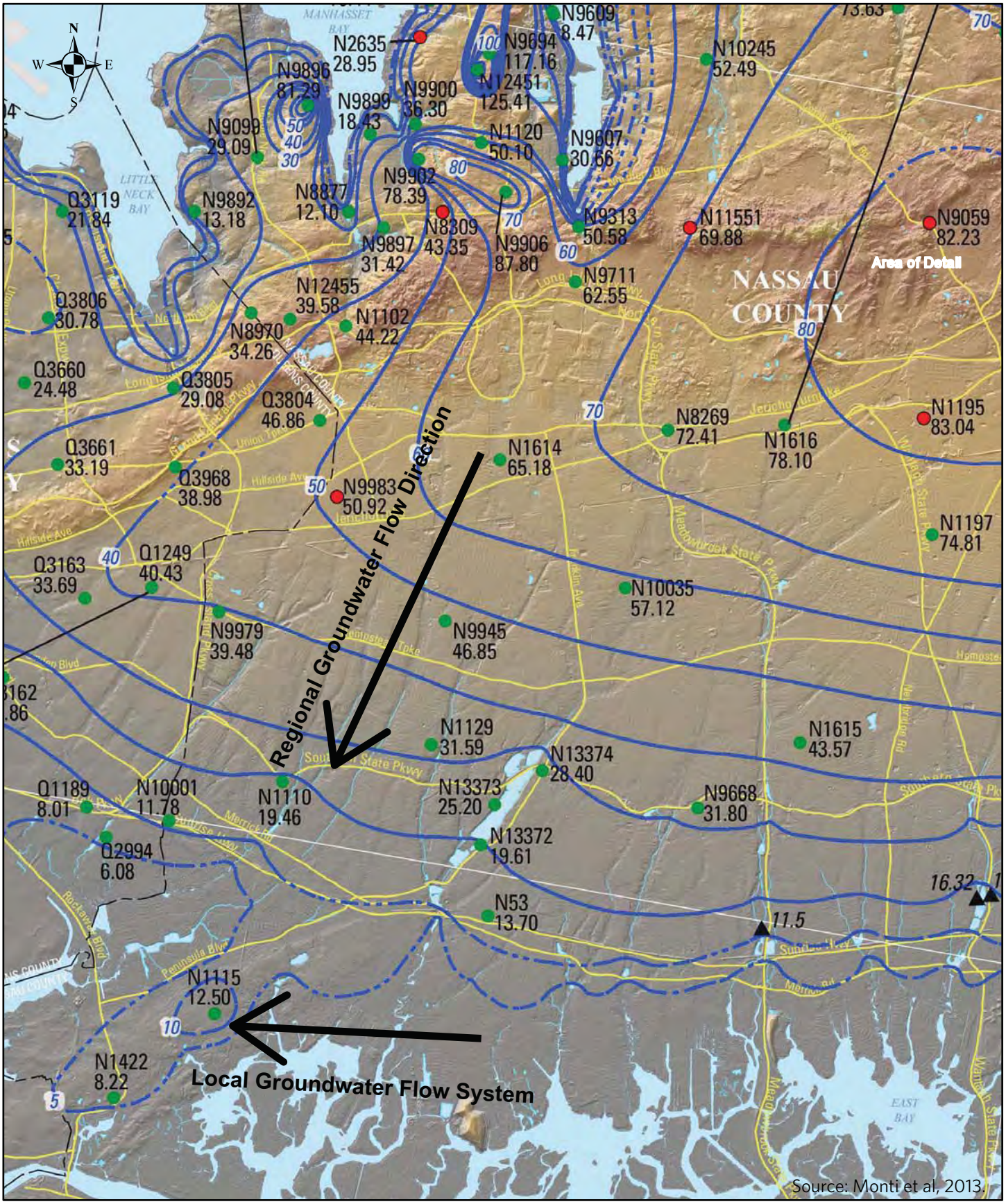
Source: Buxton and Shernoff, 1999.

GEOLOGICAL CROSS SECTION OF
WESTERN NASSAU COUNTY, LONG ISLAND, NEW YORK

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-3

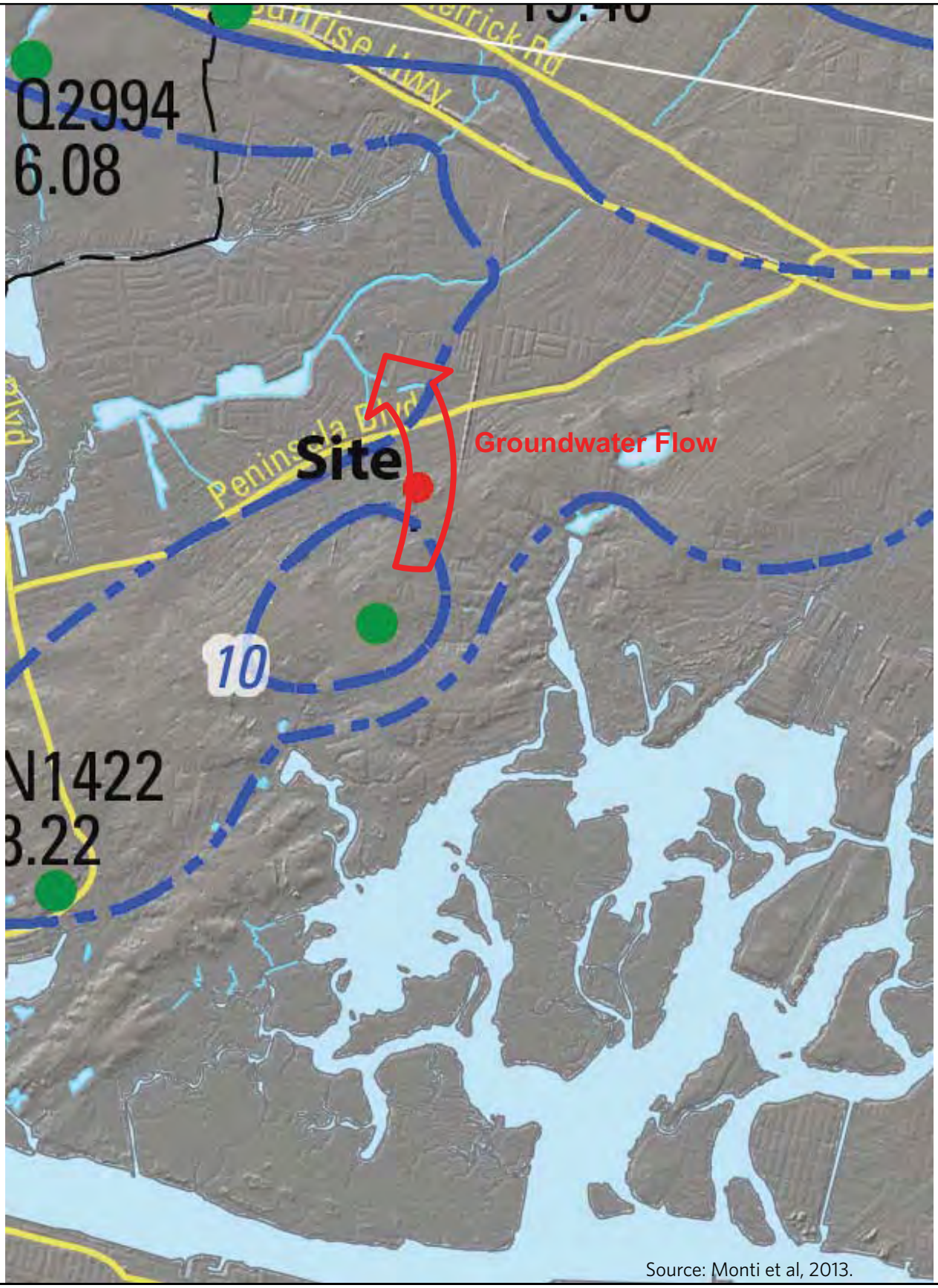


WATER TABLE IN THE UPPER GLACIAL AQUIFER
LONG ISLAND, NEW YORK

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-4



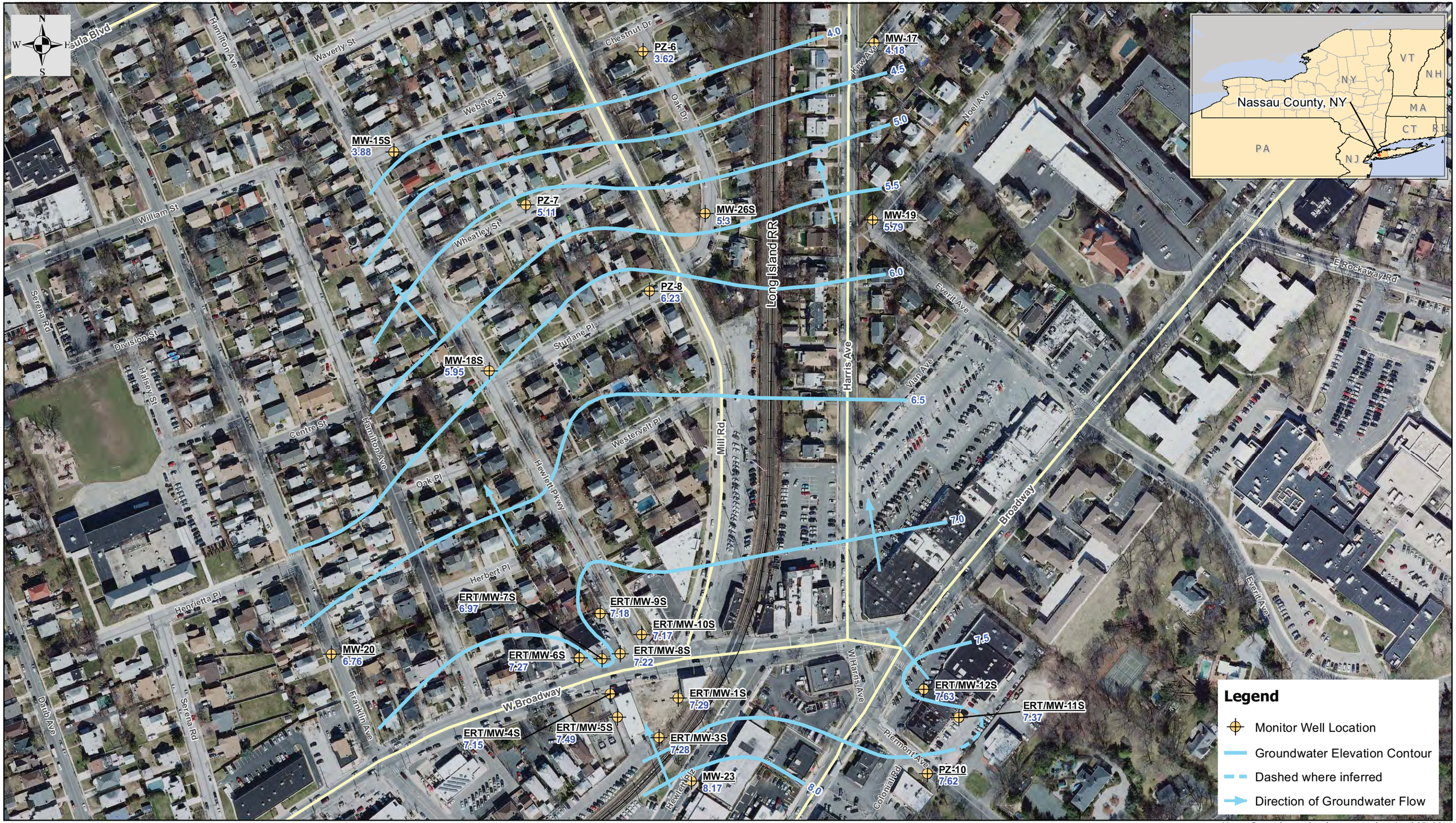
Source: Monti et al, 2013.

LOCAL GROUNDWATER FLOW IN THE UPPER GLACIAL AQUIFER, LONG ISLAND, NEW YORK

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-5



Note: Groundwtaer levels measured on April 27, 2016

Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 28 April 2016

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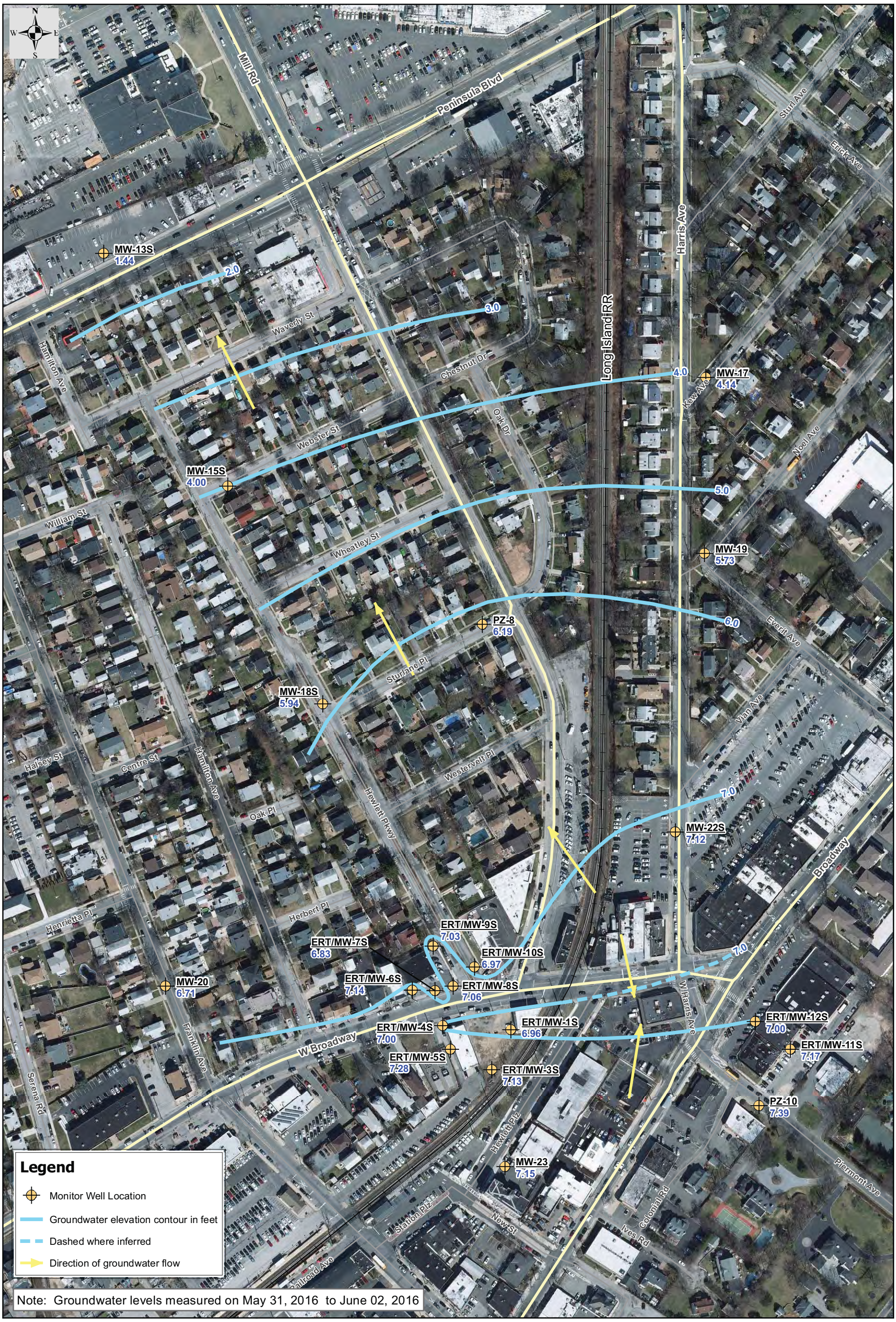
Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

GROUNDWATER ELEVATIONS IN
SHALLOW UPPER GLACIAL AQUIFER
APRIL 2016
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-6a



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Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.
Map Creation Date: 20 June 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

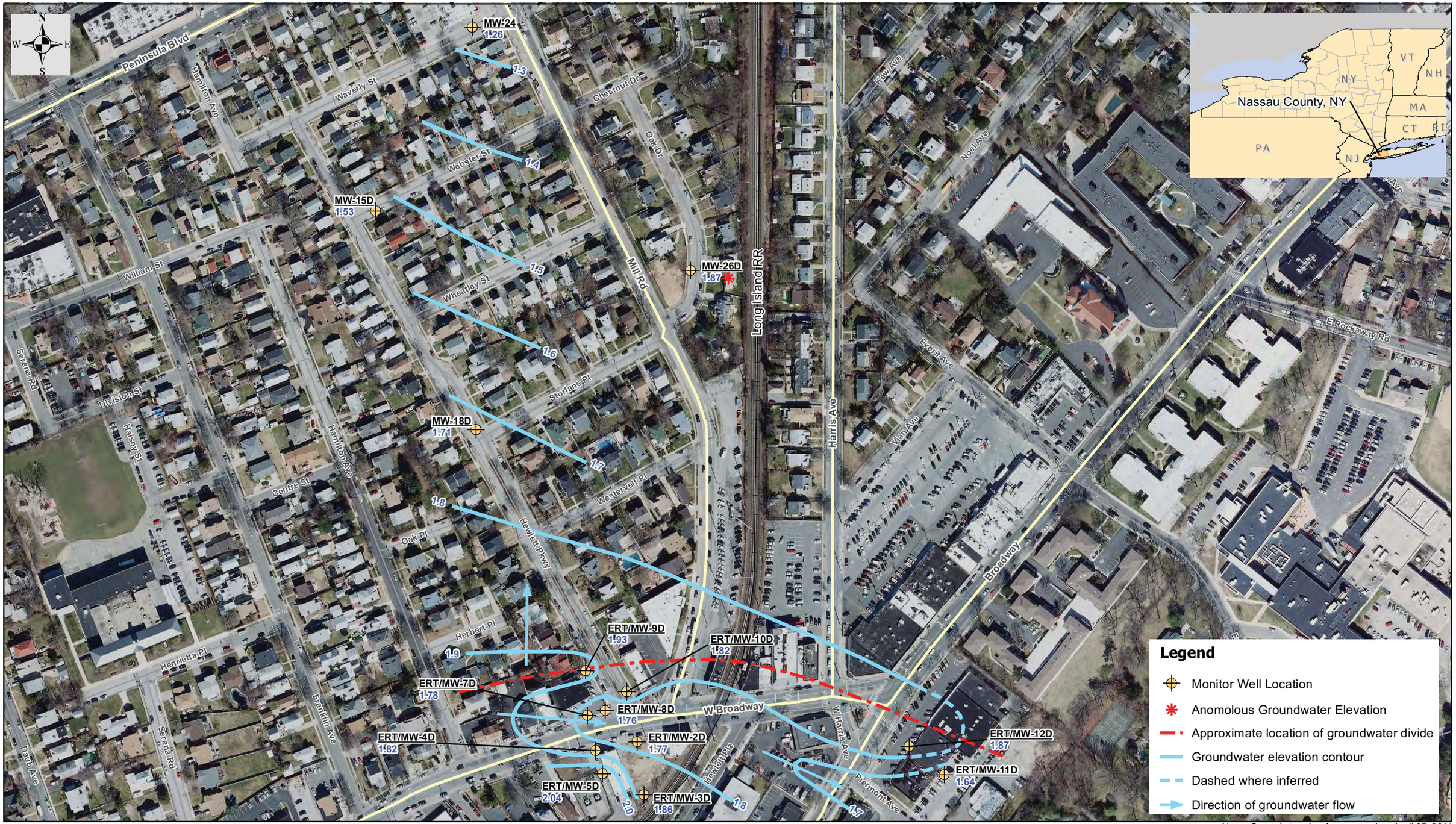
Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

GROUNDWATER ELEVATIONS IN
SHALLOW UPPER GLACIAL AQUIFER
JUNE 2016
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-6b



Note: Groundwtaer levels measured on April 27, 2016

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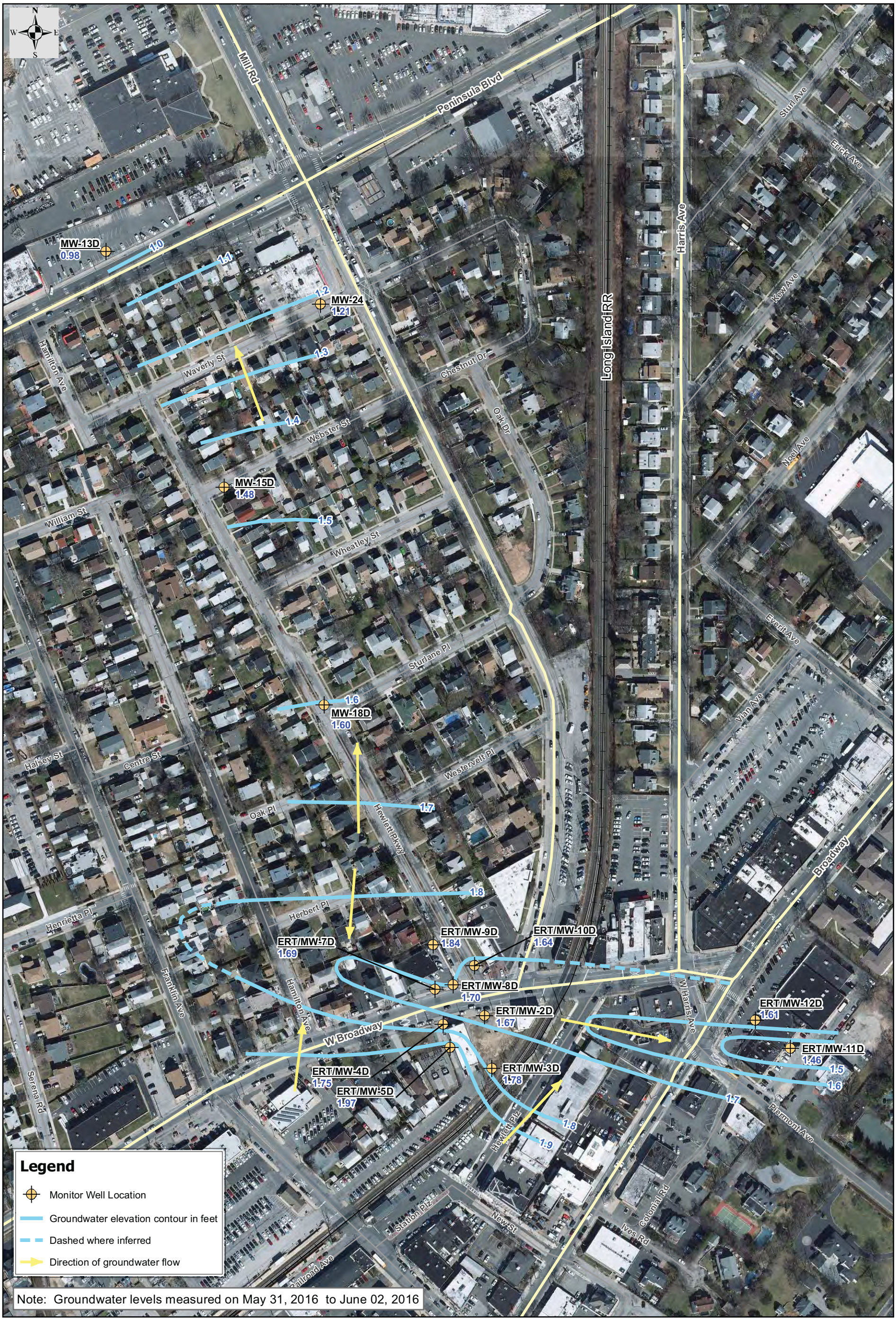
Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

GROUNDWATER ELEVATIONS IN
DEEP UPPER GLACIAL AQUIFER
APRIL 2016
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-7a



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Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.
Map Creation Date: 20 June 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

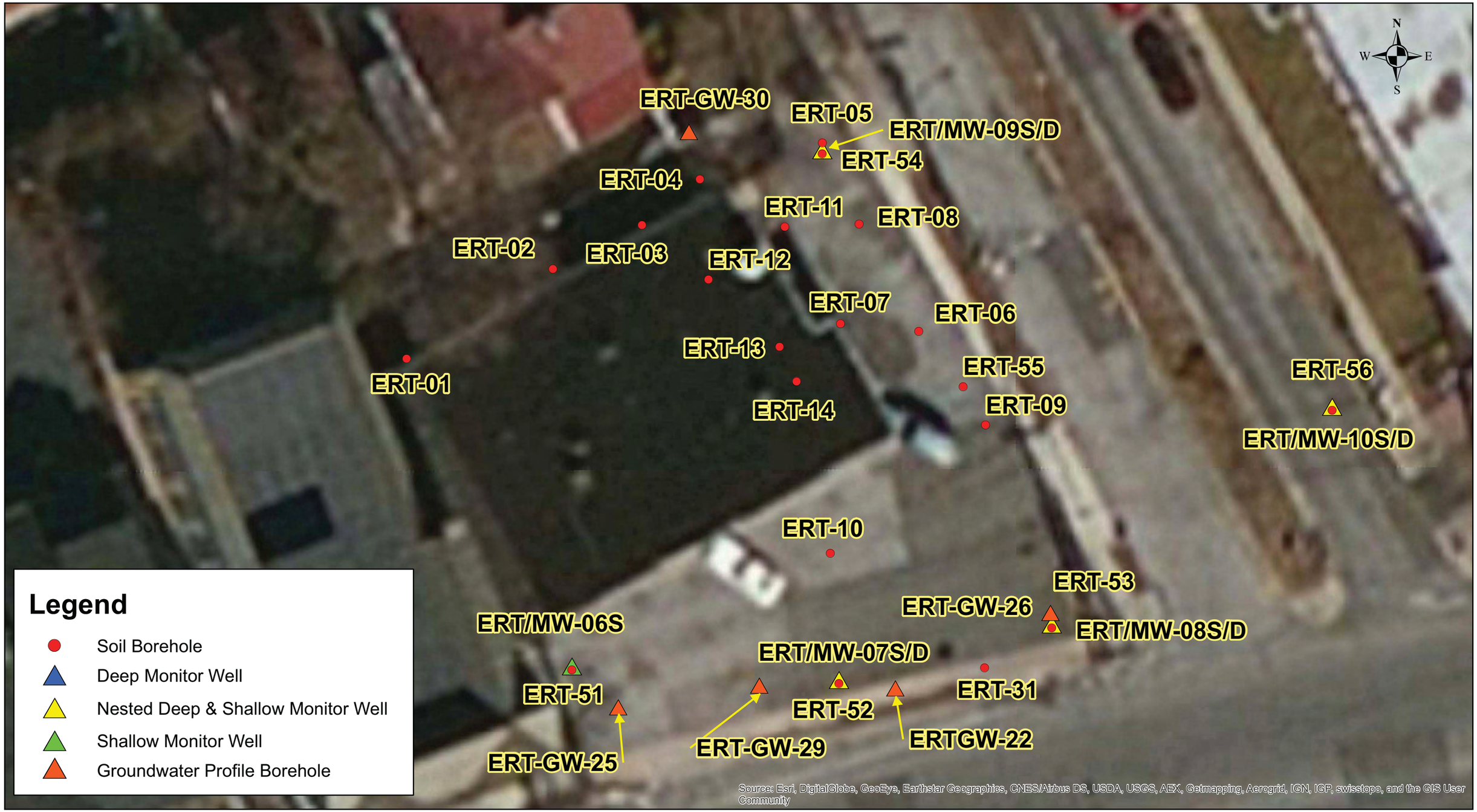
Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

GROUNDWATER ELEVATIONS IN
DEEP UPPER GLACIAL AQUIFER
JUNE 2016
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
2-7b



HDR

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

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Figure Source:
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

SAMPLE LOCATIONS
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-1

0 10 20 30 40 Feet

Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

SAMPLE LOCATIONS
PIERMONT CLEANERS
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-2

HDR

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

0 5 10 20 30 40 Feet

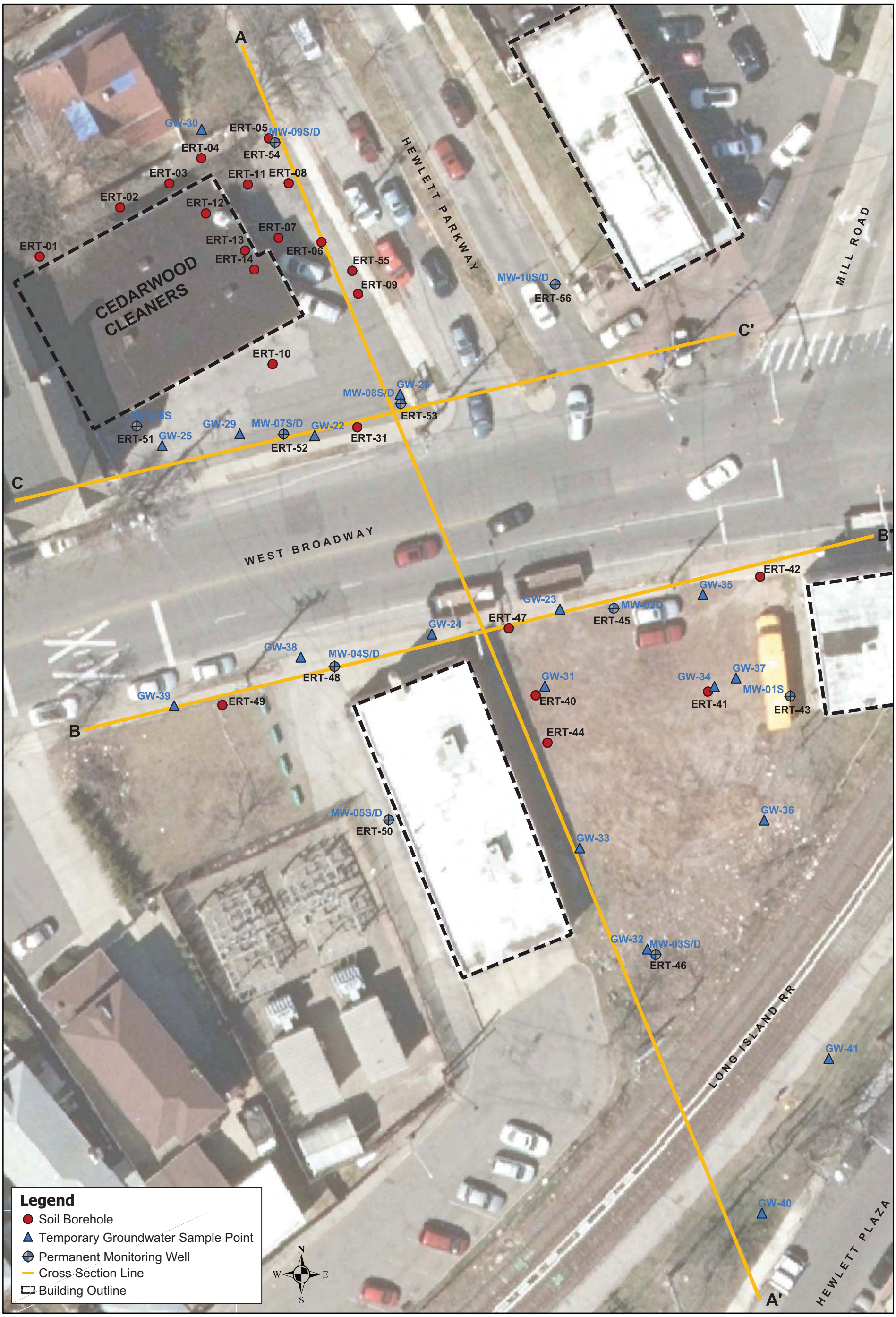
Figure Source:
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

SAMPLE LOCATIONS
LIRR SUBSTATION AND
1245/1255 WEST BROADWAY

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-3



Map created using 2013 orthoimagery from NY state, borehole location and sampling data from 2014, 2015, and 2016.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 04 May 2016

Figure Source:

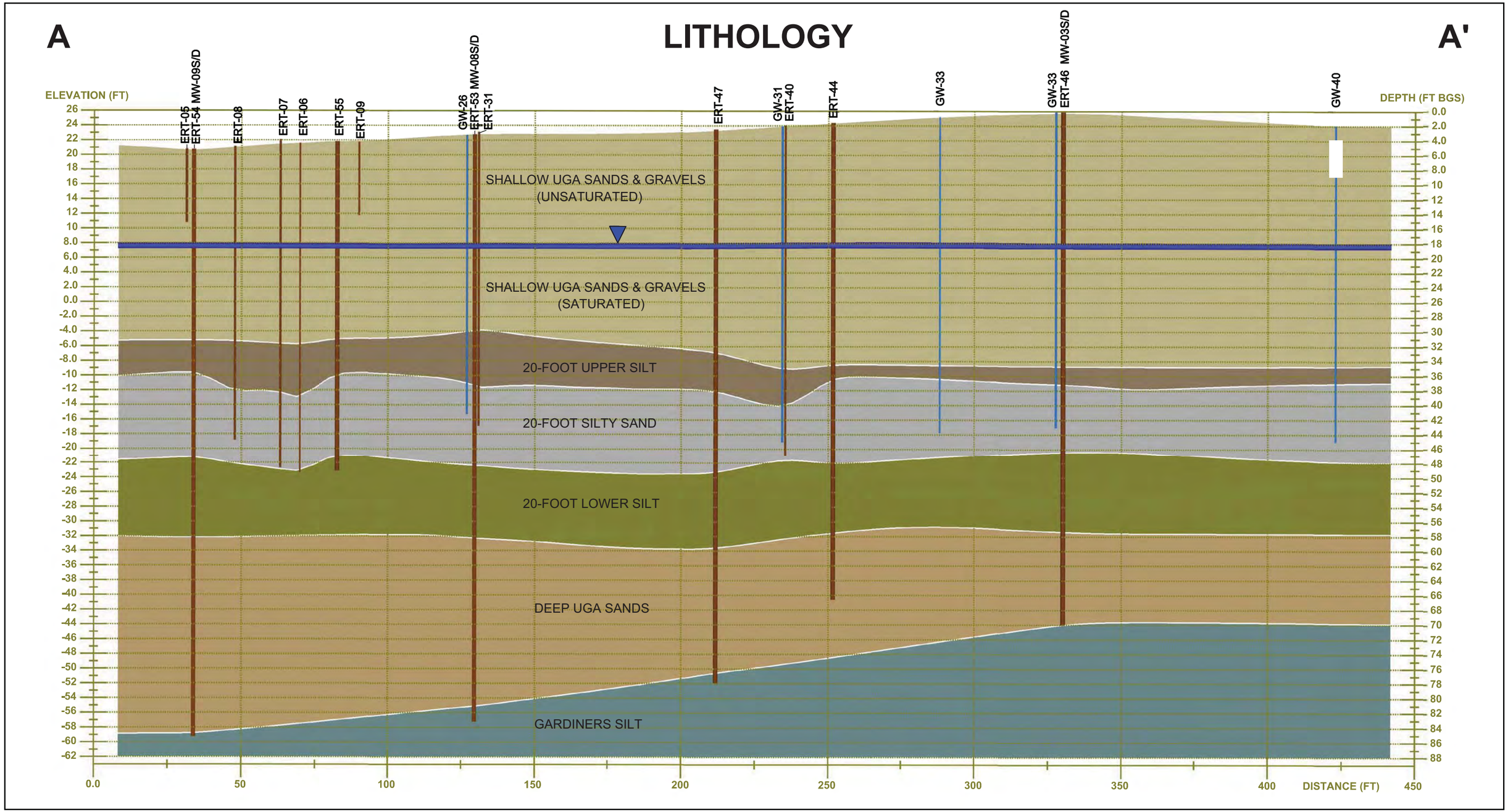
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

0 30 60 Feet

CROSS SECTION LINES
CEDARWOOD CLEANERS
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-4



Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY

- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

Figure Source:

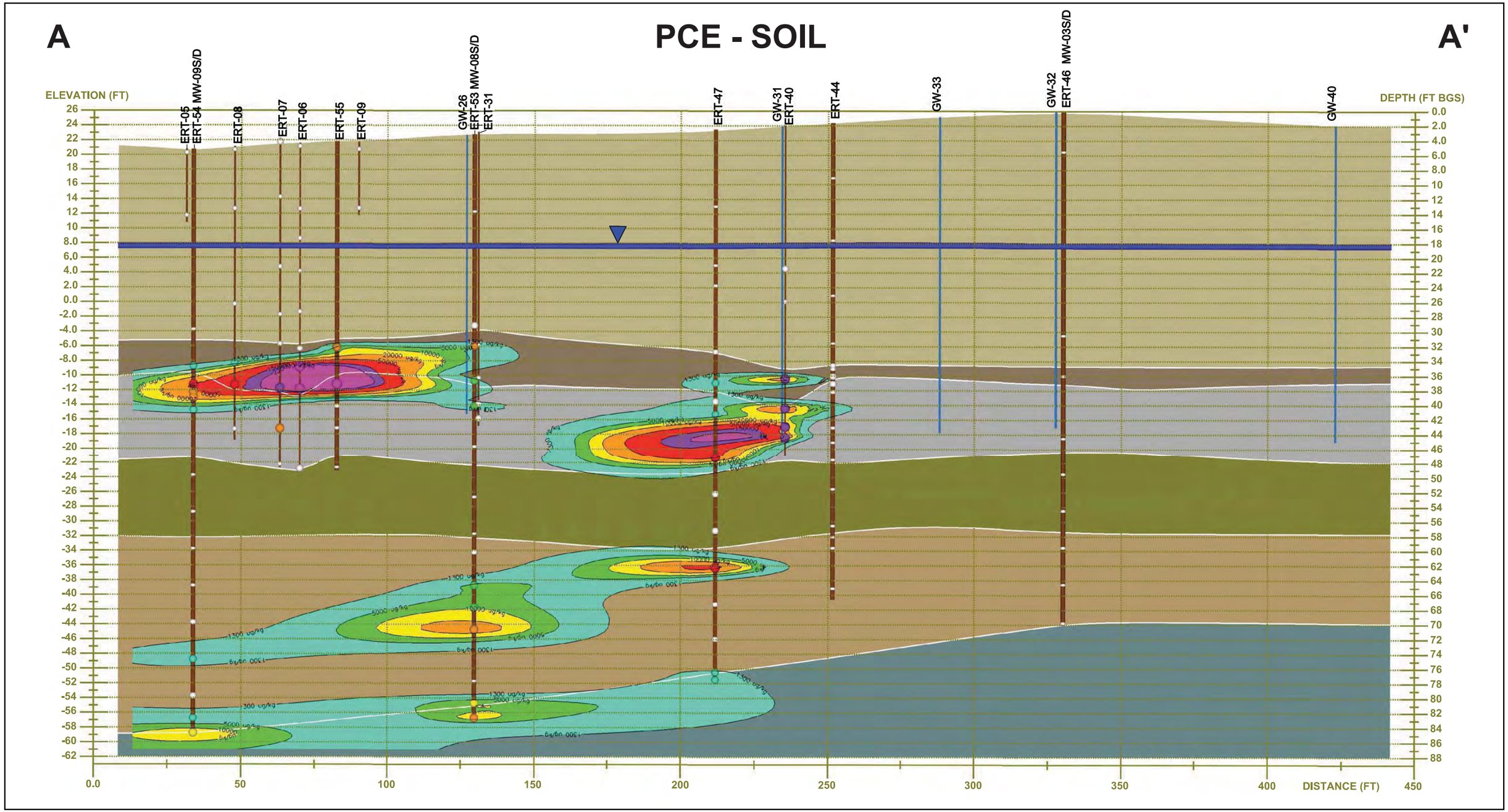
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

CROSS SECTION A-A' LITHOLOGY
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-5



Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plume depicts PCE concentrations in soil greater than 1,300 ug/kg. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

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Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

Figure Source:
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

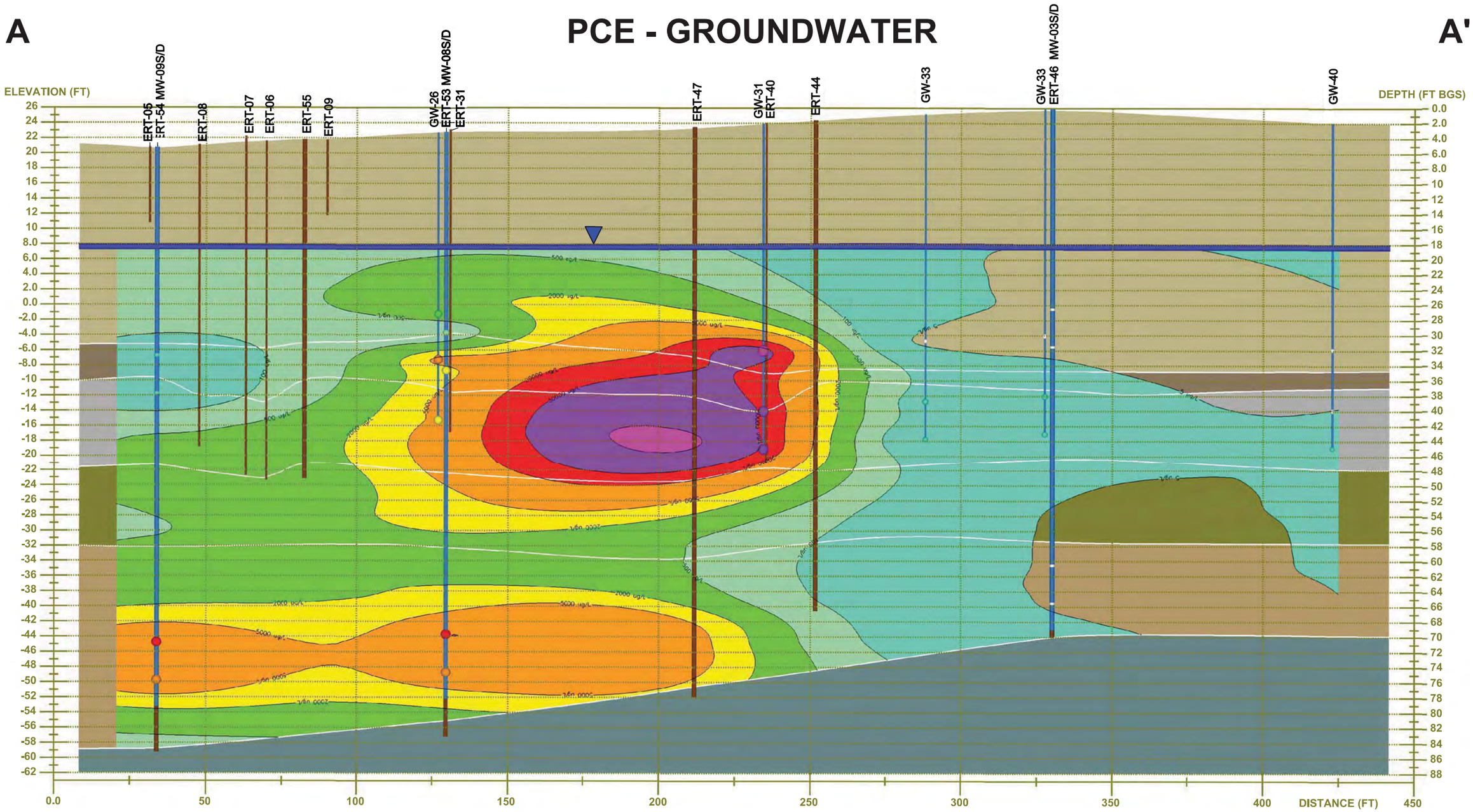
CROSS SECTION A-A' PCE IN SOIL
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-6

PCE - GROUNDWATER



Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plume depicts PCE concentrations in groundwater greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

Figure Source:
U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

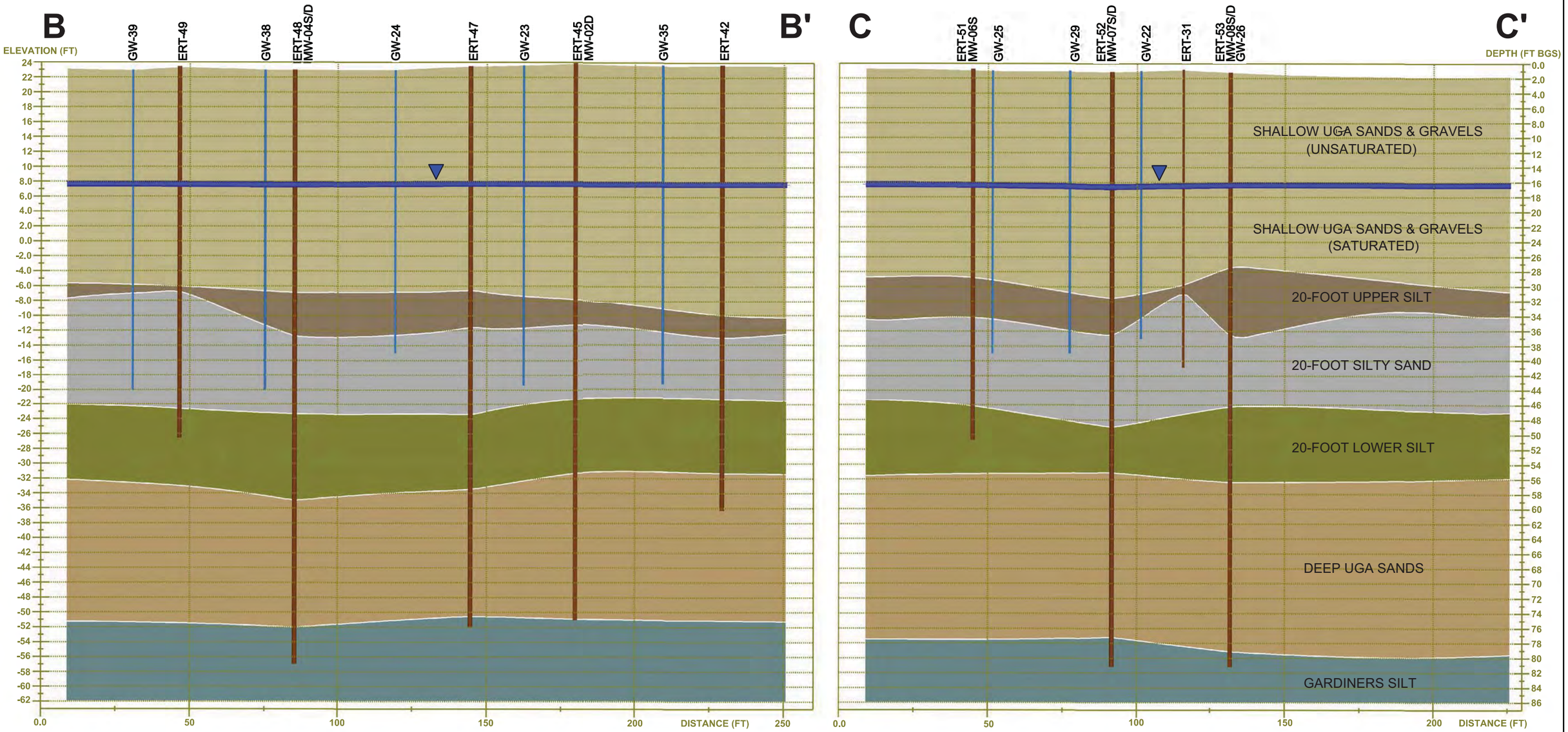
CROSS SECTION A-A' PCE IN GROUNDWATER
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-7

LITHOLOGY



Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Groundwater surface is derived from shallow groundwater monitoring well data.

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Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY

- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

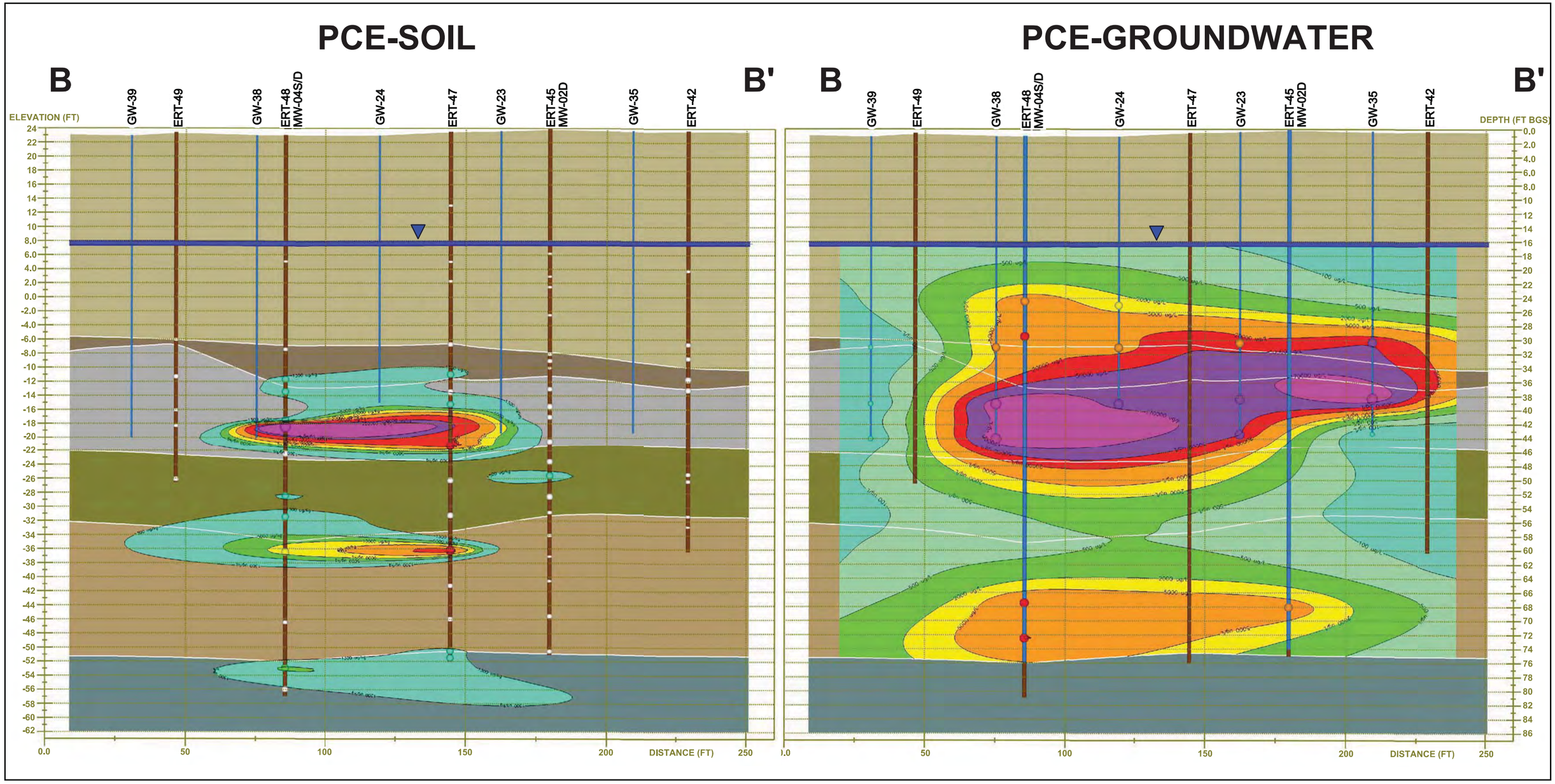
CROSS SECTION B-B' & C-C' LITHOLOGY

CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-8



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plumes depict PCE concentrations in soil greater than 1,300 ug/kg and in water greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

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Map Creation Date: 06 May 2016

Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Soil Borehole - DPT
Soil Borehole - Sonic
Temporary GW - DPT SP16
Permanent MW - Sonic

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

CROSS SECTION B-B' PCE
IN SOIL &GROUNDWATER

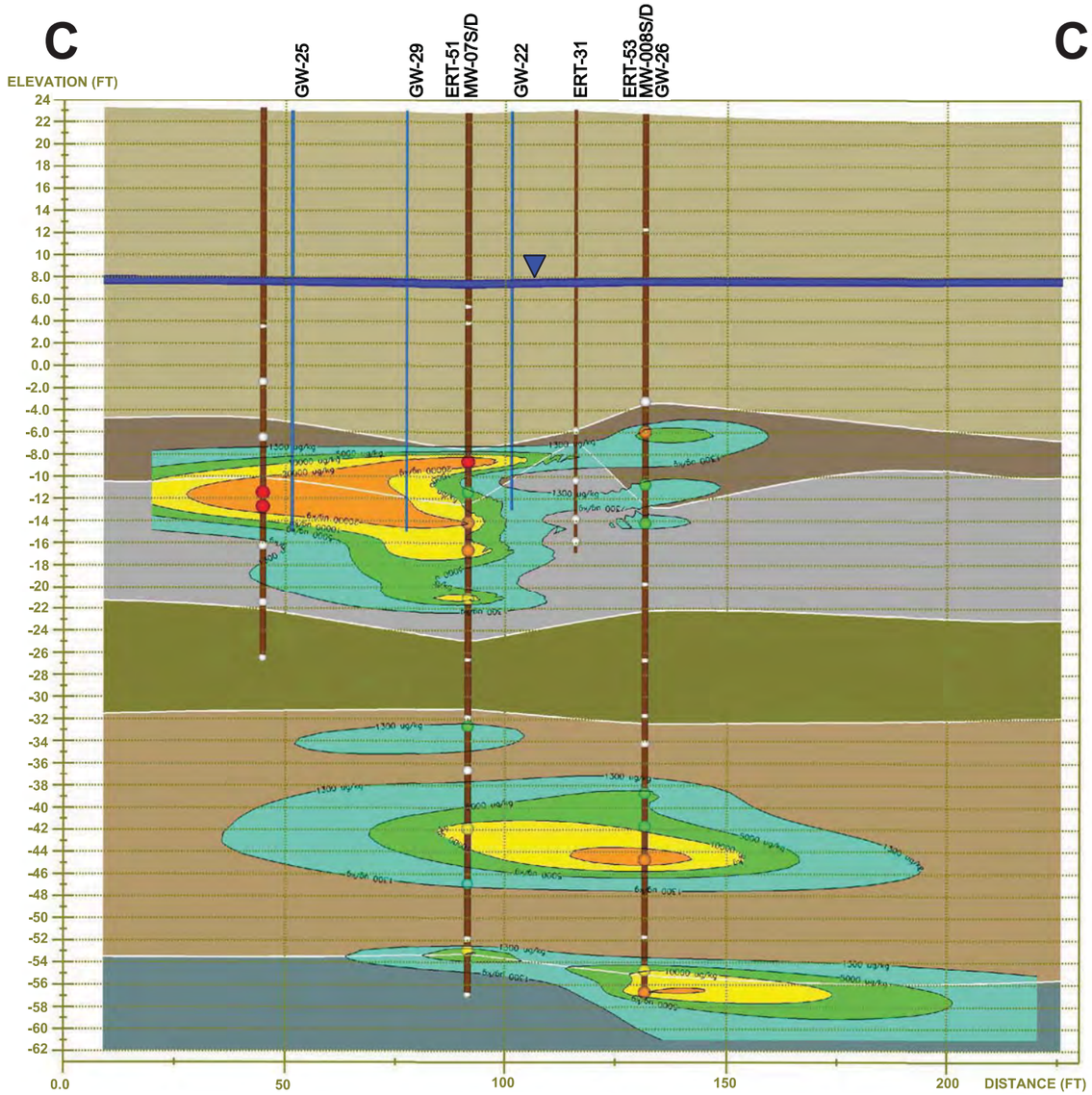
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

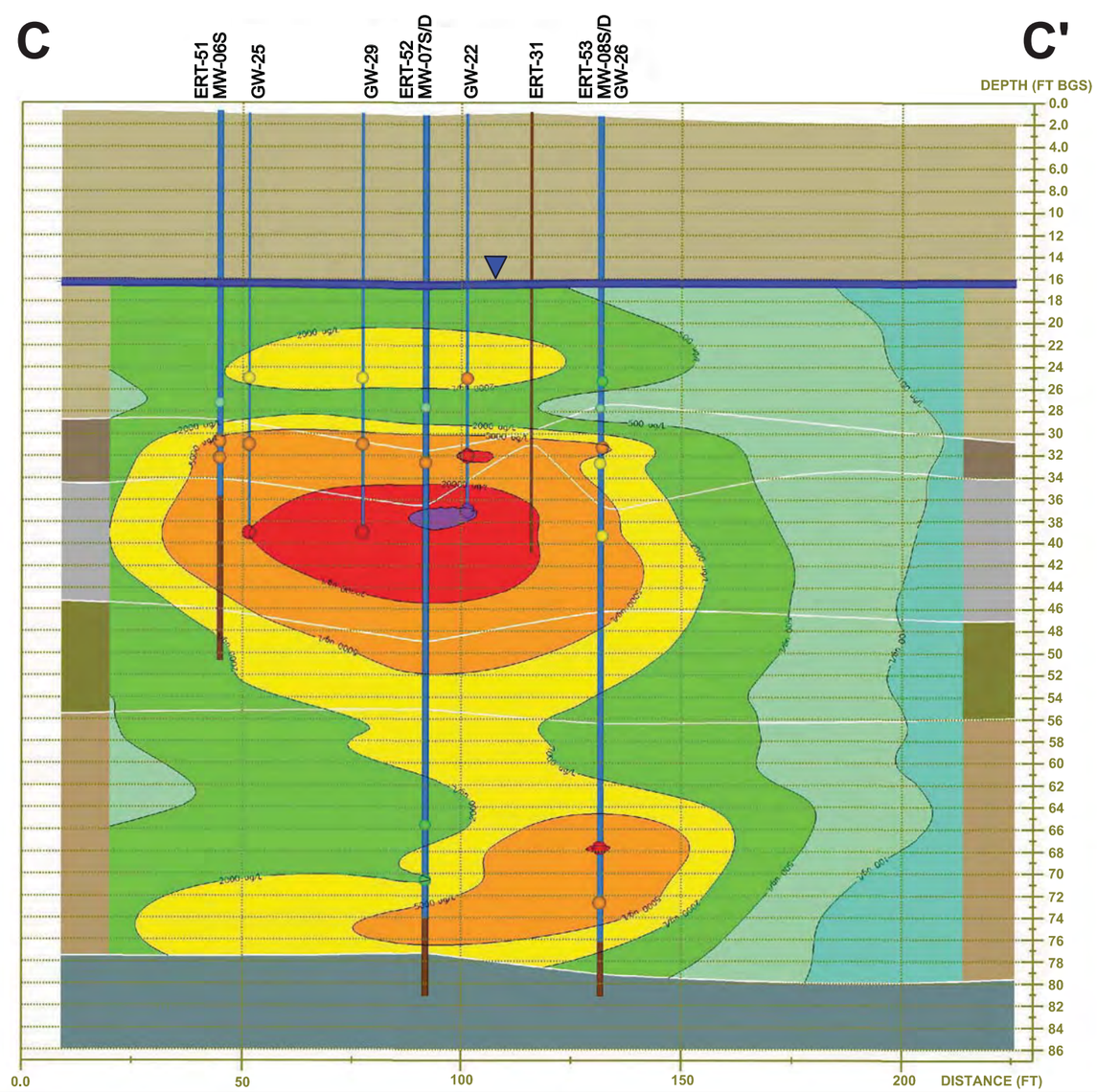
DATE
MARCH 2017

FIGURE
3-9

PCE-SOIL



PCE-GROUNDWATER



Source: Integrated Site Visualization (ISV) WCEC Environmental Consultants, 2016

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plumes depict PCE concentrations in soil greater than 1,300 ug/kg and in water greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

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Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

Soil Borehole - DPT
Soil Borehole - Sonic
Temporary GW - DPT SP16
Permanent MW - Sonic

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

CROSS SECTION C-C'
PCE IN SOIL & GROUNDWATER
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-10

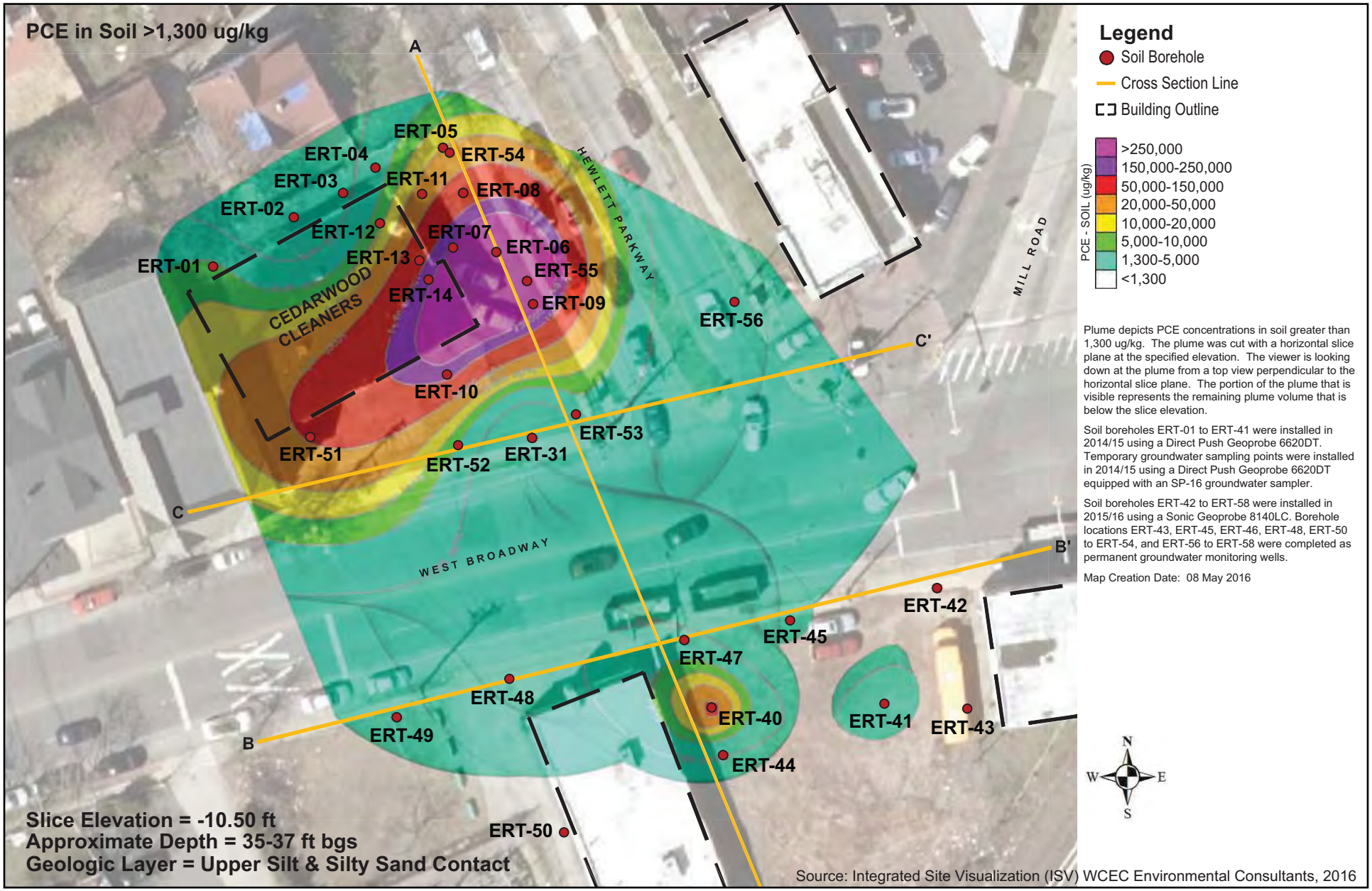


Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

PCE IN SOIL HORIZONTAL SLICES
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-11

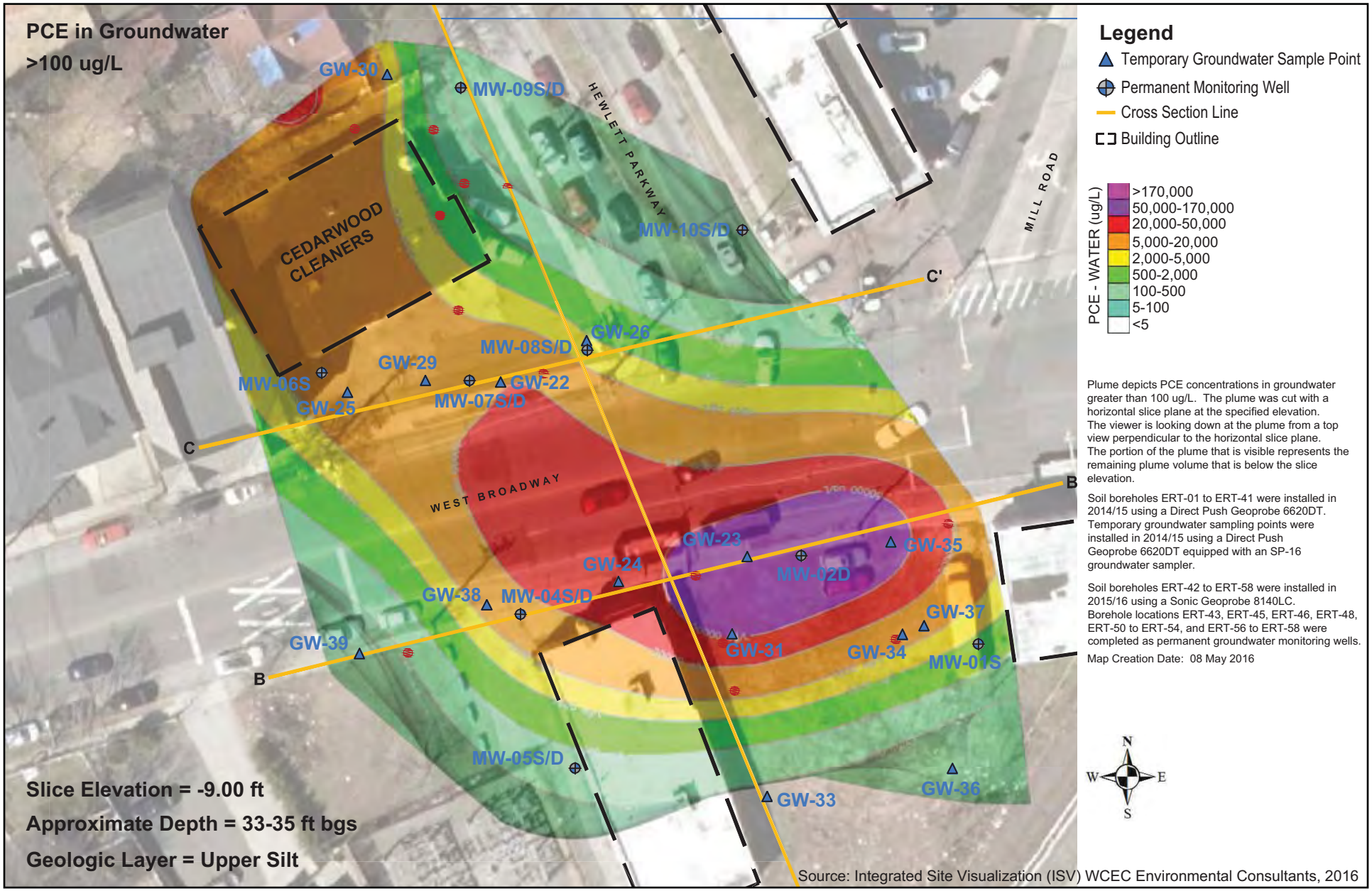


Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

PCE IN GROUNDWATER HORIZONTAL SLICES
CEDARWOOD CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-12

HDR

EXTENT OF SOIL CONTAMINATION
PIERMONT CLEANERS

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE

MARCH 2017

FIGURE

3-13

0 10 20 30 40 Feet

Figure Source:

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

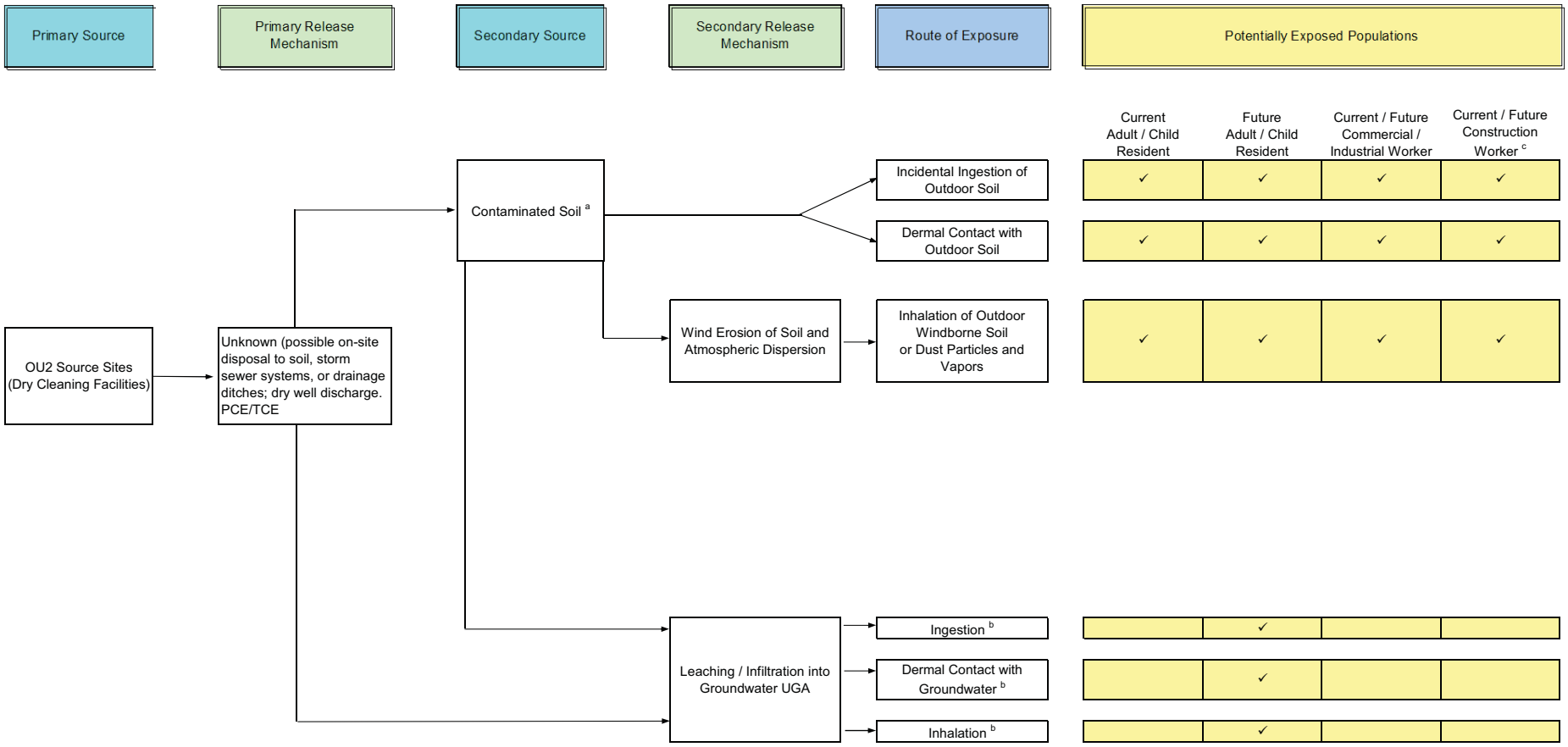
Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

EXTENT OF GROUNDWATER CONTAMINATION
PIERMONT CLEANERS
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-14



Notes:

a. The resident and commercial/industrial worker receptors are assumed to be exposed to surface soil 0-2 ft and a construction worker to 0-10 ft soil.

b. Untreated groundwater supplied via private wells is not used for potable water while treated groundwater supplied via public wells is.

c. Direct contact and inhalation with groundwater for construction workers involved in excavation activities are not evaluated, as there are no USEPA RSLs available for this scenario.

PCE - Tetrachloroethylene

TCE - Trichloroethylene

UGA - Upper Glacial Aquifer

CONCEPTUAL SITE MODEL

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
3-15

N

LEGEND

- AIR SPARGE WELL
- SOIL VAPOR EXTRACTION WELL
- PROCESS EQUIPMENT ENCLOSURE
- EXTENT OF FENCING
- VACUUM PIPING
- AIR SPARGING PIPING
- APPROXIMATE AREA FOR TREATMENT

NOTES

1. 59 AIR SPARGING WELLS INSTALLED TO A DEPTH OF 80 FEET BGS WERE ASSUMED TO HAVE A RADIUS OF INFLUENCE OF 15 FEET. 53 SOIL VAPOR EXTRACTION WELLS INSTALLED TO A DEPTH OF 10 FEET BGS WERE ASSUMED TO HAVE A RADIUS OF INFLUENCE OF 25 FEET. GROUNDWATER TABLE IS APPROXIMATELY 15 FEET BGS.
2. DIRECTIONAL DRILLING WILL BE EVALUATED DURING DESIGN FOR WELLS.UNDER THE BUILDING.

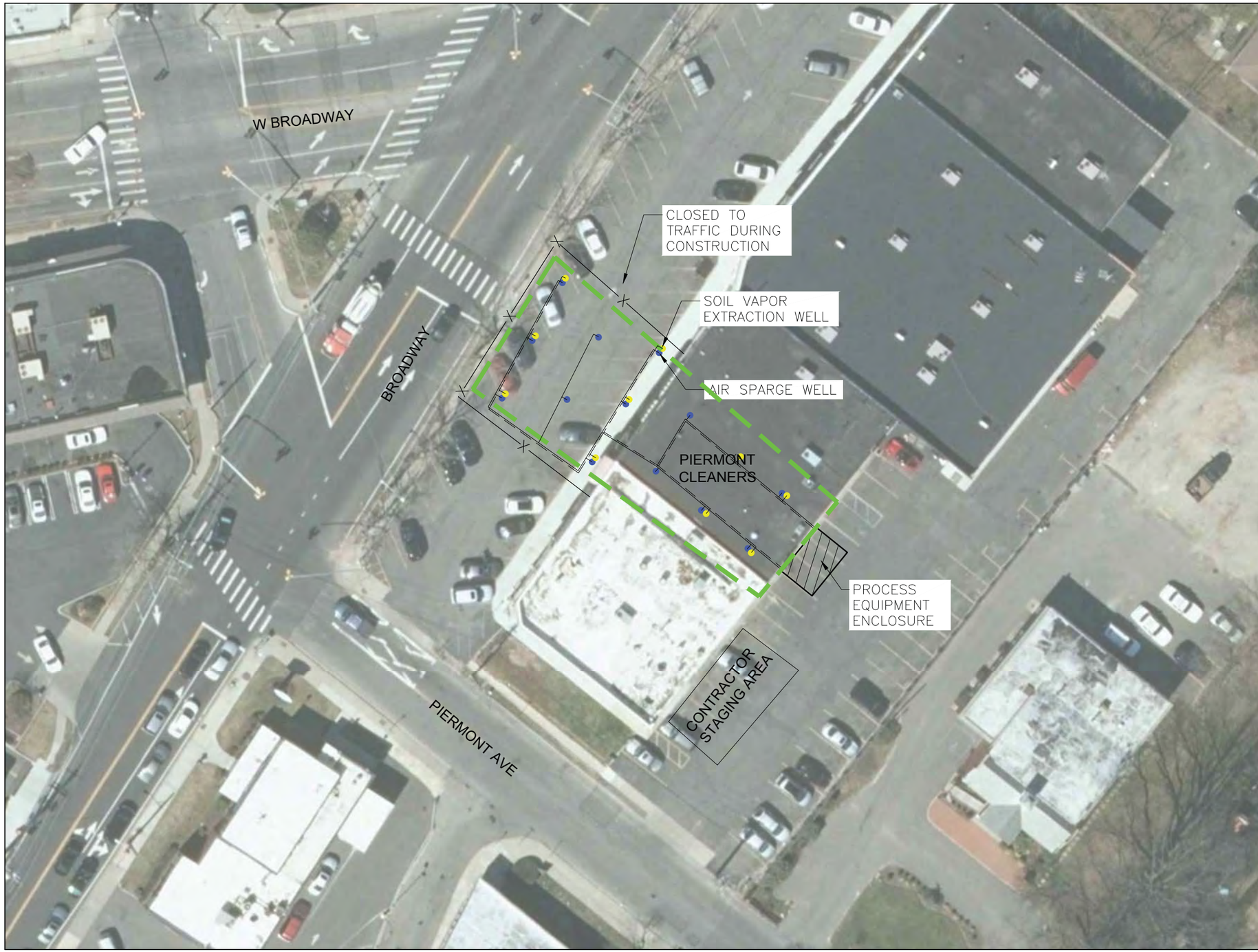
0 40' 80'

HDR

ALTERNATIVE 2
AIR SPARGING / SOIL VAPOR EXTRACTION
AOC 1
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-1a



N

LEGEND

- AIR SPARGE WELL
- SOIL VAPOR EXTRACTION WELL
- PROCESS EQUIPMENT ENCLOSURE
- EXTENT OF FENCING
- VACUUM PIPING
- AIR SPARGING PIPING
- APPROXIMATE AREA FOR TREATMENT

NOTES

1. 14 AIR SPARGING WELLS INSTALLED TO A DEPTH OF 38 FEET BGS WERE ASSUMED TO HAVE A RADIUS OF INFLUENCE OF 15 FEET. 10 SOIL VAPOR EXTRACTION WELLS INSTALLED TO A DEPTH OF 12 FEET BGS WERE ASSUMED TO HAVE A RADIUS OF INFLUENCE OF 25 FEET. THE DEPTH TO THE GROUNDWATER TABLE IS ANTICIPATED AT 17 FEET BGS.
2. DIRECTIONAL DRILLING WILL BE EVALUATED DURING THE DESIGN FOR WELLS UNDER THE BUILDING.

0 40' 80'

HDR

ALTERNATIVE 2
AIR SPARGING / SOIL VAPOR EXTRACTION
AOC 2
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-1b

N

LEGEND

PROCESS EQUIPMENT STAGING AREA

EXTENTS OF FENCING

APPROXIMATE EXTENT OF THERMAL TREATMENT AREA

NOTES

1. APPROXIMATELY 220 TO 240 ELECTRODES INSTALLED TO AN APPROXIMATE DEPTH OF 81 FEET BGS ARE ASSUMED TO BE INSTALLED IN A GRID LAYOUT. DISTANCE BETWEEN ELECTRODES IS ASSUMED TO BE 16 FEET.
2. APPROXIMATELY 220 TO 240 VAPOR RECOVERY WELLS ESTIMATED.

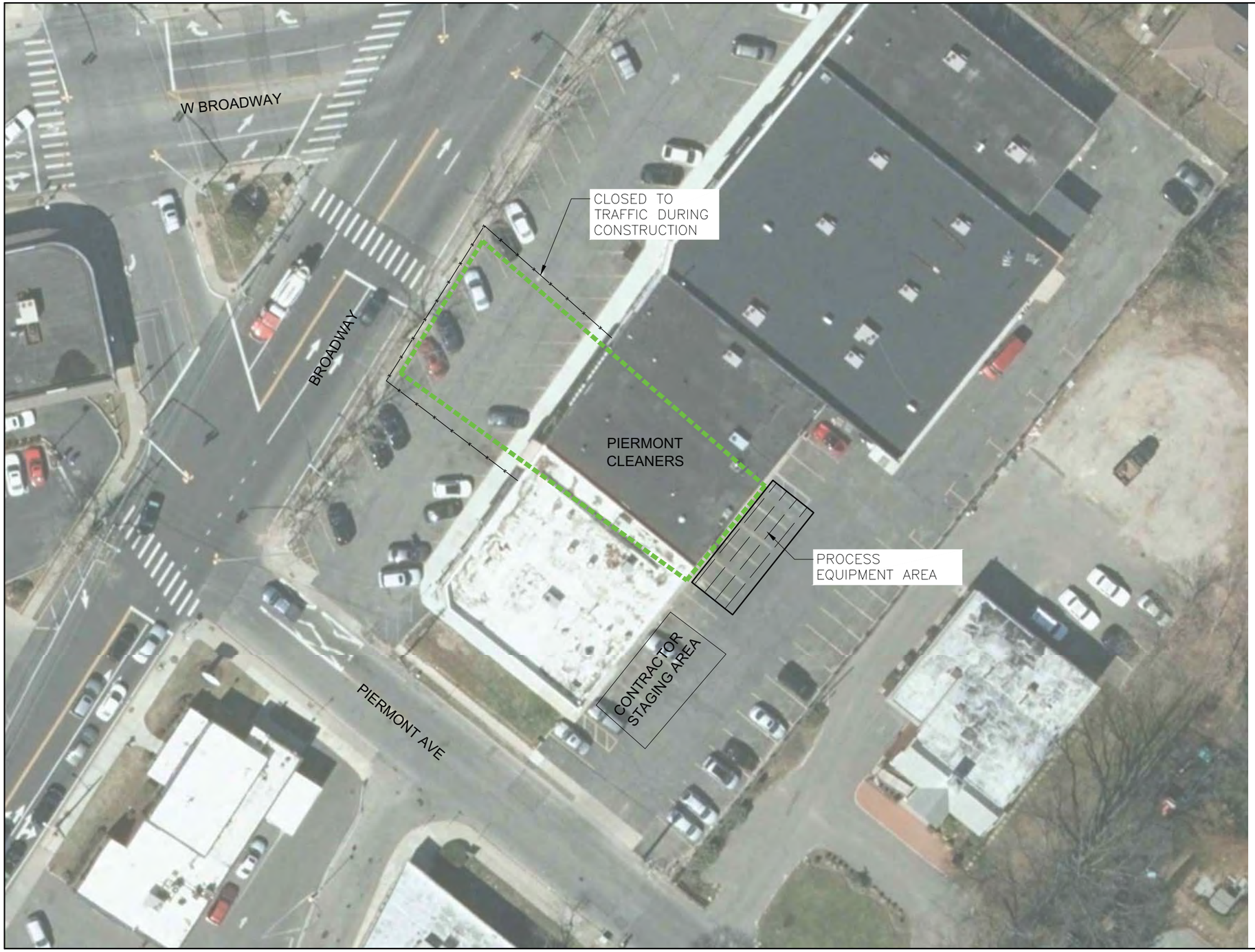
0 40' 80'

HDR

ALTERNATIVE 3
IN SITU THERMAL TREATMENT
AOC 1
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-2a



N

LEGEND

PROCESS EQUIPMENT STAGING AREA

EXTENTS OF FENCING

APPROXIMATE EXTENT OF THERMAL TREATMENT AREA

NOTES

1. APPROXIMATELY 33 TO 40 ELECTRODES INSTALLED TO AN APPROXIMATE DEPTH OF 39 FEET BGS ARE ASSUMED TO BE INSTALLED IN A GRID LAYOUT. DISTANCE BETWEEN ELECTRODES IS ASSUMED TO BE 16 FEET.
2. APPROXIMATELY 33 TO 40 VAPOR RECOVERY WELLS ESTIMATED.

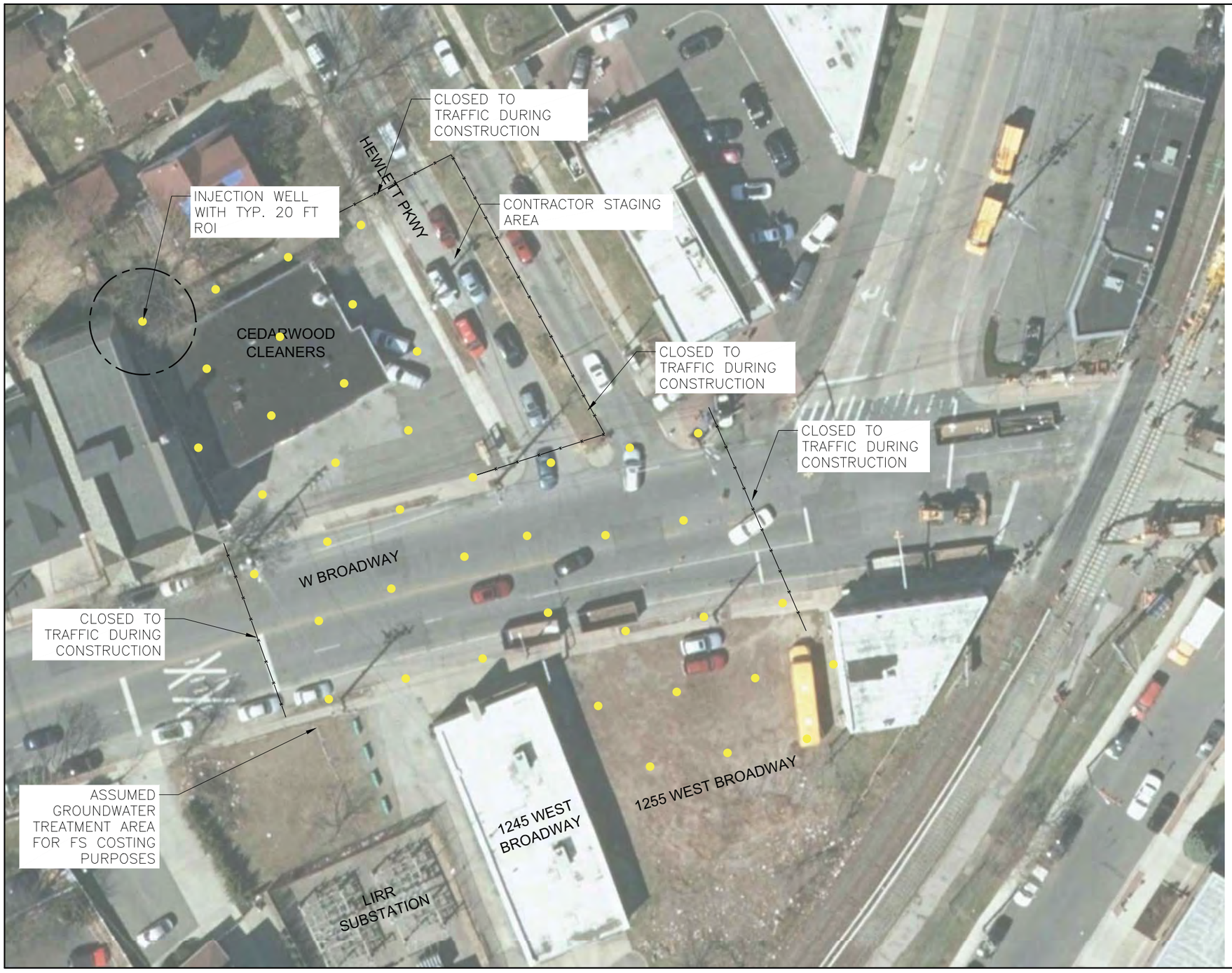
0 40' 80'

HDR

ALTERNATIVE 3
IN SITU THERMAL TREATMENT
AOC 2
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-2b



N

LEGEND

TYPICAL ROI 20 FT

EXTENT OF FENCING

NOTES

1. FOR BIOREMEDIATION - 63 INJECTION WELLS INSTALLED TO A DEPTH OF APPROXIMATELY 80 FEET BGS WITH AN ASSUMED 20 FEET ROI. INJECTION WELLS WERE ASSUMED TO BE INSTALLED IN A GRID LAYOUT.

0 40' 80'

HDR

ALTERNATIVE 4A
IN SITU BIOREMEDIATION LTM AND ICS
AOC 1
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-3a

N

LEGEND

TYPICAL ROI 20 FT

EXTENT OF FENCING

NOTES

1. FOR BIOREMEDIATION - 7 INJECTION WELLS INSTALLED TO A DEPTH OF APPROXIMATELY 38 FEET BGS WITH AN ASSUMED 20 FEET ROI. INJECTION WELLS WERE ASSUMED TO BE INSTALLED IN A GRID LAYOUT.

0 40' 80'

HDR

ALTERNATIVE 4A
IN-SITU BIOREMEDIATION LTM AND iCS
AOC 2
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-3b

N

LEGEND

TYPICAL ROI 20 FT

EXTENT OF FENCING

APPROXIMATE EXTENT FOR HEPA TREATMENT

HEPA HEAT ENHANCED PLUME ATTENUATION

NOTES

1. FOR BIOREMEDIATION - 63 INJECTION WELLS INSTALLED TO A DEPTH OF APPROXIMATELY 80 FEET BGS WITH AN ASSUMED 20 FEET ROI. INJECTION WELLS WERE ASSUMED TO BE INSTALLED IN A GRID LAYOUT.

2. FOR HEPA - APPROXIMATELY 100 ELECTRODES INSTALLED TO A DEPTH OF 81 FEET BGS. ELECTRODES WERE ASSUMED TO BE INSTALLED IN A GRID LAYOUT WITH A DISTANCE BETWEEN ELECTRODES OF 23 FEET.

0 40' 80'

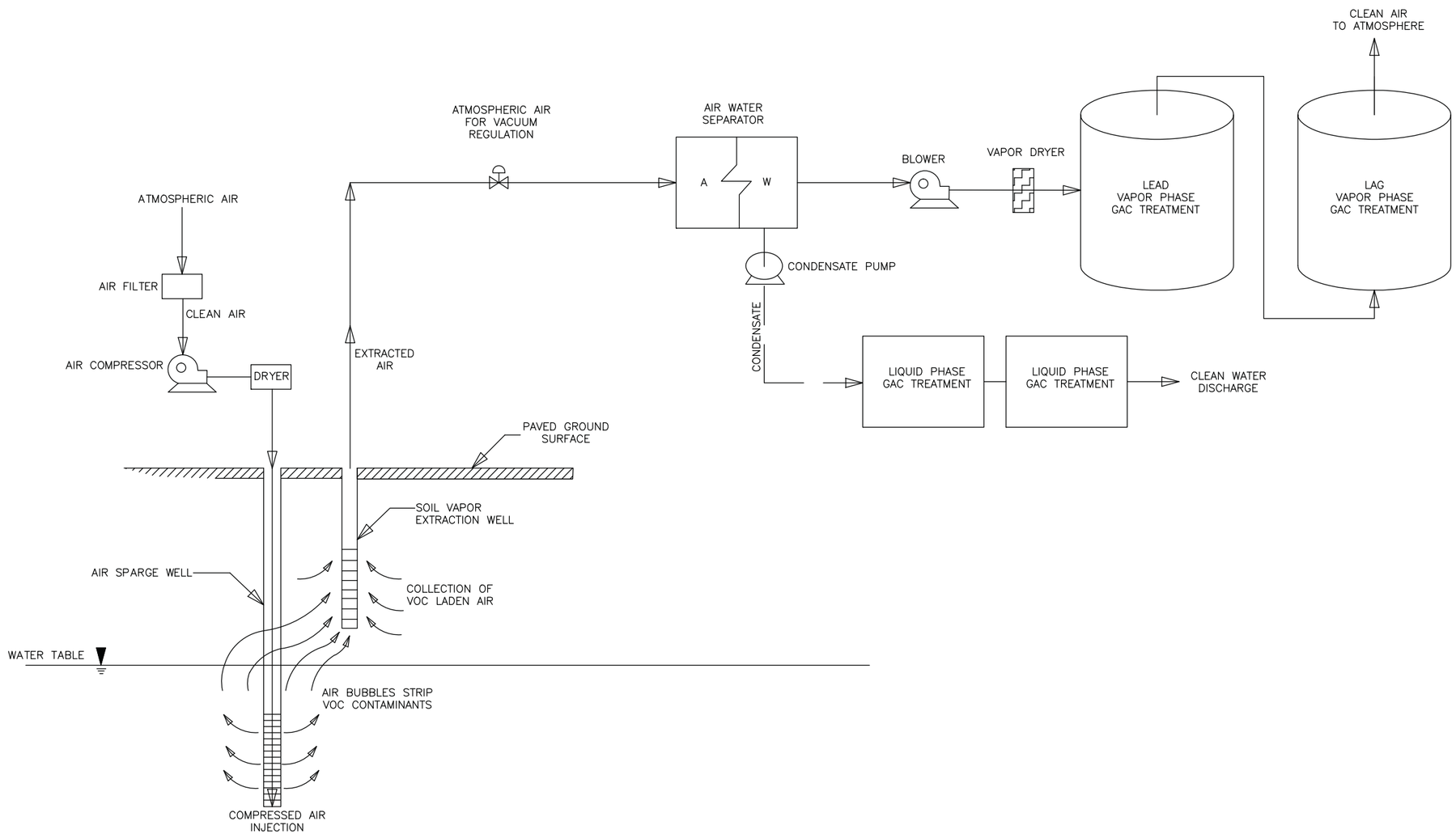
HDR

ALTERNATIVE 4B

IN SITU BIOREMEDIATION HEPA, LTM AND ICS
AOC 1
PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-3c

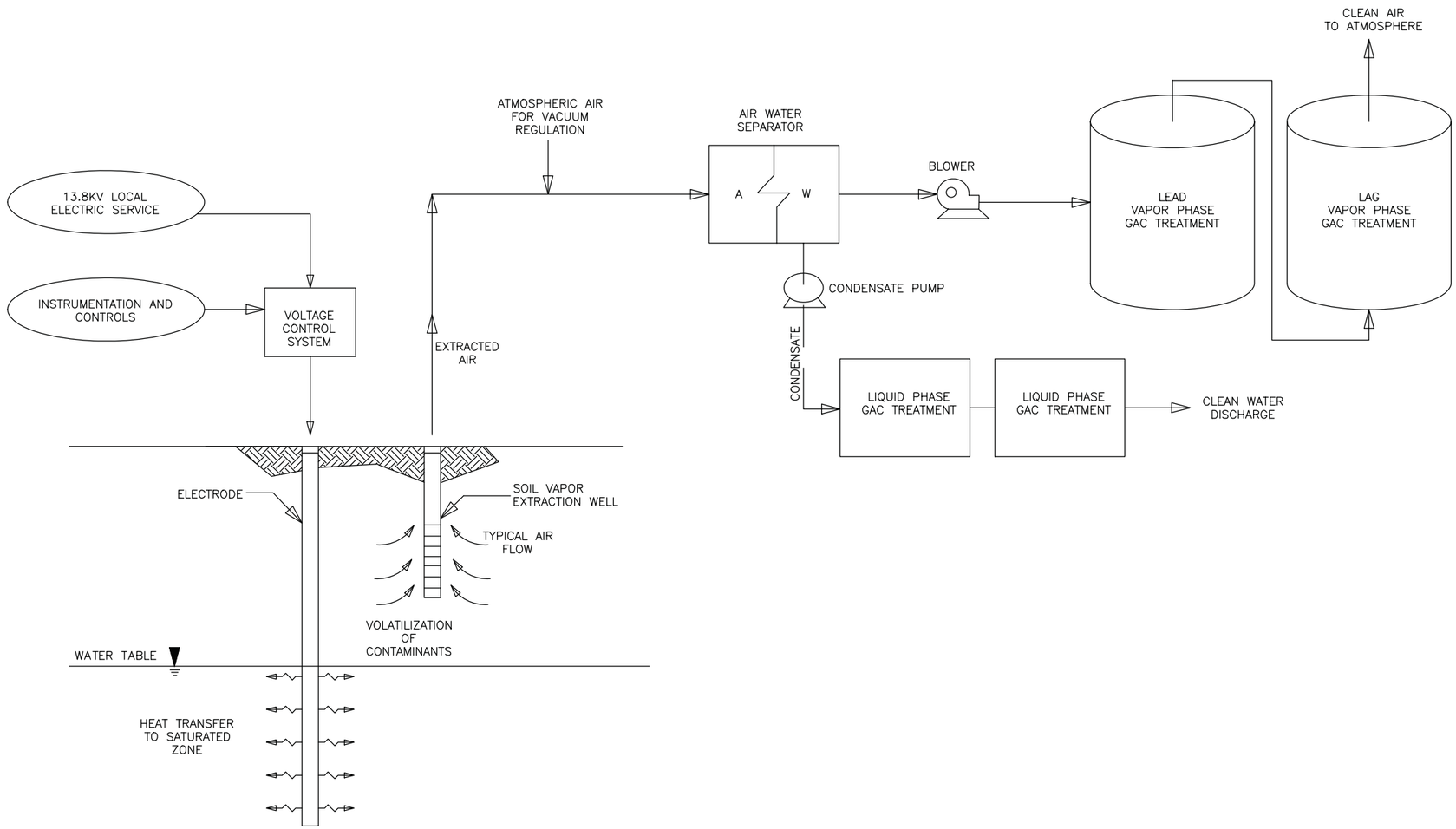


AIR SPARGING / SOIL VAPOR EXTRACTION
SYSTEM SCHEMATIC

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-4



IN SITU THERMAL TREATMENT
SYSTEM SCHEMATIC

PENINSULA BOULEVARD OU2
SUPERFUND SITE
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
MARCH 2017

FIGURE
8-5

APPENDICES

APPENDIX A

COST ESTIMATE BACKUP

REMEDIAL ALTERNATIVES AOC1

Appendix A-1 Summary of Total Cost of Remedial Alternatives for AOC1

Site:	Peninsula Boulevard Superfund Site, OU2	**Base Year:**	2017
Location:	Hewlett, Town of Hempstead, New York	**Date:**	March 21, 2017
Phase:	Feasibility Study (-30% - +50%)		

	Alternative 1	**Alternative 2**	**Alternative 3***	**Alternative 4A***	**Alternative 4B***
Description	**No Action**	**Soil Vapor Extraction & Air Sparging, LTM, ICs**	**In-Situ Thermal Treatment, LTM, ICs**	**In-Situ Bioremediation, LTM, ICs**	**In-Situ Bioremediation and Heat Enhanced Plume Attenuation, LTM, ICs**
Estimated Active Project Duration (Years)	-	10	2	10 years for bioremediation	5 years for bioremediation and HEPA
Estimated Long Term Monitoring (Years)	-	30	5	30	25
Total Capital Cost	$ -	$ 2,899,086	$ 21,632,524	$ 3,798,403	$ 15,768,864
Total O&M Cost	$ -	$ 7,211,883	$ 18,722,129	$ 1,783,220	$ 5,332,620
Total Periodic Cost	$ -	$ 381,460	$ 693,956	$ 284,462	$ 450,966
Total Present Value of Alternatives	**$ -**	**$ 10,492,429**	**$ 41,048,610**	**$ 5,866,084**	**$ 21,552,450**

AOC 1 refers to Cedarwood Cleaners and includes the properties south of Cedarwood Cleaners, i.e, 1245/1255 West Broadway and the LIRR Substation ROW
*Costs related to temporary or permanent re-location of occupants are not included.

Appendix A2 - Cost Estimate for Alternative 1, AOC1

Alternative 1, AOC1

No Action

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2

Description: Alternative 1 consists of no action.

Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

CAPITAL COSTS:

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
1	**Capital Costs**					
1.1	No Capital Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
2	**Institutional Controls**					
2.1	No Institutional Controls	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
	TOTAL CAPITAL COST				**$ -**	

ANNUAL O&M COST:

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
1	**Annual O&M Costs**					
1.1	No Annual O&M Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
2	**Maintenance**					
2.1	No Maintenance Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
	Sub-Total				**$ -**	Sub-Total O&M Costs.
	Contingency	15%			$ -	
	Sub-Total				**$ -**	
	Project Management				$ -	
	Technical Support				$ -	
	TOTAL ANNUAL O&M COST				**$ -**	

PERIODIC COSTS:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**Periodic Costs**						
1.1	No Periodic Costs		0	LS	$ -	$ -	
	Sub-Total					**$ -**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Interest Rate: 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		$ -	
2	**Annual O&M Cost**		0	$ -	
3	**Periodic Costs**		0	$ -	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ -**	

Appendix A3 - Cost Estimate for Alternative 2, AOC1

Alternative 2, AOC1
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Air Sparging (AS) for saturated soils and groundwater in combination with Soil Vapor Extraction (SVE). PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey and Utility Clearance**					
1.1	Survey	1	LS	$ 15,000	$ 15,000	approx 48,570 sq ft
1.2	Utility Clearance	1	LS	$ 15,000	$ 15,000	
	Sub-Total				**$ 30,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	10	Day	$ 1,500	$ 15,000	Assumes 30 borings at AOC1, upto 15 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	7	Day	$ 2,000	$ 14,000	Assumes 5 temporary points at AOC1, varying depths of 15 to 80 ft deep; 1 boring/day
2.5	Monitoring Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC1; 2-inch diameter; 80 ft deep, PVC riser, screen and development.
2.6	Flush-mount curb box with inner locking cap	5	EA	$ 275	$ 1,375	For monitoring wells
2.7	Steam Clean Equipment	17	Day	$ 350	$ 5,950	inc. daily rental for steam cleaner and 2 hr/day for decon equipment
2.8	IDW	1	LS	$ 10,000	$ 10,000	Sleeves, decon water, misc used items, groundwater waste from well installation and development.
2.9	Surface Repair	1	LS	$ 6,000	$ 6,000	
2.10	Water Level Measurements	1	LS	$ 1,500	$ 1,500	
2.11	Soil Sample Analysis and data evaluation	108	EA	$ 550	$ 59,400	Sampling 30 borings at 5 ft intervals from 0 - 15 ft bgs for VOCs, 20% QC samples
2.12	Groundwater Sampling and data evaluation	102	EA	$ 550	$ 56,100	Sampling 5 temporary points at 5 ft intervals from 15 - 80 ft bgs, and 15 monitoring wells for baseline; 20% QC samples; analysis for VOCs
2.13	Field Work Oversight	380	MH	$ 150	$ 57,000	2 persons; includes sampling labor
2.14	Pilot Study	1	LS	$ 50,000	$ 50,000	Pilot Study to determine radius of influence and blower capacity needed
2.15	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 429,825**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 5,000**	

Appendix A3 - Cost Estimate for Alternative 2, AOC1

Alternative 2, AOC1
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Air Sparging (AS) for saturated soils and groundwater in combination with Soil Vapor Extraction (SVE). PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
5	**Site Preparation**					
5.1	Temporary Security Fence	1,000	LF	$ 30	$ 30,000	Temporary fence around property boundary, extending to Hewlett Parkway and West Broadway during construction
5.2	Traffic Re-routing and closure of Roadways	1	LS	$ 150,000	$ 150,000	Closure of Hewlett Parkway and West Broadway, traffic study and traffic plan
	Sub-Total				**$ 180,000**	
6	**AS/SVE System**					
6.1	Air Sparging Well Installation	59	EA	$ 5,000	$ 295,000	Drilling, construction and development. 4-inch diameter; 80 ft depth.
6.2	Soil Vapor Extraction Well Installation	53	EA	$ 1,000	$ 53,000	Drilling, construction and development. 4-inch diameter; 10 ft depth.
6.3	Air Sparging/SVE Equipment/Components	1	LS	$ 190,000	$ 190,000	Includes equipment, mobilization and start up, technical assistance and consulting, and material and expenses.
6.4	Process Equipment Enclosure	400	SF	$ 80	$ 32,000	Includes foundation, electric, construction, site work, HVAC
6.5	Power Service	1	LS	$ 50,000	$ 50,000	Includes transformer
6.6	Trenching	3,510	LF	$ 40	$ 140,400	Excavation, piping, bedding for SVE and AS.
6.7	Surface Restoration	1	LS	$ 15,000	$ 15,000	Site restoration
6.8	Asphalt Cap for Vacant lot	1	LS	$ 15,000	$ 15,000	
6.9	Asphalt Disposal	3,510	LF	$ 16	$ 56,160	From any trenching or saw cut work
6.10	Vapor Phase GAC Vessels	2	EA	$ 10,000	$ 20,000	2,000 lb vapor phase GAC vessel
6.11	IDW	1	LS	$ 100,000	$ 100,000	include IDW from drilling
6.12	Well Survey	4	DAY	$ 1,500	$ 6,000	
6.13	Permits	1	LS	$ 10,000	$ 10,000	
	Sub-Total				**$ 982,560**	
7	**Reporting and Institutional Controls**					
7.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
7.2	Institutional Controls & Site Management Plan	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees at AOC1
	Sub-Total				**$ 70,000**	
	Sub-Total				**$ 1,917,385**	Sub-Total All Construction Costs.
	Contingency	20%			$ 383,477	10% scope + 10% bid
	Sub-Total				**$ 2,300,862**	
	Project Management	6%			$ 138,052	
	Remedial Design	12%			$ 276,103	
	Construction Management	8%			$ 184,069	
	TOTAL CAPITAL COST				**$ 2,899,086**	

Appendix A3 - Cost Estimate for Alternative 2, AOC1

Alternative 2, AOC1
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Air Sparging (AS) for saturated soils and groundwater in combination with Soil Vapor Extraction (SVE). PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

ANNUAL O&M COST

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**Operations Costs - Year 1 to 10**	1 to 10					Every year through year 10.
1.1	Electrical Usage		170,000	KW-Hr	$ 0.44	$ 74,800	System operates for 10 years
1.2	Vapor Carbon Usage		24,000	LB	$ 3.30	$ 79,200	Change out both units 6 x per year
1.3	Vapor Carbon Disposal		24,000	LB	$ 2	$ 48,000	
1.4	Weekly Inspections		52	EA	$1,000	$ 52,000	Weekly once
1.5	Effluent Sampling		36	EA	$ 1,150	$ 41,400	Monthly Influent, Effluent Air Sampling and between GAC vessels for VOCs; includes labor
1.6	Reporting		12	Month	$ 5,000	$ 60,000	Monthly
	Sub-Total					**$ 355,400**	
	Contingency		15%			$ 53,310	
	TOTAL OPERATIONS COST (Year 1 to 10)					**$ 408,710**	
2	**LTM and Institutional Controls - Year 1 to 5**	1 to 5					Every year through year 5.
2.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
2.2	Soil Sampling		20	EA	$ 600	$ 12,000	10 borings semi-annually; includes labor
2.3	Groundwater Sampling		30	EA	$ 600	$ 18,000	15 wells semi-annually; includes labor
2.4	Soil Sample Laboratory Analysis		24	EA	$ 550	$ 13,200	Total VOCs analysis + 20% QC samples.
2.5	Groundwater Sample Laboratory Analysis		36	EA	$ 550	$ 19,800	Total VOCs analysis + 20% QC samples.
2.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
2.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 119,000**	
	Contingency		15%			$ 17,850	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 1 to 5)					**$ 146,850**	
3	**LTM and Institutional Controls - Year 6 to 30**	6 to 30					Annually from year 6 through year 30.
3.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
3.2	Soil Sampling		10	EA	$ 600	$ 6,000	10 borings annually; includes labor
3.3	Groundwater Sampling		15	EA	$ 600	$ 9,000	15 wells annually; includes labor
3.4	Soil Sample Laboratory Analysis		12	EA	$ 550	$ 6,600	Total VOCs analysis + 20% QC samples.
3.5	Groundwater Sample Laboratory Analysis		18	EA	$ 550	$ 9,900	Total VOCs analysis + 20% QC samples.
3.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
3.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 87,500**	
	Contingency		15%			$ 13,125	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 6 to 30)					**$ 110,625**	

Appendix A3 - Cost Estimate for Alternative 2, AOC1

Alternative 2, AOC1
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Air Sparging (AS) for saturated soils and groundwater in combination with Soil Vapor Extraction (SVE). PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**5 Year Review**	5 to 30					
1.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	Every 5 years through year 30
1.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
	Contingency		15%			$ 4,725	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 5 to 30)					**$ 46,225**	
2	**Decommission System**	10					At the end of Year 10
2.1	Decommission System		1	LS	$ 50,000	$ 50,000	
2.2	Decommission AS/SVE Wells		112	EA	$ 1,500	$ 168,000	
2.3	Closeout Report		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 248,000**	
	Contingency		15%			$ 37,200	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 10)					**$ 295,200**	
3	**Site Close Out**	30					At the end of Year 30
3.1	Monitoring Well Abandonment		15	EA	$ 1,500	$ 22,500	Drilling subcontractor, abandonment of monitoring wells at AOC1.
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 72,500**	
	Contingency		15%			$ 10,875	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 30)					**$ 93,375**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 2,899,086**	
2	**Annual O&M Cost**				
2.1	Year 1 to 5	1 to 5	555,560	$2,481,371	
2.2	Year 6 to 10	6 to 10	519,335	$2,689,022	
2.3	Year 11 to 30	11 to 30	110,625	$2,041,490	
	Sub-Total			**$ 7,211,883**	
3	**Periodic Costs**				
3.1	Year 5	5	46,225	$38,200	
3.2	Year 10	10	341,425	$233,250	
3.3	Year 15	15	46,225	$26,100	
3.4	Year 20	20	46,225	$21,570	
3.5	Year 25	25	46,225	$17,830	
3.6	Year 30	30	139,600	$44,510	
	Sub-Total			**$ 381,460**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 10,492,429**	

Appendix A4 - Cost Estimate for Alternative 3, AOC1

Alternative 3, AOC1

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for the residual plume only. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 15,000	$ 15,000	approx 48,570 sq ft
1.2	Utility Clearance	1	LS	$ 15,000	$ 15,000	
	Sub-Total				**$ 30,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	10	Day	$ 1,500	$ 15,000	Assumes 30 borings at AOC1, upto 15 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	7	Day	$ 2,000	$ 14,000	Assumes 5 temporary points at AOC1, varying depths of 15 to 80 ft deep; 1 boring/day
2.5	Monitoring Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC1; 2-inch diameter; 80 ft deep, PVC
2.6	Flush-mount curb box with inner locking cap	5	EA	$ 275	$ 1,375	For monitoring wells
2.7	Steam Clean Equipment	17	Day	$ 350	$ 5,950	inc. daily rental for steam cleaner and 2 hr/day for decon
2.8	IDW	1	LS	$ 10,000	$ 10,000	Sleeves, decon water, misc used items
2.9	Surface Repair	1	LS	$ 6,000	$ 6,000	
2.10	Water Level Measurements	1	LS	$ 1,500	$ 1,500	
2.11	Soil Sample Analysis and data evaluation	108	EA	$ 550	$ 59,400	Sampling 30 borings at 5 ft intervals from 0 - 15 ft bgs for VOCs, 20% QC samples
2.12	Groundwater Sampling and data evaluation	102	EA	$ 550	$ 56,100	Sampling 5 temporary points at 5 ft intervals from 15 - 80 ft bgs, and 15 monitoring wells for baseline; 20% QC samples;
2.13	Field Work Oversight	380	MH	$ 150	$ 57,000	2 persons; includes sampling labor
2.14	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 379,825**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 5,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	1,000	LF	$ 30	$ 30,000	Temporary fence around property boundary, extending to Hewlett Parkway and West Broadway during construction
5.2	Traffic Re-routing and closure of Roadways	1	LS	$ 150,000	$ 150,000	Closure of Hewlett Parkway and West Broadway, traffic study and traffic plan
	Sub-Total				**$ 180,000**	

Appendix A4 - Cost Estimate for Alternative 3, AOC1

Alternative 3, AOC1

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for the residual plume only. Costs related to temporary or permanent re-location of occupants are not included.

Item No.		Description	Quantity	Unit	Unit Cost	Total	Notes
6		**In-Situ Thermal Treatment**					
	6.1	Contractor Mob/Demob	1	LS	$ 3,200,000	$ 3,200,000	Estimate provided by vendor
	6.2	Drilling Mob/Demob	1	LS	$ 50,000	$ 50,000	Remote access rig, decon pad, water truck for decon
	6.3	Drilling Electrodes	221	EA	$ 4,000	$ 884,000	12-inch OD to 81 feet depth
	6.4	Drilling Co-located Vapor Recovery Wells	221	EA	$ 4,000	$ 884,000	
	6.5	Drilling Temperature Monitoring Points (TMPs)	20	EA	$ 4,000	$ 80,000	Avg 15 sensors each
	6.6	Power Supply, Instrumentation Controls	1	LS	$ 500,000	$ 500,000	Estimate provided by vendor
	6.7	System Installation	1	LS	$ 5,500,000	$ 5,500,000	Estimate provided by vendor
	6.8	Startup and Operations	1	LS	$ 1,400,000	$ 1,400,000	Estimate provided by vendor
	6.9	Reporting and Permitting	1	LS	$ 15,000	$ 15,000	
	6.10	SVE Equipment/Components	1	LS	$ 80,000	$ 80,000	
	6.11	Vapor Phase GAC Vessels	2	EA	$ 10,000	$ 20,000	2,000 lb vapor phase GAC vessel
	6.12	Post Remediation Drilling and Soil Sampling	1,600	LF	$ 150	$ 240,000	20 borings up to 80 feet or depending on PDI results
	6.13	Soil Sample Analysis and data evaluation	168	EA	$ 550	$ 92,400	Sampling 20 borings, 7 samples per boring, 20% QC samples
	6.14	Drill Cutting and Waste Disposal	1	LS	$ 250,000	$ 250,000	
	6.15	Permits	1	LS	$ 5,000	$ 5,000	
	6.16	Surface Restoration	5,550	SY	$ 40	$ 222,000	Site restoration includes Hewlett Parkway and West Broadway
		Sub-Total				**$ 13,422,400**	
7		**Reporting and Institutional Controls**					
	7.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
	7.2	Institutional Controls	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees.
		Sub-Total				**$ 70,000**	
		Sub-Total				**$ 14,307,225**	Sub-Total All Construction Costs.
		Contingency	20%			$ 2,861,445	10% scope + 10% bid
		Sub-Total				**$ 17,168,670**	
		Project Management	6%			$ 1,030,120	
		Remedial Design	12%			$ 2,060,240	
		Construction Management	8%			$ 1,373,494	
		TOTAL CAPITAL COST				**$ 21,632,524**	

Appendix A4 - Cost Estimate for Alternative 3, AOC1

Alternative 3, AOC1

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for the residual plume only. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

ANNUAL O&M COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**In-Situ Thermal Treatment System O&M - Year 1 and 2**						Active heating time assumed 2 years
1.1	Monthly Vapor Effluent Sample		43	EA	$ 300	$ 12,960	collect samples monthly from VGAC influent, between units, effluent + 20% QC samples; inc. labor and analysis
1.2	Water Condensate Samples		12	EA	$ 500	$ 6,000	Monthly samples of condensate water for 12 month operation
1.3	Water Disposal		12	MO	$ 800	$ 9,600	dispose water off site; 12 month operation
1.4	Plant Operator		480	HR	$ 80	$ 38,400	10 hr/week; 4 weeks/mo - 12 month operation.
1.5	Vapor Carbon Change out		24,000	LB	$ 3.30	$ 79,200	change out both units 6x per year
1.6	Vapor Carbon Disposal		24,000	LB	$ 2	$ 48,000	
1.7	Maintenance of ISTT system		1	LS	$ 2,000	$ 2,000	
1.8	Power costs		27,035,000	KWH	$ 0.30	$ 8,110,500	Total energy usage for entire heating period of 2 years estimated by vendor as 54,070,000 kwh
	Sub-Total					**$ 8,306,660**	
	Contingency		15%			$ 1,245,999	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL OPERATIONAL COSTS (Year 1 and 2)					**$ 9,562,659**	
2	**LTM and Institutional Controls - Year 1 to 5**						Every year through year 5.
2.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
2.2	Soil Sampling		20	EA	$ 600	$ 12,000	10 borings semi-annually; includes labor
2.3	Groundwater Sampling		30	EA	$ 600	$ 18,000	15 wells semi-annually; includes labor
2.4	Soil Sample Laboratory Analysis		24	EA	$ 550	$ 13,200	Total VOCs analysis + 20% QC samples
2.5	Groundwater Sample Laboratory Analysis		36	EA	$ 550	$ 19,800	Total VOCs analysis + 20% QC samples
2.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
2.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 119,000**	
	Contingency		15%			$ 17,850	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COSTS (Year 1 to 5)					**$ 146,850**	

Appendix A4 - Cost Estimate for Alternative 3, AOC1

Alternative 3, AOC1

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for the residual plume only. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**System Decommissioning**	2					At the end of Year 2
1.1	Decommission System Components		1	LS	$ 50,000	$ 50,000	
1.2	Well Decommissioning		462	EA	$ 1,000	$ 462,000	Electrodes, recovery wells, TMPs
1.3	Reporting		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 542,000**	
	Contingency		15%			$ 81,300	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 2)					**$ 633,300**	
2	**5 Year Review**	5					At the end of Year 5
2.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	
2.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
3	**Site Close Out**	5					At the end of Year 5
3.1	Monitoring Well Abandonment		15	EA	$ 1,500	$ 22,500	Drilling subcontractor, abandonment of monitoring wells at AOC1.
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 72,500**	
	Contingency		15%			$ 15,600	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 5)					**$ 129,600**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 21,632,524**	
2	**Annual O&M Cost**				
2.1	Year 1 & 2	1 & 2	9,709,509	$18,343,670	
2.3	Year 3 to 5	3 to 5	146,850	$378,459	
	Sub-Total			**$ 18,722,129**	
3	**Periodic Costs**				
3.1	Year 2	2	633,300	$586,836	
3.2	Year 5	5	129,600	$107,120	
	Sub-Total			**$ 693,956**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 41,048,610**	

Appendix A5 - Cost Estimate for Alternative 4A, AOC1

Alternative 4A, AOC1

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4 consists of bioremediation injections at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 15,000	$ 15,000	approx 48,570 sq ft
1.2	Utility Clearance	1	LS	$ 15,000	$ 15,000	
	Sub-Total				**$ 30,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	10	Day	$ 1,500	$ 15,000	Assumes 30 borings at AOC1, 15 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	7	Day	$ 2,000	$ 14,000	Assumes 5 temporary points at AOC1, varying depths of 15 to 80 ft deep; 1 boring/day
2.5	Monitoring/Performance Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC1; 2-inch diameter; 80 ft deep, PVC riser, screen and development.
2.6	Aquifer Pump Test	1	LS	$ 50,000	$ 50,000	Assumes 1 4-inch diameter monitoring well installation; 130 ft deep, PVC riser, screen, and IDW
2.7	Flush-mount curb box with inner locking cap	6	EA	$ 275	$ 1,650	For 6 monitoring wells
2.8	Water Level Measurements/Transducers	1	LS	$ 5,000	$ 5,000	
2.9	Steam Clean Equipment	17	Day	$ 350	$ 5,950	inc. daily rental for steam cleaner and 2 hr/day for decon equipment
2.10	IDW	1	LS	$ 15,000	$ 15,000	Sleeves, decon water, misc used items, Groundwater waste from well installation and development.
2.11	Surface Repair	1	LS	$ 6,000	$ 6,000	
2.12	Soil Sample Analysis and data evaluation	108	EA	$ 550	$ 59,400	Sampling 30 borings at 5 ft intervals from 0 - 15 ft bgs for VOCs, 20% QC samples
2.13	Groundwater Sampling and data evaluation	102	EA	$ 1,000	$ 102,000	Sampling 5 temporary points at 5 ft intervals from 15 - 80 ft bgs, and 15 monitoring wells for baseline; 20% QC samples; analysis for VOCs, TOC, ORP, etc
2.14	Geochem and treatbility study analysis	6	EA	$ 1,000	$ 6,000	1 deep and 1 shallow sample from 3 locations
2.15	Field Work Oversight	380	MH	$ 150	$ 57,000	2 persons; includes sampling labor
2.16	Treatability Study	1	LS	$ 50,000	$ 50,000	
2.17	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 540,500**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad/truck tire wash
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	Perimeter Air Monitoring	4	Week	$ 1,200	$ 4,800	Tripod station with Dust and PID monitors
4.2	H&S Monitoring	4	Week	$ 300	$ 1,200	Meters for monitoring work zone
4.3	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 11,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	1,000	LF	$ 30	$ 30,000	Temporary fence around property boundary, extending to Hewlett Parkway and West Broadway during construction
5.2	Silt Fence	400	LF	$ 3	$ 1,200	Install silt fence around Cedarwood Cleaners property perimeter
5.3	Traffic Re-routing and closure of Roadways	1	LS	$ 150,000	$ 150,000	Closure of Hewlett Parkway and West Broadway, traffic study and traffic plan
	Sub-Total				**$ 181,200**	

Alternative 4A, AOC1

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4 consists of bioremediation injections at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
6	**Pilot Study**					
6.1	Mob/Demob- Drilling subcontractor	1	LS	$ 6,000	$ 6,000	Hollow stem auger rig, decon pad, water truck
6.2	Mob/Demob- Injection subcontractor	1	LS	$ 6,000	$ 6,000	Equipment for pilot test
6.3	Injection Well Installation	2	EA	$ 4,500	$ 9,000	4-inch diameter PVC casing / 20-ft PVC screen; 80 ft deep
6.4	Injection Substrate Material	4,408	LBS	$ 2	$ 6,612	2,204 lbs of Lactoil emulsion per well at Cedarwood Cleaners
6.5	Injection Labor and Equipment	1	DAY	$ 6,000	$ 6,000	Labor and equipment for 1, 3man crew + per diem
6.6	Well Development	4	HR	$ 200	$ 800	2 hr / injection well
6.7	Water truck	1	DAY	$ 450	$ 450	2,000 -gal non-potable water
6.8	Temporary water storage tank	1	DAY	$ 30	$ 30	5,000 gal poly
6.9	Delivery fee of truck and tank	1	EA	$ 700	$ 700	includes drop off and pick up
6.10	IDW- Injection Wells	1	LS	$ 4,000	$ 4,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon water
6.11	Pilot Study Sampling	18	EA	$ 1,000	$ 18,000	Sampling one round at 15 MWs, includes sample and VOCs analysis and water chemistry, 20% QC samples
6.12	Data Reduction, Evaluation, Reporting	1	LS	$ 30,000	$ 30,000	
6.13	Surface Repair	1	LS	$ 200	$ 200	
6.14	Flush-mount curb box with inner locking cap	2	EA	$ 1,500	$ 3,000	For injection wells
	Sub-Total				**$ 90,792**	
7	**Full Scale Injection Well Installation**					
7.1	Mob/Demob- Drilling subcontractor	1	LS	$ 100,000	$ 100,000	Hollow stem auger rig, decon pad, water truck
7.2	Injection Well Installation	61	EA	$ 4,500	$ 274,500	4-inch diameter PVC casing / 20-ft PVC screen; 80 ft deep
7.3	Saw cut Slab	5	Day	$ 375	$ 1,875	Rental
7.4	Injection well piping	5,040	LF	$ 40	$ 201,600	
7.5	Well Development	122	HR	$ 200	$ 24,400	2 hr / injection well
7.6	IDW- Injection Wells	1	LS	$ 20,000	$ 20,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon water
7.7	Surface Repair	1	LS	$ 5,000	$ 5,000	
7.8	Flush-mount curb box with inner locking cap	61	EA	$ 1,500	$ 91,500	For injection wells
7.9	Asphalt and concrete disposal	5,040	LF	$ 16	$ 80,640	From any trenching or saw cut work
7.10	Waste characterization testing	1	EA	$ 500	$ 500	
	Sub-Total				**$ 800,015**	
8	**Round 1 Injection Event**					
8.1	Mob/Demob- Injection subcontractor	1	LS	$ 16,000	$ 16,000	
8.2	Injection Substrate Material	81,564	LBS	$ 2	$ 122,346	2,204 lbs of Lactoil emulsion per well at Cedarwood Cleaners; 882 lbs of Lactoil emulsion per well at rest of AOC1; assumes 2 of the 63 wells have been injected with EVO during the pilot test
8.3	Truck freight charges for Substrate	2	trucks	$ 4,000	$ 8,000	
8.4	Injection Labor and Equipment	31	DAY	$ 3,500	$ 106,750	Labor and equipment for 1 crew + per diem
8.5	Water Truck	31	DAY	$ 450	$ 13,725	2,000 -gal non-potable water
8.6	Temporary water storage tank	31	DAY	$ 30	$ 915	5,000 gal poly
8.7	Delivery fee of water truck and tank	2	EA	$ 700	$ 1,400	includes drop off and pick up
8.8	Performance Sampling	18	EA	$ 550	$ 9,900	Sampling for VOCs, labor, mobilization, data management and sample analysis at 15 monitoring wells + 20% QC samples
	Sub-Total				**$ 279,036**	

Alternative 4A, AOC1

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4 consists of bioremediation injections at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
9	**Round 2 Injection Event**					
9.1	Mob/Demob- Injection subcontractor	1	LS	$ 16,000	$ 16,000	
9.2	Injection Substrate Material	85,972	LBS	$ 2	$ 128,958	2,204 lbs of Lactoil emulsion per well at Cedarwood Cleaners; 882 lbs of Lactoil emulsion per well at rest of AOC1; assumes all 63 wells
9.3	Truck freight charges for Substrate	2	trucks	$ 4,000	$ 8,000	
9.4	Injection Labor and Equipment	32	DAY	$ 3,500	$ 110,250	Labor and equipment for 1 crew + per diem
9.5	Water Truck	32	DAY	$ 450	$ 14,175	2,000 -gal non-potable water
9.6	Temporary water storage tank	32	DAY	$ 30	$ 945	5,000 gal poly
9.7	Delivery fee of water truck and tank	2	EA	$ 700	$ 1,400	includes drop off and pick up
9.8	Performance Sampling	18	EA	$ 550	$ 9,900	Sampling for VOCs, labor, mobilization, data management and sample analysis at 15 monitoring wells + 20% QC samples
	Sub-Total				**$ 289,628**	
10	**Reporting and Institutional Controls**					
10.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
10.2	Institutional Controls	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees at AOC 1
	Sub-Total				**$ 70,000**	
	Sub-Total Capital costs				**$ 2,512,171**	Sub-Total All Construction Costs.
	Contingency	20%			$ 502,434	10% scope + 10% bid
	Sub-Total				**$ 3,014,605**	
	Project Management	6%			$ 180,876	
	Remedial Design	12%			$ 361,753	
	Construction Management	8%			$ 241,168	
	TOTAL CAPITAL COST				**$ 3,798,403**	

ANNUAL O&M COST:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**LTM and Institutional Controls - Year 1 to 5**						
1.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
1.2	Groundwater Sampling		30	EA	$ 600	$ 18,000	15 wells semi-annually; includes labor
1.3	Groundwater Sample Laboratory Analysis		36	EA	$ 550	$ 19,800	Total VOCs analysis + 20% QC samples.
1.4	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
1.5	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 93,800**	
	Contingency		15%			$ 14,070	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 1 to 5)					**$ 117,870**	

Appendix A5 - Cost Estimate for Alternative 4A, AOC1

Alternative 4A, AOC1

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4 consists of bioremediation injections at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
2	**LTM and Institutional Controls - Year 5 to 30**					
2.1	Maintain Institutional Controls	1	LS	$ 12,000	$ 12,000	
2.2	Groundwater Sampling	15	EA	$ 600	$ 9,000	15 wells annually; includes labor
2.3	Groundwater Sample Laboratory Analysis	18	EA	$ 550	$ 9,900	Total VOCs analysis + 20% QC samples.
2.4	Data Reduction, Evaluation and Reporting	1	EA	$ 20,000	$ 20,000	
2.5	Annual Report	1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total				**$ 74,900**	
	Contingency	15%			$ 11,235	
	Project Management				$ 5,000	
	Technical Support				$ 5,000	
	TOTAL ANNUAL LTM COST (Year 5 to 30)				**$ 96,135**	

PERIODIC COSTS:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**5 Year Review**	5 to 30					
1.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	Every 5 years through year 30
1.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
	Contingency		15%			$ 4,725	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Years 5 to 30)					**$ 46,225**	
2	**System Decommissioning**	10					At the end of Year 10
2.1	Injection Well Abandonment		63	EA	$ 1,500	$ 94,500	Drilling subcontractor, abandonment of injection wells and piping
2.2	Reporting		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 124,500**	
	Contingency		15%			$ 18,675	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 10)					**$ 153,175**	

Appendix A5 - Cost Estimate for Alternative 4A, AOC1

Alternative 4A, AOC1

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4 consists of bioremediation injections at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description		Quantity	Unit	Unit Cost	Total	Notes
3	**Site Close Out**	30					At the end of Year 30
3.1	Monitoring Well Abandonment		15	EA	$ 1,500	$ 22,500	Drilling subcontractor, abandonment of monitoring wells
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 72,500**	
	Contingency		15%			$ 10,875	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 30)					**$ 93,375**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 3,798,403**	
2	**Annual O&M Cost**				
2.1	Year 1 to 5	1 to 5	$ 117,870	$ 526,460	
2.2	Year 6 to 30	6 to 30	$ 96,135	$ 1,256,760	
	Sub-Total			**$ 1,783,220**	
3	**Periodic Costs**				
3.1	Year 5	5	$ 46,225	$ 38,208	
3.2	Year 10	10	$ 199,400	$ 136,226	
3.3	Year 15	15	$ 46,225	$ 26,102	
3.4	Year 20	20	$ 46,225	$ 21,580	
3.5	Year 25	25	$ 46,225	$ 17,833	
3.6	Year 30	30	$ 139,600	$ 44,513	
	Sub-Total			**$ 284,462**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 5,866,084**	

Appendix A6 - Cost Estimate for Alternative 4B, AOC1

Alternative 4B, AOC1

In-Situ Bioremediation, HEPA, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4B consists of bioremediation injections followed by heat enhanced plume attenuatior (HEPA) treatment for groundwater and saturated soils at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 15,000	$ 15,000	approx 48,570 sq ft
1.2	Utility Clearance	1	LS	$ 15,000	$ 15,000	
	Sub-Total				**$ 30,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASF
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	10	Day	$ 1,500	$ 15,000	Assumes 30 borings at AOC1, 15 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	7	Day	$ 2,000	$ 14,000	Assumes 5 temporary points at AOC1, varying depths of 15 to 80 ft deep; 1 boring/day
2.5	Monitoring/Performance Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC1; 2-inch diameter; 80 ft deep, PVC riser, screen and development.
2.6	Aquifer Pump Test	1	LS	$ 50,000	$ 50,000	Assumes 1 4-inch diameter monitoring well installation; 130 ft deep, PVC riser, screen, and IDW
2.7	Flush-mount curb box with inner locking cap	6	EA	$ 275	$ 1,650	For 6 monitoring wells
2.8	Water Level Measurements/Transducers	1	LS	$ 5,000	$ 5,000	
2.9	Steam Clean Equipment	17	Day	$ 350	$ 5,950	inc. daily rental for steam cleaner and 2 hr/day for decon equipment
2.10	IDW	1	LS	$ 15,000	$ 15,000	Sleeves, decon water, misc used items, Groundwater waste from well installation and development
2.11	Surface Repair	1	LS	$ 6,000	$ 6,000	
2.12	Soil Sample Analysis and data evaluation	108	EA	$ 550	$ 59,400	Sampling 30 borings at 5 ft intervals from 0 - 15 ft bgs for VOCs, 20% QC samples
2.13	Groundwater Sampling and data evaluation	102	EA	$ 1,000	$ 102,000	Sampling 5 temporary points at 5 ft intervals from 15 - 80 ft bgs, and 15 monitoring wells for baseline; 20% QC samples; analysis for VOCs, TOC, ORP, etc
2.14	Geochem and treatability study analysis	6	EA	$ 1,000	$ 6,000	1 deep and 1 shallow sample from 3 locations
2.15	Field Work Oversight	380	MH	$ 150	$ 57,000	2 persons; includes sampling labo
2.16	Treatability Study	1	LS	$ 50,000	$ 50,000	
2.17	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 540,500**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad/truck tire wash
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	Perimeter Air Monitoring	4	Week	$ 1,200	$ 4,800	Tripod station with Dust and PID monitors
4.2	H&S Monitoring	4	Week	$ 300	$ 1,200	Meters for monitoring work zone
4.3	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 11,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	1,000	LF	$ 30	$ 30,000	Temporary fence around property boundary, extending to Hewlett Parkway and West Broadway during construction
5.2	Silt Fence	400	LF	$ 3	$ 1,200	Install silt fence around Cedarwood Cleaners property perimeter
5.3	Traffic Re-routing and closure of Roadways	1	LS	$ 150,000	$ 150,000	Closure of Hewlett Parkway and West Broadway, traffic study and traffic plan
	Sub-Total				**$ 181,200**	

Appendix A6 - Cost Estimate for Alternative 4B, AOC1

Alternative 4B, AOC1

In-Situ Bioremediation, HEPA, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4B consists of bioremediation injections followed by heat enhanced plume attenuatior (HEPA) treatment for groundwater and saturated soils at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
6	**Pilot Study**					
6.1	Mob/Demob- Drilling subcontractor	1	LS	$ 6,000	$ 6,000	Hollow stem auger rig, decon pad, water truck
6.2	Mob/Demob- Injection subcontractor	1	LS	$ 6,000	$ 6,000	Equipment for pilot test
6.3	Injection Well Installation	2	EA	$ 4,500	$ 9,000	4-inch diameter PVC casing / 20-ft PVC screen; 80 ft deep
6.4	Injection Substrate Material	4,408	LBS	$ 2	$ 6,612	2,204 lbs of Lactoil emulsion per well at Cedarwood Cleaners
6.5	Injection Labor and Equipment	1	DAY	$ 6,000	$ 6,000	Labor and equipment for 1, 3man crew + per diem
6.6	Well Development	4	HR	$ 200	$ 800	2 hr / injection well
6.7	Water truck	1	DAY	$ 450	$ 450	2,000 -gal non-potable water
6.8	Temporary water storage tank	1	DAY	$ 30	$ 30	5,000 gal poly
6.9	Delivery fee of truck and tank	1	EA	$ 700	$ 700	includes drop off and pick up
6.10	IDW- Injection Wells	1	LS	$ 4,000	$ 4,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon wate
6.11	Pilot Study Sampling	18	EA	$ 1,000	$ 18,000	Sampling one round at 15 MWs, includes sample and VOCs analysis and water chemistry, 20% QC sample
6.12	Data Reduction, Evaluation, Reporting	1	LS	$ 30,000	$ 30,000	
6.13	Surface Repair	1	LS	$ 200	$ 200	
6.14	Flush-mount curb box with inner locking cap	2	EA	$ 1,500	$ 3,000	For injection wells
	Sub-Total				**$ 90,792**	
7	**Full Scale Injection Well Installation**					
7.1	Mob/Demob- Drilling subcontractor	1	LS	$ 100,000	$ 100,000	Hollow stem auger rig, decon pad, water truck
7.2	Injection Well Installation	61	EA	$ 4,500	$ 274,500	4-inch diameter PVC casing / 20-ft PVC screen; 80 ft deep
7.3	Saw cut Slab	5	Day	$ 375	$ 1,875	Rental
7.4	Injection well piping	5,040	LF	$ 40	$ 201,600	
7.5	Well Development	122	HR	$ 200	$ 24,400	2 hr / injection well
7.6	IDW- Injection Wells	1	LS	$ 20,000	$ 20,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon wate
7.7	Surface Repair	1	LS	$ 5,000	$ 5,000	
7.8	Flush-mount curb box with inner locking cap	61	EA	$ 1,500	$ 91,500	For injection wells
7.9	Asphalt and concrete disposal	5,040	LF	$ 16	$ 80,640	From any trenching or saw cut work
7.10	Waste characterization testing	1	EA	$ 500	$ 500	
	Sub-Total				**$ 800,015**	
8	**Round 1 Injection Event**					
8.1	Mob/Demob- Injection subcontractor	1	LS	$ 16,000	$ 16,000	
8.2	Injection Substrate Material	81,564	LBS	$ 2	$ 122,346	2,204 lbs of Lactoil emulsion per well at Cedarwood Cleaners; 882 lbs of Lactoil emulsion per well at rest of AOC1; assumes 2 of the 63 wells have been injected with EVO during the pilot test
8.3	Truck freight charges for Substrate	2	trucks	$ 4,000	$ 8,000	
8.4	Injection Labor and Equipment	31	DAY	$ 3,500	$ 106,750	Labor and equipment for 1 crew + per diem
8.5	Water Truck	31	DAY	$ 450	$ 13,725	2,000 -gal non-potable water
8.6	Temporary water storage tank	31	DAY	$ 30	$ 915	5,000 gal poly
8.7	Delivery fee of water truck and tank	2	EA	$ 700	$ 1,400	includes drop off and pick up
8.8	Performance Sampling	18	EA	$ 550	$ 9,900	Sampling for VOCs, labor, mobilization, data management and sample analysis at 15 monitoring wells + 20% QC samples
	Sub-Total				**$ 279,036**	

Appendix A6 - Cost Estimate for Alternative 4B, AOC1

Alternative 4B, AOC1

In-Situ Bioremediation, HEPA, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4B consists of bioremediation injections followed by heat enhanced plume attenuatior (HEPA) treatment for groundwater and saturated soils at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
9	**Heat Enhanced Plume Attenuation (HEPA)- Thermal Treatment**					
9.1	Contractor Mob/Demob	1	LS	$ 1,800,000	$ 1,800,000	Estimate provided by vendor
9.2	Drilling Mob/Demob	1	LS	$ 50,000	$ 50,000	Remote access rig, decon pad, water truck for decon
9.3	Drilling Electrodes	91	EA	$ 4,000	$ 364,000	12-inch OD to 81 feet depth
9.4	Drilling Temperature Monitoring Points (TMPs)	20	EA	$ 4,000	$ 80,000	Avg 14 sensors each
9.5	Power Supply, Instrumentation Controls	1	LS	$ 150,000	$ 150,000	
9.6	Electrical Usage	4,550,000	kwh	$ 0.30	$ 1,365,000	Total energy use during heating phase (3 months) estimated by vendor
9.7	System Installation	1	LS	$ 3,000,000	$ 3,000,000	Estimate provided by vendor
9.8	Startup and Operations	1	LS	$ 560,000	$ 560,000	Estimate provided by vendor
9.9	Reporting and Permitting	1	LS	$ 15,000	$ 15,000	
9.10	Post Remediation Drilling and Soil Sampling	1,600	LF	$ 150	$ 240,000	20 borings up to 80 feet or depending on PDI results
9.11	Soil Sample Analysis and data evaluation	192	EA	$ 550	$ 105,600	Sampling 20 borings, 8 samples per boring, 20% QC samples
9.12	Drill Cutting and Waste Disposal	1	LS	$ 250,000	$ 250,000	
9.13	Permits	1	LS	$ 5,000	$ 5,000	
9.14	Surface Restoration	5,550	SY	$ 40	$ 222,000	Site restoration includes Hewlett Parkway and West Broadway
	Sub-Total				**$ 8,206,600**	
10	**Reporting and Institutional Controls**					
10.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
10.2	Institutional Controls	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees at AOC 1
	Sub-Total				**$ 70,000**	
	Sub-Total Capital costs				**$ 10,429,143**	Sub-Total All Construction Costs.
	Contingency	20%			$ 2,085,829	10% scope + 10% bid
	Sub-Total				**$ 12,514,972**	
	Project Management	6%			$ 750,898	
	Remedial Design	12%			$ 1,501,797	
	Construction Management	8%			$ 1,001,198	
	TOTAL CAPITAL COST				**$ 15,768,864**	

Appendix A6 - Cost Estimate for Alternative 4B, AOC1

Alternative 4B, AOC1

In-Situ Bioremediation, HEPA, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4B consists of bioremediation injections followed by heat enhanced plume attenuatior (HEPA) treatment for groundwater and saturated soils at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

ANNUAL O&M COST:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**In-Situ HEPA O&M - Year 1**						Initial heat treatment to target temperature assumed 3 months by vendor
1.1	Monthly Power Costs		12	MO	$ 30,000	$ 360,000	To maintain temperature
1.2	Initial Power costs		4,550,000	KWH	$ 0.30	$ 1,365,000	Total energy usage for initial heating period estimated by vendor as 4,550,000 kwh
1.3	Plant Operator		384	HR	$ 80	$ 30,720	8 hr/week; 4 weeks/mo
1.4	Maintenance of system		1	LS	$ 2,000	$ 2,000	
	Sub-Total					**$ 1,757,720**	
	Contingency		15%			$ 263,658	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL OPERATIONAL COSTS (Year 1)					**$ 2,031,378**	
2	**In-Situ HEPA O&M - Year 2 to 5**						Active heating time assumed 5 years
1.1	Monthly Power Costs		12	MO	$ 30,000	$ 360,000	
1.2	Plant Operator		384	HR	$ 80	$ 30,720	8 hr/week; 4 weeks/mo
1.3	Maintenance of system		1	LS	$ 2,000	$ 2,000	
	Sub-Total					**$ 392,720**	
	Contingency		15%			$ 58,908	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL OPERATIONAL COSTS (Year 2 to 5)					**$ 461,628**	
3	**LTM and Institutional Controls - Year 1 to 5**						
2.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
2.2	Groundwater Sampling		30	EA	$ 600	$ 18,000	15 wells semi-annually; includes labor
2.3	Groundwater Sample Laboratory Analysis		36	EA	$ 550	$ 19,800	Total VOCs analysis + 20% QC samples
2.4	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
2.5	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 93,800**	
	Contingency		15%			$ 14,070	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 1 to 5)					**$ 117,870**	
4	**LTM and Institutional Controls - Year 5 to 25**						
3.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
3.2	Groundwater Sampling		15	EA	$ 600	$ 9,000	15 wells annually; includes labor
3.3	Groundwater Sample Laboratory Analysis		18	EA	$ 550	$ 9,900	Total VOCs analysis + 20% QC samples
3.4	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
3.5	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 74,900**	
	Contingency		15%			$ 11,235	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 5 to 25)					**$ 96,135**	

Appendix A6 - Cost Estimate for Alternative 4B, AOC1

Alternative 4B, AOC1

In-Situ Bioremediation, HEPA, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4B consists of bioremediation injections followed by heat enhanced plume attenuatior (HEPA) treatment for groundwater and saturated soils at AOC1. PDI will be performed at AOC1. ICs and LTM will be maintained for AOC1. Costs related to temporary or permanent re-location of occupants are not included.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**5 Year Review**	5 to 25					
1.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	Every 5 years through year 25
1.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
	Contingency		15%			$ 4,725	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Years 5 to 25)					**$ 46,225**	
2	**System Decommissioning**	5					At the end of Year 5
2.1	Injection Well Abandonment		63	EA	$ 1,500	$ 94,500	Drilling subcontractor, abandonment of injection wells and piping
2.2	Decommission HEPA System Components		1	LS	$ 50,000	$ 50,000	
2.3	HEPA Well Decommissioning		111	EA	$ 1,000	$ 111,000	Electrodes, TMPs
2.4	Reporting		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 285,500**	
	Contingency		15%			$ 42,825	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 5)					**$ 338,325**	
3	**Site Close Out**	25					At the end of Year 25
3.1	Monitoring Well Abandonment		15	EA	$ 1,500	$ 22,500	Drilling subcontractor, abandonment of monitoring well
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 72,500**	
	Contingency		15%			$ 10,875	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 25)					**$ 93,375**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 15,768,864**	
2	**Annual O&M Cost**				
2.1	Year 1	1	$ 2,149,248	$ 2,068,910	
2.2	Year 2 to 5	2 to 5	$ 579,498	$ 2,172,590	
2.3	Year 6 to 25	6 to 25	$ 96,135	$ 1,091,120	
	Sub-Total			**$ 5,332,620**	
3	**Periodic Costs**				
3.1	Year 5	5	$ 384,550	$ 317,849	
3.2	Year 10	10	$ 46,225	$ 31,580	
3.3	Year 15	15	$ 46,225	$ 26,102	
3.4	Year 20	20	$ 46,225	$ 21,580	
3.5	Year 25	25	$ 139,600	$ 53,854	
	Sub-Total			**$ 450,966**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 21,552,450**	

APPENDIX B

COST ESTIMATE BACKUP

REMEDIAL ALTERNATIVES AOC2

Appendix B-1 Summary of Total Cost of Remedial Alternatives for AOC2

Site:	Peninsula Boulevard Superfund Site, OU2	**Base Year:**	2017
Location:	Hewlett, Town of Hempstead, New York	**Date:**	March 21, 2017
Phase:	Feasibility Study (-30% - +50%)		

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4A**	**Alternative 4B**
Description	**No Action**	**Soil Vapor Extraction & Air Sparging, LTM, ICs**	**In-Situ Thermal Treatment, LTM, ICs**	**In-Situ Bioremediation, LTM, ICs**	**In-Situ Bioremediation and Heat Enhanced Plume Attenuation, LTM, ICs**
Estimated Active Project Duration (Years)	-	10	1	10 years for bioremediation	Not applicable
Estimated Long Term Monitoring (Years)	-	30	5	30	-
Capital Cost	$ -	$ 1,736,759	$ 7,256,345	$ 1,589,854	$ -
Total O&M Cost	$ -	$ 4,422,318	$ 6,015,498	$ 1,382,456	$ -
Total Periodic Cost	$ -	$ 240,245	$ 277,148	$ 214,060	$ -
Total Present Worth of Alternatives	**$ -**	**$ 6,399,321**	**$ 13,548,991**	**$ 3,186,371**	**$ -**

AOC 2 refers to Piermont Cleaners, front parking lot and its immediately adjacent commercial businesses in the strip mall

Appendix B2 - Cost Estimate for Alternative 1, AOC2

Alternative 1, AOC2

No Action

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2

Description: Alternative 1 consists of no action.

Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Capital Costs**					
1.1	No Capital Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
2	**Institutional Controls**					
2.1	No Institutional Controls	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
	TOTAL CAPITAL COST				**$ -**	

ANNUAL O&M COST:

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
1	**Annual O&M Costs**					
1.1	No Annual O&M Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
2	**Maintenance**					
2.1	No Maintenance Costs	0	LS	$ -	$ -	
	Sub-Total				**$ -**	
	Sub-Total				**$ -**	Sub-Total O&M Costs.
	Contingency	15%			$ -	
	Sub-Total				**$ -**	
	Project Management				$ -	
	Technical Support				$ -	
	TOTAL ANNUAL O&M COST				**$ -**	

PERIODIC COSTS:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**Periodic Costs**						
1.1	No Periodic Costs		0	LS	$ -	$ -	
	Sub-Total					**$ -**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Interest Rate: 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		$ -	
2	**Annual O&M Cost**		0	$ -	
3	**Periodic Costs**		0	$ -	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ -**	

Appendix B3 - Cost Estimate for Alternative 2, AOC2

Alternative 2, AOC2
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Soil Vapor Extraction (SVE) in combination with Air Sparging (AS) for saturated soils and groundwater. PDI will be performed at AOC2. ICs and LTM will be maintained for AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 5,000	$ 5,000	approx 7,400 sq ft
1.2	Utility Clearance	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 10,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	4	Day	$ 1,500	$ 6,000	Assumes 8 borings at AOC2, 18 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	5	Day	$ 2,000	$ 9,000	Assumes 5 temporary points at AOC2, varying depths of 18 to 38 ft deep; 2 borings/day
2.5	Monitoring Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC2; 2-inch diameter; 38 ft deep, PVC riser, screen and development.
2.6	Flush-mount curb box with inner locking cap	5	EA	$ 275	$ 1,375	For monitoring wells
2.7	Steam Clean Equipment	9	Day	$ 350	$ 2,975	inc. daily rental for steam cleaner and 2 hr/day for decon equipment
2.8	IDW	1	LS	$ 10,000	$ 10,000	Sleeves, decon water, misc used items, groundwater waste from well installation and development.
2.9	Surface Repair	1	LS	$ 2,000	$ 2,000	
2.10	Water Level Measurements	1	LS	$ 1,500	$ 1,500	
2.11	Soil Sample Analysis and data evaluation	38	EA	$ 550	$ 21,120	Sampling 8 borings at 5 ft intervals from 0 - 18 ft bgs for VOCs, 20% QC samples
2.12	Groundwater Sampling and data evaluation	38	EA	$ 550	$ 21,120	Sampling 5 temporary points at 5 ft intervals from 18 - 38 ft bgs, and 7 monitoring wells for baseline; 20% QC samples; analysis for VOCs
2.13	Field Work Oversight	210	MH	$ 150	$ 31,500	2 persons; includes sampling labor
2.14	Pilot Study	1	LS	$ 50,000	$ 50,000	Pilot Study to determine radius of influence and blower capacity needed
2.15	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 310,090**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 5,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	400	LF	$ 30	$ 12,000	Temporary fence around a portion of the front parking lot during construction
	Sub-Total				**$ 12,000**	

Appendix B3 - Cost Estimate for Alternative 2, AOC2

Alternative 2, AOC2
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Soil Vapor Extraction (SVE) in combination with Air Sparging (AS) for saturated soils and groundwater. PDI will be performed at AOC2. ICs and LTM will be maintained for AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
6	**AS/SVE System**					
6.1	Air Sparging Well Installation	14	EA	$ 4,000	$ 56,000	Drilling, construction and development. 4-inch diameter; 38 ft depth.
6.2	Soil Vapor Extraction Well Installation	10	EA	$ 1,000	$ 10,000	Drilling, construction and development. 4-inch diameter; 12 ft depth.
6.3	Air Sparging/SVE Equipment/Components	1	LS	$ 190,000	$ 190,000	Includes equipment, mobilization and start up, technical assistance and consulting, and material and expenses.
6.4	Process Equipment Enclosure	400	SF	$ 80	$ 32,000	Includes foundation, electric, construction, site work, HVAC
6.5	Power Service	1	LS	$ 50,000	$ 50,000	Includes Transformer
6.6	Trenching	760	LF	$ 40	$ 30,400	Excavation, piping, bedding.
6.7	Site Restoration	1	LS	$ 35,000	$ 35,000	Site restoration, includes backfill and asphalt
6.8	Soil Disposal	200	Tons	$ 100	$ 20,000	2 foot depth x 2 foot wide by total trench length x 1.5 tons/CY.
6.9	Asphalt Disposal	760	LF	$ 16	$ 12,160	From any trenching or saw cut work
6.10	Vapor Phase GAC Vessels	2	EA	$ 10,000	$ 20,000	2,000 lb vapor phase GAC vessel
6.11	IDW	1	LS	$ 50,000	$ 50,000	includes IDW from drilling
6.12	Well Survey	4	DAY	$ 1,500	$ 6,000	
6.13	Permits	1	LS	$ 10,000	$ 10,000	
	Sub-Total				**$ 521,560**	
7	**Reporting and Institutional Controls**					
7.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
7.2	Institutional Controls & Site Management Plan	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees at AOC2
	Sub-Total				**$ 70,000**	
	Sub-Total				**$ 1,148,650**	Sub-Total All Construction Costs.
	Contingency	20%			$ 229,730	10% scope + 10% bid
	Sub-Total				**$ 1,378,380**	
	Project Management	6%			$ 82,703	
	Remedial Design	12%			$ 165,406	
	Construction Management	8%			$ 110,270	
	TOTAL CAPITAL COST				**$ 1,736,759**	

Appendix B3 - Cost Estimate for Alternative 2, AOC2

Alternative 2, AOC2
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Soil Vapor Extraction (SVE) in combination with Air Sparging (AS) for saturated soils and groundwater. PDI will be performed at AOC2. ICs and LTM will be maintained for AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

ANNUAL O&M COST

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**Operations Costs - Year 1 to 10**	1 to 10					Every year through year 10.
1.1	Electrical Usage		30,000	KW-Hr	$ 0.30	$ 9,000	System operates for 10 years
1.2	Vapor Carbon Usage		8,000	LB	$ 3.30	$ 26,400	Change out both units 2 x per year
1.3	Vapor Carbon Disposal		8,000	LB	$ 2	$ 16,000	
1.4	Weekly Inspections		52	EA	$1,000	$ 52,000	Weekly once
1.5	Effluent Sampling		36	EA	$ 1,150	$ 41,400	Monthly Influent, Effluent Air Sampling and between GAC vessels for VOCs; includes labor
1.6	Reporting		12	Month	$ 5,000	$ 60,000	Monthly
	Sub-Total					**$ 204,800**	
	Contingency		15%			$ 30,720	
	TOTAL OPERATIONS COST (Year 1 to 10)					**$ 235,520**	
2	**LTM and Institutional Controls - Year 1 to 5**	1 to 5					Every year through year 5.
2.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
2.2	Soil Sampling		20	EA	$ 600	$ 12,000	10 borings semi-annually; includes labor
2.3	Groundwater Sampling		14	EA	$ 600	$ 8,400	7 wells semi-annually; includes labor
2.4	Soil Sample Laboratory Analysis		24	EA	$ 550	$ 13,200	Total VOCs analysis + 20% QC samples.
2.5	Groundwater Sample Laboratory Analysis		17	EA	$ 550	$ 9,240	Total VOCs analysis + 20% QC samples.
2.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
2.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 98,840**	
	Contingency		15%			$ 14,826	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL O&M COSTS (Year 1 to 5)					**$ 123,666**	
3	**LTM and Institutional Controls - Year 6 to 30**	6 to 30					Annually from year 6 through year 30.
3.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
3.2	Soil Sampling		10	EA	$ 600	$ 6,000	10 borings annually; includes labor
3.3	Groundwater Sampling		7	EA	$ 600	$ 4,200	7 wells annually; includes labor
3.4	Soil Sample Laboratory Analysis		12	EA	$ 550	$ 6,600	Total VOCs analysis + 20% QC samples.
3.5	Groundwater Sample Laboratory Analysis		8	EA	$ 550	$ 4,620	Total VOCs analysis + 20% QC samples.
3.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
3.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 77,420**	
	Contingency		15%			$ 11,613	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COST (Year 6 to 30)					**$ 99,033**	

Appendix B3 - Cost Estimate for Alternative 2, AOC2

Alternative 2, AOC2
Soil Vapor Extraction, Air Sparging, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 2 consists of Soil Vapor Extraction (SVE) in combination with Air Sparging (AS) for saturated soils and groundwater. PDI will be performed at AOC2. ICs and LTM will be maintained for AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**5 Year Review**	5 to 30					
1.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	Every 5 years through year 30
1.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
	Contingency		15%			$ 4,725	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 5 to 30)					**$ 46,225**	
2	**Decommission System**	10					At the end of Year 10
2.1	Decommission System		1	LS	$ 25,000	$ 25,000	
2.2	Decommission AS/SVE Wells		24	EA	$ 1,500	$ 36,000	
2.3	Closeout Report		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 91,000**	
	Contingency		15%			$ 13,650	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 10)					**$ 114,650**	
3	**Site Close Out**	30					At the end of Year 30
3.1	Monitoring Well Abandonment		7	EA	$ 1,500	$ 10,500	Drilling subcontractor, abandonment of monitoring wells at AOC2.
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 60,500**	
	Contingency		15%			$ 9,075	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 30)					**$ 79,575**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 1,736,759**	
2	**Annual O&M Cost**				
2.1	Year 1 to 5	1 to 5	359,186	$1,604,279	
2.2	Year 6 to 10	6 to 10	334,553	$1,732,254	
2.3	Year 11 to 30	11 to 30	99,033	$1,085,784	
	Sub-Total			**$ 4,422,318**	
3	**Periodic Costs**				
3.1	Year 5	5	46,225	$38,207	
3.2	Year 10	10	160,875	$109,906	
3.3	Year 15	15	46,225	$26,102	
3.4	Year 20	20	46,225	$21,575	
3.5	Year 25	25	46,225	$11,945	
3.6	Year 30	30	125,800	$32,509	
	Sub-Total			**$ 240,245**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 6,399,321**	

Appendix B4 - Cost Estimate for Alternative 3

Alternative 3

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC2. PDI will be performed at AOC2. ICs and LTM will be maintained for the residual plume only.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 5,000	$ 5,000	approx 7,400 sq ft
1.2	Utility Clearance	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 10,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	4	Day	$ 1,500	$ 6,000	Assumes 8 borings at AOC2, 18 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	5	Day	$ 2,000	$ 9,000	Assumes 5 temporary points at AOC2, varying depths of 18 to 38 ft deep; 2 borings/day
2.5	Monitoring Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC2; 2-inch diameter; 38 ft deep, PVC
2.6	Flush-mount curb box with inner locking cap	5	EA	$ 275	$ 1,375	For monitoring wells
2.7	Steam Clean Equipment	9	Day	$ 350	$ 2,975	inc. daily rental for steam cleaner and 2 hr/day for decon
2.8	IDW	1	LS	$ 10,000	$ 10,000	Sleeves, decon water, misc used items
2.9	Surface Repair	1	LS	$ 2,000	$ 2,000	
2.10	Water Level Measurements	1	LS	$ 1,500	$ 1,500	
2.1	Soil Sample Analysis and data evaluation	38	EA	$ 1,000	$ 38,400	Sampling 8 borings at 5 ft intervals from 0 - 18 ft bgs for VOCs, bench test parameters; 20% QC samples
2.12	Groundwater Sampling and data evaluation	38	EA	$ 1,000	$ 38,400	Sampling 5 temporary points at 5 ft intervals from 18 - 38 ft bgs, and 7 monitoring wells for baseline; analysis for VOCs and bench test parameters; 20% QC samples
2.13	Field Work Oversight	210	MH	$ 150	$ 31,500	2 persons; includes sampling labor
2.14	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 294,650**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 5,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	400	LF	$ 30	$ 12,000	Temporary fence around a portion of the front parking lot during construction
	Sub-Total				**$ 12,000**	

Appendix B4 - Cost Estimate for Alternative 3

Alternative 3

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC2. PDI will be performed at AOC2. ICs and LTM will be maintained for the residual plume only.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
6	**In-Situ Thermal Treatment**					
6.1	Contractor Mob/Demob	1	LS	$ 2,000,000	$ 2,000,000	Estimate provided by vendor
6.2	Drilling Mob/Demob	1	LS	$ 10,000	$ 10,000	Remote access rig, decon pad, water truck for decon
6.3	Drilling Electrodes	33	EA	$ 2,000	$ 66,000	12-inch OD to 38 feet depth
6.4	Drilling Co-located Vapor Recovery Wells	33	EA	$ 2,000	$ 66,000	
6.5	Drilling Temperature Monitoring Points (TMPs)	28	EA	$ 2,000	$ 56,000	Avg 6 sensors each
6.6	Power Supply, Instrumentation Controls	1	LS	$ 250,000	$ 250,000	Estimate provided by vendor
6.7	System Installation	1	LS	$ 250,000	$ 250,000	Estimate provided by vendor
6.8	Startup and Operations	1	LS	$ 1,000,000	$ 1,000,000	Estimate provided by vendor
6.9	Reporting and Permitting	1	LS	$ 15,000	$ 15,000	
6.10	SVE Equipment/Components	1	LS	$ 80,000	$ 80,000	
6.11	Vapor Phase GAC Vessels	2	EA	$ 10,000	$ 20,000	2,000 lb vapor phase GAC vessel
6.12	Post Remediation Drilling and Soil Sampling	1,064	LF	$ 150	$ 159,600	28 borings to 38 feet or deeper depending on PDI results
6.13	Soil Sample Analysis and data evaluation	134	EA	$ 550	$ 73,920	Sampling 28 borings, 4 samples per boring, 20% QC sample
6.14	Drill Cutting and Waste Disposal	1	LS	$ 100,000	$ 100,000	
6.15	Permits	1	LS	$ 5,000	$ 5,000	
6.16	Surface Restoration	900	SY	$ 40	$ 36,000	
	Sub-Total				**$ 4,187,520**	
7	**Reporting and Institutional Controls**					
7.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
7.2	Institutional Controls	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees.
	Sub-Total				**$ 70,000**	
	Sub-Total				**$ 4,799,170**	Sub-Total All Construction Costs.
	Contingency	20%			$ 959,834	10% scope + 10% bid
	Sub-Total				**$ 5,759,004**	
	Project Management	6%			$ 345,540	
	Remedial Design	12%			$ 691,080	
	Construction Management	8%			$ 460,720	
	TOTAL CAPITAL COST				**$ 7,256,345**	

Appendix B4 - Cost Estimate for Alternative 3

Alternative 3

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC2. PDI will be performed at AOC2. ICs and LTM will be maintained for the residual plume only.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

ANNUAL O&M COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**In-Situ Thermal Treatment System O&M - Year 1**						Active heating time assumed 12 months
1.1	Monthly Vapor Effluent Sample		43	EA	$ 300	$ 12,960	collect samples monthly from VGAC influent, between units, effluent + 20% QC samples; inc. labor and analysis
1.2	Water Condensate Samples		12	EA	$ 500	$ 6,000	Monthly samples of condensate water for 12 month operation
1.3	Water Disposal		12	MO	$ 800	$ 9,600	dispose water off site; 12 month operation
1.4	Plant Operator		480	HR	$ 80	$ 38,400	10 hr/week; 4 weeks/mo - 12 month operation.
1.5	Vapor Carbon Change out		8,000	LB	$ 3.30	$ 26,400	change out both units 2x per year
1.6	Vapor Carbon Disposal		8,000	LB	$ 2	$ 16,000	
1.7	Maintenance of ISTT system		1	LS	$ 2,000	$ 2,000	
1.8	Power costs		16,050,000	KWH	$ 0.30	$ 4,815,000	Total energy usage for entire heating period of 12 months estimated by vendor as 16,050,000 kwh
	Sub-Total					**$ 4,926,360**	
	Contingency		15%			$ 738,954	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL OPERATIONAL COSTS (Year 1)					**$ 5,675,314**	
2	**LTM and Institutional Controls - Year 1 to 5**						Every year through year 5.
2.1	Maintain Institutional Controls		1	LS	$ 12,000	$ 12,000	
2.2	Soil Sampling		20	EA	$ 600	$ 12,000	10 borings semi-annually; includes labor
2.3	Groundwater Sampling		14	EA	$ 600	$ 8,400	7 wells semi-annually; includes labor
2.4	Soil Sample Laboratory Analysis		24	EA	$ 550	$ 13,200	Total VOCs analysis + 20% QC samples
2.5	Groundwater Sample Laboratory Analysis		17	EA	$ 550	$ 9,240	Total VOCs analysis + 20% QC samples
2.6	Data Reduction, Evaluation and Reporting		1	EA	$ 20,000	$ 20,000	
2.7	Annual Report		1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total					**$ 98,840**	
	Contingency		15%			$ 14,826	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL ANNUAL LTM COSTS (Year 1 to 5)					**$ 123,666**	

Appendix B4 - Cost Estimate for Alternative 3

Alternative 3

In-Situ Thermal Treatment, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 3 consists of In-situ Thermal Treatment (ISTT) for saturated soils and groundwater at AOC2. PDI will be performed at AOC2. ICs and LTM will be maintained for the residual plume only.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**System Decommissioning**	1					At the end of Year 1
1.1	Decommission System Components		1	LS	$ 50,000	$ 50,000	
1.2	Well Decommissioning		94	EA	$ 800	$ 75,200	Electrodes, recovery wells, TMPs
1.3	Reporting		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 155,200**	
	Contingency		15%			$ 23,280	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 1)					**$ 188,480**	
2	**Periodic Costs**	5					At the end of Year 5
2.1	Deed Restriction Certification & Site Inspection		1	LS	$ 1,500	$ 1,500	
2.2	5 Year Review		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 31,500**	
3	**Site Close Out**	5					At the end of Year 5
3.1	Monitoring Well Abandonment		7	EA	$ 1,500	$ 10,500	Drilling subcontractor, abandonment of monitoring wells at AOC2.
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 60,500**	
	Contingency		15%			$ 13,800	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 5)					**$ 115,800**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 7,256,345**	
2	**Annual O&M Cost**				
2.1	Year 1	1	5,798,980	$5,582,196	
2.2	Year 2 to 5	2 to 5	123,666	$433,303	
	Sub-Total			**$ 6,015,498**	
3	**Periodic Costs**				
3.1	Year 1	1	188,480	$181,434	
3.2	Year 5	5	115,800	$95,714	
	Sub-Total			**$ 277,148**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 13,548,991**	

Alternative 4A, AOC2

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4A consists of bioremediation injections for groundwater and saturated soils at AOC2. ICs and LTM will be maintained for AOC2. PDI will be performed at AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
CAPITAL COSTS:						
1	**Site Survey**					
1.1	Survey	1	LS	$ 5,000	$ 5,000	approx 7,400 sq ft
1.2	Utility Clearance	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 10,000**	
2	**Pre-Design Investigation**					
2.1	Investigation Work Plan	1	LS	$ 75,000	$ 75,000	Sampling Plan, QAPP, HASP
2.2	Geoprobe Mob/Demob	1	LS	$ 6,000	$ 6,000	
2.3	Direct Push Geoprobe Borings	4	Day	$ 1,500	$ 6,000	Assumes 8 borings at AOC2, 18 ft deep; 4 borings/day, assumes 2 days for mob/demob
2.4	Temporary Groundwater Sampling Points	5	Day	$ 2,000	$ 9,000	Assumes 5 temporary points at AOC2, varying depths of 18 to 38 ft deep; 2 borings/day
2.5	Monitoring/Performance Wells Installation	5	EA	$ 4,500	$ 22,500	Assumes 5 MWs at AOC2; 2-inch diameter; 38 ft deep, PVC riser, screen and development.
2.6	Aquifer Pump Test	1	LS	$ 50,000	$ 50,000	includes 1 4-inch diameter monitoring well installation; 130 ft deep, PVC riser, screen, and IDW
2.7	Flush-mount curb box with inner locking cap	5	EA	$ 275	$ 1,375	For monitoring wells
2.8	Water Level Measurements/Transducers	1	LS	$ 5,000	$ 5,000	
2.9	Steam Clean Equipment	9	Day	$ 350	$ 2,975	inc. daily rental for steam cleaner and 2 hr/day for decon equipment
2.10	IDW	1	LS	$ 15,000	$ 15,000	Sleeves, decon water, misc used items, Groundwater waste from well installation and development.
2.11	Surface Repair	1	LS	$ 2,000	$ 2,000	
2.12	Soil Sample Analysis and data evaluation	38	EA	$ 550	$ 21,120	Sampling 8 borings at 5 ft intervals from 0 - 18 ft bgs for VOCs, 20% QC samples
2.13	Groundwater Sampling and data evaluation	38	EA	$ 1,000	$ 38,400	Sampling 5 temporary points at 5 ft intervals from 18 - 38 ft bgs, and 7 monitoring wells for baseline; 20% QC samples; analysis for VOCs, TOC, ORP, etc
2.14	Geochem and treatbility study analysis	6	EA	$ 1,000	$ 6,000	1 deep and 1 shallow sample from 3 locations
2.15	Field Work Oversight	210	MH	$ 150	$ 31,500	2 persons; includes sampling labor
2.16	Treatability Study	1	LS	$ 50,000	$ 50,000	
2.17	Pre-Design Report	1	LS	$ 50,000	$ 50,000	
	Sub-Total				**$ 391,870**	
3	**Site Mobilization/Demobilization**					
3.1	Remedial Action Workplan/Permitting	1	LS	$ 100,000	$ 100,000	
3.2	Submittals/Implementation Plans	1	LS	$ 75,000	$ 75,000	
3.3	Post Construction Submittals	1	LS	$ 40,000	$ 40,000	
3.4	Decontamination Station	1	LS	$ 5,000	$ 5,000	Portable decontamination pad/truck tire wash
	Sub-Total				**$ 220,000**	
4	**Health and Safety**					
4.1	Perimeter Air Monitoring	4	Week	$ 1,200	$ 4,800	Tripod station with Dust and PID monitors
4.2	H&S Monitoring	4	Week	$ 300	$ 1,200	Meters for monitoring work zone
4.3	PPE and Field Supplies	1	LS	$ 5,000	$ 5,000	
	Sub-Total				**$ 11,000**	
5	**Site Preparation**					
5.1	Temporary Security Fence	400	LF	$ 30	$ 12,000	Temporary fence around a portion of the front parking lot during construction
	Sub-Total				**$ 12,000**	

Alternative 4A, AOC2

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4A consists of bioremediation injections for groundwater and saturated soils at AOC2. ICs and LTM will be maintained for AOC2. PDI will be performed at AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
6	**Pilot Study**					
6.1	Mob/Demob- Drilling subcontractor	1	LS	$ 6,000	$ 6,000	Hollow stem auger rig, decon pad, water truck
6.2	Mob/Demob- Injection subcontractor	1	LS	$ 6,000	$ 6,000	Equipment for pilot test
6.3	Injection Well Installation	2	EA	$ 2,500	$ 5,000	4-inch diameter PVC casing / 20-ft PVC screen; 38 ft deep
6.4	Injection Substrate Material	3,016	LBS	$ 2	$ 4,524	1,508 lbs of Lactoil emulsion per well at Piermont Cleaners
6.5	Injection Labor and Equipment	1	DAY	$ 6,000	$ 6,000	Labor and equipment for 1, 3man crew + per diem, includes mob and demob
6.6	Well Development	4	HR	$ 200	$ 800	2 hr / injection well; 4 hr/extraction well
6.7	Water truck	1	DAY	$ 450	$ 450	2,000 -gal non-potable water
6.8	Temporary water storage tank	1	DAY	$ 30	$ 30	5,000 gal poly
6.9	Delivery fee of truck and tank	1	EA	$ 700	$ 700	includes drop off and pick up
6.10	IDW- Injection Wells	1	LS	$ 10,000	$ 10,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon water
6.11	Pilot Study Sampling	9	EA	$ 1,000	$ 9,000	Sampling one round at 7 MWs, includes sample and VOCs analysis and water chemistry, 20% QC samples
6.12	Data Reduction, Evaluation, Reporting	1	LS	$ 30,000	$ 30,000	
6.13	Surface Repair	1	LS	$ 200	$ 200	
6.14	Flush-mount curb box with inner locking cap	2	EA	$ 1,500	$ 3,000	For injection wells
	Sub-Total				**$ 81,704**	
7	**Full Scale Injection Well Installation**					
7.1	Mob/Demob- Drilling subcontractor	1	LS	$ 100,000	$ 100,000	Hollow stem auger rig, decon pad, water truck
7.2	Injection Well Installation	5	EA	$ 6,000	$ 30,000	4-inch diameter PVC casing / 20-ft PVC screen; 38 ft deep
7.3	Saw cut Slab	5	Day	$ 375	$ 1,875	Rental
7.4	Injection well piping	722	LF	$ 40	$ 28,880	
7.5	Well Development	10	HR	$ 200	$ 2,000	2 hr / injection well
7.6	IDW- Injection Wells	1	LS	$ 20,000	$ 20,000	Includes soil cuttings from installation and water disposal from development of injection wells and decon water
7.7	Surface Repair	1	LS	$ 5,000	$ 5,000	
7.8	Flush-mount curb box with inner locking cap	5	EA	$ 1,500	$ 7,500	For injection wells
7.9	Asphalt and concrete disposal	722	LF	$ 16	$ 11,552	From any trenching or saw cut work
7.10	Waste characterization testing	1	EA	$ 500	$ 500	
	Sub-Total				**$ 207,307**	
8	**Round 1 Injection Event**					
8.1	Mob/Demob- Injection subcontractor	1	LS	$ 16,000	$ 16,000	
8.2	Injection Substrate Material	7,540	LBS	$ 2	$ 11,310	1,508 lbs of Lactoil emulsion per well at AOC2; assumes 2 of the 7 wells have been injected with EVO during the pilot test
8.3	Truck freight charges for Substrate	1	trucks	$ 4,000	$ 4,000	
8.4	Injection Labor and Equipment	3	DAY	$ 3,500	$ 8,750	Labor and equipment for 1 crew + per diem
8.5	Water Truck	3	DAY	$ 450	$ 1,125	2,000 -gal non-potable water
8.6	Temporary water storage tank	3	DAY	$ 30	$ 75	5,000 gal poly
8.7	Delivery fee of water truck and tank	2	EA	$ 700	$ 1,400	includes drop off and pick up
8.8	Performance Sampling	9	EA	$ 550	$ 4,950	Sampling for VOCs, labor, mobilization, data management and sample analysis at 7 monitoring wells + 20% QC
	Sub-Total				**$ 47,610**	

Appendix B5 - Cost Estimate for Alternative 4A, AOC2

Alternative 4A, AOC2

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4A consists of bioremediation injections for groundwater and saturated soils at AOC2. ICs and LTM will be maintained for AOC2. PDI will be performed at AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
10	**Reporting and Institutional Controls**					
10.1	Remedial Action Report	1	LS	$ 50,000	$ 50,000	
10.2	Institutional Controls	1	LS	$ 20,000	$ 20,000	Environmental easement/deed restriction, legal fees at AOC2
	Sub-Total				**$ 70,000**	
	Sub-Total Capital costs				**$ 1,051,491**	Sub-Total All Construction Costs.
	Contingency	20%			$ 210,298	10% scope + 10% bid
	Sub-Total				**$ 1,261,789**	
	Project Management	6%			$ 75,707	
	Remedial Design	12%			$ 151,415	
	Construction Management	8%			$ 100,943	
	TOTAL CAPITAL COST				**$ 1,589,854**	

ANNUAL O&M COST:

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes
1	**LTM and Institutional Controls - Year 1 to 5**					
1.1	Maintain Institutional Controls	1	LS	$ 12,000	$ 12,000	
1.2	Groundwater Sampling	14	EA	$ 600	$ 8,400	7 wells semi-annually; includes labor
1.3	Groundwater Sample Laboratory Analysis	17	EA	$ 550	$ 9,240	Total VOCs analysis + 20% QC samples.
1.4	Data Reduction, Evaluation and Reporting	1	EA	$ 20,000	$ 20,000	
1.5	Annual Report	1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total				**$ 73,640**	
	Contingency	15%			$ 11,046	
	Project Management				$ 5,000	
	Technical Support				$ 5,000	
	TOTAL ANNUAL LTM COST (Year 1 to 5)				**$ 94,686**	
2	**LTM and Institutional Controls - Year 6 to 30**					
2.1	Maintain Institutional Controls	1	LS	$ 12,000	$ 12,000	
2.2	Groundwater Sampling	7	EA	$ 600	$ 4,200	7 wells annually; includes labor
2.3	Groundwater Sample Laboratory Analysis	8	EA	$ 550	$ 4,620	Total VOCs analysis + 20% QC samples.
2.4	Data Reduction, Evaluation and Reporting	1	EA	$ 20,000	$ 20,000	
2.5	Annual Report	1	EA	$ 24,000	$ 24,000	Includes periodic report
	Sub-Total				**$ 64,820**	
	Contingency	15%			$ 9,723	
	Project Management				$ 5,000	
	Technical Support				$ 5,000	
	TOTAL ANNUAL LTM COST (Year 6 to 30)				**$ 84,543**	

Appendix B5 - Cost Estimate for Alternative 4A, AOC2

Alternative 4A, AOC2

In-Situ Bioremediation, LTM, and ICs

COST ESTIMATE SUMMARY

Site: Peninsula Boulevard Superfund Site, OU2
Location: Hewlett, Town of Hempstead, New York
Phase: Feasibility Study (-30% - +50%)
Base Year: 2017
Date: March 21, 2017

Description: Alternative 4A consists of bioremediation injections for groundwater and saturated soils at AOC2. ICs and LTM will be maintained for AOC2. PDI will be performed at AOC2.

Item No.	Description	Quantity	Unit	Unit Cost	Total	Notes

PERIODIC COSTS:

Item No.	Description	Year	Quantity	Unit	Unit Cost	Total	Notes
1	**5 Year Review Costs**						
1.1	Deed Restriction Certification & Site Inspection	5 to 30					Every 5 years through year 30
1.2	5 Year Review		1	LS	$ 1,500	$ 1,500	
	Sub-Total		1	LS	$ 30,000	$ 30,000	
						$ 31,500	
	Contingency		15%			$ 4,725	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Years 5 to 30)					**$ 46,225**	
2	**System Decommissioning**	10					At the end of Year 10
2.1	Injection Well Abandonment		7	EA	$ 1,500	$ 10,500	Drilling subcontractor, abandonment of injection wells and piping
2.2	Reporting		1	LS	$ 30,000	$ 30,000	
	Sub-Total					**$ 40,500**	
	Contingency		15%			$ 6,075	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 10)					**$ 56,575**	
3	**Site Close Out**	30					At the end of Year 30
3.1	Monitoring Well Abandonment		7	EA	$ 1,500	$ 10,500	Drilling subcontractor, abandonment of monitoring wells
3.2	Final Closure Report		1	LS	$ 50,000	$ 50,000	
	Sub-Total					**$ 60,500**	
	Contingency		15%			$ 9,075	
	Project Management					$ 5,000	
	Technical Support					$ 5,000	
	TOTAL PERIODIC COSTS (Year 30)					**$ 79,575**	

PRESENT VALUE ANALYSIS: Rate of Return: 7% Inflation Rate 3%

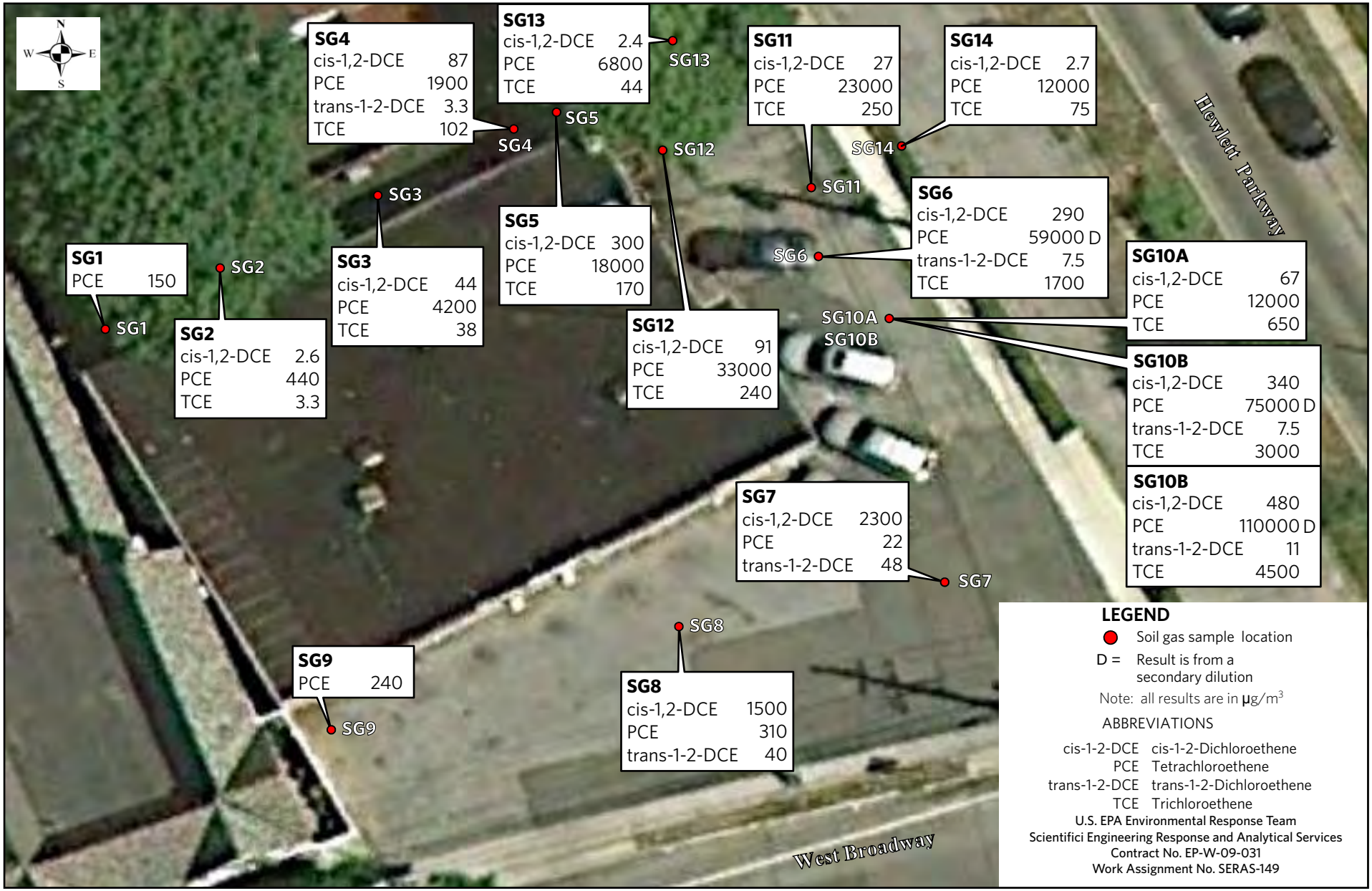
Item No.	Cost Type	Year	Total Cost	Present Value	Notes
1	**Capital Cost**	0		**$ 1,589,854**	
2	**Annual O&M Cost**				
2.1	Year 1 to 5	1 to 5	$ 94,686	$ 422,908	
2.2	Year 6 to 30	6 to 30	$ 84,543	$ 959,547	
	Sub-Total			**$ 1,382,456**	
3	**Periodic Costs**				
3.1	Year 5	5	$ 46,225	$ 38,207	
3.2	Year 10	10	$ 102,800	$ 70,231	
3.3	Year 15	15	$ 46,225	$ 26,102	
3.4	Year 20	20	$ 46,225	$ 21,575	
3.5	Year 25	25	$ 46,225	$ 17,833	
3.6	Year 30	30	$ 125,800	$ 40,113	
	Sub-Total			**$ 214,060**	
	TOTAL PRESENT VALUE OF ALTERNATIVE			**$ 3,186,371**	

APPENDIX C

OU2 RI FIGURES

APPENDIX C1

2012



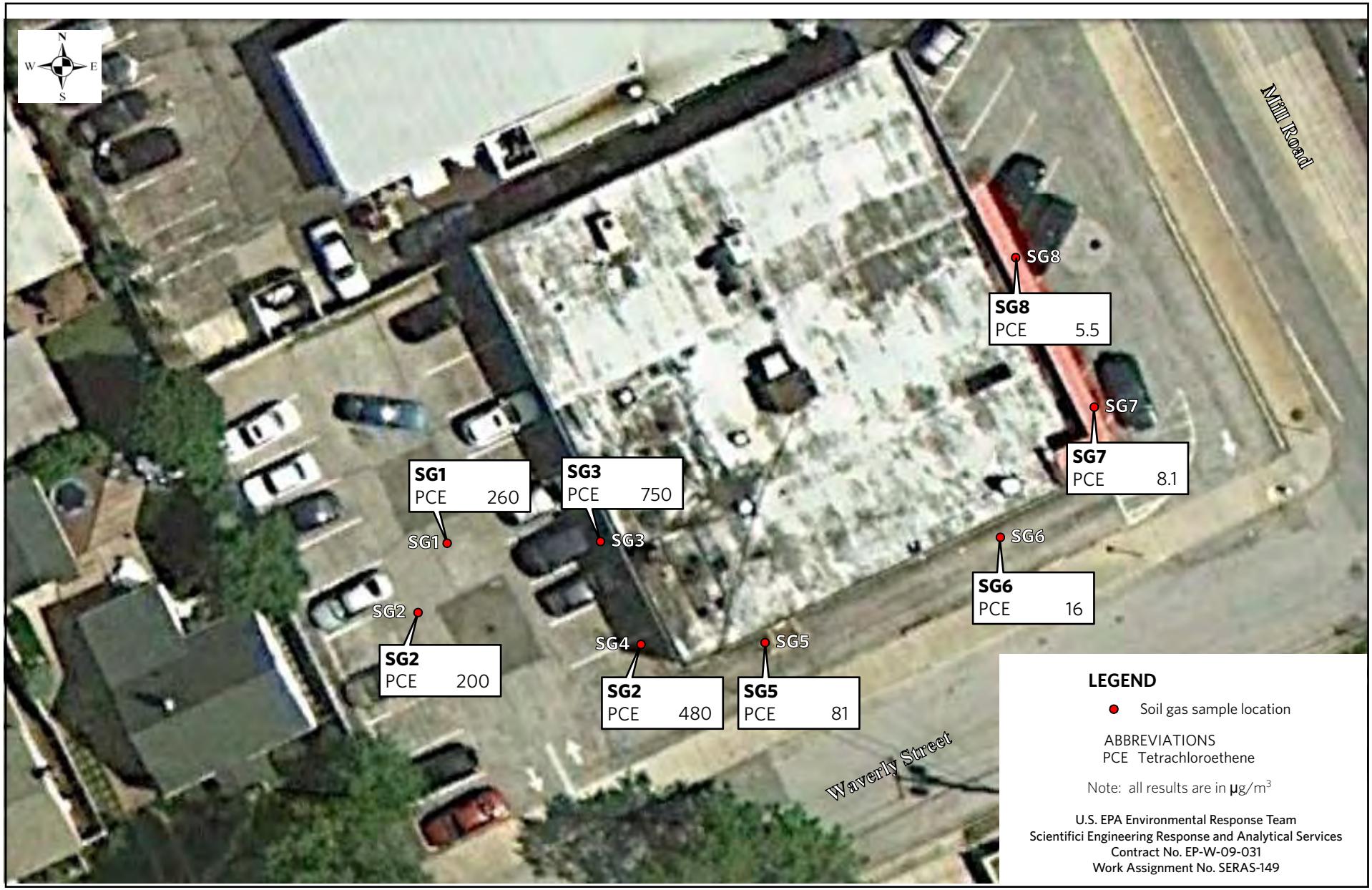
HDR

CEDARWOOD CLEANERS
SOIL GAS SAMPLING RESULTS - 2012

CEDARWOOD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-1



HDR

MILL ROAD CLEANERS
SOIL GAS SAMPLING RESULTS 2012

MILL ROAD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-2

HDR

PIERMONT CLEANERS
SOIL GAS SAMPLING RESULTS - 2012

PIERMONT CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-3

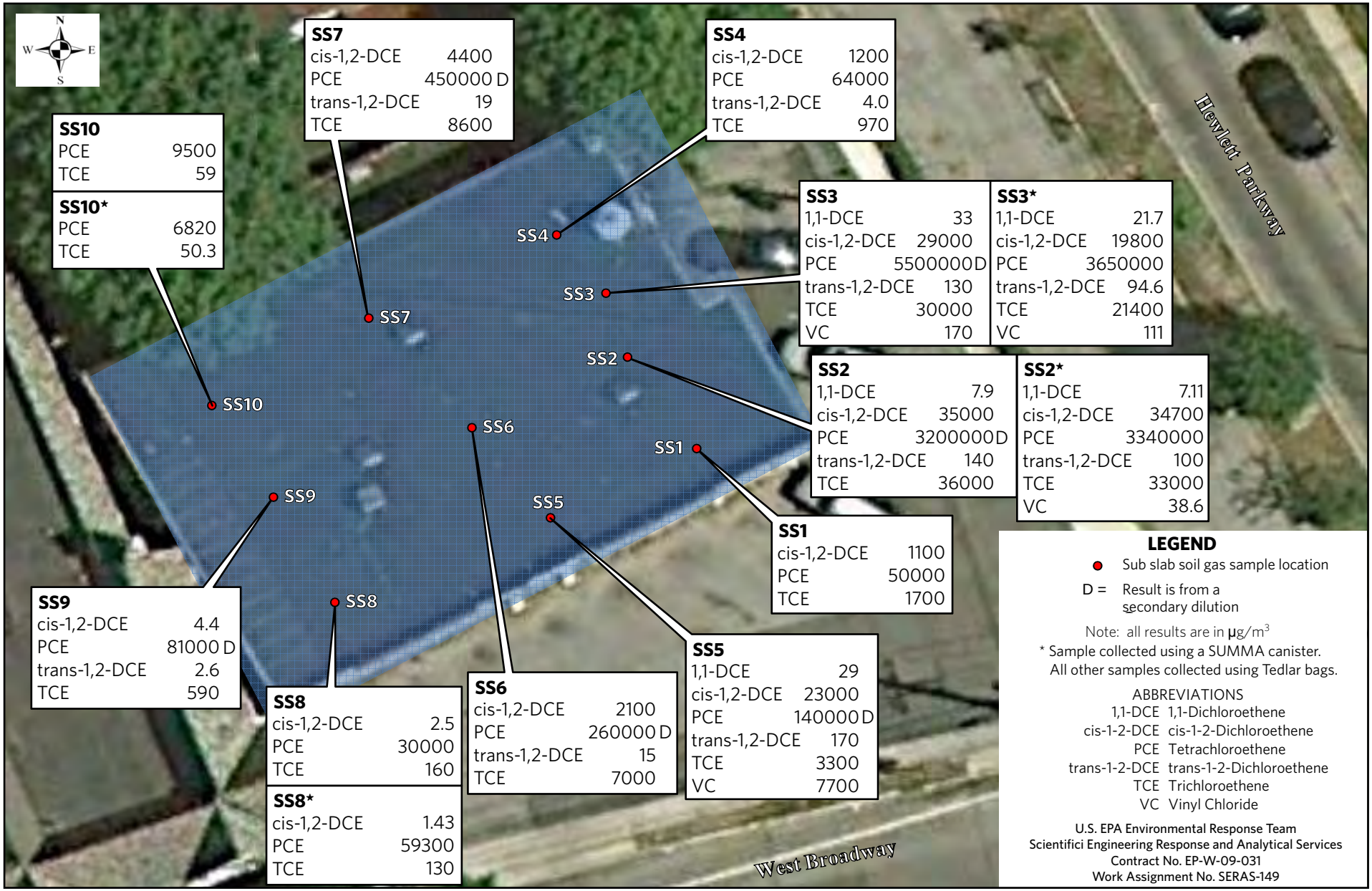
HDR

FORMER VOGUE CLEANERS
SOIL GAS SAMPLING RESULTS - 2012

FORMER VOGUE CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-4



HDR

CEDARWOOD CLEANERS
SUB SLAB SOIL GAS SAMPLING RESULTS - 2012

CEDARWOOD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-5

HDR

PIERMONT CLEANERS
SUB SLAB SOIL GAS SAMPLING RESULTS - 2012

PIERMONT CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-6

LEGEND

- Groundwater sample location

(18') Depth in feet

Note: all results are in µg/L

J = Value is estimated

ABBREVIATIONS

cis-1-2-DCE cis-1-2-Dichloroethene

PCE Tetrachloroethene

TCE Trichloroethene

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Scientifici Engineering Response and Analytical Services
Contract No. EP-W-09-031
Work Assignment No. SERAS-149

\2012 Unit001_ExteriorSamplingResultsSG.ai

HDR

CEDARWOOD CLEANERS
GROUNDWATER SAMPLING RESULTS - 2012

CEDARWOOD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE

AUGUST 2014

FIGURE

C1-7

HDR

MILL ROAD CLEANERS
GROUNDWATER SAMPLING RESULTS - 2012

MILL ROAD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-8

HDR

PIERMONT CLEANERS
GROUNDWATER SAMPLING RESULTS - 2012

CEDARWOOD CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-9

HDR

FORMER VOGUE CLEANERS
GROUNDWATER SAMPLING RESULTS - 2012

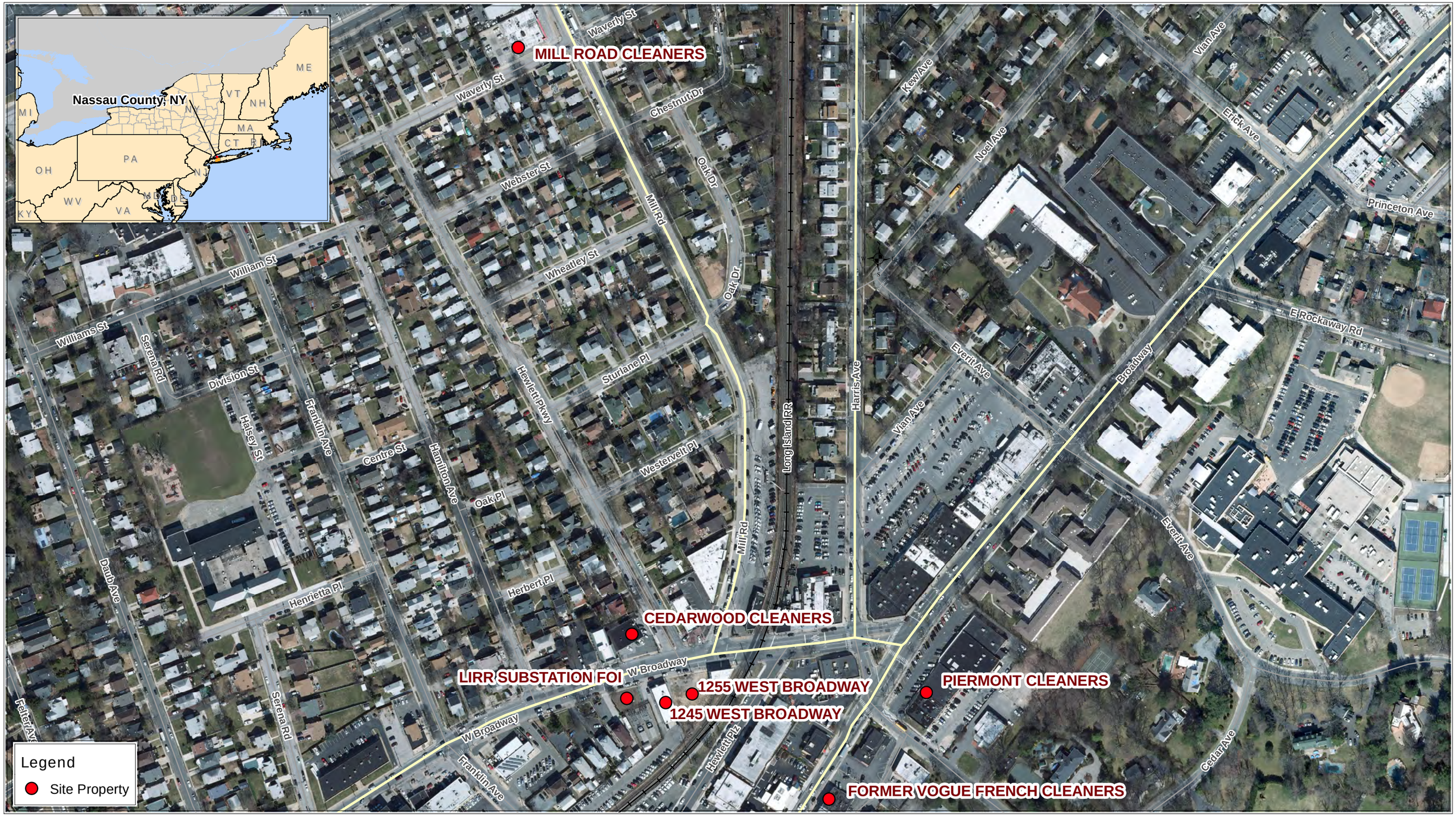
FORMER VOGUE CLEANERS
PENINSULA BOULEVARD - OU2
VILLAGE OF HEWLETT, TOWN OF HEMPSTEAD
NASSAU COUNTY, NEW YORK

DATE
AUGUST 2014

FIGURE
C1-10

APPENDIX C2

2014 to 2016



Map created using 2010 orthoimagery data from NY state.

Map Creation Date: 04 April 2016

Coordinate system: State Plane New York Long Island
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Datum: NAD83
Units: Feet

360 0 360 Feet

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U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0-149

Figure 1
Property Location Map
Peninsula Boulevard Site
Hewlett, New York

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

N W E S

0 5 10 20 30 40 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 2
Sample Locations
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

0 5 10 20 30 40 Feet

N W E S

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 3
Sample Locations
Piermont Cleaners
Peninsula Boulevard Site
Hewlett, NY

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

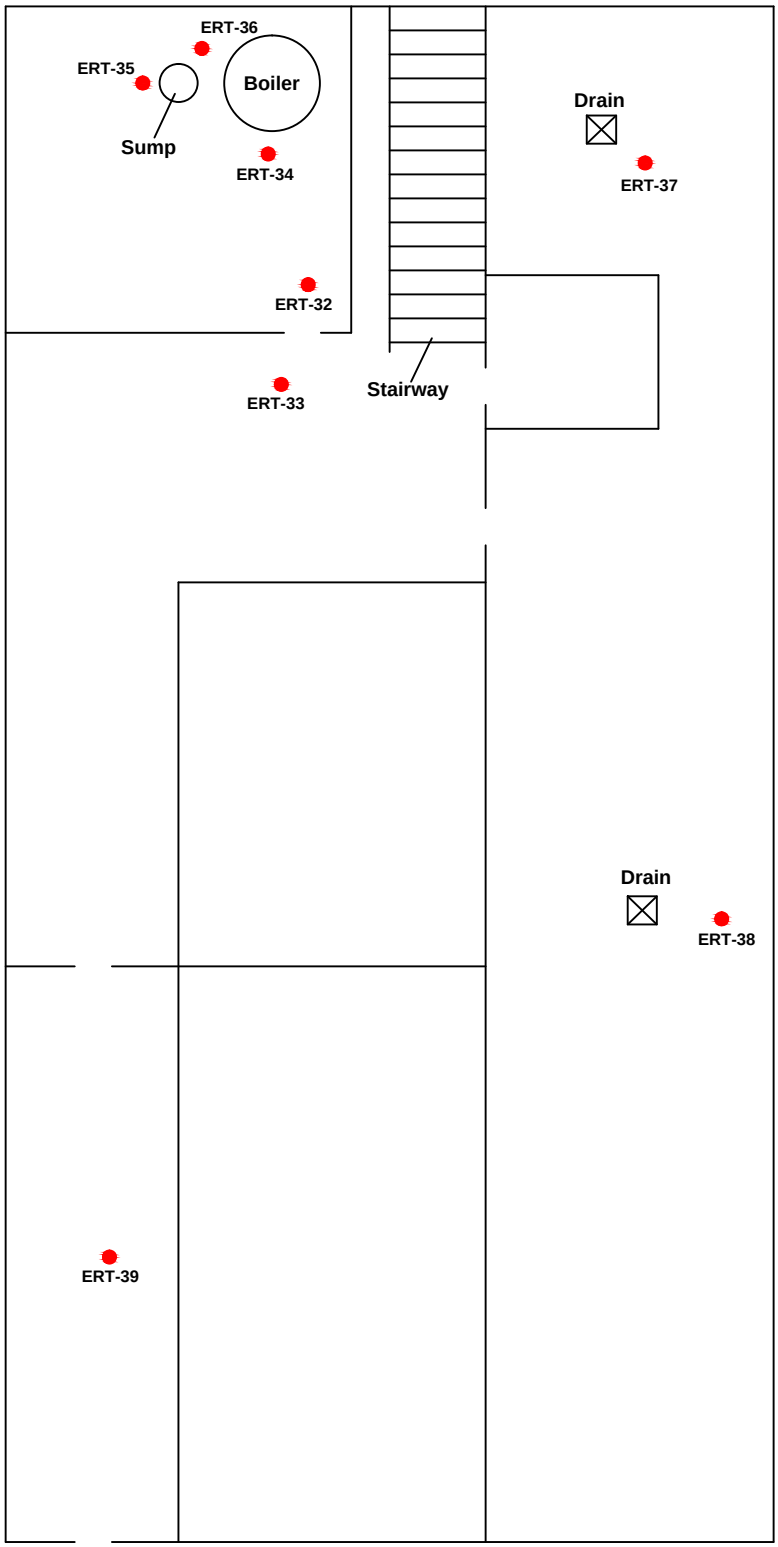
N
W E
S

0 5 10 20 30 40
Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 4
Sample Locations
Former Vogue French Cleaners
Peninsula Boulevard Site
Hewlett, NY

Rear Parking Lot



Soil Borehole

Scale:

0 8 Ft

U.S. EPA Environmental Response Team
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EP-W-09-031
W.A.# 0 - 149

Figure 5
Interior Soil Borehole
Location Map
Piermont Cleaners
Peninsula Boulevard Site
Hewlett, New York

J:/SERAS01/ACAD_2013/00-149/149_TRGW_Piermont_Interior_SB_Loc_F5.dwg 02/17/15

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

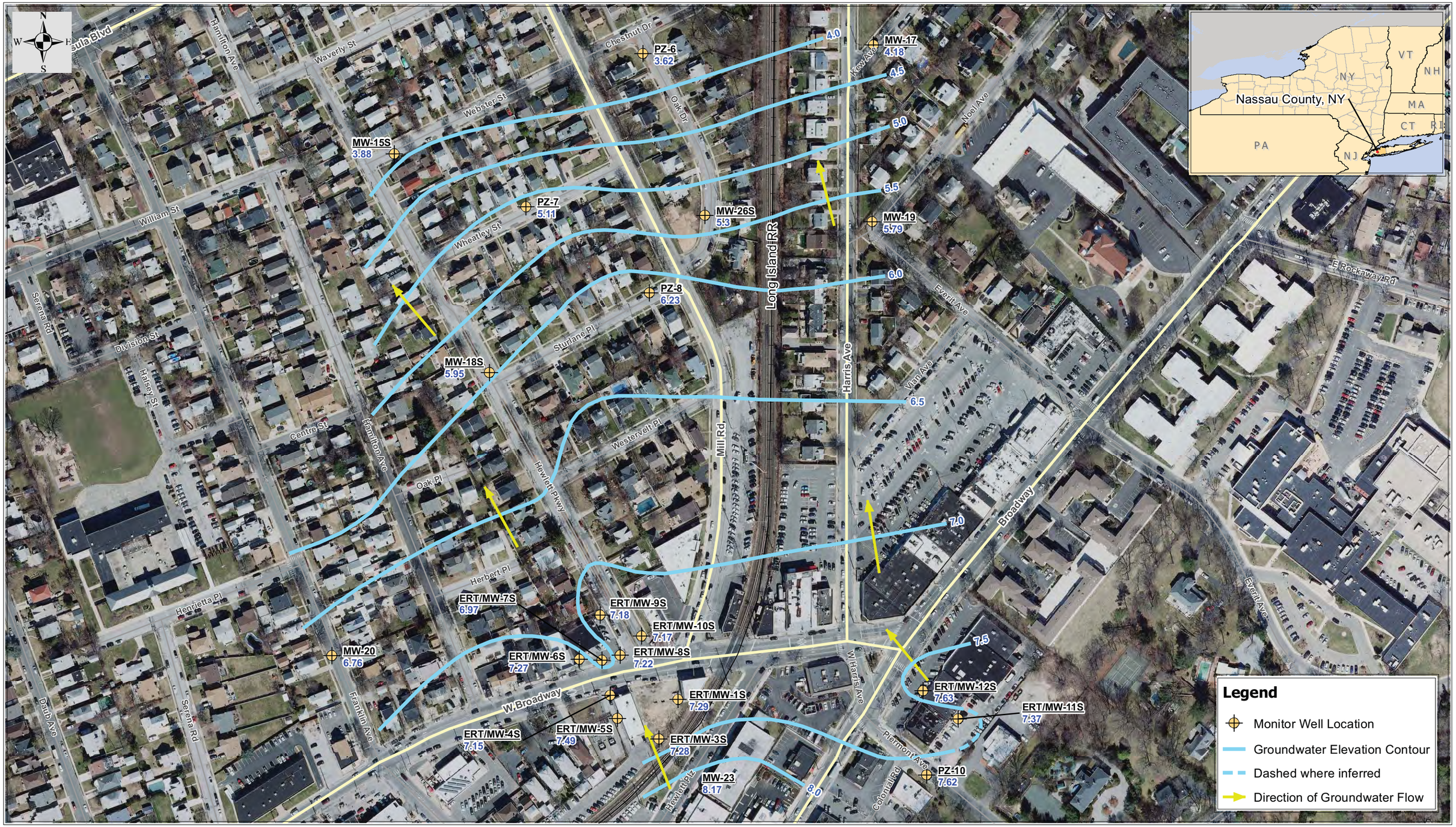
Data: Base Map.mxd

N W E S

0 5 10 20 30 40 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 6
Sample Locations
LIRR Substation and
1245/1255 West Broadway
Peninsula Boulevard Site
Hewlett, NY



Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 28 April 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

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0 200 400 Feet

Note: Groundwater levels measured on April 27, 2016

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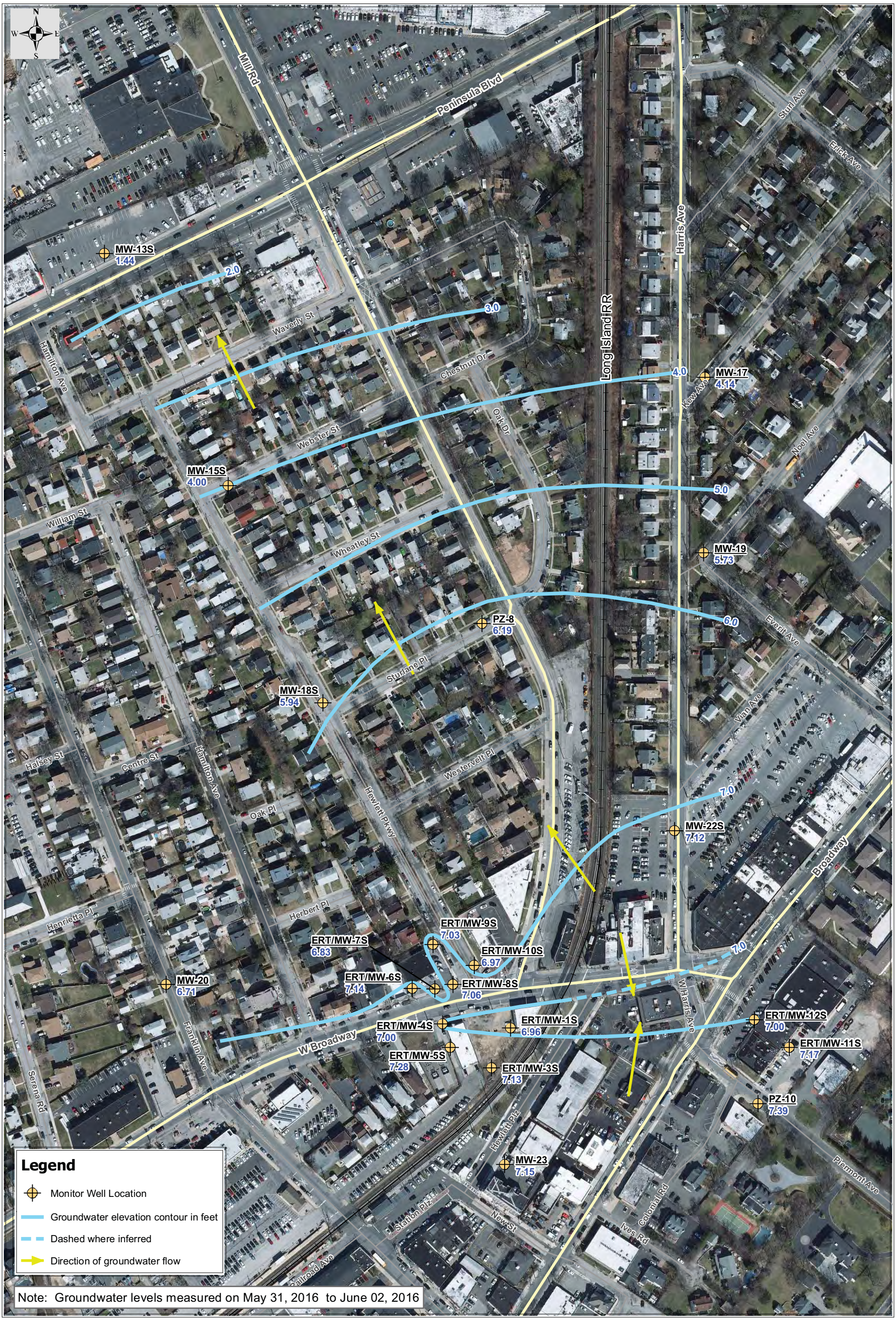
EP-W-09-031
W.A.# SERAS-149

Figure 7a
Groundwater Elevations in Shallow Upper Glacial Aquifer
Peninsula Boulevard Site
Hewlett, New York



Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 20 June 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 200 400 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 7b
Groundwater Elevations
in Shallow Upper Glacial Aquifer
Peninsula Boulevard Site
Hewlett, New York

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report
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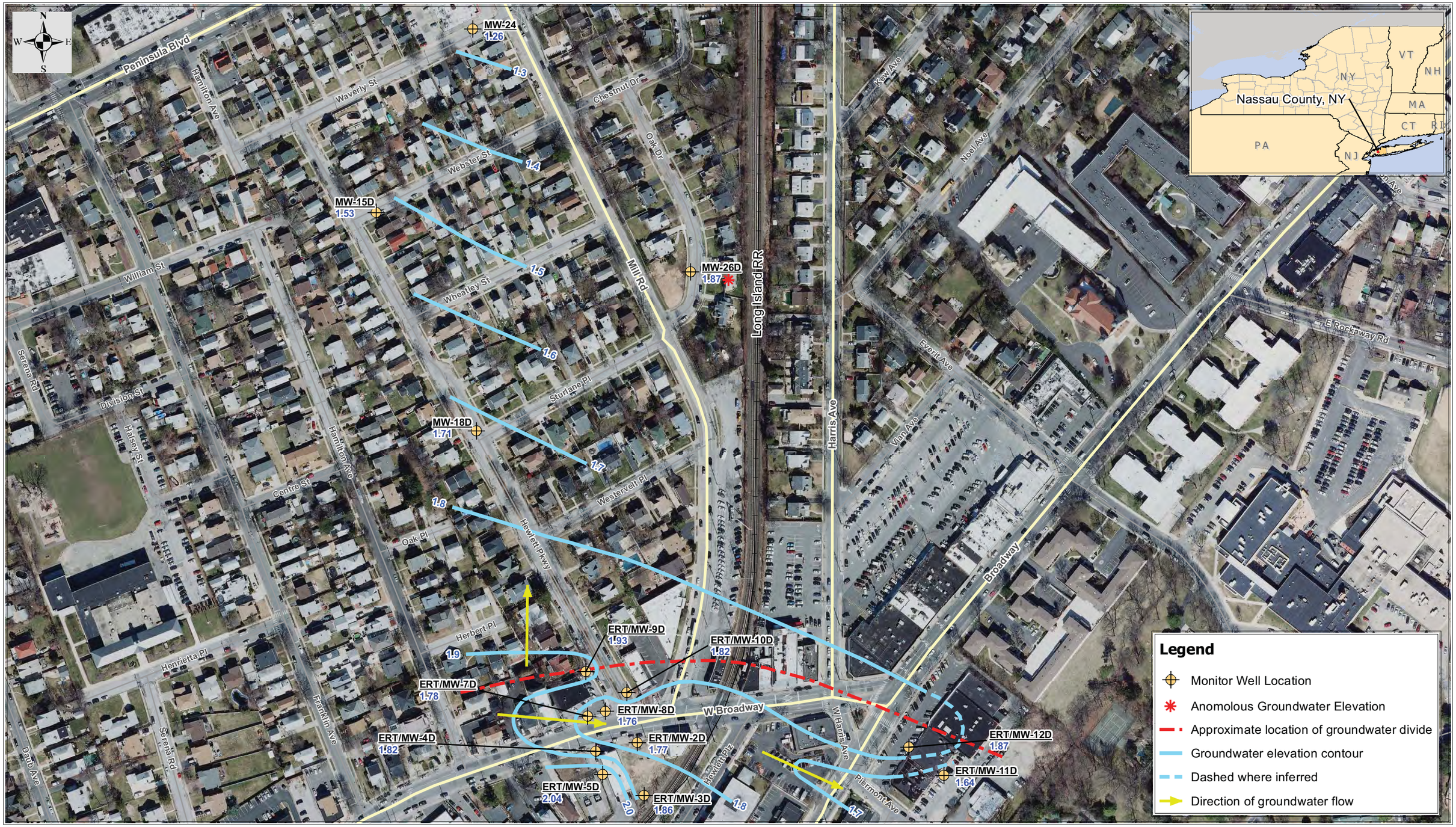

Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 28 April 2016

Coordinate system: State Plane New York Long Island
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Datum: NAD83
Units: Feet

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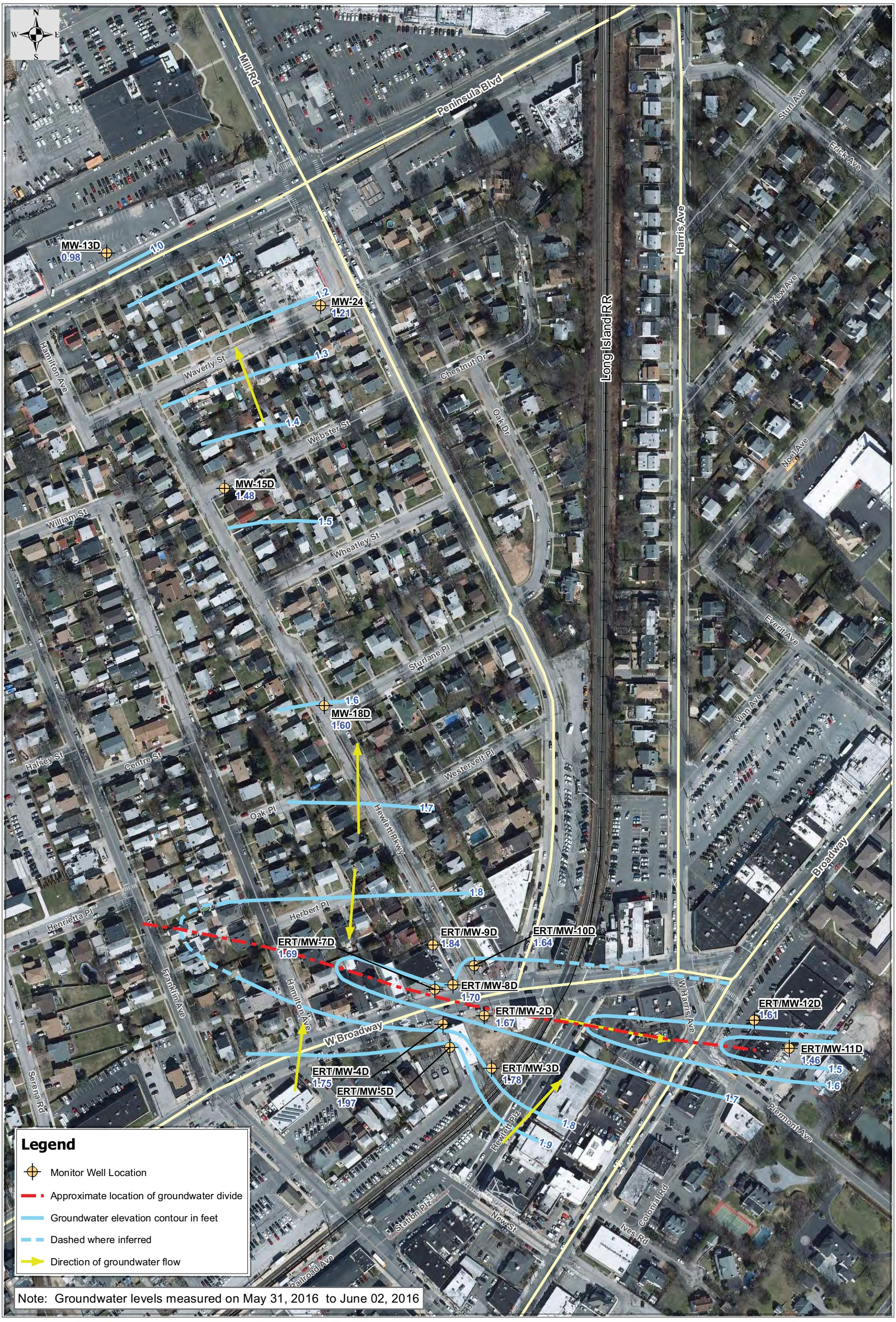
0 200 400 Feet

Note: Groundwater levels measured on April 27, 2016

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 8a
Groundwater Elevations in Deep Upper Glacial Aquifer
Peninsula Boulevard Site
Hewlett, New York



Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 20 June 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 200 400 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 8b
Groundwater Elevations
in Deep Upper Glacial Aquifer
Peninsula Boulevard Site
Hewlett, New York

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report
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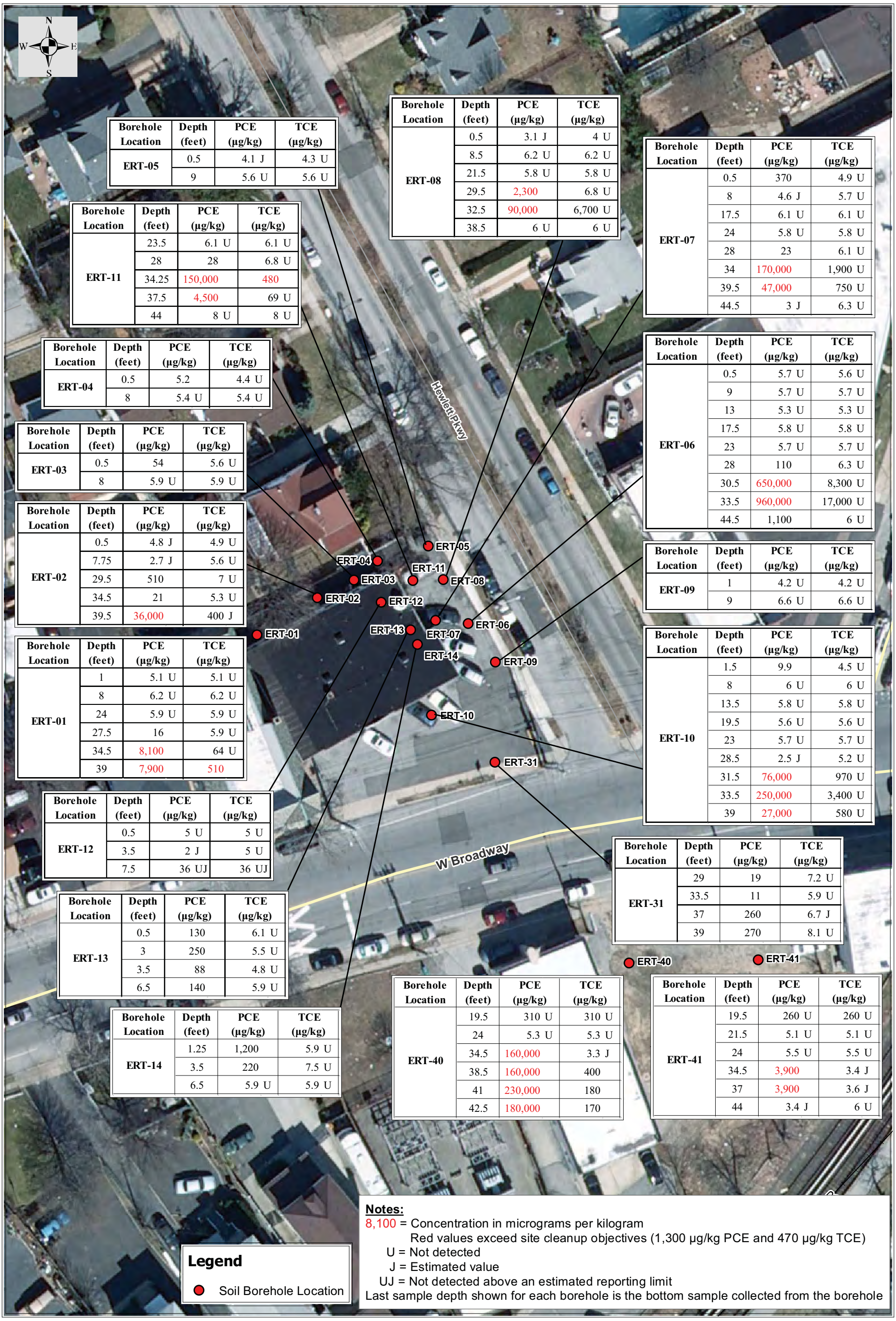


Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-05	0.5	4.1 J	4.3 U
	9	5.6 U	5.6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-11	23.5	6.1 U	6.1 U
	28	28	6.8 U
	34.25	150,000	480
	37.5	4,500	69 U
	44	8 U	8 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-04	0.5	5.2	4.4 U
	8	5.4 U	5.4 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-03	0.5	54	5.6 U
	8	5.9 U	5.9 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-02	0.5	4.8 J	4.9 U
	7.75	2.7 J	5.6 U
	29.5	510	7 U
	34.5	21	5.3 U
	39.5	36,000	400 J

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-01	1	5.1 U	5.1 U
	8	6.2 U	6.2 U
	24	5.9 U	5.9 U
	27.5	16	5.9 U
	34.5	8,100	64 U
	39	7,900	510

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-12	0.5	5 U	5 U
	3.5	2 J	5 U
	7.5	36 UJ	36 UJ

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-13	0.5	130	6.1 U
	3	250	5.5 U
	3.5	88	4.8 U
	6.5	140	5.9 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-14	1.25	1,200	5.9 U
	3.5	220	7.5 U
	6.5	5.9 U	5.9 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-08	0.5	3.1 J	4 U
	8.5	6.2 U	6.2 U
	21.5	5.8 U	5.8 U
	29.5	2,300	6.8 U
	32.5	90,000	6,700 U
	38.5	6 U	6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-07	0.5	370	4.9 U
	8	4.6 J	5.7 U
	17.5	6.1 U	6.1 U
	24	5.8 U	5.8 U
	28	23	6.1 U
	34	170,000	1,900 U
	39.5	47,000	750 U
	44.5	3 J	6.3 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-06	0.5	5.7 U	5.6 U
	9	5.7 U	5.7 U
	13	5.3 U	5.3 U
	17.5	5.8 U	5.8 U
	23	5.7 U	5.7 U
	28	110	6.3 U
	30.5	650,000	8,300 U
	33.5	960,000	17,000 U
	44.5	1,100	6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-09	1	4.2 U	4.2 U
	9	6.6 U	6.6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-10	1.5	9.9	4.5 U
	8	6 U	6 U
	13.5	5.8 U	5.8 U
	19.5	5.6 U	5.6 U
	23	5.7 U	5.7 U
	28.5	2.5 J	5.2 U
	31.5	76,000	970 U
	33.5	250,000	3,400 U
	39	27,000	580 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-31	29	19	7.2 U
	33.5	11	5.9 U
	37	260	6.7 J
	39	270	8.1 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-40	19.5	310 U	310 U
	24	5.3 U	5.3 U
	34.5	160,000	3.3 J
	38.5	160,000	400
	41	230,000	180
	42.5	180,000	170

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-41	19.5	260 U	260 U
	21.5	5.1 U	5.1 U
	24	5.5 U	5.5 U
	34.5	3,900	3.4 J
	37	3,900	3.6 J
	44	3.4 J	6 U

Notes:

8,100 = Concentration in micrograms per kilogram
Red values exceed site cleanup objectives (1,300 µg/kg PCE and 470 µg/kg TCE)
U = Not detected
J = Estimated value
UJ = Not detected above an estimated reporting limit
Last sample depth shown for each borehole is the bottom sample collected from the borehole

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2014.

Map Creation Date: 12 April 2016

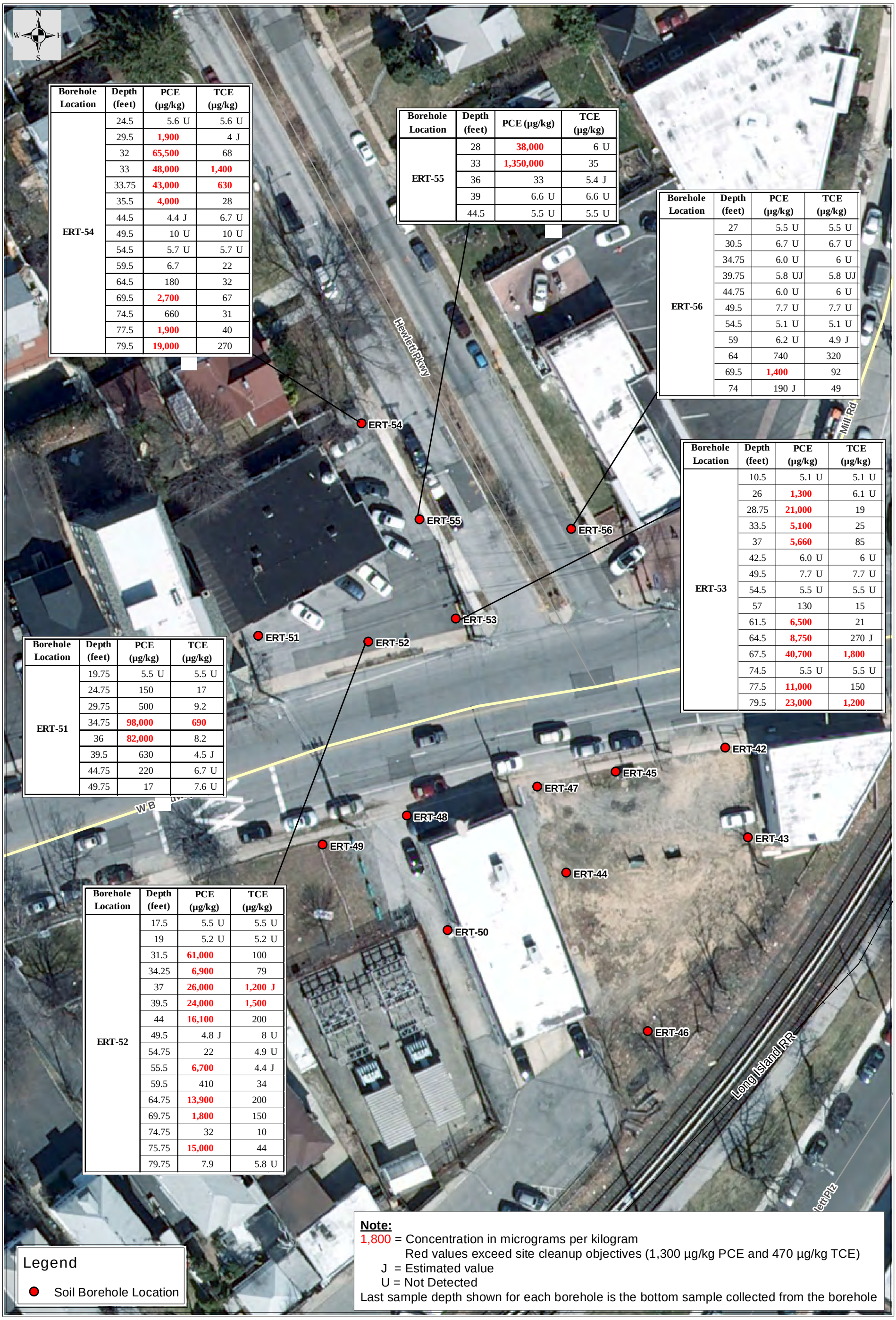
Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 40 80 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\149_TM2016_f11_PCE&TCE_Soil_CedarwoodC_1255Wbroadway_April2014_f11.mxd

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 9
PCE and TCE Concentrations in Soil
Cedarwood Cleaners and 1255 West Broadway
March/April 2014
Peninsula Boulevard Site
Hewlett, New York



Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-54	24.5	5.6 U	5.6 U
	29.5	**1,900**	4 J
	32	**65,500**	68
	33	**48,000**	**1,400**
	33.75	**43,000**	**630**
	35.5	**4,000**	28
	44.5	4.4 J	6.7 U
	49.5	10 U	10 U
	54.5	5.7 U	5.7 U
	59.5	6.7	22
	64.5	180	32
	69.5	**2,700**	67
	74.5	660	31
	77.5	**1,900**	40
	79.5	**19,000**	270

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-55	28	**38,000**	6 U
	33	**1,350,000**	35
	36	33	5.4 J
	39	6.6 U	6.6 U
	44.5	5.5 U	5.5 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-56	27	5.5 U	5.5 U
	30.5	6.7 U	6.7 U
	34.75	6.0 U	6 U
	39.75	5.8 UJ	5.8 UJ
	44.75	6.0 U	6 U
	49.5	7.7 U	7.7 U
	54.5	5.1 U	5.1 U
	59	6.2 U	4.9 J
	64	740	320
	69.5	**1,400**	92
	74	190 J	49

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-53	10.5	5.1 U	5.1 U
	26	**1,300**	6.1 U
	28.75	**21,000**	19
	33.5	**5,100**	25
	37	**5,660**	85
	42.5	6.0 U	6 U
	49.5	7.7 U	7.7 U
	54.5	5.5 U	5.5 U
	57	130	15
	61.5	**6,500**	21
	64.5	**8,750**	270 J
	67.5	**40,700**	**1,800**
	74.5	5.5 U	5.5 U
	77.5	**11,000**	150
	79.5	**23,000**	**1,200**

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-51	19.75	5.5 U	5.5 U
	24.75	150	17
	29.75	500	9.2
	34.75	**98,000**	**690**
	36	**82,000**	8.2
	39.5	630	4.5 J
	44.75	220	6.7 U
	49.75	17	7.6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-52	17.5	5.5 U	5.5 U
	19	5.2 U	5.2 U
	31.5	**61,000**	100
	34.25	**6,900**	79
	37	**26,000**	**1,200 J**
	39.5	**24,000**	**1,500**
	44	**16,100**	200
	49.5	4.8 J	8 U
	54.75	22	4.9 U
	55.5	**6,700**	4.4 J
	59.5	410	34
	64.75	**13,900**	200
	69.75	**1,800**	150
	74.75	32	10
	75.75	**15,000**	44
	79.75	7.9	5.8 U

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2016.

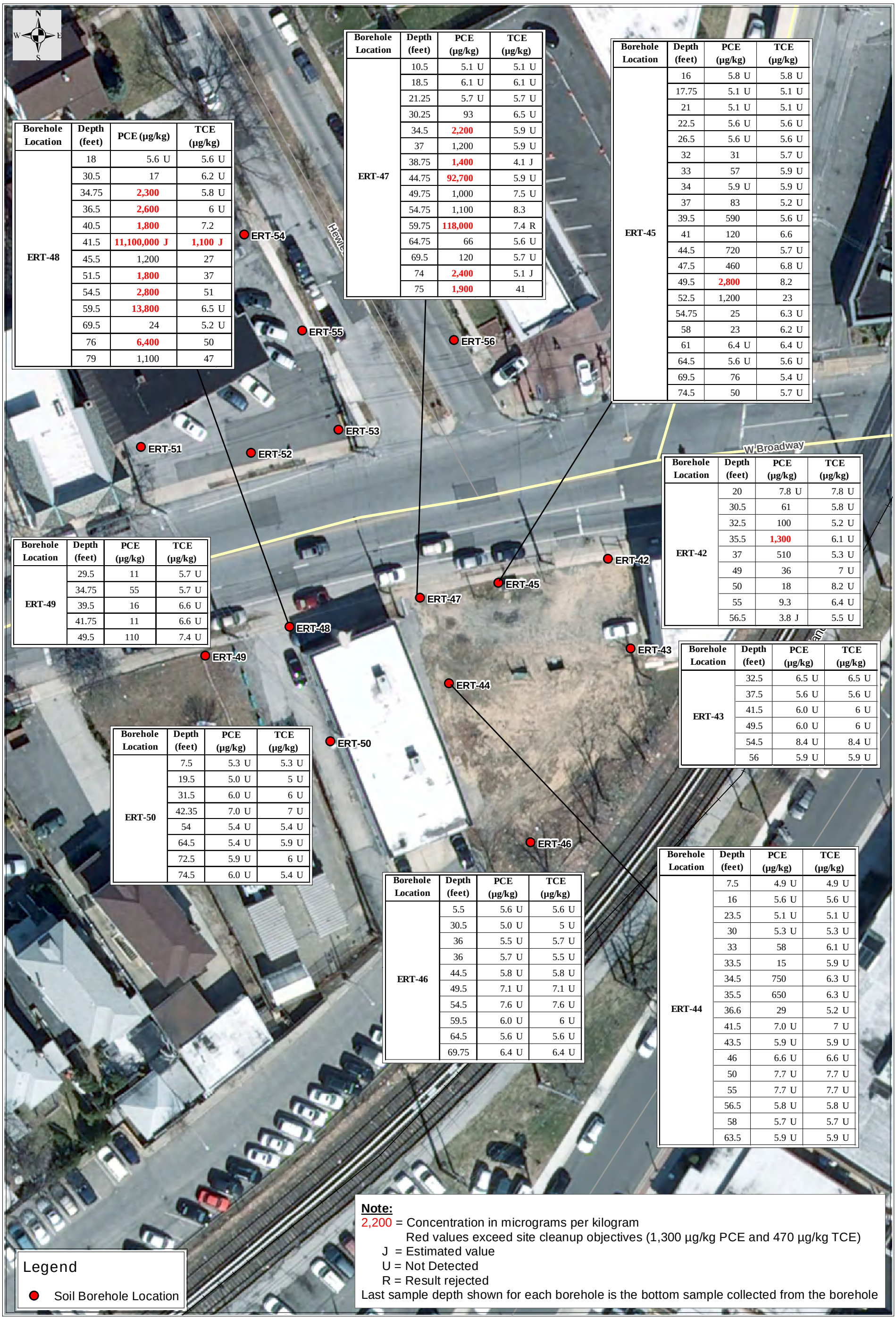
Map Creation Date: 14 April 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD
\149_TM2016_f10_PCE_TCE_inSoil_CedarwoodClearners_Jan2016_f10.mxd

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 10
PCE and TCE Concentrations in Soil
Cedarwood Cleaners
January 2016
Peninsula Boulevard Site
Hewlett, New York



Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-48	18	5.6 U	5.6 U
	30.5	17	6.2 U
	34.75	2,300	5.8 U
	36.5	2,600	6 U
	40.5	1,800	7.2
	41.5	11,100,000 J	1,100 J
	45.5	1,200	27
	51.5	1,800	37
	54.5	2,800	51
	59.5	13,800	6.5 U
	69.5	24	5.2 U
	76	6,400	50
	79	1,100	47

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-47	10.5	5.1 U	5.1 U
	18.5	6.1 U	6.1 U
	21.25	5.7 U	5.7 U
	30.25	93	6.5 U
	34.5	2,200	5.9 U
	37	1,200	5.9 U
	38.75	1,400	4.1 J
	44.75	92,700	5.9 U
	49.75	1,000	7.5 U
	54.75	1,100	8.3
	59.75	118,000	7.4 R
	64.75	66	5.6 U
	69.5	120	5.7 U
	74	2,400	5.1 J
	75	1,900	41

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-45	16	5.8 U	5.8 U
	17.75	5.1 U	5.1 U
	21	5.1 U	5.1 U
	22.5	5.6 U	5.6 U
	26.5	5.6 U	5.6 U
	32	31	5.7 U
	33	57	5.9 U
	34	5.9 U	5.9 U
	37	83	5.2 U
	39.5	590	5.6 U
	41	120	6.6
	44.5	720	5.7 U
	47.5	460	6.8 U
	49.5	2,800	8.2
	52.5	1,200	23
	54.75	25	6.3 U
	58	23	6.2 U
	61	6.4 U	6.4 U
	64.5	5.6 U	5.6 U
	69.5	76	5.4 U
	74.5	50	5.7 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-42	20	7.8 U	7.8 U
	30.5	61	5.8 U
	32.5	100	5.2 U
	35.5	1,300	6.1 U
	37	510	5.3 U
	49	36	7 U
	50	18	8.2 U
	55	9.3	6.4 U
	56.5	3.8 J	5.5 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-49	29.5	11	5.7 U
	34.75	55	5.7 U
	39.5	16	6.6 U
	41.75	11	6.6 U
	49.5	110	7.4 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-43	32.5	6.5 U	6.5 U
	37.5	5.6 U	5.6 U
	41.5	6.0 U	6 U
	49.5	6.0 U	6 U
	54.5	8.4 U	8.4 U
	56	5.9 U	5.9 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-50	7.5	5.3 U	5.3 U
	19.5	5.0 U	5 U
	31.5	6.0 U	6 U
	42.35	7.0 U	7 U
	54	5.4 U	5.4 U
	64.5	5.4 U	5.9 U
	72.5	5.9 U	6 U
	74.5	6.0 U	5.4 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-46	5.5	5.6 U	5.6 U
	30.5	5.0 U	5 U
	36	5.5 U	5.7 U
	36	5.7 U	5.5 U
	44.5	5.8 U	5.8 U
	49.5	7.1 U	7.1 U
	54.5	7.6 U	7.6 U
	59.5	6.0 U	6 U
	64.5	5.6 U	5.6 U
	69.75	6.4 U	6.4 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-44	7.5	4.9 U	4.9 U
	16	5.6 U	5.6 U
	23.5	5.1 U	5.1 U
	30	5.3 U	5.3 U
	33	58	6.1 U
	33.5	15	5.9 U
	34.5	750	6.3 U
	35.5	650	6.3 U
	36.6	29	5.2 U
	41.5	7.0 U	7 U
	43.5	5.9 U	5.9 U
	46	6.6 U	6.6 U
	50	7.7 U	7.7 U
	55	7.7 U	7.7 U
	56.5	5.8 U	5.8 U
	58	5.7 U	5.7 U
	63.5	5.9 U	5.9 U

Note:
2,200 = Concentration in micrograms per kilogram
Red values exceed site cleanup objectives (1,300 µg/kg PCE and 470 µg/kg TCE)
J = Estimated value
U = Not Detected
R = Result rejected
Last sample depth shown for each borehole is the bottom sample collected from the borehole

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2016.

Map Creation Date: 14 April 2016

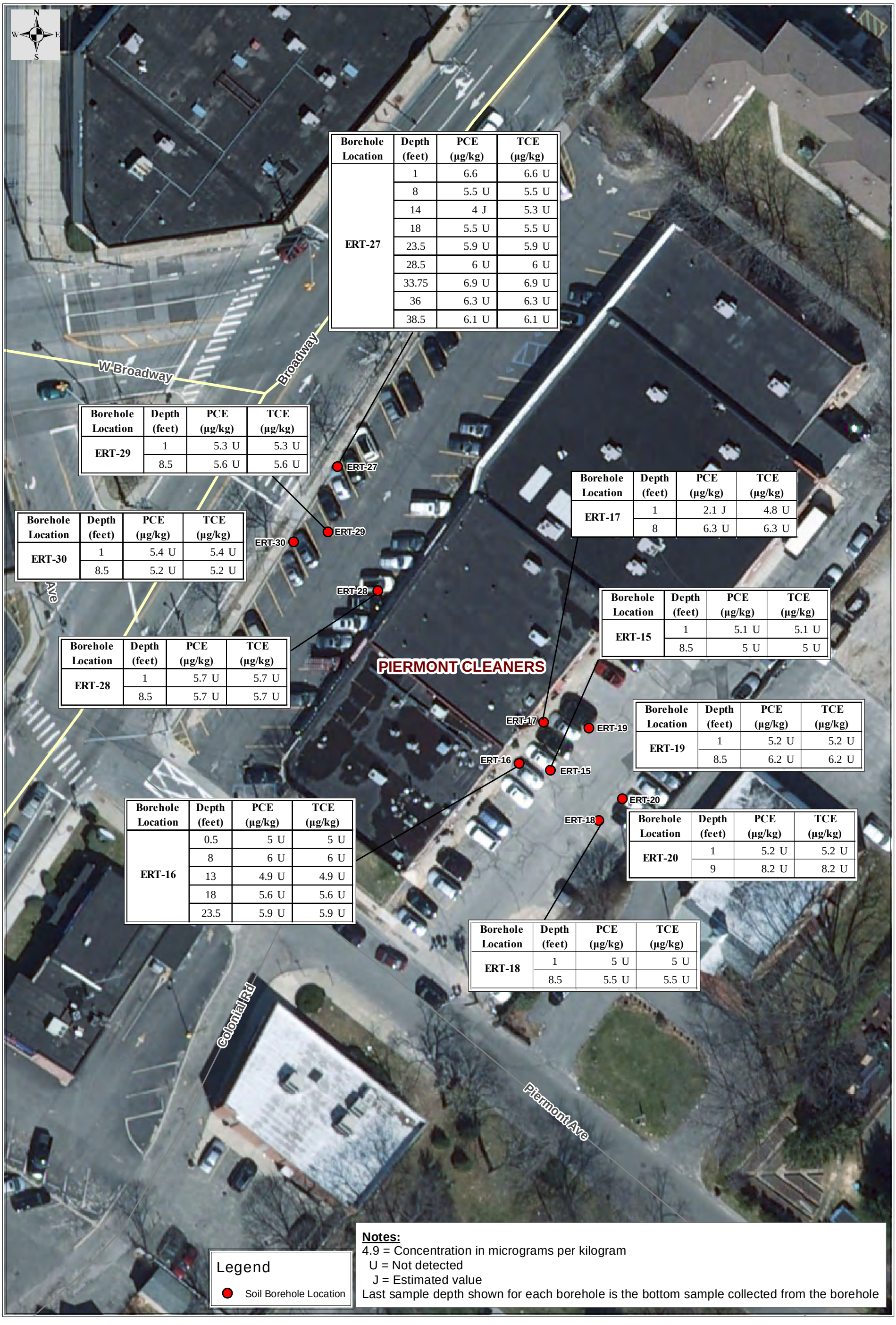
Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 40 80 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 11
PCE and TCE Concentrations in Soil
1245/1255 West Broadway and LIRR Substation
November/December 2015 and January 2016
Peninsula Boulevard Site
Hewlett, New York

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD
\149_TM2016_f11_PCE_TCE_inSoil_1255Wbroadway_LIRR_Dec2015_Jan2016_f11.mxd



Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-27	1	6.6	6.6 U
	8	5.5 U	5.5 U
	14	4 J	5.3 U
	18	5.5 U	5.5 U
	23.5	5.9 U	5.9 U
	28.5	6 U	6 U
	33.75	6.9 U	6.9 U
	36	6.3 U	6.3 U
	38.5	6.1 U	6.1 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-29	1	5.3 U	5.3 U
	8.5	5.6 U	5.6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-30	1	5.4 U	5.4 U
	8.5	5.2 U	5.2 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-28	1	5.7 U	5.7 U
	8.5	5.7 U	5.7 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-17	1	2.1 J	4.8 U
	8	6.3 U	6.3 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-15	1	5.1 U	5.1 U
	8.5	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-19	1	5.2 U	5.2 U
	8.5	6.2 U	6.2 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-16	0.5	5 U	5 U
	8	6 U	6 U
	13	4.9 U	4.9 U
	18	5.6 U	5.6 U
	23.5	5.9 U	5.9 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-20	1	5.2 U	5.2 U
	9	8.2 U	8.2 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-18	1	5 U	5 U
	8.5	5.5 U	5.5 U

Notes:
4.9 = Concentration in micrograms per kilogram
U = Not detected
J = Estimated value
Last sample depth shown for each borehole is the bottom sample collected from the borehole

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2014.

Map Creation Date: 12 April 2016

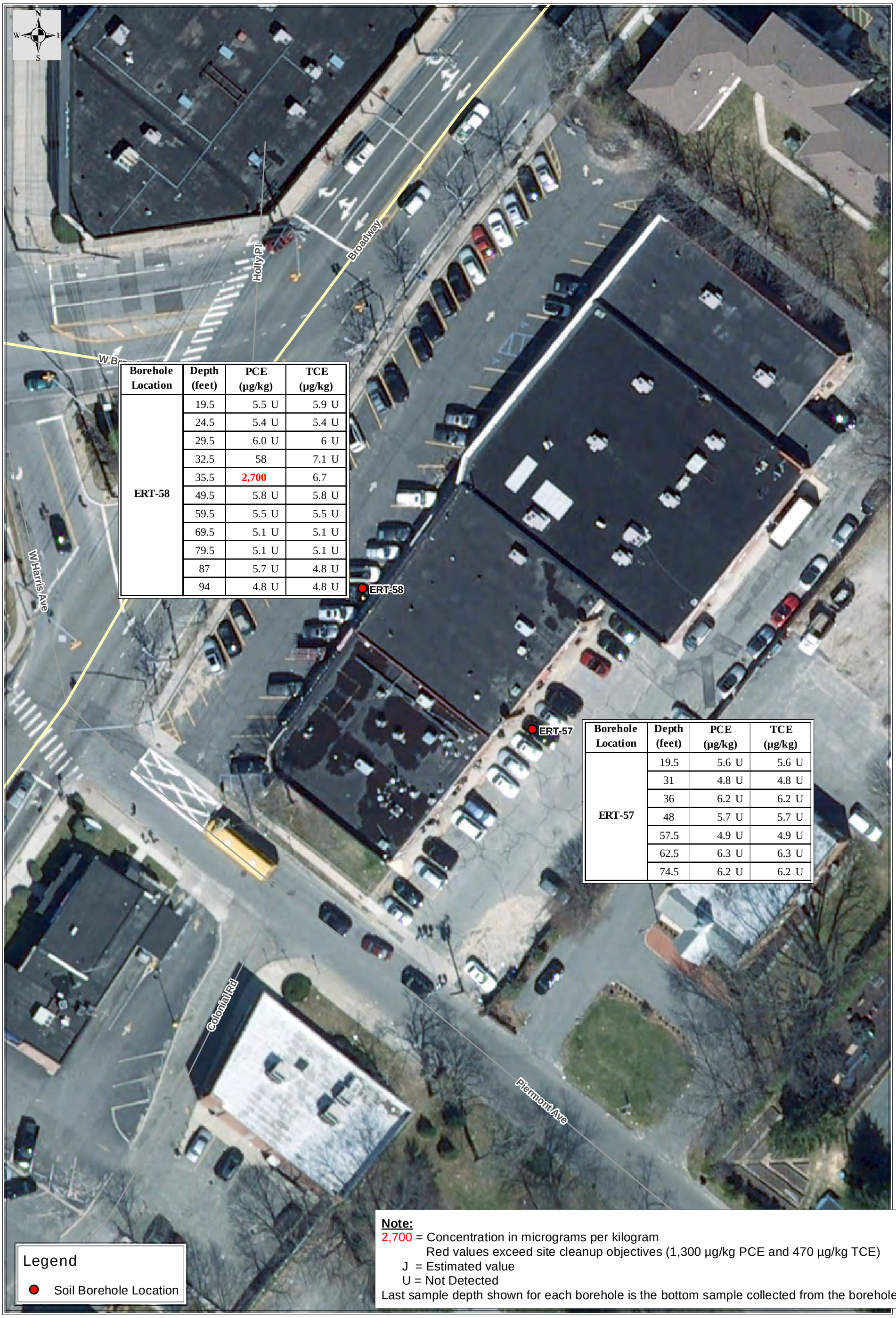
Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 40 80 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\149_TM2016_f12_PCE_TCE_Soil_PiermontCleaners_March_April2014_f12.mxd

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 12
PCE and TCE Concentrations in Soil
Piermont Cleaners
March/April 2014
Peninsula Boulevard Site
Hewlett, New York



Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-58	19.5	5.5 U	5.9 U
	24.5	5.4 U	5.4 U
	29.5	6.0 U	6 U
	32.5	58	7.1 U
	35.5	2,700	6.7
	49.5	5.8 U	5.8 U
	59.5	5.5 U	5.5 U
	69.5	5.1 U	5.1 U
	79.5	5.1 U	5.1 U
	87	5.7 U	4.8 U
	94	4.8 U	4.8 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-57	19.5	5.6 U	5.6 U
	31	4.8 U	4.8 U
	36	6.2 U	6.2 U
	48	5.7 U	5.7 U
	57.5	4.9 U	4.9 U
	62.5	6.3 U	6.3 U
	74.5	6.2 U	6.2 U

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2016.

Map Creation Date: 14 April 2016

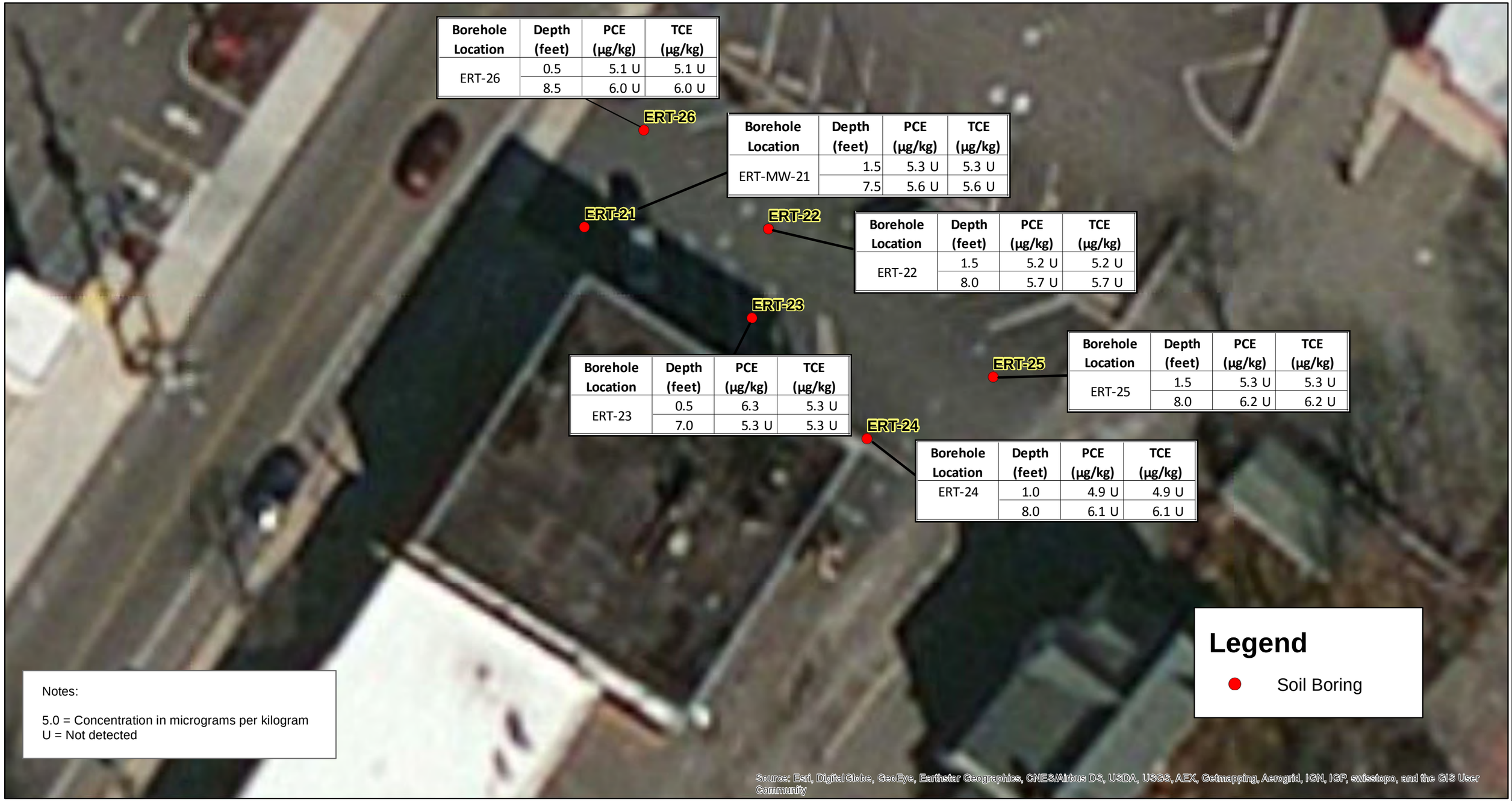
Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 40 80 Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 13
PCE and TCE Concentrations in Soil
Piermont Cleaners
January 2016
Peninsula Boulevard Site
Hewlett, New York

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD
\149_TM2016_f11_PCE_TCE_inSoil_PiermontCleaners_Jan2016_f13.mxd



Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-26	0.5	5.1 U	5.1 U
	8.5	6.0 U	6.0 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-MW-21	1.5	5.3 U	5.3 U
	7.5	5.6 U	5.6 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-22	1.5	5.2 U	5.2 U
	8.0	5.7 U	5.7 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-23	0.5	6.3	5.3 U
	7.0	5.3 U	5.3 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-25	1.5	5.3 U	5.3 U
	8.0	6.2 U	6.2 U

Borehole Location	Depth (feet)	PCE (µg/kg)	TCE (µg/kg)
ERT-24	1.0	4.9 U	4.9 U
	8.0	6.1 U	6.1 U

Notes:

5.0 = Concentration in micrograms per kilogram
U = Not detected

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

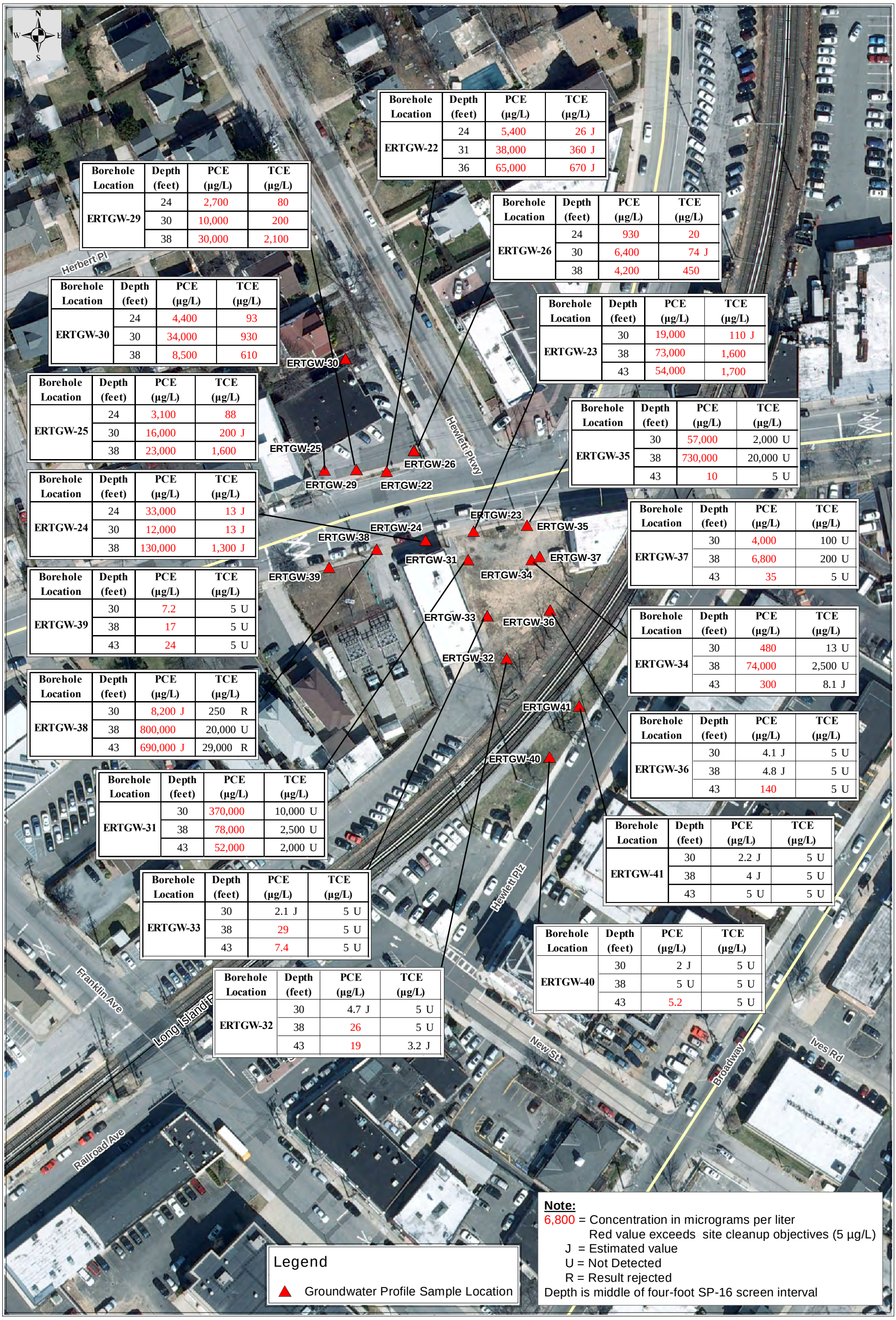
Data: Base Map.mxd

N
W E
S

0 5 10 20 30 40
Feet

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 14
PCE and TCE Concentrations in Soil
Former Vogue French Cleaners
April 2014
Peninsula Boulevard Site
Hewlett, NY



Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-22	24	5,400	26 J
	31	38,000	360 J
	36	65,000	670 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-29	24	2,700	80
	30	10,000	200
	38	30,000	2,100

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-26	24	930	20
	30	6,400	74 J
	38	4,200	450

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-30	24	4,400	93
	30	34,000	930
	38	8,500	610

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-23	30	19,000	110 J
	38	73,000	1,600
	43	54,000	1,700

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-25	24	3,100	88
	30	16,000	200 J
	38	23,000	1,600

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-35	30	57,000	2,000 U
	38	730,000	20,000 U
	43	10	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-24	24	33,000	13 J
	30	12,000	13 J
	38	130,000	1,300 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-37	30	4,000	100 U
	38	6,800	200 U
	43	35	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-39	30	7.2	5 U
	38	17	5 U
	43	24	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-34	30	480	13 U
	38	74,000	2,500 U
	43	300	8.1 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-38	30	8,200 J	250 R
	38	800,000	20,000 U
	43	690,000 J	29,000 R

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-36	30	4.1 J	5 U
	38	4.8 J	5 U
	43	140	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-31	30	370,000	10,000 U
	38	78,000	2,500 U
	43	52,000	2,000 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-41	30	2.2 J	5 U
	38	4 J	5 U
	43	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-33	30	2.1 J	5 U
	38	29	5 U
	43	7.4	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-40	30	2 J	5 U
	38	5 U	5 U
	43	5.2	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-32	30	4.7 J	5 U
	38	26	5 U
	43	19	3.2 J

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2014.

Map Creation Date: 12 April 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 80 160 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\149_TM2016_f15_PCE_TCE_inGW_CedarwoodC_1255W_LIRR_October2014_f15.mxd

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 15
PCE and TCE Concentrations in Groundwater Profile Samples
Cedarwood Cleaners, 1245/1255 West Broadway, and LIRR Substation
October 2014
Peninsula Boulevard Site
Hewlett, New York

Notes:

100 = Concentration in micrograms per liter
U = Not detected
L = Result biased low
Red values exceed the NYSDEC Class GA principal organic contaminant standards for groundwater of 5 µg/L.
Last sample depth shown for each well is the bottom sample collected from that well.

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/23/2016	5/31/2016	2/23/2016	5/31/2016
ERT-MW-09S	27.5	9.8	5.0U	5.0U	5.0U
	32.5	9.9	5.0U	5.0U	5.0U
ERT-MW-09D	65.5	20,000	16,000	3,500	5,000
	70.5	15,000	21,000	4,600	5,000U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/23/2016	5/31/2016	2/23/2016	5/31/2016
ERT-MW-10S	31.5	5.0U	5.0U	5.0U	5.0U
	36.5	9.9	5.0U	5.0U	5.0U
ERT-MW-10D	66.5	14	5.0U	5.0U	5.0U
	71.5	5.0U	5.0U	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/23/2016	5/31/2016	2/23/2016	5/31/2016
ERT-MW-08S	26.5	110	18	5.0U	10U
	31.5	2,500	61	500U	5.0U
ERT-MW-08D	66.5	24,000	46,000	2,700	5,000U
	71.5	13,000	44,000	2,300	2,500U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-06S	26.5	380	2,900	25U	1,000U
	30	7,600	NS	10L	NS
	31.5	8,000	5,800	250U	2,500U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-07S	26.5	430	1,100	46	50U
	31.5	5,400	1,100	250U	500U
ERT-MW-07D	64.5	830	8,700	130	500
	69.5	1,700	6,400	500	820

Map created using 2010 orthoimagery data from NY state, well location survey data and sampling data in 2016.

Map Creation Date: 13 July 2016

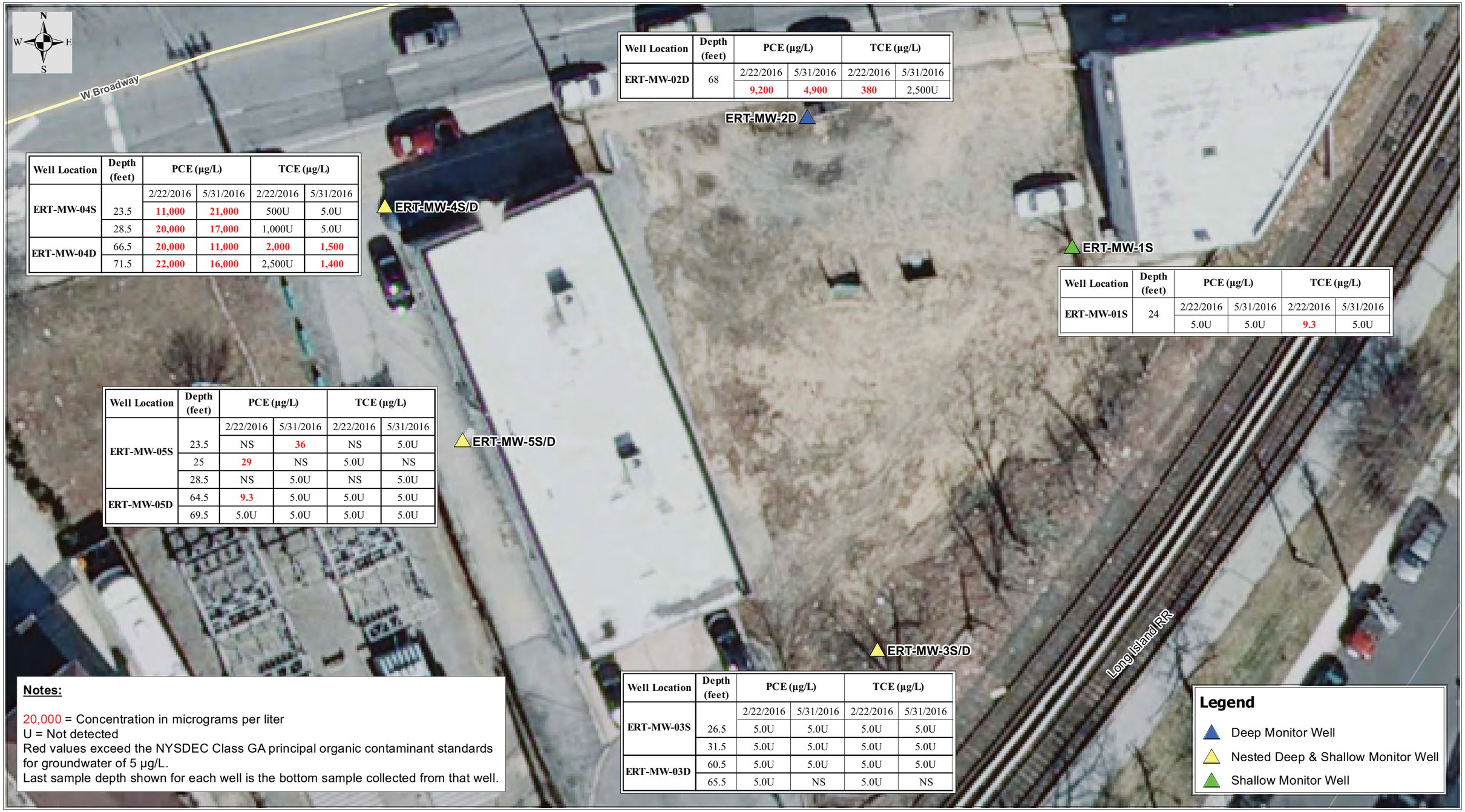
Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 20 40 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\149_TM2016_f18_PCE_TCE_inERTMW_Cedarwood_Feb_MayJune_f18.mxd

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 16
PCE and TCE Concentrations in Groundwater
Cedarwood Cleaners
February and May/June 2016
Peninsula Boulevard Site
Hewlett, New York



Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-02D	68	9,200	4,900	380	2,500U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-04S	23.5	11,000	21,000	500U	5.0U
	28.5	20,000	17,000	1,000U	5.0U
ERT-MW-04D	66.5	20,000	11,000	2,000	1,500
	71.5	22,000	16,000	2,500U	1,400

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-01S	24	5.0U	5.0U	9.3	5.0U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-05S	23.5	NS	36	NS	5.0U
	25	29	NS	5.0U	NS
	28.5	NS	5.0U	NS	5.0U
ERT-MW-05D	64.5	9.3	5.0U	5.0U	5.0U
	69.5	5.0U	5.0U	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/22/2016	5/31/2016	2/22/2016	5/31/2016
ERT-MW-03S	26.5	5.0U	5.0U	5.0U	5.0U
	31.5	5.0U	5.0U	5.0U	5.0U
ERT-MW-03D	60.5	5.0U	5.0U	5.0U	5.0U
	65.5	5.0U	NS	5.0U	NS

Notes:

20,000 = Concentration in micrograms per liter
U = Not detected
Red values exceed the NYSDEC Class GA principal organic contaminant standards for groundwater of 5 µg/L.
Last sample depth shown for each well is the bottom sample collected from that well.

Legend

- Deep Monitor Well
- Nested Deep & Shallow Monitor Well
- Shallow Monitor Well

Map created using 2010 orthoimagery data from NY state, well location survey data and sampling data in 2016.

Map Creation Date: 13 July 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 20 40 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\149_TM2016_f19_PCE_TCE_inERTMW_1255Wbroadway_LIRR_Feb_MayJune_f19.mxd

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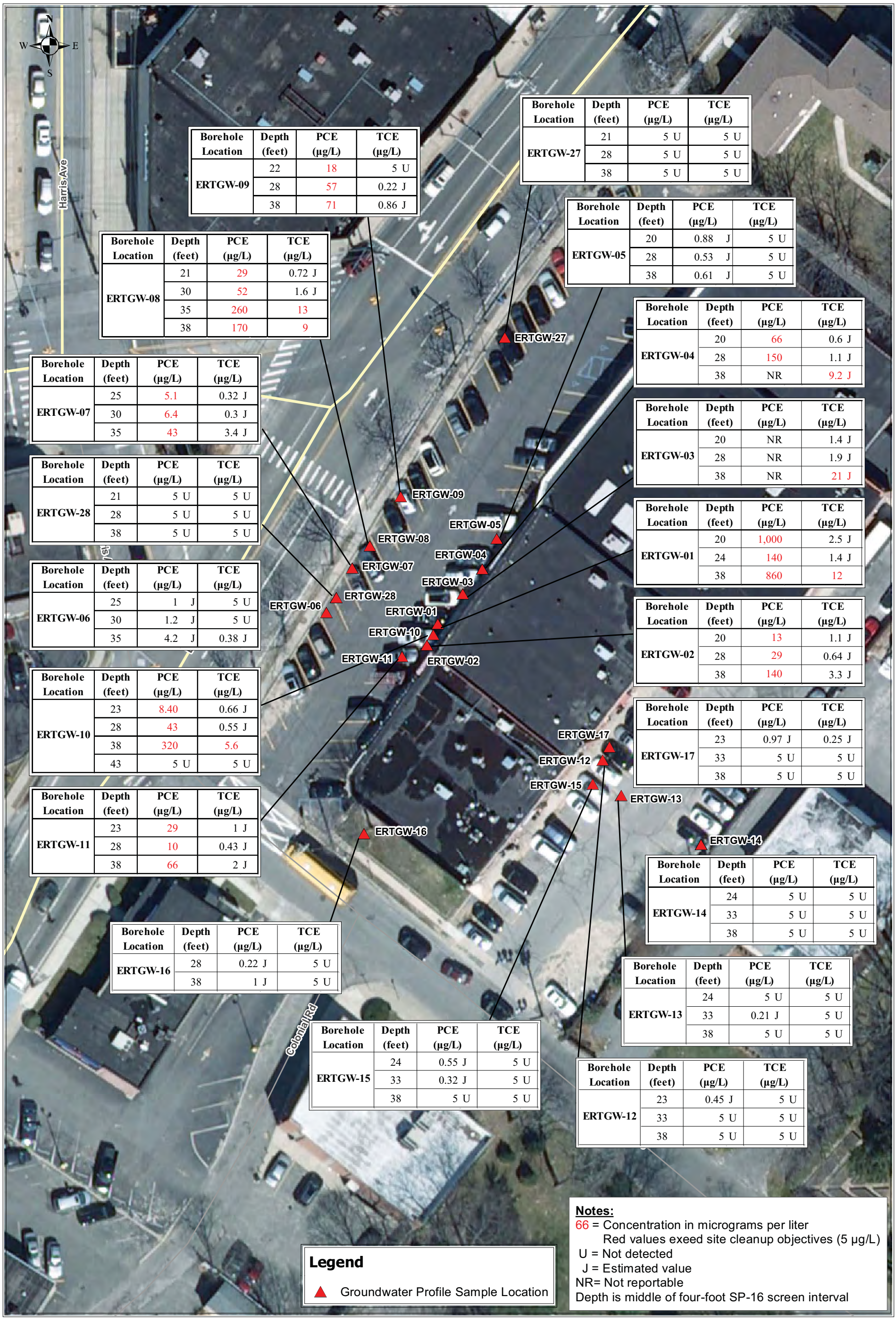
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 17
PCE and TCE Concentrations in Groundwater
1245/1255 West Broadway and LIRR Substation
February and May/June 2016
Peninsula Boulevard Site
Hewlett, New York



Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-09	22	18	5 U
	28	57	0.22 J
	38	71	0.86 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-27	21	5 U	5 U
	28	5 U	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-05	20	0.88 J	5 U
	28	0.53 J	5 U
	38	0.61 J	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-08	21	29	0.72 J
	30	52	1.6 J
	35	260	13
	38	170	9

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-04	20	66	0.6 J
	28	150	1.1 J
	38	NR	9.2 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-07	25	5.1	0.32 J
	30	6.4	0.3 J
	35	43	3.4 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-03	20	NR	1.4 J
	28	NR	1.9 J
	38	NR	21 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-28	21	5 U	5 U
	28	5 U	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-01	20	1,000	2.5 J
	24	140	1.4 J
	38	860	12

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-06	25	1 J	5 U
	30	1.2 J	5 U
	35	4.2 J	0.38 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-02	20	13	1.1 J
	28	29	0.64 J
	38	140	3.3 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-10	23	8.40	0.66 J
	28	43	0.55 J
	38	320	5.6
	43	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-17	23	0.97 J	0.25 J
	33	5 U	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-11	23	29	1 J
	28	10	0.43 J
	38	66	2 J

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-14	24	5 U	5 U
	33	5 U	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-16	28	0.22 J	5 U
	38	1 J	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-13	24	5 U	5 U
	33	0.21 J	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-15	24	0.55 J	5 U
	33	0.32 J	5 U
	38	5 U	5 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERTGW-12	23	0.45 J	5 U
	33	5 U	5 U
	38	5 U	5 U

Map created using 2010 orthoimagery data from NY state, borehole location and sampling data from 2014.

Map Creation Date: 12 April 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 40 80 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\149_TM2016_f20_PCE&TCE_GW_PiermontCleaners_October2014_f20.mxd

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Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 18
PCE and TCE Concentrations in Groundwater Profile Samples
Piermont Cleaners
October 2014
Peninsula Boulevard Site
Hewlett, New York

Notes:

800 = Concentration in micrograms per liter
U = Not detected
L = Result biased low
Red values exceed the NYSDEC Class GA principal organic contaminant standards for groundwater of 5 µg/L.
Last sample depth shown for each well is the bottom sample collected from that well.

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/23/2016	6/1/2016	2/23/2016	6/1/2016
ERT-MW-12S	31.5	34	1,200	5.0U	5.0U
	36.5	680	740	50U	5.0U
ERT-MW-12D	81.5	6.7	5.0U	5.0U	5.0U
	86.5	8.3	5.0U	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)		TCE (µg/L)	
		2/23/2016	6/1/2016	2/23/2016	6/1/2016
ERT-MW-11S	25	12	5.0U	5.0U	5.0U
ERT-MW-11D	69	9.1	5.0U	5.0U	5.0U

Map created using 2010 orthoimagery data from NY state, well location survey data and sampling data in 2016.

Map Creation Date: 13 July 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 30 60 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\149_TM2016_f21_PCE_TCE_inERTMW_Piermont_Feb_MayJune_f21.mxd

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Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 19
PCE and TCE Concentrations in Groundwater
Piermont Cleaners
February and May/June 2016
Peninsula Boulevard Site
Hewlett, New York

Notes:

5.0 = Concentration in micrograms per liter
U = Not detected
Last sample depth shown for each well is the bottom sample collected from that well.

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERT-GW-18	23	5.0 U	5.0 U
	33	5.0 U	5.0 U
	38	5.0 U	5.0 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERT-GW-19	23	5.0 U	5.0 U
	33	5.0 U	5.0 U
	38	5.0 U	5.0 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERT-GW-20	23	5.0 U	5.0 U
	33	5.0 U	5.0 U
	38	5.0 U	5.0 U

Borehole Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
ERT-GW-21	23	5.0 U	5.0 U
	33	5.0 U	5.0 U
	38	5.0 U	5.0 U

Map Date: 16 February 2016
Coordinate system: Latitude/Longitude
Datum: WGS 1984

Data: Base Map.mxd

N
W E
S

0 5 10 20 30 40
Feet

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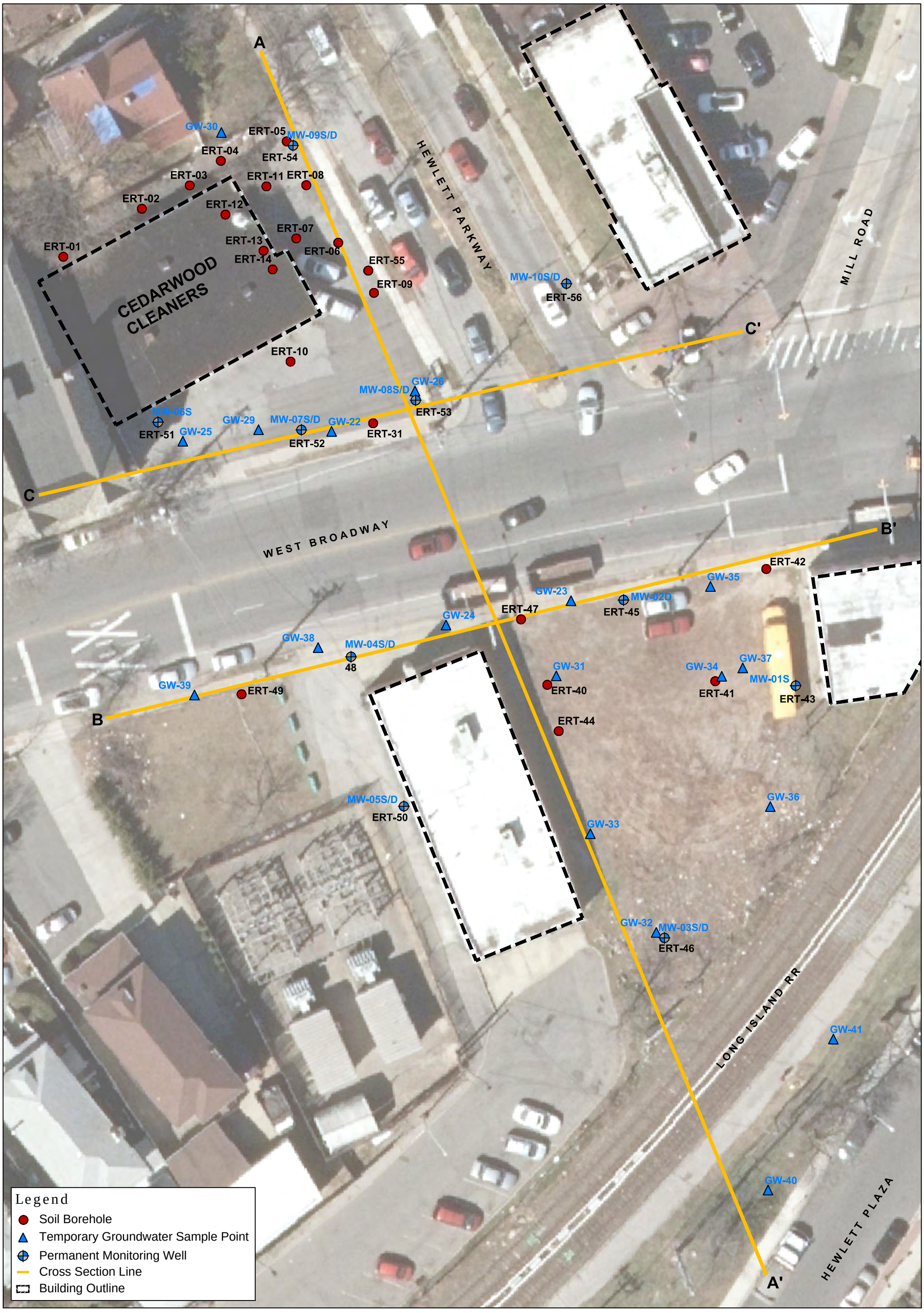
EP-W-09-031
W.A.# 0149

Figure 20
PCE and TCE Concentrations in Groundwater Profile Samples
Former Vogue French Cleaners
October 2014
Peninsula Boulevard Site
Hewlett, NY



Map created using 2013 orthoimagery from NY state, borehole location and sampling data from 2014, 2015, and 2016.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 04 May 2016

D R A F T

N W E S

0 30 60 Feet

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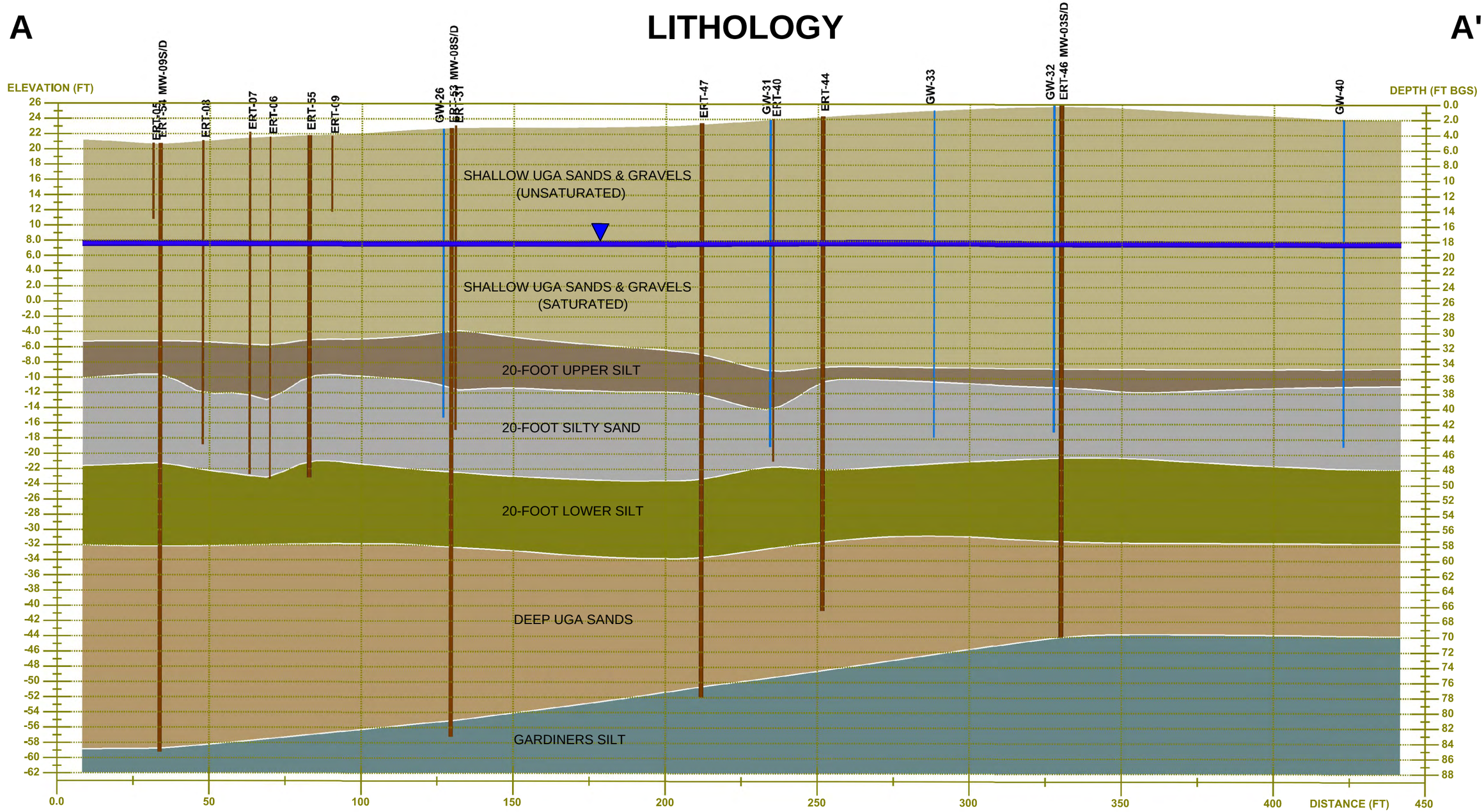
W.A.# 0149

Figure 21
Sample Locations and Cross Section Lines
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY

- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

D R A F T

Integrated Site Visualization (ISV)

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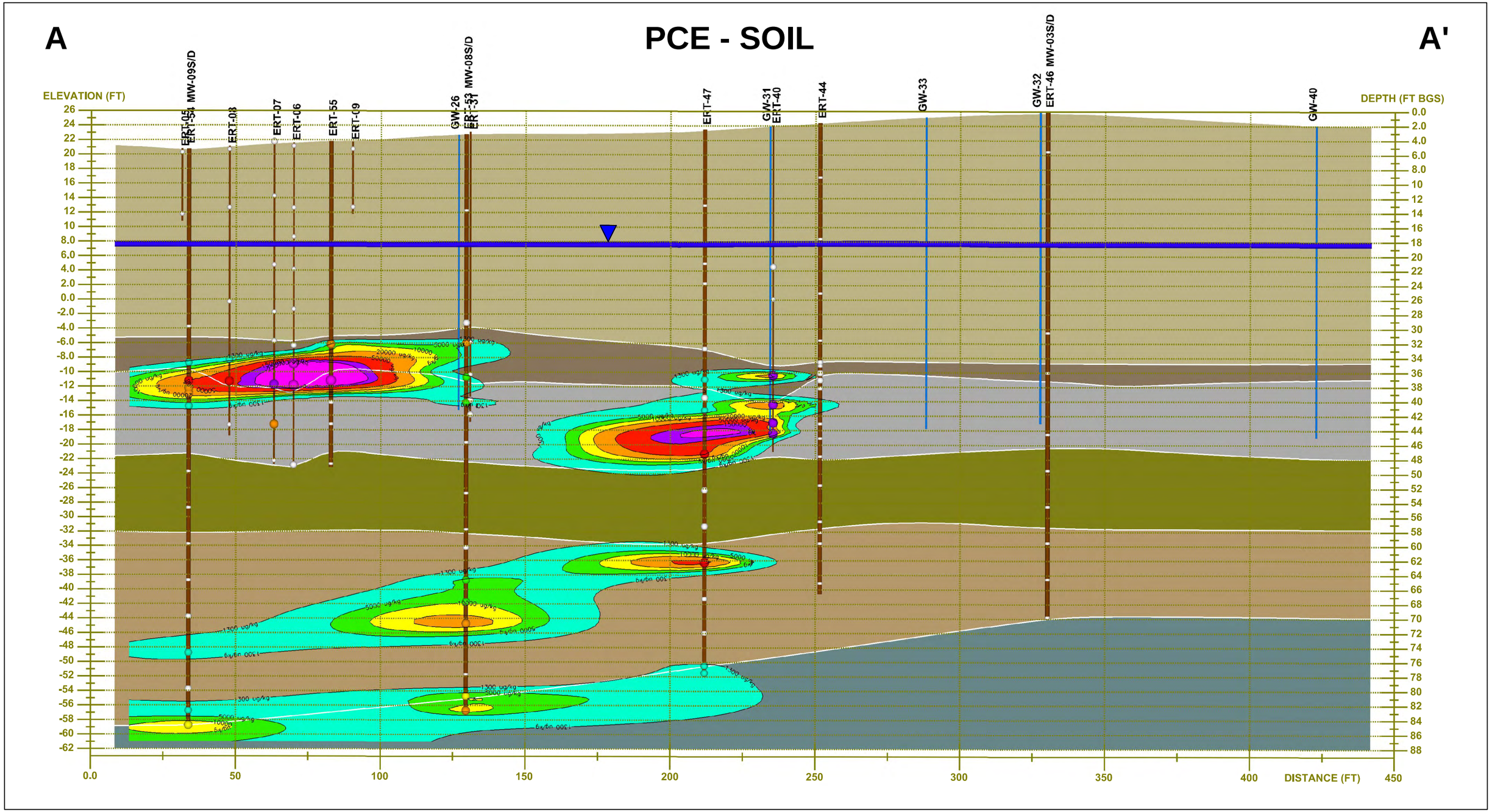
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# 0149

Figure 22
Cross Section A-A'
Lithology
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plume depicts PCE concentrations in soil greater than 1,300 ug/kg. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

D R A F T

Integrated Site Visualization (ISV)

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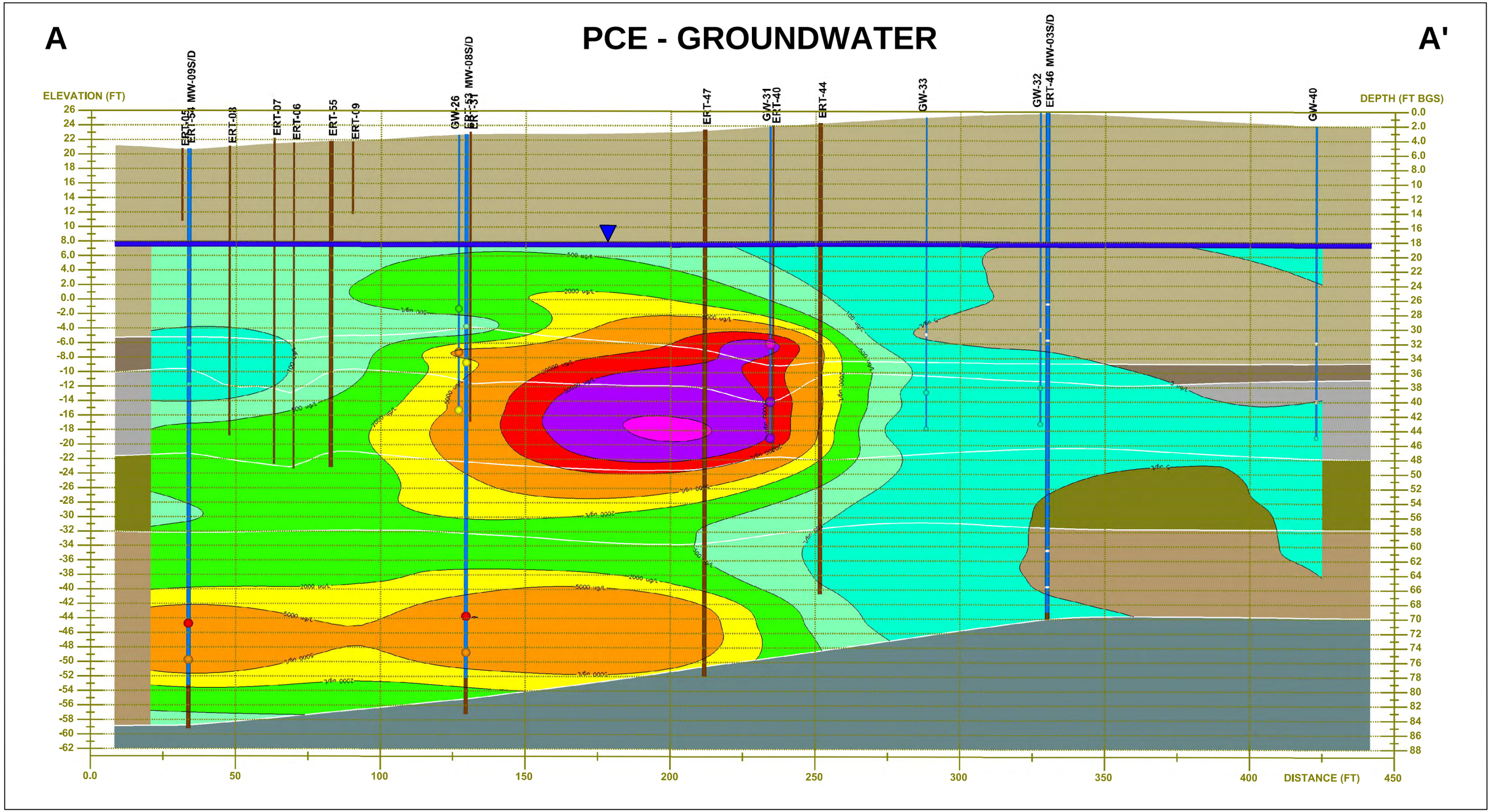
EP-W-09-031
W.A.# 0149

Figure 23
Cross Section A-A'
PCE in Soil
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plume depicts PCE concentrations in groundwater greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

D R A F T

Integrated Site Visualization (ISV)

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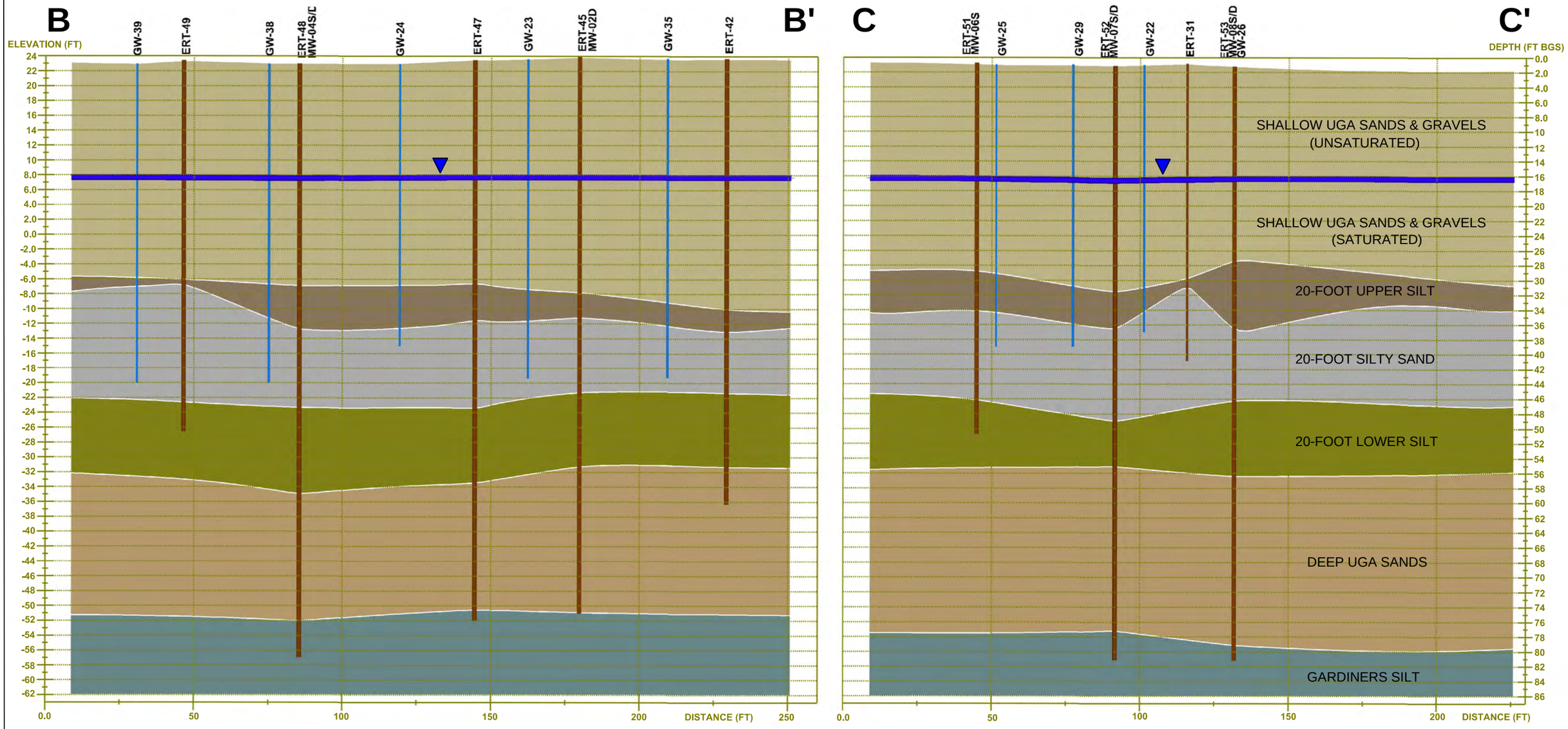
W.A.# 0149

Figure 24
Cross Section A-A'
PCE in Groundwater
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

LITHOLOGY



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY

- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

- Soil Borehole - DPT
- Soil Borehole - Sonic
- Temporary GW - DPT SP16
- Permanent MW - Sonic

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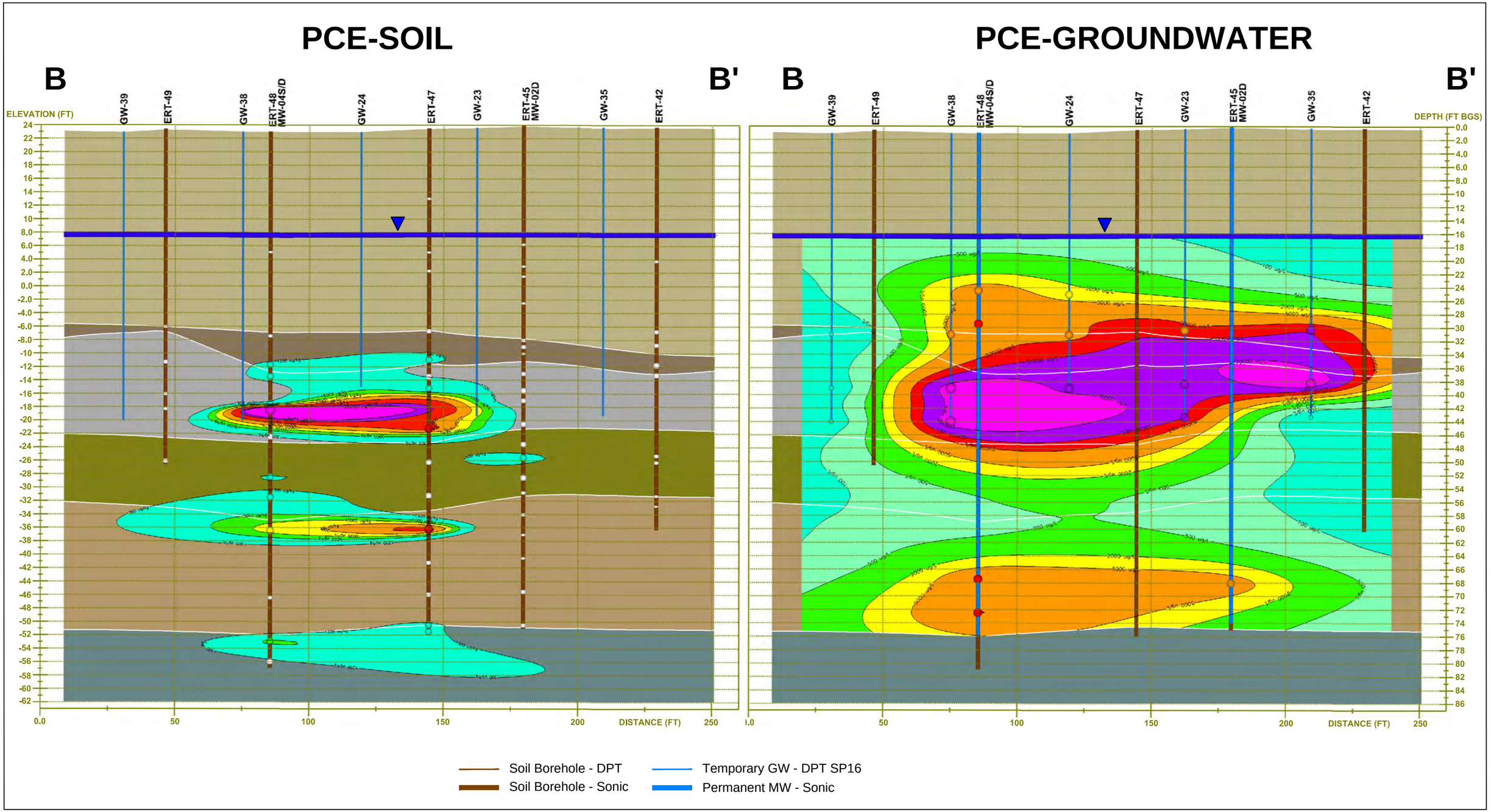
Figure 25
Cross Sections A-A' & B-B'
Lithology
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY



Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plumes depict PCE concentrations in soil greater than 1,300 ug/kg and in water greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

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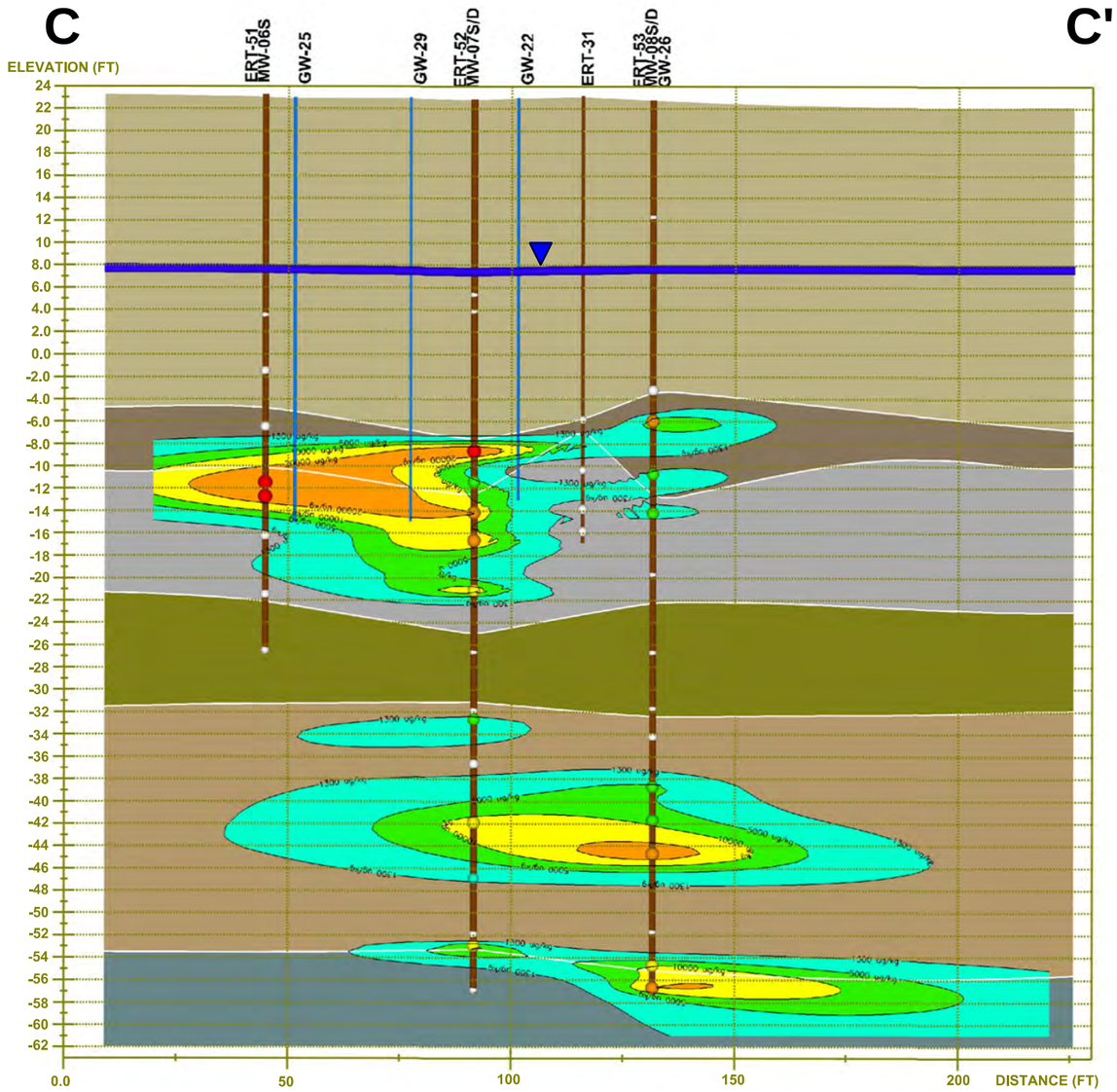
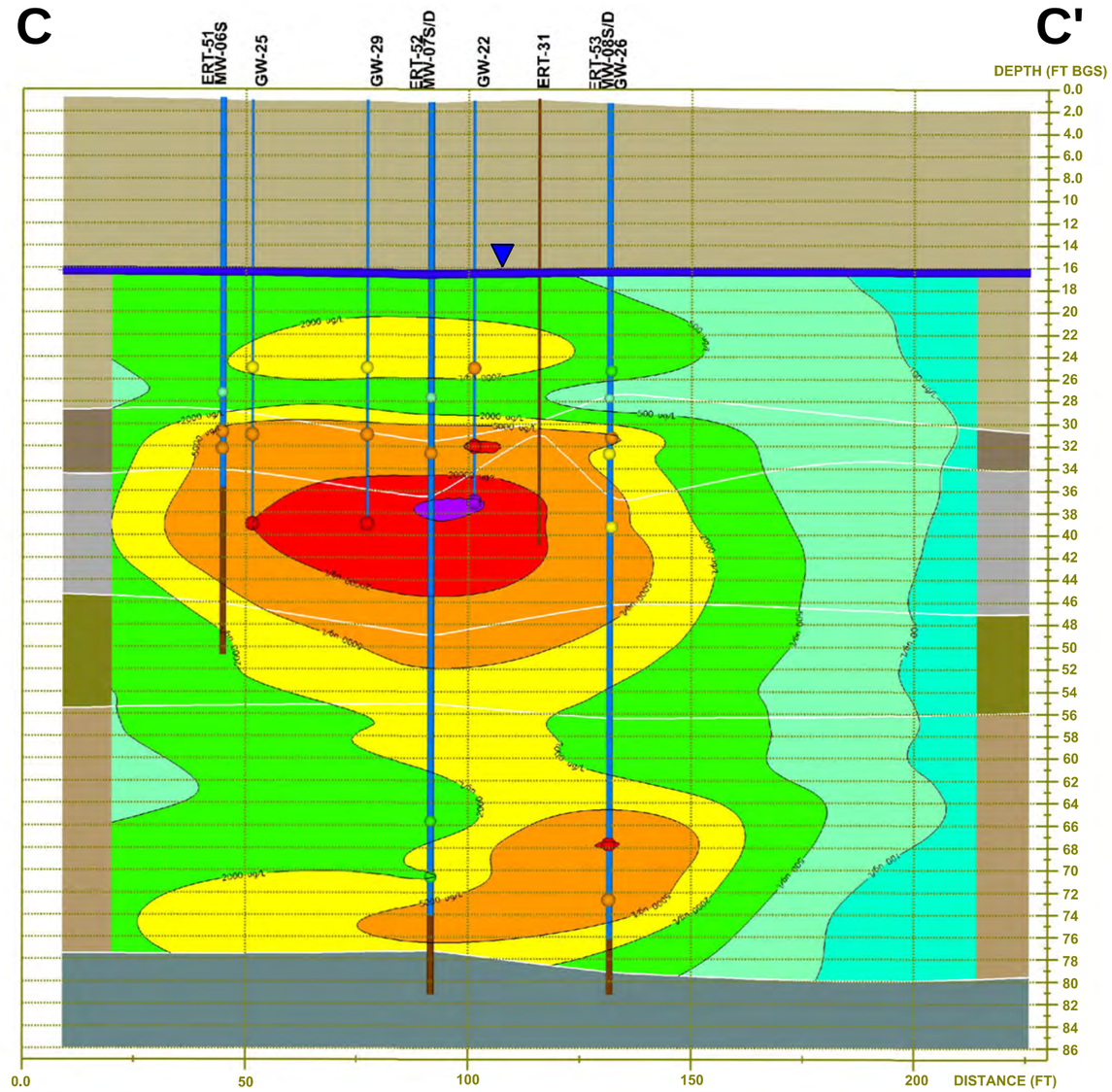
Figure 26
Cross Section B-B'
PCE in Soil & Groundwater
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

PCE-SOIL



PCE-GROUNDWATER



Soil Borehole - DPT
Soil Borehole - Sonic
Temporary GW - DPT SP16
Permanent MW - Sonic

Cross section vertical exaggeration = 2.5:1. Borings within an offset distance of 15 feet from the cross section line are shown. Plumes depict PCE concentrations in soil greater than 1,300 ug/kg and in water greater than 5 ug/L. Groundwater surface is derived from shallow groundwater monitoring well data.

Soil boreholes ERT-01 to ERT-41 (thin brown lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points (thin blue lines) were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 (thick brown lines) were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells (thick blue lines).

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

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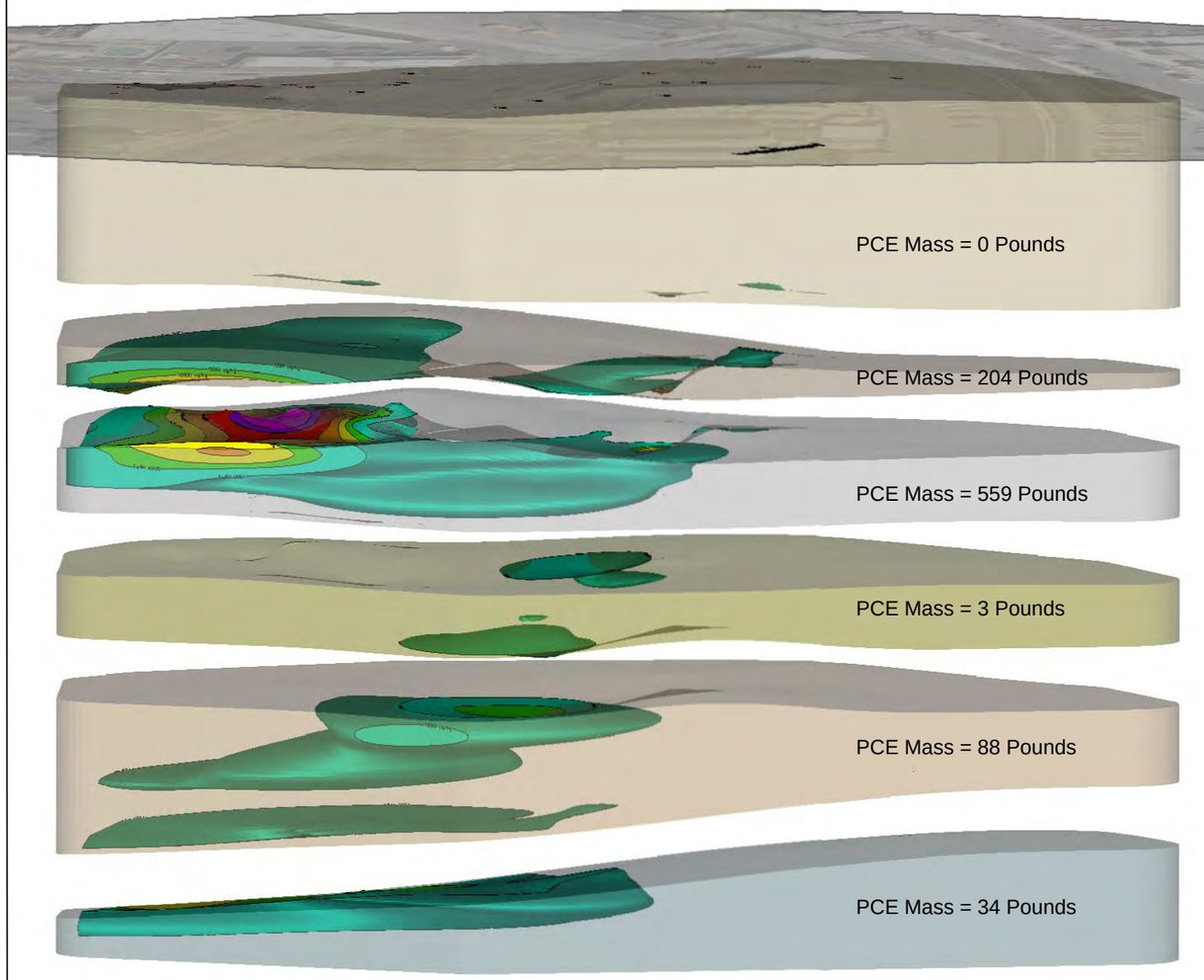
Figure 27
Cross Section C-C'
PCE in Soil & Groundwater
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

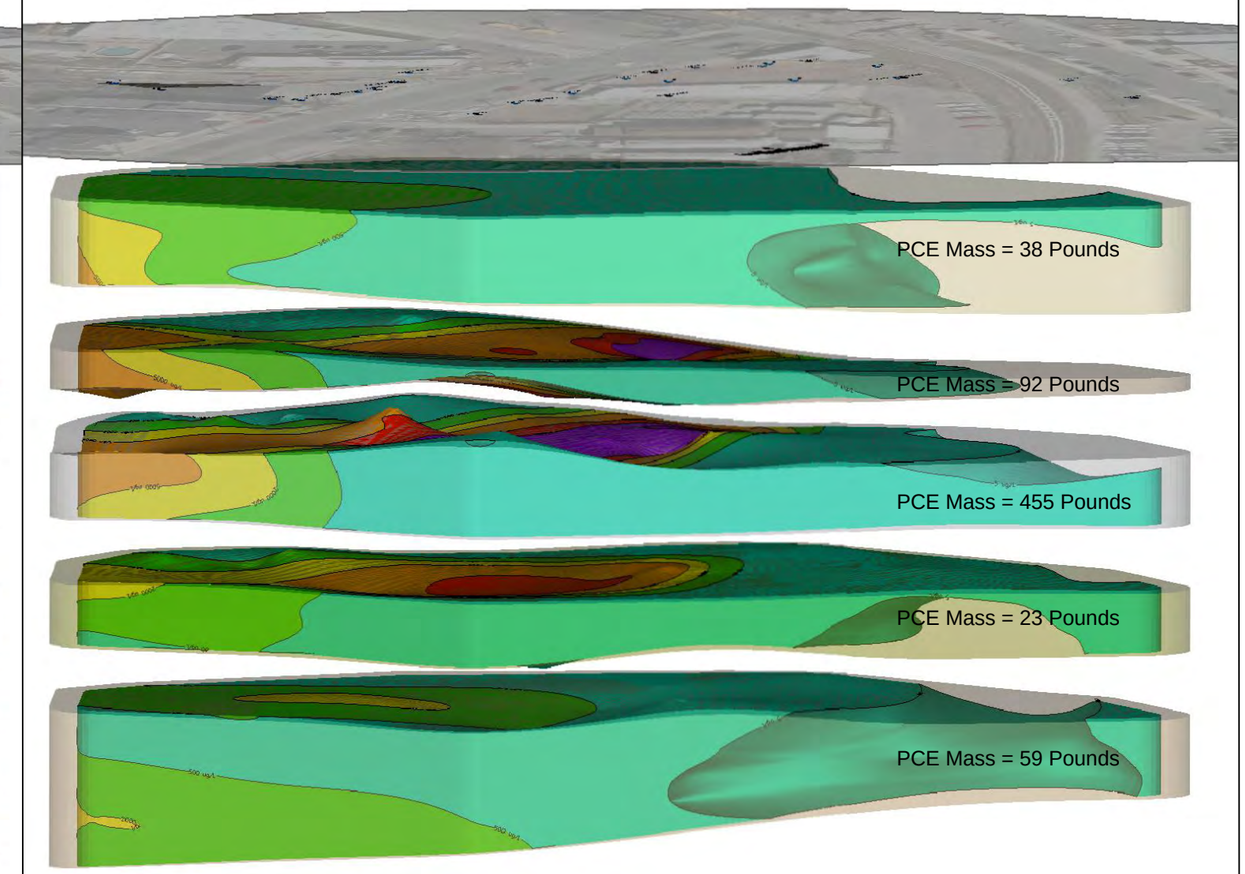
PCE-SOIL



Total PCE Mass in Soil = 888 Pounds

Elevation Angle = 6, Azimuth Angle = 230, Looking Northeast

PCE-GROUNDWATER



PCE Mass = 0 Pounds
(Gardiners Silt not shown)

Total PCE Mass in Groundwater = 667 Pounds

Elevation Angle = 6, Azimuth Angle = 230, Looking Northeast

Vertical exaggeration = 2.5:1. Plumes depict PCE concentrations in soil greater than 1,300 ug/kg and in water greater than 5 ug/L.

PCE mass estimates were calculated using volumetrics module in MVS. Mass estimates have been rounded to the nearest whole number. Soil density and porosity values for each individual geologic layer were input as parameters in the mass calculations as follows:
Shallow UGA Sands & Gravels - 1.65 g/cc, 38%
20-Foot Upper Silt - 1.40 g/cc, 47%
20-Foot Silty Sand - 1.55 g/cc, 42%
20-Foot Lower Silt - 1.40 g/cc, 47%
Deep UGA Sands - 1.60 g/cc, 40%
Gardiners Silt - 1.40 g/cc, 47%

Map Creation Date: 06 May 2016

LITHOLOGY
- Shallow UGA Sands & Gravels
- 20-Foot Upper Silt
- 20-Foot Silty Sand
- 20-Foot Lower Silt
- Deep UGA Sands
- Gardiners Silt

PCE - SOIL (ug/kg)
- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

PCE - WATER (ug/L)
- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

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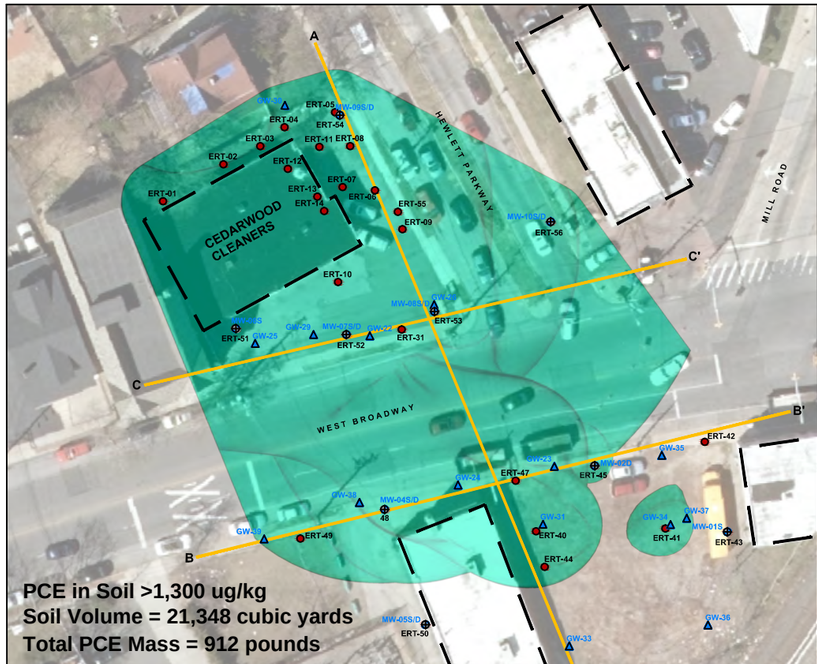
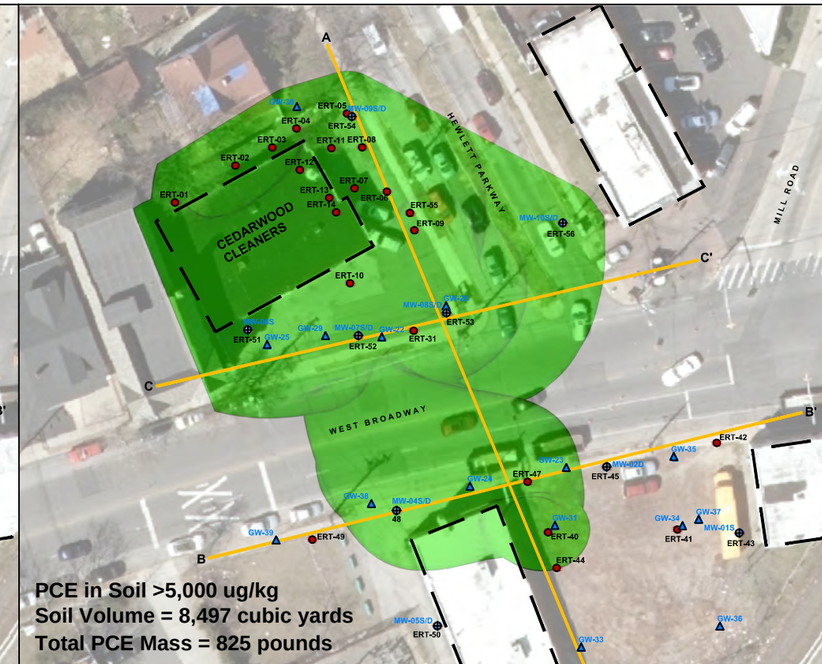
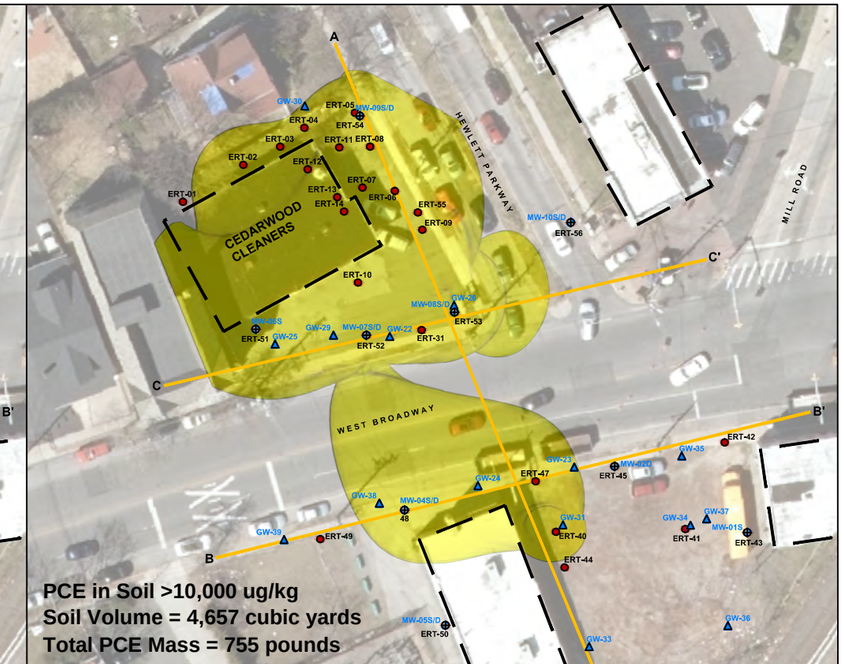
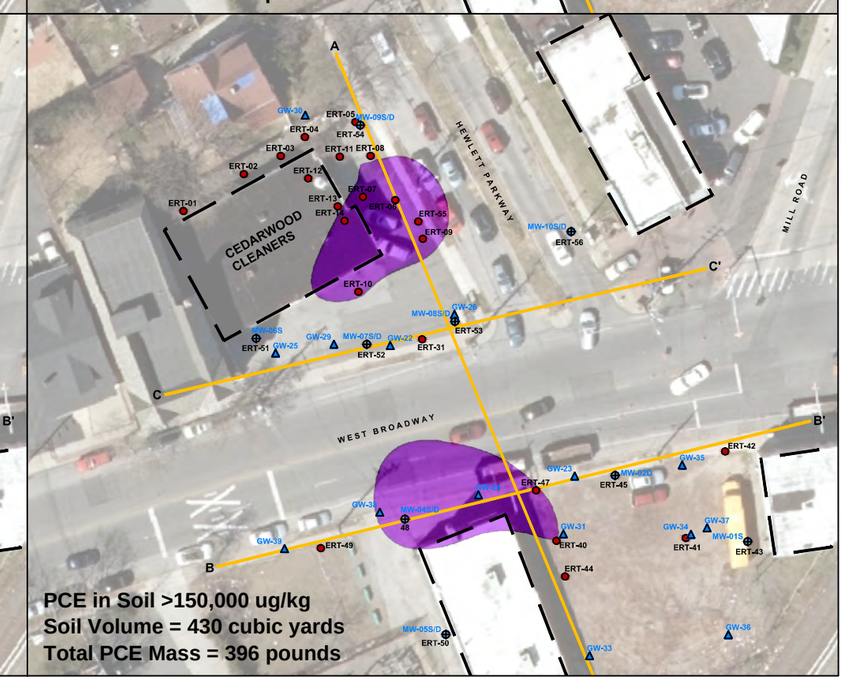
Figure 28
PCE in Soil & Groundwater
Mass Calculations by Layer
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY









Total PCE mass and soil volume estimates were calculated using volumetrics module in MVS. Mass and volume estimates have been rounded to the nearest whole number. An average soil density of 1.55 g/cc was input for total PCE Mass calculations in soil.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 08 May 2016

- Soil Borehole
- Temporary Groundwater Sample Point
- Permanent Monitoring Well
- Cross Section Line
- Building Outline

D R A F T

PCE - SOIL (ug/kg)

- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

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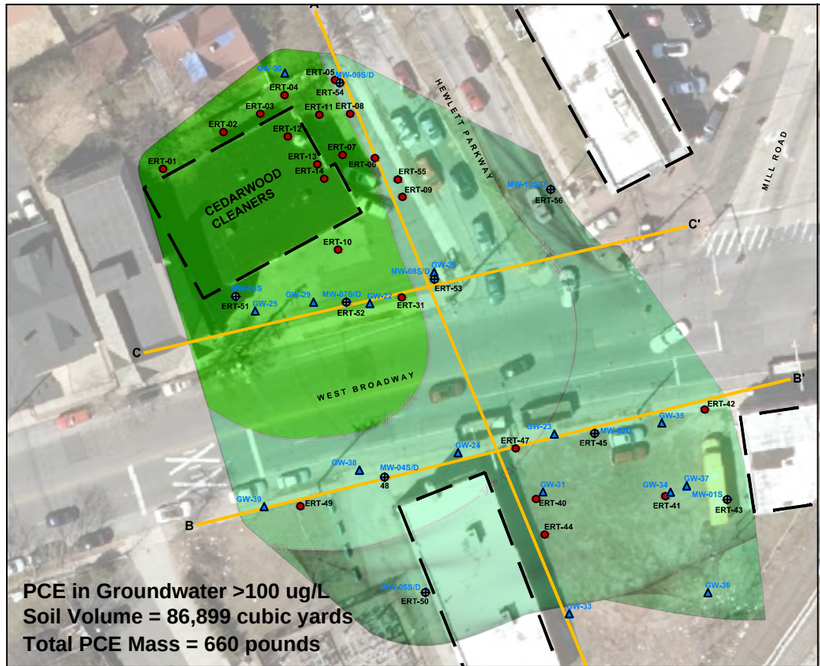
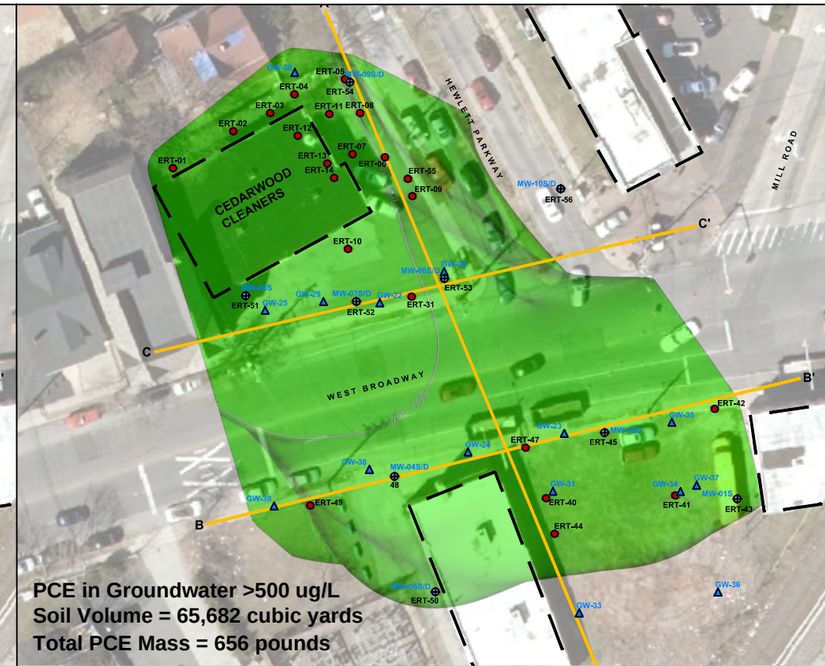
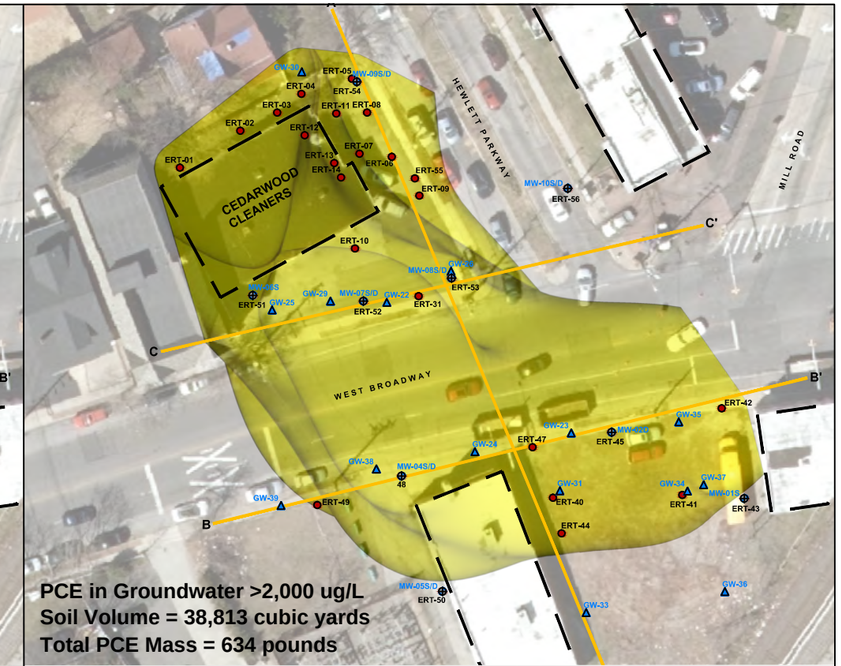
Figure 29
PCE in Soil
Total Mass Calculations
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY







Total PCE mass and soil volume estimates were calculated using volumetrics module in MVS. Mass and volume estimates have been rounded to the nearest whole number. An average soil porosity of 42% was input for total PCE Mass calculations in groundwater.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 08 May 2016

- Soil Borehole
- Temporary Groundwater Sample Point
- Permanent Monitoring Well
- Cross Section Line
- Building Outline

D R A F T

PCE - WATER (ug/L)

- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

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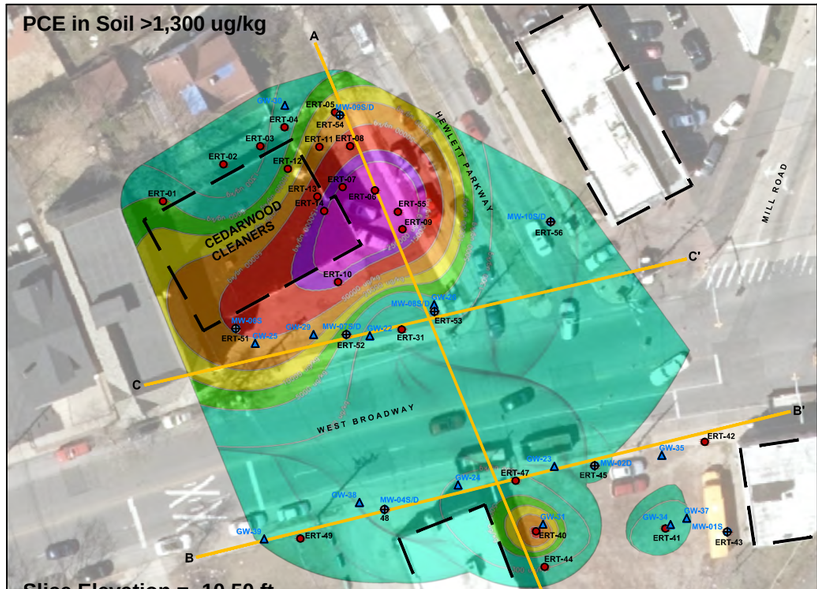
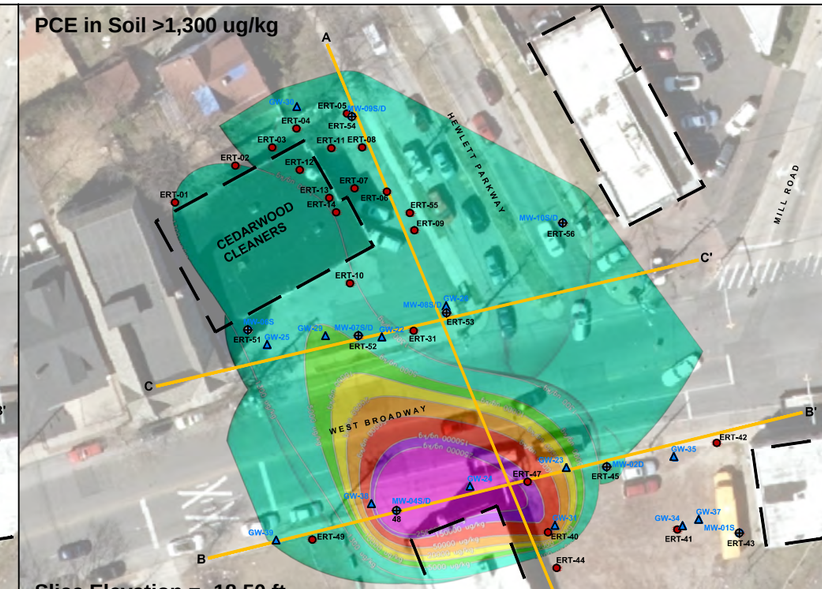
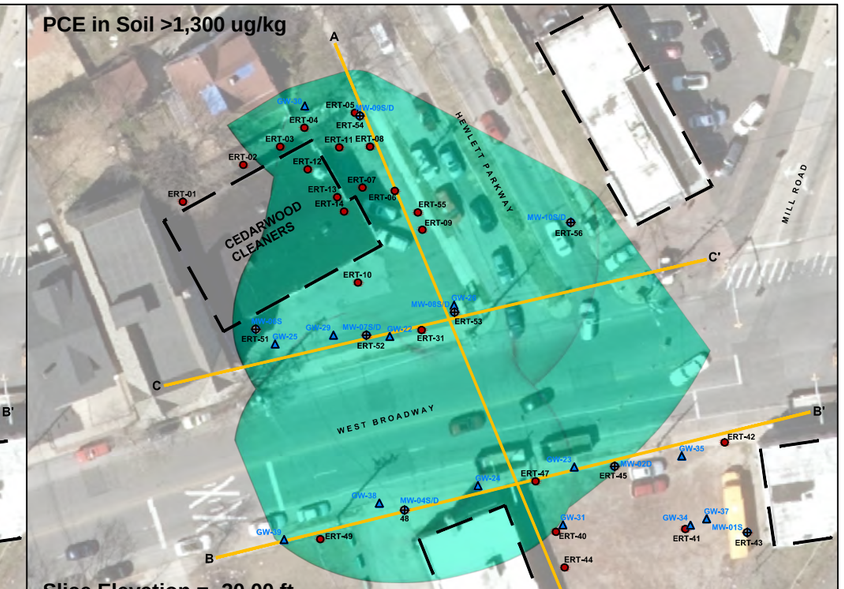
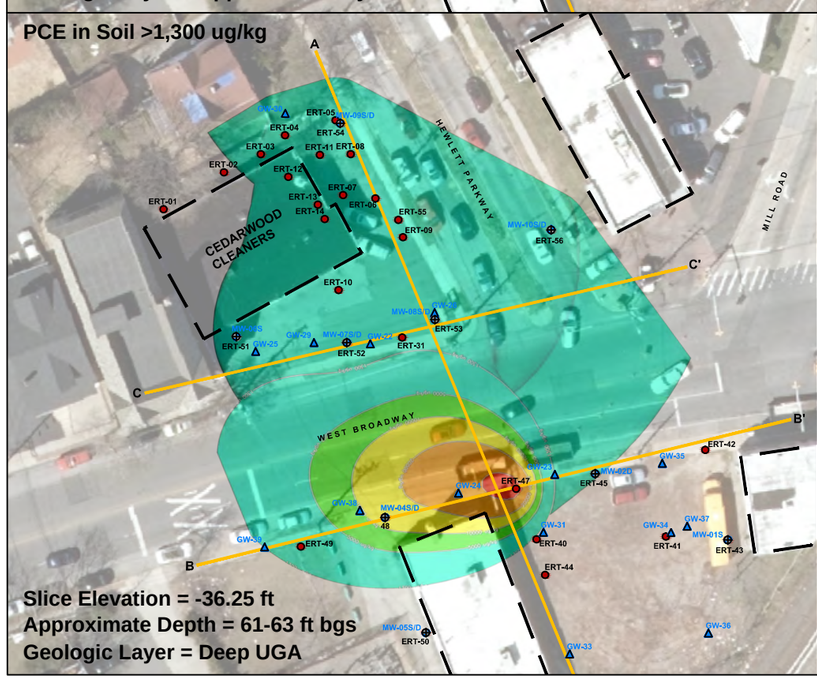
W.A.# 0149

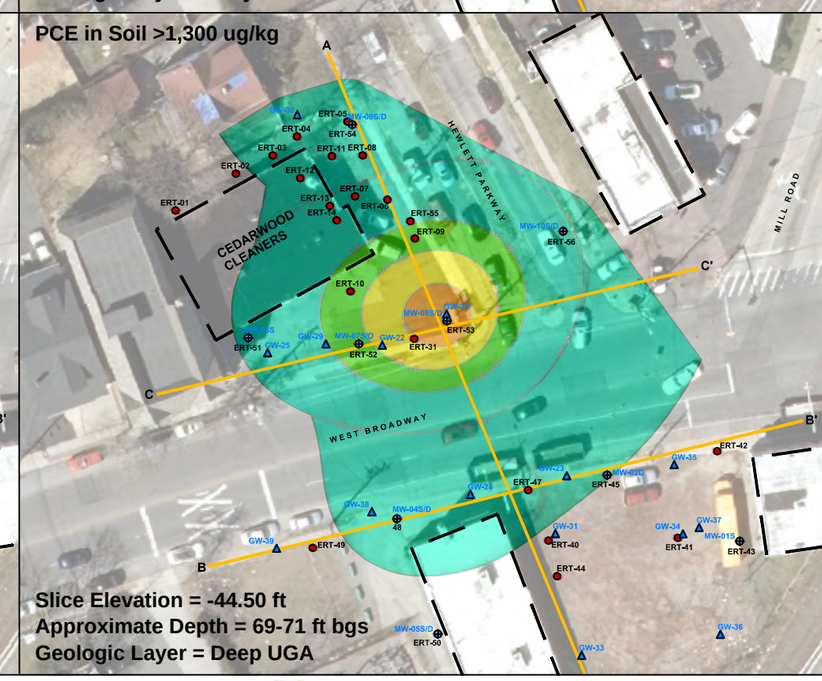
Figure 30
PCE in Groundwater
Total Mass Calculations
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

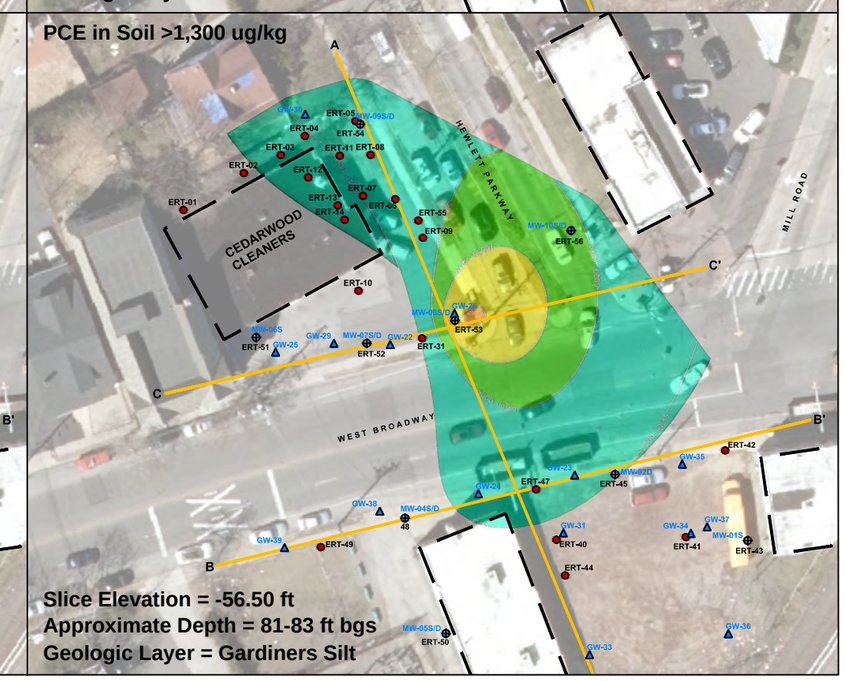












Plume depicts PCE concentrations in soil greater than 1,300 ug/kg. The plume was cut with a horizontal slice plane at the specified elevation. The viewer is looking down at the plume from a top view perpendicular to the horizontal slice plane. The portion of the plume that is visible represents the remaining plume volume that is below the slice elevation.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 08 May 2016

- Soil Borehole
- Temporary Groundwater Sample Point
- Permanent Monitoring Well
- Cross Section Line
- Building Outline

D R A F T

PCE - SOIL (ug/kg)

- >250,000
- 150,000-250,000
- 50,000-150,000
- 20,000-50,000
- 10,000-20,000
- 5,000-10,000
- 1,300-5,000
- <1,300

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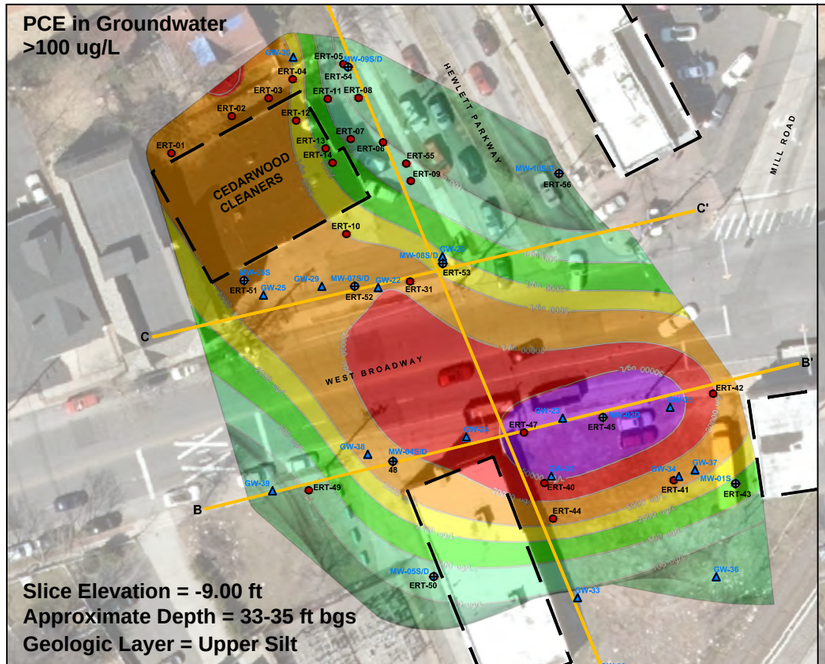
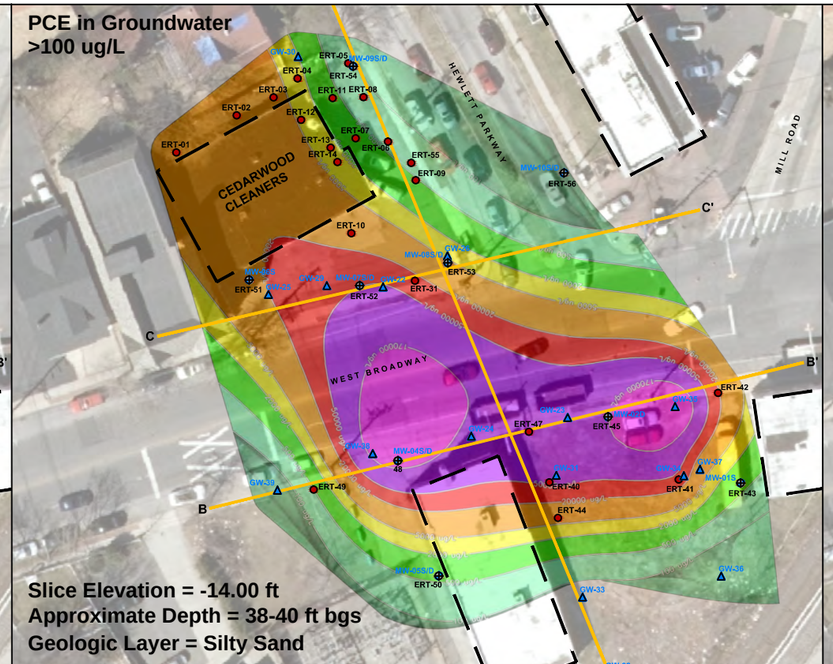
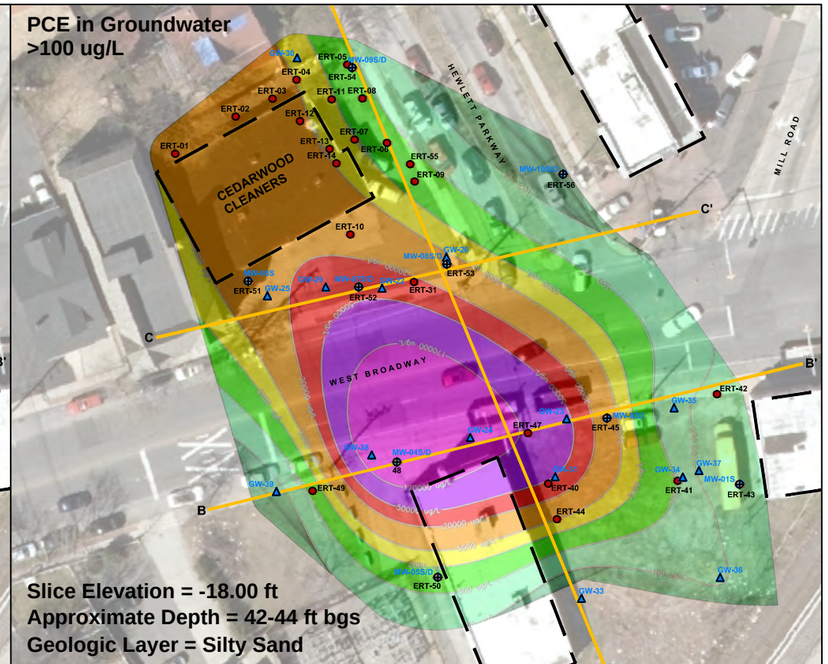
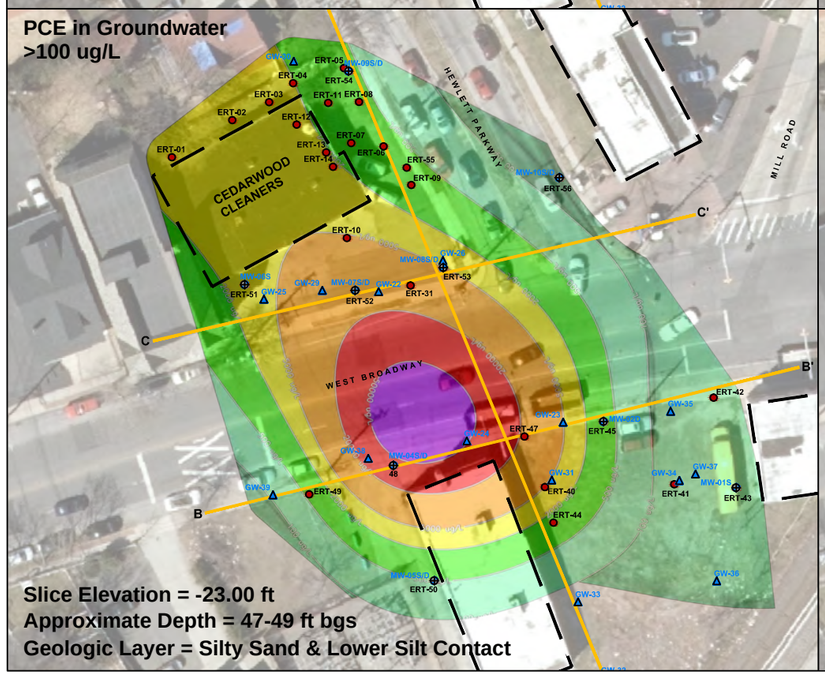
W.A.# 0149

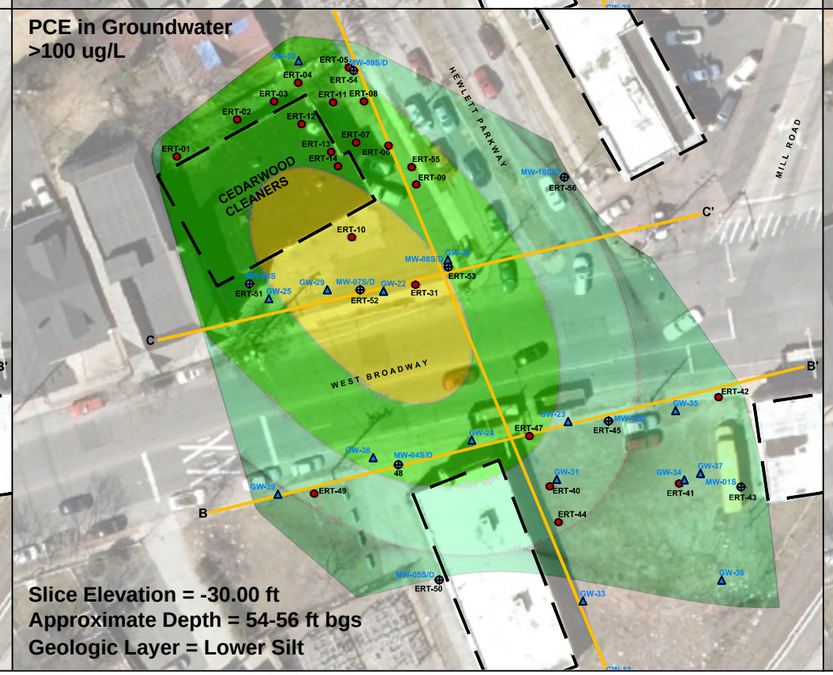
Figure 31
PCE in Soil
Horizontal Slices
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY

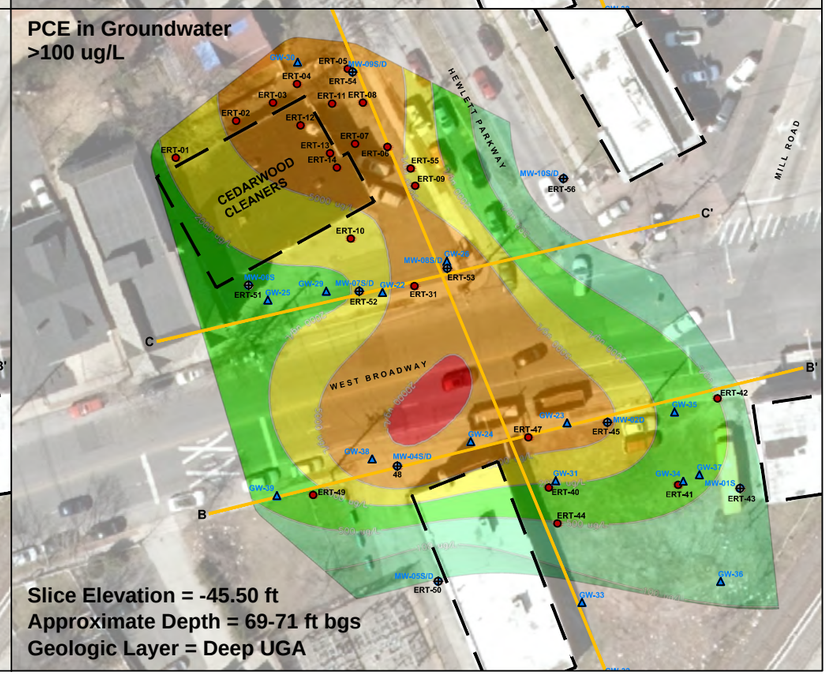












Plume depicts PCE concentrations in groundwater greater than 100 ug/L. The plume was cut with a horizontal slice plane at the specified elevation. The viewer is looking down at the plume from a top view perpendicular to the horizontal slice plane. The portion of the plume that is visible represents the remaining plume volume that is below the slice elevation.

Soil boreholes ERT-01 to ERT-41 were installed in 2014/15 using a Direct Push Geoprobe 6620DT. Temporary groundwater sampling points were installed in 2014/15 using a Direct Push Geoprobe 6620DT equipped with an SP-16 groundwater sampler.

Soil boreholes ERT-42 to ERT-58 were installed in 2015/16 using a Sonic Geoprobe 8140LC. Borehole locations ERT-43, ERT-45, ERT-46, ERT-48, ERT-50 to ERT-54, and ERT-56 to ERT-58 were completed as permanent groundwater monitoring wells.

Map Creation Date: 08 May 2016

- Soil Borehole
- Temporary Groundwater Sample Point
- Permanent Monitoring Well
- Cross Section Line
- Building Outline

D R A F T

PCE - WATER (ug/L)

- >170,000
- 50,000-170,000
- 20,000-50,000
- 5,000-20,000
- 2,000-5,000
- 500-2,000
- 100-500
- 5-100
- <5

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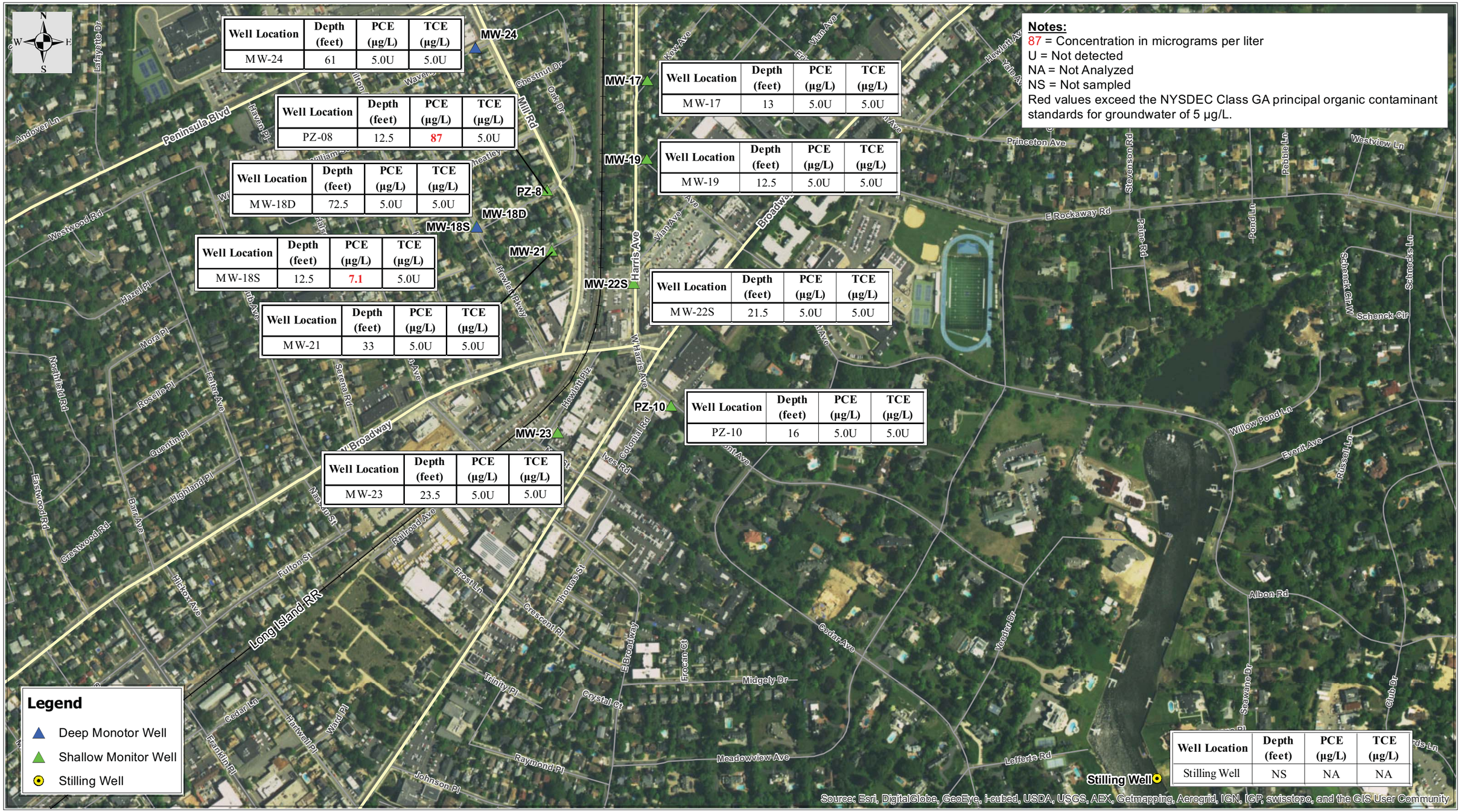
Figure 32
PCE in Groundwater
Horizontal Slices
Cedarwood Cleaners
Peninsula Boulevard Site
Hewlett, NY



Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-24	61	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
PZ-08	12.5	87	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-18D	72.5	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-18S	12.5	7.1	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-21	33	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-23	23.5	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-17	13	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-19	12.5	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
MW-22S	21.5	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
PZ-10	16	5.0U	5.0U

Well Location	Depth (feet)	PCE (µg/L)	TCE (µg/L)
Stilling Well	NS	NA	NA

Notes:
87 = Concentration in micrograms per liter
U = Not detected
NA = Not Analyzed
NS = Not sampled
Red values exceed the NYSDEC Class GA principal organic contaminant standards for groundwater of 5 µg/L.

Map created using 2010 orthoimagery data from NY state, well location survey data in 2016.

Map Creation Date: 25 July 2016

Coordinate system: State Plane New York Long Island
FIPS: 3104
Datum: NAD83
Units: Feet

0 450 900 Feet

Data: g:\arcviewprojects\SERAS01\00-149
MXD file: g:\arcinfoprojects\SERAS01\SER00149_Peninsula_BLVD\TM2016_Report\\149_TM2016_f23_PCE_TCE_inGW_Commercial_ResidentialArea_MayJune2016_f23.mxd

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Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-149

Figure 33
PCE and TCE Concentrations in Groundwater
Commercial/Residential Area
May/June 2016
Peninsula Boulevard Site
Hewlett, New York

APPENDIX D

HUMAN HEALTH RISK ASSESSMENT SCREENING

Memo

Date:	Friday, July 15, 2016
Project:	Peninsula Blvd OU2
To:	Gloria Sosa, USEPA
From:	Michael P. Musso and Mayble M. Abraham, HDR
Subject:	Risk Assessment Screening (potential source sites)

Introduction

This memorandum was prepared to present the risk assessment screening of the data associated with the Remedial Investigation (RI) sampling events conducted by the United States Environmental Protection Agency (USEPA) at the Peninsula Boulevard Operable Unit 2 (OU2) – potential source sites.

The risk assessment screening information provided herein will also be presented in the OU2 Feasibility Study (FS) report being prepared by HDR, with revisions based on comments from USEPA staff and further reviews of the RI data available.

The risk assessment screening attachments includes the following components:

- Figures 1 and 2 – OU1 groundwater tetrachloroethylene (PCE) plume;
- Figure 3 – HHRA conceptual site model;
- Tables 1 to 5 – Risk screening calculations;
- Attachment A – ProUCL documentation for risk calculations;
- Attachment B – USEPA RSL table excerpts (May 2016);
- Attachment C – USEPA RSL Calculator outputs for a construction worker; and
- Attachment D – Sensitivity analysis for groundwater risks at Cedarwood/Vacant Lot.

Site Background

The Peninsula Boulevard OU2 Site consists of areas impacted by groundwater contamination in the Upper Glacial Aquifer (UGA) located in the Village of Hewlett, Town of Hempstead, Nassau County, New York. The contamination includes chlorinated VOCs (CVOCs) originating from existing or former dry cleaning facilities. The area consists of a mix of commercial and residential properties, with the majority of the commercial properties being located along Mill Road, Peninsula Boulevard, Broadway and West Broadway (Figure 1).The area of the Site is serviced by the Long Island American Water Company (LIAWC). Since 1991, LIAWC has been treating groundwater pumped from its well field with an air stripper prior to distribution to the water supply system. Private wells are not utilized for drinking water in the area.

A. Site History – OU1 (Area-Wide)

A series of investigations and removal actions completed from 1991 to 1999 on behalf of the owner of the former Grove Cleaners and the New York State Department of Environmental Conservation (NYSDEC) revealed a groundwater contaminant plume extending both to the north and south of Peninsula Boulevard, primarily consisting of PCE. On March 7, 2004, USEPA proposed inclusion of the Site on the National Priorities List (NPL); it was placed on the NPL on July 22, 2004.

USEPA conducted an RI for OU1 (area-wide plume) from 2005 through 2010. The results of the OU1 RI indicate that the shallow and deep portions of the UGA have been impacted by CVOC contamination. In OU1, the shallow UGA groundwater [generally 0 to 20 feet below ground surface (ft bgs)] PCE plume is approximately 3,500 ft long, oriented in a north-south direction. South of Peninsula Boulevard, the plume is approximately 1,000 ft wide and north of Peninsula Boulevard the plume is approximately 400 ft wide. The deep UGA (40 to 75 ft bgs) groundwater plume is approximately 1,110 ft long, oriented in a northeast-southwest direction. See Figures 1 and 2 for the PCE plumes of the shallow and deep UGA.

Supplemental OU1 RI work was conducted at the Site in 2010 that included the development of a baseline human health risk assessment (HHRA). The HHRA evaluated health effects that could result from exposure to contaminated media through use of groundwater for potable purposes (including inhalation of vapors in the bathroom after showering), direct exposure to groundwater in an excavation trench, wading in Site waterways, direct contact exposure to surface (0 to 2 ft) soil and subsurface (2 to 10 ft) soil, and inhalation of vapors from soils. Based on the current zoning and anticipated future land use in the area, the HHRA included current and future recreational users, residents, commercial workers and construction workers. The HHRA concluded an excess lifetime cancer risk of 2×10^{-1} for the future adult and child resident and 2×10^{-2} for the future commercial worker. The calculated noncancer hazard quotients (HQs) were also elevated, with a HQ of 300 for a future adult resident, HQ of 600 for a future child resident and HQ of 50 for a future commercial worker. These cancer risks and noncancer health hazards indicate that there is significant potential risk to potentially exposed populations from direct exposure to groundwater. The contaminants in groundwater that contribute most significantly to the cancer risks and noncancer hazards are cis-1,2-dichloroethene (DCE), PCE, trichloroethene (TCE) and vinyl chloride (VC).

The 2011 RI identified groundwater contamination with PCE, PCE breakdown products and low levels of other VOCs; however, the source(s) of the PCE groundwater contamination identified in OU1 was not identified.

B. Site History – OU2 (Source Identification)

The purpose of OU2 is to investigate potential source areas of the PCE groundwater contamination plume.

The potential OU2 source sites – existing or former dry cleaning establishments – and the OU1 groundwater plume in the shallow and deep UGA are shown on Figures 1 and 2, and include:

- Cedarwood Cleaners and Vacant Lot
- Piermont Cleaners

C. Site Hydrogeology

Generalized descriptions of the unconsolidated materials encountered during OU2 RI drilling are as follows (Lockheed 2016):

- 0 to 36.5 ft-bgs — Shallow Upper Glacial Aquifer: mixture of sands and gravels.
- 36.5 to 39.5 ft-bgs — Upper Silt of 20-Foot Clay: silt with little fine-grained sand.
- 39.5 to 48 ft-bgs — Silty Sand of 20-Foot Clay: fine-grained sand with little silt.
- 48 to 58 ft-bgs — Lower Silt of 20-Foot Clay: high plasticity silt with little clay.
- 58 to 94.5 ft-bgs — Deep Upper Glacial Aquifer: mixture of sands and gravels.
- >94.5 ft-bgs — Gardiners Clay: high plasticity silt with little fine- to coarse-grained sand and clay.

Due to the variability in thickness, the bottom of each unit listed above indicates the maximum depth at which it was found in the boreholes.

Groundwater level measurements were manually collected from site-related monitoring wells in 2016. On April 27, 2016, groundwater was measured in the shallow UGA under unconfined conditions at depths between 4.32 and 20.33 feet below top of casing (BTOC) (elevations of 3.62 to 8.17 feet Mean Sea Level [MSL]) and under confined conditions in the deep UGA at depths between 5.74 and 25.78 feet BTOC (elevations of 1.26 to 2.04 feet MSL). Groundwater flow in the shallow UGA on that date was to the north - northwest in the areas of Cedarwood and Piermont Cleaners. As of the date of this memorandum, EPA is continuing its OU2 evaluation of groundwater flow characteristics in the shallow and deep UGA.

D. Data Collection

The risk assessment screening evaluates the available OU2 RI data, including those associated with the eight OU2 RI sampling events, completed since the OU1 HHRA was performed in 2010. The OU2 RI sampling conducted to-date includes investigations of subsurface media at potential contaminant source sites, as follows:

- February 2012 (Soil Gas and Groundwater sampling)
- June 2013 (Membrane Interface-Hydraulic Profiling Tool [MiHPT] sampling)
- March – April 2014 (Soil sampling)
- September – October 2014 (Groundwater sampling)
- February 2015 (Soil and Groundwater sampling)
- April 2015 (Soil and Groundwater sampling)
- November – December 2015 (Soil sampling)
- January 2016 (Soil sampling)
- February 2016 (Groundwater sampling)

The February 2012 soil gas data and June 2013 MiHPT data were not evaluated quantitatively in this risk assessment screening (USEPA 2014a). Soil gas data is being evaluated separately by USEPA and the June 2013 MiHPT data do not have laboratory analytical data associated with that field event. In addition to the OU2 RI sampling events, the risk assessment screening includes groundwater analytical data from the OU1 Remedial Design treatability study; during three sampling events (July 2012, May 2013 and December

2013), samples were collected at locations MW-27D and MW-27S (located near Cedarwood Cleaners). Samples from the OU1 treatability study that were collected from injection, pumping and observation wells were not included in the risk assessment screening.

USEPA is developing an OU2 RI report based on these sampling events and data. It is understood that field sampling methodologies, data quality (e.g., validation), and physical/geological characteristics observed at the OU2 potential source sites (e.g., field logs) will be discussed further in the RI report.

Risk Assessment Screening

The OU2 risk assessment screening evaluates the potential for OU2 source site contaminants to pose a current or future risk to human health and the environment in the absence of any remedial action. The OU2 risk assessment screening uses exposure point concentrations (EPCs) and available risk-based screening levels, i.e., USEPA May 2016 Regional Screening Levels (RSLs, USEPA 2016d) at a target risk of 1×10^{-6} and target HQ of 1 to calculate facility-specific cancer risks and noncancer HQs. The RSLs incorporate assumptions on potential exposure scenarios and human receptors, along with contaminant-specific toxicological information. CVOCs that were identified in the OU1 area-wide HHRA as the contaminants of potential concern (COPCs) are included in this OU2 risk assessment screening: cis-1,2-DCE, PCE, TCE and VC.

A. Conceptual Site Model

The conceptual site model (CSM) is a dynamic tool for understanding site conditions and potential exposure scenarios for human receptors that may be exposed to site-related contamination that may change as new information is provided. An exposure pathway consists of:

- A source (i.e., discharge) and mechanism of contaminant release from source;
- A retention or transport medium (i.e., groundwater) for the contaminant;
- A point of contact (e.g., drinking water) between the human receptor and the medium; and
- A route of exposure (e.g., ingestion) for the potential human receptor at the contact point

An exposure pathway is considered complete only if all four components are present. The 2010 HHRA for OU1 described the exposure pathways and receptors that may be present on-site or in the future in its CSM, which has been refined for this OU2 risk assessment screening as presented in Figure 3. The CSM includes exposure to CVOCs in soil via the ingestion, dermal contact and inhalation pathways for a current/future resident (adult and child), current/future commercial/industrial worker and current/future construction worker. The resident and commercial/industrial worker are expected to contact surface soil (0 to 2 ft bgs), while a construction worker is expected to contact soil with a depth of 0 to 10 ft bgs. The CSM also includes a future resident's exposure to CVOCs in groundwater via ingestion, dermal contact and inhalation of tap water (where groundwater is an untreated source of tap water). Currently, treated groundwater is supplied via public wells for use; private wells are not used for potable water.

B. Exposure Point Concentrations

The EPCs used in this risk assessment screening are the lower of the maximum detected concentration and the calculated 95% upper confidence limit (UCL) of the arithmetic mean for a given data set and COPC. Calculation of the 95% UCL is conducted in accordance with USEPA guidance (USEPA 2002, 2015b and c)

and using ProUCL software, version 5.1.00 (USEPA 2016). ProUCL identifies the distribution of the data (e.g., normal, gamma), calculates UCLs using different statistical methods and recommends a UCL as part of the output.

Determination of Soil EPCs

The soil data includes one data set of surface samples (0 to 2 ft bgs) and another including soil samples with a depth of 0 to 10 ft bgs. Soil EPCs were calculated for each dry cleaner facility by depth for the four CVOCs as follows:

- Cedarwood Cleaners/Vacant Lot surface soil (0 to 2 ft bgs);
- Cedarwood Cleaners/Vacant Lot all soil (0 to 10 ft bgs);
- Piermont Cleaners surface soil (0 to 2 ft bgs); and
- Piermont Cleaners all soil (0 to 10 ft bgs).

A total of 35 soil samples (depth range of 0 to 10 ft bgs) were collected from Cedarwood Cleaners/Vacant Lot; of these samples, 30 normal samples and two field duplicates were collected from Cedarwood Cleaners and three normal samples were collected from the Vacant Lot. There were 43 normal samples and four field duplicates collected from Piermont Cleaners in the same depth range.

The maximum of the field duplicate result and the parent sample result was chosen in the determination of EPCs. Rejected data were excluded from the risk assessment screening.

The soil EPCs are summarized in Table 1 (attached) and the supplemental information including the ProUCL outputs are presented in Attachment A.

Determination of Groundwater EPCs

The USEPA memorandum *Determining Groundwater Exposure Point Concentrations, Supplemental Guidance* (USEPA, 2014c) provides a recommended approach to improve the quality and consistency in calculating groundwater EPCs. The approach recommends evaluating data from the "core/center of the plume," which is defined as the three-dimensional core/center zone of highest concentrations of each contaminant within a delineated groundwater plume. The guidance also defines what type of groundwater data should be used in the calculation of the EPC.

A total of 103 groundwater samples were collected from Cedarwood Cleaners/Vacant Lot; of these samples, 43 normal samples and one field duplicate were collected from Cedarwood Cleaners and 52 normal samples and seven field duplicates were collected from Vacant Lot. There were 66 normal samples and four field duplicates collected from Piermont Cleaners.

The maximum of the field duplicate result and the parent sample result was chosen in the determination of EPCs. Rejected data were excluded from the risk assessment screening.

For purposes of this OU2 risk assessment screening, due to the defined area involved, it was determined that use of USEPA memorandum *Determining Groundwater Exposure Point Concentrations, Supplemental Guidance* (2014c) was not necessary and has not been applied to this risk assessment screening.

The groundwater EPCs were calculated using full data sets for Piermont and Cedarwood Cleaners/Vacant

Lot. The groundwater EPCs are summarized in Table 1 (attached). Supplemental information including the ProUCL outputs is presented in Attachment A.

C. Exposure Factors and Toxicity Values

The risk assessment screening uses soil and groundwater EPCs and USEPA RSLs to calculate cancer risks and noncancer HQs. The RSLs incorporate exposure factors (e.g., body weight) for each receptor and contaminant-specific toxicity values that are used to determine concentration levels at which there are low or no potential adverse effect to human receptors.

The exposure factor values used in deriving the RSLs (USEPA 2016d) are from USEPA *Risk Assessment Guidelines for Superfund* (RAGS) (USEPA 1989) and other more recent applicable risk guidance, e.g., 2011 *Exposure Factors Handbook* (USEPA 2011a) and 2014 OSWER (now Office of Land and Emergency Management [OLAM]) Directive 9200.1-120 *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors* (USEPA 2014d). The exposure factors for a current/future resident adult/child, current/future commercial/industrial worker and current/future construction worker that are incorporated in the RSLs are presented in Table 2 (attached).

The USEPA RSL tables (USEPA 2016d) include cancer and noncancer toxicity values in accordance with USEPA's OSWER Directive 9285.7-53, *Human Health Toxicity Values in Superfund Risk Assessments* (USEPA 2003), which identified a descending hierarchy of sources for applying toxicity values as follows:

- Tier 1 – USEPA's Integrated Risk Information System (IRIS, USEPA 2016a).
- Tier 2 – USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Superfund Health Risk Technical Support Center develops PPRTVs on a contaminant-specific basis when requested by USEPA's Superfund program (USEPA 2014e).
- Tier 3 – Other Toxicity Values – Tier 3 includes additional USEPA and non-USEPA sources of toxicity information (ATSDR 2014, Cal EPA 2007 and USEPA 2011b). Priority is given to sources of information that are the most current, transparent, publicly available and those which have been peer reviewed.

The toxicity values that are incorporated in the RSLs for cis-1,2-DCE, PCE, TCE and VC are presented in Table 3 (attached). Under the *Guidelines for Carcinogenic Risk Assessment*, TCE and VC are considered carcinogenic to humans, PCE is likely to be carcinogenic to humans and there is inadequate information to assess carcinogenic potential for cis-1,2-DCE (USEPA 2005); therefore, evaluating these COPCs as human carcinogens in this risk assessment screening is appropriate and conservative.

D. Risk Assessment Methodology

For each receptor, the risk assessment screening compared the soil and groundwater EPCs to the respective USEPA RSLs, which are presented in Attachments B and C as follows:

- Resident – surface soil (0 to 2 ft bgs) EPCs compared to USEPA Residential Soil RSL and groundwater EPCs compared to USEPA Tapwater RSL (Attachment B);
- Commercial/Industrial Worker – surface soil (0 to 2 ft bgs) EPCs compared to USEPA Industrial Soil RSL (Attachment B); and

- Construction Worker – all soil (0 to 10 ft bgs) EPCs compared to Site-Specific Construction Worker Soil RSLs that were calculated using the RSL Calculator's Construction Worker - Other Construction Activities scenario. Site-specific adjustments were made for the inhalation of soil particulates in this scenario by assuming a 100% of the facility area to be used as the aerial extent of dozing, grading, tilling and excavation; a sensitivity analysis performed using 50% of the facility area, which is presented in Attachment C, indicated no appreciable difference in the resulting cancer and noncancer RSLs. Other site-specific assumptions provided by EPA Region 2 include use of a Caterpillar dozer blade of 92 inches (2.337 meters; CAT 2016), a grader blade of 60 inches (1.524 meters; CAT 2016), and assuming an average excavation depth of 10 ft bgs (3.048 meters) with the site being dozed and graded once. The input for the site area defaulted to 0.5 acres unless the facility area was greater than 0.5 acres; Cedarwood Cleaners/Vacant Lot are a combined area of 1.115 acres and Piermont Cleaners is 0.17 acres. The facilities are relatively small and would have construction work constraints due to nearby property lines, roads and neighboring land uses. The RSL calculator inputs and outputs are provided in Attachment C.

The cancer risk and noncancer HQ for each COPC were determined using the following equations, where the target risk is $1x10^{-6}$ and target HQ is 1 for the RSL:

$$Risk = \frac{EPC \times Target\ Risk}{RSL_{cancer}} \quad \text{and} \quad HQ = \frac{EPC \times Target\ HQ}{RSL_{noncancer}}$$

The cumulative cancer risk from exposure to the combination of contaminants in an environmental medium and also across all media for a receptor is estimated following USEPA guidance (USEPA 1989) and the following general equation:

$$Cumulative\ Risk\ = \sum_i Risk_i$$

For known or suspected carcinogens, USEPA considers acceptable exposure levels to generally be concentration levels that represent an excess lifetime cancer risk (ELCR) to an individual of between one in ten thousand ($1x10^{-4}$) and one in a million ($1x10^{-6}$).

The cumulative noncancer hazard index (HI) from exposure to the combination of COPCs in an environmental medium and across all media for a receptor is estimated using the following equation (USEPA 1989):

$$Hazard\ Index\ = \sum_i HQ_i$$

When the HI for a COPC exceeds unity (one), there may be concern for potential noncancer effects from that COPC. The HI is an indicator that potential hazard for a specific receptor exposed to a COPC in the environment cannot be ruled out, if it is greater than one, not that the hazard actually exists.

E. Risk Assessment Screening Results

A summary of the risk assessment screening results by medium and receptor for Cedarwood Cleaners/Vacant Lot is presented in Table A below and the results for Piermont Cleaners are in Table B below. The actual risk and HQ calculations are presented in Tables 5 and 6 (attached).

Cedarwood Cleaners/Vacant Lot

Table A. Cancer Risks and Noncancer HQs for Cedarwood Cleaners/Vacant Lot

	Resident		Commercial / Industrial Worker	Construction Worker
	Surface Soil 0-2ft	Groundwater	Surface Soil 0-2ft	All Soil 0-10ft
Cancer				
cis-1,2-DCE	No RSL	No RSL	No RSL	No RSL
PCE	5.0E-08	1.6E-02	1.2E-08	1.3E-09
TCE	ND	1.6E-03	ND	ND
VC	ND	8.8E-04	ND	ND
Total	5.0E-08	**1.9E-02**	1.2E-08	1.3E-09
Noncancer				
cis-1,2-DCE	4.1E-05	6.2E+00	2.9E-06	9.7E-07
PCE	1.5E-02	4.3E+03	3.1E-03	2.6E-03
TCE	ND	2.8E+02	ND	ND
VC	ND	3.8E-01	ND	ND
Total	1.5E-02	**4.6E+03**	3.1E-03	2.6E-03

The ELCR and HI are within the acceptable limits for current/future resident's, current/future commercial/industrial worker's and current/future construction worker's exposures to COPCs in soil. A future resident's exposure to COPCs in groundwater results in a cancer risk of 1.9×10^{-2} and HI of 4.6×10^{3} with PCE as the primary contributor.

Refer to Table 4 (attached) for the risk calculations.

Piermont Cleaners

Table B. Cancer Risks and Noncancer HQs for Piermont Cleaners

	Resident		Commercial / Industrial Worker	Construction Worker
	Surface Soil 0-2ft	Groundwater	Surface Soil 0-2ft	All Soil 0-10ft
Cancer				
cis-1,2-DCE	No RSL	No RSL	No RSL	No RSL
PCE	1.6E-10	6.1E-05	3.7E-11	1.9E-11
TCE	6.2E-10	5.7E-06	9.7E-11	1.6E-11
VC	ND	8.0E-05	ND	ND
Total	7.8E-10	**1.5E-04**	1.3E-10	3.5E-11
Noncancer				
cis-1,2-DCE	2.0E-06	1.7E-01	1.4E-07	4.7E-08
PCE	4.6E-05	1.6E+01	9.6E-06	3.6E-05
TCE	1.4E-04	1.0E+00	3.1E-05	1.4E-04
VC	ND	3.4E-02	ND	ND
Total	1.9E-04	**1.8E+01**	4.0E-05	1.8E-04

The ELCR and HI are within the acceptable limits for current/future resident's, current/future commercial/industrial worker's and current/future construction worker's exposures to COPCs in soil. A future resident's exposure to COPCs in groundwater results in a cancer risk of 1.5×10^{-4} and HI of 1.8×10^{1} with PCE and VC as the primary contributors.

Refer to Table 5 (attached) for the risk calculations.

F. Sensitivity Analysis (Groundwater – Cedarwood Cleaners and Vacant Lot)

Since a future resident's exposure to COPCs in groundwater results in a cancer risk of 1.9×10^{-2} and HI of 4.6×10^{3} based on the data collected from both Cedarwood Cleaners and Vacant Lot, a sensitivity analysis was performed to evaluate the risks from each part of the AOC (namely, considering data collected at the Cedarwood Cleaners property separately from groundwater data collected from the Vacant Lot area). Groundwater EPCs were determined for each portion and are presented in Attachment D. The analysis indicates a cancer risk of 6.2×10^{-3} and HI of 9.2×10^{2} for the Cedarwood Cleaners property, and a cancer risk of 3.0×10^{-2} and HI of 7.7×10^{3} for the Vacant Lot area (based on the groundwater data groupings). PCE is noted to be the main contributor of cancer risk at the Vacant Lot area while PCE, TCE and VC all contribute to the cancer risk at the Cedarwood Cleaners property. Supporting tables are presented in Attachment D.

G. Conclusions

Based on the screening-level risk assessment of the OU2 RI data available, the risks and hazards calculated for the two OU2 AOCs (Cedarwood Cleaners and Piermont Cleaners) for the groundwater medium are above the cancer and noncancer target thresholds.

Based on the OU2 RI data reviewed and the risk assessment screening described in this memorandum, it appears that surface soils (0 to 2 ft bgs) and all soil (0 to 10 ft bgs) at the OU2 potential source sites do not warrant further action. It is understood that EPA is evaluating OU2 soil gas data.

The OU2 RI data demonstrates impacts to UGA groundwater at the potential source sites, with risks and hazards associated with the future residential receptor calculated to be above target levels. The COPCs that contribute to elevated cancer risks and/or noncancer hazards and that are now considered contaminants of concern (COCs) are 1,2-DCE, PCE, TCE and VC.

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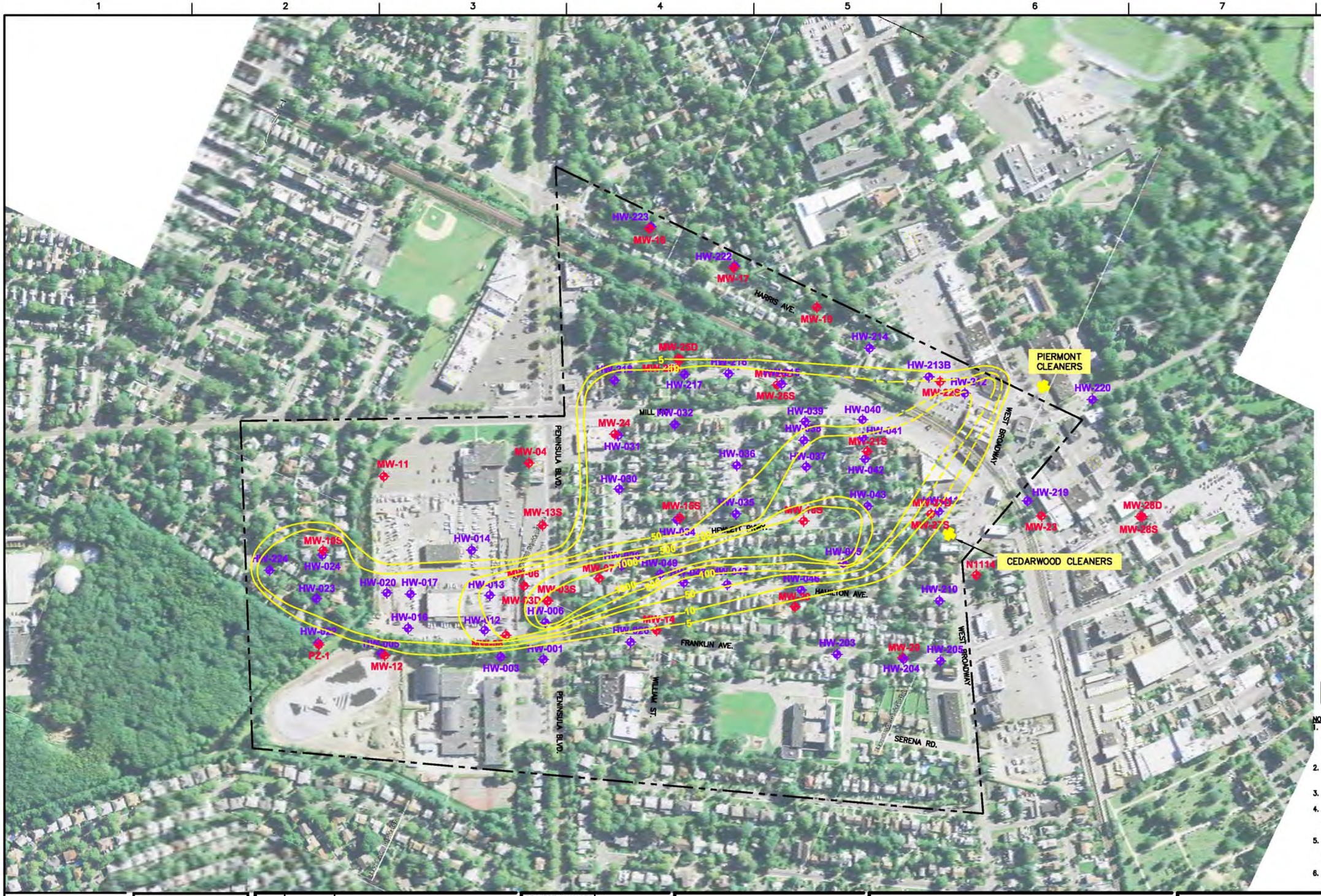
RISK SCREENING FIGURES



LEGEND:

- SITE BOUNDARY
- MW-06 MONITORING WELL LOCATION
- HW-006 HYDROPUNCH LOCATION
- 1000 PCE ISOCONCENTRATION CONTOUR IN ug/L

NOTES:

1. SURVEY SOURCES:
   - TETRATECH E.C., INC., DATA EVALUATION REPORT, OCTOBER 2008.
   - RETTEW, MAY 19, 2010.
2. DATUM: NEW YORK STATE PLANE (L.I.)–NORTH AMERICAN DATUM (NAD83:FEET)
3. FILE FORMAT: AUTOCAD (.DWG FORMAT)
4. MONITORING WELL LOCATIONS WERE SURVEYED. ALL OTHER SAMPLE LOCATIONS AND SITE BOUNDARY ARE APPROXIMATE.
5. SHALLOW GROUNDWATER IS DESCRIBED AS GROUNDWATER ABOVE THE CLAY LAYER, ALSO DESCRIBED AS THE "UNCONFINED" LAYER.
6. DEEP GROUNDWATER IS DESCRIBED AS GROUNDWATER BELOW THE CLAY LAYER, ALSO DESCRIBED AS THE "SEMI-CONFINED" LAYER.

DRAFT

HDR

Henningson, Durham & Richardson, Architecture and Engineering, P.C. In Association with HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION
1	02–01–11	DRAFT ISSUE

PROJECT MANAGER	MM
LEAD DESIGN PROF	SE
DESIGN ENGINEER	TF
DRAWN BY	JW, SS
PROGRAM MANAGER	BW
QUALITY ASSURANCE MGR	ES
PROJECT NUMBER	147–112840

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CONTRACT NO. EP-W-09-009
WORK ASSIGNMENT NO.
002-RICO-02TV

PENINSULA BOULEVARD GROUNDWATER PLUME RI

TOWN OF HEMPSTEAD, VILLAGE OF HEWLETT, NASSAU COUNTY, NEW YORK

PCE ISOCONCENTRATIONS FOR SHALLOW UPPER GLACIAL AQUIFER AERIAL VIEW (2011 OU1 RI)

0 200 400
0 1" 2"

FILENAME 00C–30–31

SCALE 1"=200'

FIGURE 1

LEGEND:

- SITE BOUNDARY
- MW-06 MONITORING WELL LOCATION
- HW-006 HYDROPUNCH LOCATION
- 1000 PCE ISOCONCENTRATION CONTOUR IN ug/L

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1. SURVEY SOURCES:
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6. DEEP GROUNDWATER IS DESCRIBED AS GROUNDWATER BELOW THE CLAY LAYER, ALSO DESCRIBED AS THE "SEMI–CONFINED" LAYER.

DRAFT

HDR

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ISSUE	DATE	DESCRIPTION
1	02–01–11	DRAFT ISSUE

PROJECT MANAGER	MM
LEAD DESIGN PROF	SE
DESIGN ENGINEER	TF
DRAWN BY	JW, SS
PROGRAM MANAGER	BW
QUALITY ASSURANCE MGR	ES
PROJECT NUMBER	147–112840

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

CONTRACT NO. EP-W-09-009
WORK ASSIGNMENT NO.
002-RICO-02TV

PENINSULA BOULEVARD GROUNDWATER PLUME RI

TOWN OF HEMPSTEAD, VILLAGE OF HEWLETT, NASSAU COUNTY, NEW YORK

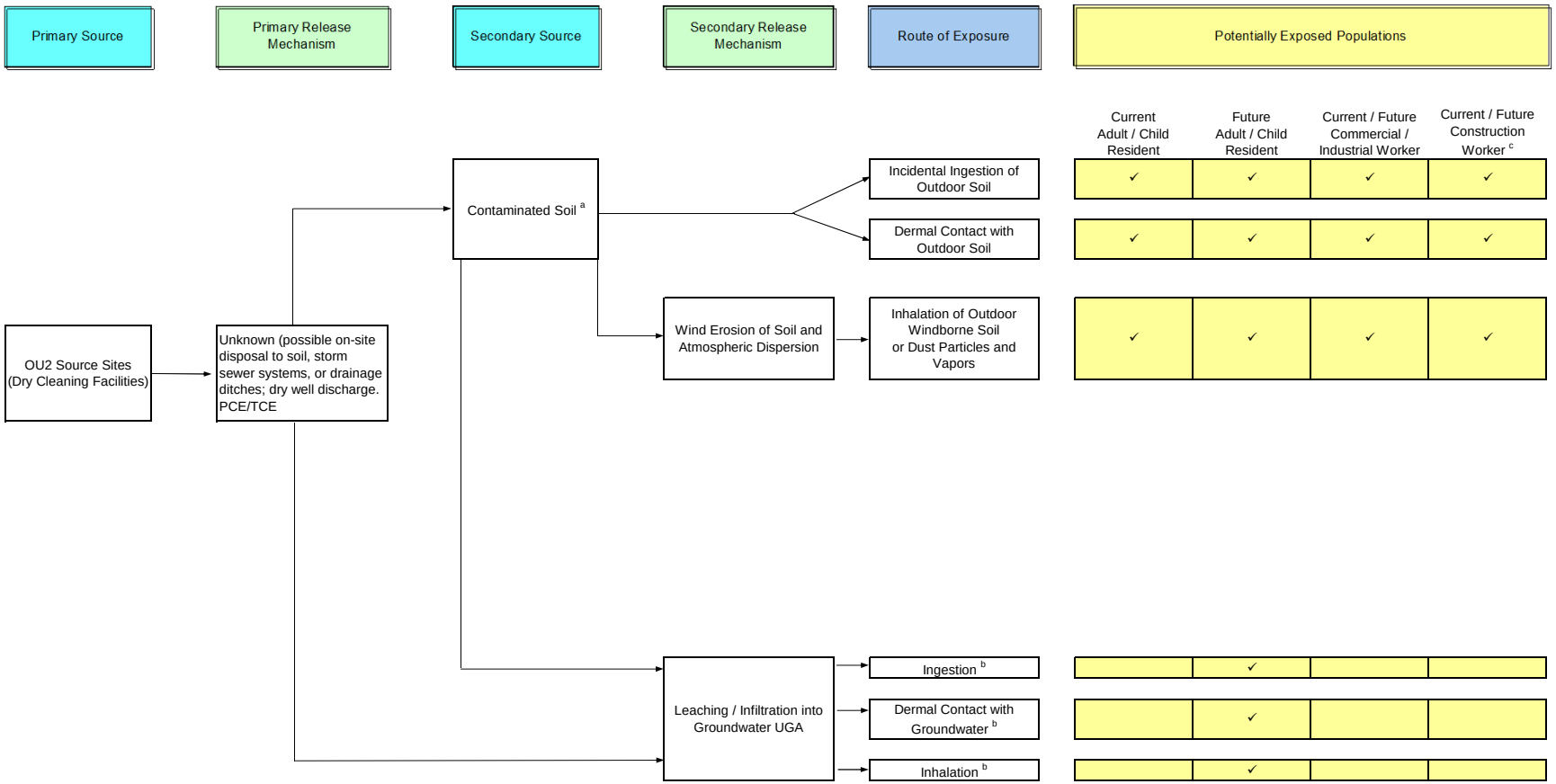
PCE ISOCONCENTRATIONS FOR DEEP UPPER GLACIAL AQUIFER AERIAL VIEW (2011 OU1 RI)

0 200 400
0 1" 2"

FILENAME 00C–30–31
SCALE –

FIGURE 2

Figure 3
Conceptual Site Model
Peninsula Boulevard OU2, Hempstead, NY



Legend:

→ Complete exposure pathway

✓ Quantitative Assessment (Risk Assessment Screening)

Notes:

a. The resident and commercial/industrial worker receptors are assumed to be exposed to surface soil 0-2 ft and a construction worker to 0-10 ft soil.
b. Untreated groundwater supplied via private wells is not used for potable water while treated groundwater supplied via public wells is.
c. Direct contact and inhalation with groundwater for construction workers involved in excavation activities are not evaluated, as there are no USEPA RSLs available for this scenario.
PCE - Tetrachloroethylene
TCE - Trichloroethylene
UGA - Upper Glacial Aquifer

RISK SCREENING TABLES

Table 1: Exposure Point Concentrations
Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	Detection Ratio	Detection Frequency (%)	Max Detect	Qualifier	Location of Max Detect	Detection Limit Range	95% UCL	UCL Method	EPC	EPC Type
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	1 / 13	8	0.0066		ERT-10	0.004 - 0.0061	NA	ProUCL did not calculate UCL; one detect	0.0066	Max
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	10 / 13	77	1.2	D	ERT-14	0.004 - 0.054	1.3	95% KM Bootstrap t UCL	1.2	Max
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	0 / 13	0				0.004 - 0.0061	NA	ProUCL did not calculate UCL; nondetect	0	Max
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	0 / 13	0				0.004 - 0.0061	NA	ProUCL did not calculate UCL; nondetect	0	Max
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	1 / 33	3	0.0066		ERT-10	0.004 - 0.036	NA	ProUCL did not calculate UCL; one detect	0.0066	Max
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	17 / 33	52	1.2	D	ERT-14	0.004 - 0.054	0.22	Gamma Adjusted KM-UCL	0.22	UCL
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	0 / 33	0				0.004 - 0.036	NA	ProUCL did not calculate UCL; nondetect	0	Max
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	0 / 33	0				0.004 - 0.036	NA	ProUCL did not calculate UCL; nondetect	0	Max
Cedarwood & Vacant Lot	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	24 / 93	26	2600		MW-27D	5 - 20000	222	95% KM (Chebyshev) UCL	222	UCL
Cedarwood & Vacant Lot	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	84 / 95	88	800000		ERT-GW-38	5 - 20000	176216	99% KM (Chebyshev) UCL	176216	UCL
Cedarwood & Vacant Lot	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	40 / 93	43	6300		MW-27D	5 - 20000	785	95% KM Approximate Gamma UCL	785	UCL
Cedarwood & Vacant Lot	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	5 / 93	5	300		MW-27D	0.5 - 20000	17	95% KM (t) UCL	17	UCL
Piermont	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	1 / 24	4	0.00032	J	ERT-37	0.0046 - 0.0066	NA	ProUCL did not calculate UCL; one detect	0.00032	Max
Piermont	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	10 / 24	42	0.013		ERT-34	0.0046 - 0.0066	0.0037	95% KM (t) UCL	0.0037	UCL
Piermont	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	4 / 24	17	0.00066	J	ERT-34	0.0046 - 0.0066	0.00058	95% KM (t) UCL	0.00058	UCL
Piermont	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	0 / 24	0				0.0046 - 0.0066	NA	ProUCL did not calculate UCL; nondetect	0	Max
Piermont	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	1 / 43	2	0.00032	J	ERT-37	0.0046 - 0.0082	NA	ProUCL did not calculate UCL; one detect	0.00032	Max
Piermont	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	15 / 43	35	0.013		ERT-34	0.0046 - 0.0082	0.0031	Gamma Adjusted KM-UCL	0.0031	UCL
Piermont	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	5 / 43	12	0.00066	J	ERT-34	0.0046 - 0.0082	0.00055	95% KM (t) UCL	0.00055	UCL
Piermont	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	0 / 43	0				0.0046 - 0.0082	NA	ProUCL did not calculate UCL; nondetect	0	Max
Piermont	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	48 / 66	73	51		ERT-GW-28	5 - 50	6.2	KM H-UCL	6.2	UCL
Piermont	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	49 / 66	74	4260		UNIT003_GW2	5 - 100	674	97.5% KM (Chebyshev) UCL	674	UCL
Piermont	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	31 / 66	47	21	J	ERT-GW-03	5 - 50	2.8	KM H-UCL	2.8	UCL
Piermont	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	14 / 66	21	12		ERT-GW-35	5 - 50	1.5	KM H-UCL	1.5	UCL

Notes:
1. Concentrations and RSLs are presented in mg/kg for soil and in ug/L for groundwater.
2. The surface soil data includes samples with a depth of 0 to 2 ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0 to 10 ft for the construction worker exposure scenario.
3. Upper Confidence Limits (UCLs) are calculated using ProUCL 5.1 with a 95% confidence level and 2,000 bootstrap operations. The maximum of the parent and field duplicate sample results was applied. See Attachment A.
4. The UCL was applied as the EPC, except for when the UCL is greater than the maximum detected concentration, as indicated by the ProUCL output. See Attachment A.

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
D -- Diluted concentration
EPC -- Exposure point concentration
ft -- Feet
J -- Estimated concentration
KM -- Kaplan Meier
NA -- Not applicable
ND -- Nondetect
UCL -- Upper confidence limit

References:
EPA. 2016. ProUCL Version 5.1.00. Last Updated May 18. Available online: https://www.epa.gov/land-research/proucl-software
EPA. 2015. ProUCL Version 5.1 Technical Guide. EPA/600/R-07/041. October. Available online: https://www.epa.gov/sites/production/files/2016-05/documents/proucl_5.1_tech-guide.pdf

Table 2: Exposure Factors
Peninsula Boulevard OU2, Hempstead, NY

		Current/Future			
		Resident Child [1]	Resident Adult [1,2]	Commercial / Industrial Worker [1]	Construction Worker [3]
Soil Ingestion					
Ingestion Rate (mg/d)	IR	200	100	100	330
Conversion Factor (kg/mg)	CF	0.000001	0.000001	0.000001	0.000001
Fraction Contacted (unitless)	FC	1	1	1	1
Exposure Frequency (d/yr)	EF	350	350	250	250
Exposure Duration (yr)	ED	6	26	25	1
Body Weight (kg-bw)	BW	15	80	80	80
Averaging Time, carc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncarc (d)	AT_{nc}	2,190	9,490	9,125	365
Soil Dermal Contact					
Adherence Factor (mg/cm^2)	AD	0.2	0.07	0.12	0.3
Skin Surface Area (cm^2/d)	SA	2,373	6,032	3,527	3,527
Fraction Absorbed in GI Tract	GIABS	chem-specific	chem-specific	chem-specific	chem-specific
Dermal Fraction Absorbed	ABS_d	chem-specific	chem-specific	chem-specific	chem-specific
Conversion Factor (kg/mg)	CF	0.000001	0.000001	0.000001	0.000001
Fraction Contacted (unitless)	FC	1	1	1	1
Exposure Frequency (d/yr)	EF	350	350	250	250
Exposure Duration (yr)	ED	6	26	25	1
Body Weight (kg-bw)	BW	15	80	80	80
Averaging Time, carc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncarc (d)	AT_{nc}	2,190	9,490	9,125	365
Soil Vapor/Particulate Inhalation					
Fraction Contacted (unitless)	FC	1	1	1	1
Volatilization Factor (m^3/kg)	VF_s	chem-specific	chem-specific	chem-specific	chem-specific
Particulate Emission Factor (m^3/kg)	PEF_w	1.36E+09	1.36E+09	1.36E+09	site-specific
Exposure Time (hours/day)	ET	24	24	8	8
Exposure Frequency (d/yr)	EF	350	350	250	250
Exposure Duration (yr)	ED	6	26	25	1
Averaging Time, carc (d)	AT_c	25,550	25,550	25,550	25,550
Averaging Time, noncarc (d)	AT_{nc}	127,750	9,490	91,250	91,250
Groundwater Ingestion					
Drinking Rate (L/d)	DR	0.78	2.5	NA	NA
Exposure Frequency (d/yr)	EF	350	350	NA	NA
Exposure Duration (yr)	ED	6	26	NA	NA
Body Weight (kg-bw)	BW	15	80	NA	NA
Averaging Time, canc (d)	AT_c	25,550	25,550	NA	NA
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490	NA	NA

Table 2: Exposure Factors
Peninsula Boulevard OU2, Hempstead, NY

		Current/Future			
		Resident Child [1]	Resident Adult [1,2]	Commercial / Industrial Worker [1]	Construction Worker [3]
Groundwater Dermal Contact					
Dose Absorbed (ug/cm^2-event)	DA_{event}	chem-specific	chem-specific	NA	NA
Dermal Permeability Constant (cm/h)	Kp	chem-specific	chem-specific	NA	NA
Fraction Absorbed	FA	chem-specific	chem-specific	NA	NA
Exposure Time for organics (h)	ET	0.54	0.71	NA	NA
Exposure Frequency (d/yr)	EF	350	350	NA	NA
Exposure Duration (yr)	ED	6	26	NA	NA
Body Weight (kg-bw)	BW	15	80	NA	NA
Averaging Time, canc (d)	AT_c	25,550	25,550	NA	NA
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490	NA	NA
Groundwater Vapor Inhalation					
Andelman Volatilization Factor (L/m^3)	K	0.5	0.5	NA	NA
Exposure Time (h)	ET	24	24	NA	NA
Exposure Frequency (d/yr)	EF	350	350	NA	NA
Exposure Duration (yr)	ED	6	26	NA	NA
Averaging Time, canc (d)	AT_c	25,550	25,550	NA	NA
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490	NA	NA

Note:

1. The exposure factors for a resident and commercial/industrial worker are from the May 2016 USEPA Standard Default Factors in Table 1 of the User's Guide (https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide-may-2016), which reflect the new exposure factors presented in the February 2014 OSWER Directive 9200.1-120 Update of Standard Default Exposure Factors.

2. The exposure duration for an adult is applied as 20 years for the cancer scenario and 26 years for a noncancer scenario, as presented in the May 2016 USEPA RSL equations: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-may-2016

3. The exposure factors for a construction worker are from the May 2016 USEPA Regional Screening Level Calculator using an "Other Construction Activities" scenario reflecting wind erosion and soil excavation, grading, tilling and dozing. The Particulate Emission Factor was generated using the RSL calculator based on site-specific area assumptions. See Attachment C for more detail.

Table 3: Toxicity Values
Peninsula Boulevard OU2, Hempstead, NY

			Cancer					Noncancer			
Chem Group	COPC	CASRN	Mutagen	Oral Slope Factor (SF_o) $(mg/kg\text{-}day)^{-1}$	GIABS	Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk (IUR) $(ug/m3)^{-1}$	Oral Reference Dose (RfD_o) (mg/kg-day)	GIABS	Dermal Reference Dose (mg/kg-day)	Inhalation Reference Concentration (RfC_i) (mg/m^3)
VOC	cis-1,2-Dichloroethylene	156-59-2	No		1			0.002	1	0.002	
VOC	Tetrachloroethylene	127-18-4	No	0.0021	1	0.0021	0.00000026	0.006	1	0.006	0.04
VOC	Trichloroethylene	79-01-6	Yes	0.046	1	0.046	0.0000041	0.0005	1	0.0005	0.002
VOC	Vinyl chloride	75-01-4	Yes	0.72	1	0.72	0.0000044	0.003	1	0.003	0.1

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
NA -- Not available

Notes:
The absorbed RfD for dermal is calculated by the following equation: RfD-oral x GIABS.
The absorbed SFd for dermal is calculated by the following equation: SF-oral / GIABS.

Reference:
USEPA 2016. Regional Screening Level (RSL) Generic Tables. May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls

Table 4: Cancer Risks and Noncancer Hazard Quotients in Soil and Groundwater
Cedarwood Cleaners; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Soil							
								Current/Future Resident				Current/Future Commercial/Industrial Worker			
								USEPA RSL Residential Soil		Risk Estimates		USEPA RSL Industrial Soil		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ	Cancer	Noncancer	Cancer Risk	Noncancer HQ
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	6.6E-03	Max	NA	1.6E+02	No RSL	4.1E-05	NA	2.3E+03	No RSL	2.9E-06
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	1.2E+00	Max	2.4E+01	8.1E+01	5.0E-08	1.5E-02	1.0E+02	3.9E+02	1.2E-08	3.1E-03
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	ND	-	9.4E-01	4.1E+00	ND	ND	6.0E+00	1.9E+01	ND	ND
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	5.9E-02	7.0E+01	ND	ND	1.7E+00	3.7E+02	ND	ND
Cumulative Risk Estimates for Selected COPCs:										5.0E-08	1.5E-02			1.2E-08	3.1E-03
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	6.6E-03	Max	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	2.2E-01	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															
Cedarwood & Vacant Lot	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	2.2E+02	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	1.8E+05	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	7.8E+02	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	1.7E+01	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															

Notes:
1. Concentrations and RSLs are presented in mg/kg for soil and in ug/L for groundwater.
2. The surface soil data includes samples with a depth of 0 to 2 ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0 to 10 ft for the construction worker exposure scenario.
3. Groundwater concentrations at Unit 001 include concentrations that were historically collected in nearby offsite monitoring well MW-27D/S as part of of the OU1 Remedial Design.
4. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
5. The construction worker RSLs were calculated using the USEPA RSL calculator. See supporting information in Attachment C.
6. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shaded bold.

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
NA -- Not applicable because the receptor exposure scenario is not evaluated for this medium.
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ *\ 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ *1}{RSL_{nc}}$$

Table 4: Cancer Risks and Noncancer Hazard Quotients in Soil and Groundwater
Cedarwood Cleaners; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Soil				Groundwater			
								Current/Future Construction Worker				Future Resident			
								USEPA RSL Construction Soil		Risk Estimates		USEPA RSL Residential Tapwater		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ	Cancer	Noncancer	Cancer Risk	Noncancer HQ
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	6.6E-03	Max	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	1.2E+00	Max	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cedarwood & Vacant Lot	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	6.6E-03	Max	NA	6.79E+03	No RSL	9.7E-07	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	2.2E-01	UCL	1.64E+02	8.54E+01	1.3E-09	2.6E-03	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	ND	-	3.36E+01	3.93E+00	ND	ND	NA	NA	NA	NA
Cedarwood & Vacant Lot	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	1.02E+01	6.27E+01	ND	ND	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:										1.3E-09	2.6E-03				
Cedarwood & Vacant Lot	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	2.2E+02	UCL	NA	NA	NA	NA	NA	3.6E+01	No RSL	6.2E+00
Cedarwood & Vacant Lot	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	1.8E+05	UCL	NA	NA	NA	NA	1.1E+01	4.1E+01	1.6E-02	4.3E+03
Cedarwood & Vacant Lot	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	7.8E+02	UCL	NA	NA	NA	NA	4.9E-01	2.8E+00	1.6E-03	2.8E+02
Cedarwood & Vacant Lot	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	1.7E+01	UCL	NA	NA	NA	NA	1.9E-02	4.4E+01	8.8E-04	3.8E-01
Cumulative Risk Estimates for Selected COPCs:														**1.9E-02**	**4.6E+03**

Notes:
1. Concentrations and RSLs are presented in mg/kg for soil and in ug/L for groundwater.
2. The surface soil data includes samples with a depth of 0 to 2 ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0 to 10 ft for the construction worker exposure scenario.
3. Groundwater concentrations at Unit 001 include concentrations that were historically collected in nearby offsite monitoring well MW-27D/S as part of of the OU1 Remedial Design.
4. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
5. The construction worker RSLs were calculated using the USEPA RSL calculator. See supporting information in Attachment C.
6. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shade

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
NA -- Not applicable because the receptor exposure scenario is not evaluated for this medium.
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ *\ 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ *1}{RSL_{nc}}$$

Table 5: Cancer Risks and Noncancer Hazard Quotients in Soil and Groundwater
Piermont Cleaners; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Soil							
								Current/Future Resident				Current/Future Commercial/Industrial Worker			
								USEPA RSL Residential Soil		Risk Estimates		USEPA RSL Industrial Soil		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ	Cancer	Noncancer	Cancer Risk	Noncancer HQ
Piermont	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	3.2E-04	Max	NA	1.60E+02	No RSL	2.0E-06	NA	2.3E+03	No RSL	1.4E-07
Piermont	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	3.7E-03	UCL	2.40E+01	8.10E+01	1.6E-10	4.6E-05	1.0E+02	3.9E+02	3.7E-11	9.6E-06
Piermont	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	5.8E-04	UCL	9.40E-01	4.10E+00	6.2E-10	1.4E-04	6.0E+00	1.9E+01	9.7E-11	3.1E-05
Piermont	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	5.90E-02	7.00E+01	ND	ND	1.7E+00	3.7E+02	ND	ND
Cumulative Risk Estimates for Selected COPCs:										7.8E-10	1.9E-04			1.3E-10	4.0E-05
Piermont	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	3.2E-04	Max	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	3.1E-03	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	5.5E-04	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															
Piermont	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	6.2E+00	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	6.7E+02	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	2.8E+00	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	1.5E+00	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															

Notes:

1. Concentrations and RSLs are presented in mg/kg for soil and in ug/L for groundwater.
2. The surface soil data includes samples with a depth of 0 to 2 ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0 to 10 ft for the construction worker exposure scenario.
3. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
4. The construction worker RSLs were calculated using the USEPA RSL calculator. See supporting information in Attachment C.
5. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shaded bold.

Abbreviations:

Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
NA -- Not applicable because the receptor exposure scenario is not evaluated for this medium.
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ * 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ * 1}{RSL_{nc}}$$

Table 5: Cancer Risks and Noncancer Hazard Quotients in Soil and Groundwater
Piermont Cleaners; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Soil				Groundwater			
								Current/Future Construction Worker				Future Resident			
								USEPA RSL Construction Soil		Risk Estimates		USEPA RSL Tapwater		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ	Cancer	Noncancer	Cancer Risk	Noncancer HQ
Piermont	Surface Soil 0-2ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	3.2E-04	Max	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Surface Soil 0-2ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	3.7E-03	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Surface Soil 0-2ft	VOC	Trichloroethylene	79-01-6	mg/kg	5.8E-04	UCL	NA	NA	NA	NA	NA	NA	NA	NA
Piermont	Surface Soil 0-2ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:															
Piermont	All Soil 0-10ft	VOC	cis-1,2-Dichloroethylene	156-59-2	mg/kg	3.2E-04	Max	NA	6.79E+03	No RSL	4.7E-08	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Tetrachloroethylene	127-18-4	mg/kg	3.1E-03	UCL	1.64E+02	8.54E+01	1.9E-11	3.6E-05	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Trichloroethylene	79-01-6	mg/kg	5.5E-04	UCL	3.36E+01	3.93E+00	1.6E-11	1.4E-04	NA	NA	NA	NA
Piermont	All Soil 0-10ft	VOC	Vinyl chloride	75-01-4	mg/kg	ND	-	1.02E+01	6.27E+01	ND	ND	NA	NA	NA	NA
Cumulative Risk Estimates for Selected COPCs:										3.5E-11	1.8E-04				
Piermont	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	6.2E+00	UCL	NA	NA	NA	NA	NA	3.6E+01	No RSL	1.7E-01
Piermont	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	6.7E+02	UCL	NA	NA	NA	NA	1.1E+01	4.1E+01	6.1E-05	1.6E+01
Piermont	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	2.8E+00	UCL	NA	NA	NA	NA	4.9E-01	2.8E+00	5.7E-06	1.0E+00
Piermont	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	1.5E+00	UCL	NA	NA	NA	NA	1.9E-02	4.4E+01	8.0E-05	3.4E-02
Cumulative Risk Estimates for Selected COPCs:														**1.5E-04**	**1.8E+01**

Notes:

1. Concentrations and RSLs are presented in mg/kg for soil and in ug/L for groundwater.
2. The surface soil data includes samples with a depth of 0 to 2 ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0 to 10 ft for the construction worker exposure scenario.
3. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
4. The construction worker RSLs were calculated using the USEPA RSL calculator. See supporting information in Attachment C.
5. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shac

Abbreviations:

Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
NA -- Not applicable because the receptor exposure scenario is not evaluated for this medium.
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ * 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ * 1}{RSL_{nc}}$$

ATTACHMENT A

PROUCL SUPPORTING DOCUMENTATION

Table A-1: 95% Upper Confidence Limits for COPCs
Peninsula Boulevard OU2, Hempstead, NY

Site	Matrix	COPC	UCL	UCL Method	Warning	Sample Count	Detect Count	% Detects
Cedarwood Cleaners	Surface Soil (0-2ft)	cis-1,2-Dichloroethene	NA	ProUCL did not calculate UCL; one detect	b, e	13	1	8
		Tetrachloroethene	1.3	95% KM Bootstrap t UCL	a, g	13	10	77
		Trichloroethene	NA	ProUCL did not calculate UCL; nondetect	e, h	13	0	0
		Vinyl Chloride	NA	ProUCL did not calculate UCL; nondetect	e, h	13	0	0
	All Soil (0-10ft)	cis-1,2-Dichloroethene	NA	ProUCL did not calculate UCL; one detect	b, e	33	1	3
		Tetrachloroethene	0.22	Gamma Adjusted KM-UCL		33	17	52
		Trichloroethene	NA	ProUCL did not calculate UCL; nondetect	e, h	33	0	0
		Vinyl Chloride	NA	ProUCL did not calculate UCL; nondetect	e, h	33	0	0
	Groundwater	cis-1,2-Dichloroethene	222	95% KM (Chebyshev) UCL		93	24	26
		Tetrachloroethene	176216	99% KM (Chebyshev) UCL		95	84	88
		Trichloroethene	785	95% KM Approximate Gamma UCL		93	40	43
		Vinyl Chloride	17	95% KM (t) UCL		93	5	5
Piermont Cleaners	Surface (0-2ft)	cis-1,2-Dichloroethene	NA	ProUCL did not calculate UCL; one detect	b, e	24	1	4
		Tetrachloroethene	0.0037	95% KM (t) UCL		24	10	42
		Trichloroethene	0.00058	95% KM (t) UCL		24	4	17
		Vinyl Chloride	NA	ProUCL did not calculate UCL; nondetect	e, h	24	0	0
	All Soil (0-10ft)	cis-1,2-Dichloroethene	NA	ProUCL did not calculate UCL; one detect	b, e	43	1	2
		Tetrachloroethene	0.0031	Gamma Adjusted KM-UCL		43	15	35
		Trichloroethene	0.00055	95% KM (t) UCL		43	5	12
		Vinyl Chloride	NA	ProUCL did not calculate UCL; nondetect	e, h	43	0	0
	Groundwater	cis-1,2-Dichloroethene	6.2	KM H-UCL		66	48	73
		Tetrachloroethene	674	97.5% KM (Chebyshev) UCL		66	49	74
		Trichloroethene	2.8	KM H-UCL		66	31	47
		Vinyl Chloride	1.5	KM H-UCL		66	14	21

Notes:
1. Concentrations and UCLs for soil are presented in mg/kg and for groundwater in ug/L.
2. Upper Confidence Limits (UCLs) were calculated using ProUCL 5.1.00 with a 95% confidence level and 2,000 bootstrap operations.
3. The surface soil data includes samples with a depth of 0-2ft for residential and commercial/industrial worker exposure scenarios and the all soil data includes samples with a depth of 0-10ft for the construction worker exposure scenario.

Abbreviations:
COPC -- Contaminants of potential concern
ft -- Feet
NA -- Not applicable
ND -- Nondetect
UCL -- Upper confidence limit

ProUCL Warnings:
a. The lowest UCL was taken when ProUCL recommended more than one UCL.
b. Only one distinct data value was detected.
e. The data set was not processed.
g. Recommended UCL exceeds the maximum observation.
h. All concentrations are nondetect.

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.17/11/2016 11:42:51 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (cedarwood & vacant & all soil 0-10ft & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	33	Number of Distinct Observations	20
Number of Detects	1	Number of Non-Detects	32
Number of Distinct Detects	1	Number of Distinct Non-Detects	20

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 result (cedarwood & vacant & all soil 0-10ft & cis-1,2-dichloroethylene) was not processed!

result (cedarwood & vacant & all soil 0-10ft & tetrachloroethylene)

General Statistics

Total Number of Observations	33	Number of Distinct Observations	30
Number of Detects	17	Number of Non-Detects	16
Number of Distinct Detects	17	Number of Distinct Non-Detects	13
Minimum Detect	0.002	Minimum Non-Detect	0.0042
Maximum Detect	1.2	Maximum Non-Detect	0.036
Variance Detects	0.0853	Percent Non-Detects	48.48%
Mean Detects	0.148	SD Detects	0.292
Median Detects	0.022	CV Detects	1.978
Skewness Detects	3.273	Kurtosis Detects	11.77
Mean of Logged Detects	-3.581	SD of Logged Detects	2.059

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.546	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.309	Lilliefors GOF Test
5% Lilliefors Critical Value	0.207	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	0.0778	KM Standard Error of Mean	0.0387
KM SD	0.216	95% KM (BCA) UCL	0.156
95% KM (t) UCL	0.143	95% KM (Percentile Bootstrap) UCL	0.15
95% KM (z) UCL	0.142	95% KM Bootstrap t UCL	0.262
90% KM Chebyshev UCL	0.194	95% KM Chebyshev UCL	0.247
97.5% KM Chebyshev UCL	0.32	99% KM Chebyshev UCL	0.463

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.821	Anderson-Darling GOF Test
5% A-D Critical Value	0.821	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.224	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.395	k star (bias corrected MLE)	0.365
Theta hat (MLE)	0.374	Theta star (bias corrected MLE)	0.405
nu hat (MLE)	13.44	nu star (bias corrected)	12.4

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Mean (detects)	0.148

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.002	Mean	0.0809
Maximum	1.2	Median	0.01
SD	0.218	CV	2.694
k hat (MLE)	0.418	k star (bias corrected MLE)	0.4
Theta hat (MLE)	0.194	Theta star (bias corrected MLE)	0.202
nu hat (MLE)	27.58	nu star (bias corrected)	26.41
Adjusted Level of Significance (β)	0.0419		
Approximate Chi Square Value (26.41, α)	15.69	Adjusted Chi Square Value (26.41, β)	15.27
95% Gamma Approximate UCL (use when n>=50)	0.136	95% Gamma Adjusted UCL (use when n<50)	0.14

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.0778	SD (KM)	0.216
Variance (KM)	0.0465	SE of Mean (KM)	0.0387
k hat (KM)	0.13	k star (KM)	0.139
nu hat (KM)	8.589	nu star (KM)	9.141
theta hat (KM)	0.598	theta star (KM)	0.562
80% gamma percentile (KM)	0.079	90% gamma percentile (KM)	0.228
95% gamma percentile (KM)	0.435	99% gamma percentile (KM)	1.045

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (9.14, α)	3.413	Adjusted Chi Square Value (9.14, β)	3.234
95% Gamma Approximate KM-UCL (use when n>=50)	0.208	95% Gamma Adjusted KM-UCL (use when n<50)	0.22

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.908	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0781	Mean in Log Scale	-4.54
SD in Original Scale	0.219	SD in Log Scale	1.797
95% t UCL (assumes normality of ROS data)	0.143	95% Percentile Bootstrap UCL	0.148
95% BCA Bootstrap UCL	0.194	95% Bootstrap t UCL	0.27
95% H-UCL (Log ROS)	0.165		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.599	KM Geo Mean	0.0101
KM SD (logged)	1.792	95% Critical H Value (KM-Log)	3.533
KM Standard Error of Mean (logged)	0.33	95% H-UCL (KM -Log)	0.154
KM SD (logged)	1.792	95% Critical H Value (KM-Log)	3.533
KM Standard Error of Mean (logged)	0.33		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.0779	Mean in Log Scale	-4.643
SD in Original Scale	0.219	SD in Log Scale	1.861
95% t UCL (Assumes normality)	0.142	95% H-Stat UCL	0.18

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Suggested UCL to Use

Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50	0.22

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

result (cedarwood & vacant & all soil 0-10ft & trichloroethylene)

General Statistics

Total Number of Observations	33	Number of Distinct Observations	21
Number of Detects	0	Number of Non-Detects	33
Number of Distinct Detects	0	Number of Distinct Non-Detects	21

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 result (cedarwood & vacant & all soil 0-10ft & trichloroethylene) was not processed!

result (cedarwood & vacant & all soil 0-10ft & vinyl chloride)

General Statistics

Total Number of Observations	33	Number of Distinct Observations	21
Number of Detects	0	Number of Non-Detects	33
Number of Distinct Detects	0	Number of Distinct Non-Detects	21

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 result (cedarwood & vacant & all soil 0-10ft & vinyl chloride) was not processed!

result (cedarwood & vacant & groundwater & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	93	Number of Distinct Observations	37
Number of Detects	24	Number of Non-Detects	69
Number of Distinct Detects	23	Number of Distinct Non-Detects	14
Minimum Detect	0.96	Minimum Non-Detect	5
Maximum Detect	2600	Maximum Non-Detect	20000
Variance Detects	378521	Percent Non-Detects	74.19%
Mean Detects	222.7	SD Detects	615.2
Median Detects	5.75	CV Detects	2.762
Skewness Detects	3.14	Kurtosis Detects	10.06
Mean of Logged Detects	2.492	SD of Logged Detects	2.202

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.416	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.491	Lilliefors GOF Test
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	64.84	KM Standard Error of Mean	36.14
KM SD	330.4	95% KM (BCA) UCL	124

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

95% KM (t) UCL	124.9	95% KM (Percentile Bootstrap) UCL	133.7
95% KM (z) UCL	124.3	95% KM Bootstrap t UCL	181.7
90% KM Chebyshev UCL	173.3	95% KM Chebyshev UCL	222.4
97.5% KM Chebyshev UCL	290.5	99% KM Chebyshev UCL	424.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.632	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.878	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.36	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.196	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)	0.245	k star (bias corrected MLE)	0.242
Theta hat (MLE)	910.6	Theta star (bias corrected MLE)	921.1
nu hat (MLE)	11.74	nu star (bias corrected)	11.61
Mean (detects)	222.7		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	59.9
Maximum	2600	Median	0.01
SD	322.8	CV	5.388
k hat (MLE)	0.122	k star (bias corrected MLE)	0.126
Theta hat (MLE)	489.7	Theta star (bias corrected MLE)	477.1
nu hat (MLE)	22.75	nu star (bias corrected)	23.35
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (23.35, α)	13.36	Adjusted Chi Square Value (23.35, β)	13.24
95% Gamma Approximate UCL (use when n>=50)	104.7	95% Gamma Adjusted UCL (use when n<50)	105.7

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	64.84	SD (KM)	330.4
Variance (KM)	109157	SE of Mean (KM)	36.14
k hat (KM)	0.0385	k star (KM)	0.0444
nu hat (KM)	7.165	nu star (KM)	8.267
theta hat (KM)	1683	theta star (KM)	1459
80% gamma percentile (KM)	5.625	90% gamma percentile (KM)	83.74
95% gamma percentile (KM)	328.6	99% gamma percentile (KM)	1476

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (8.27, α)	2.891	Adjusted Chi Square Value (8.27, β)	2.841
95% Gamma Approximate KM-UCL (use when n>=50)	185.5	95% Gamma Adjusted KM-UCL (use when n<50)	188.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.916	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	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	60.73	Mean in Log Scale	1.292
SD in Original Scale	322.3	SD in Log Scale	1.679
95% t UCL (assumes normality of ROS data)	116.3	95% Percentile Bootstrap UCL	127.1
95% BCA Bootstrap UCL	144.4	95% Bootstrap t UCL	172.9
95% H-UCL (Log ROS)	25.18		

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.396	KM Geo Mean	4.038
KM SD (logged)	1.496	95% Critical H Value (KM-Log)	2.781
KM Standard Error of Mean (logged)	0.221	95% H-UCL (KM -Log)	19.08
KM SD (logged)	1.496	95% Critical H Value (KM-Log)	2.781
KM Standard Error of Mean (logged)	0.221		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	467.8	Mean in Log Scale	3.099
SD in Original Scale	1578	SD in Log Scale	2.513
95% t UCL (Assumes normality)	739.6	95% H-Stat UCL	1514

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 222.4

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.

result (cedarwood & vacant & groundwater & tetrachloroethylene)

General Statistics

Total Number of Observations	95	Number of Distinct Observations	79
Number of Detects	84	Number of Non-Detects	11
Number of Distinct Detects	78	Number of Distinct Non-Detects	1
Minimum Detect	1.2	Minimum Non-Detect	5
Maximum Detect	800000	Maximum Non-Detect	5
Variance Detects	2.027E+10	Percent Non-Detects	11.58%
Mean Detects	43885	SD Detects	142360
Median Detects	4100	CV Detects	3.244
Skewness Detects	4.518	Kurtosis Detects	20.04
Mean of Logged Detects	6.974	SD of Logged Detects	3.778

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.333	Normal GOF Test on Detected Observations Only
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.379	Lilliefors GOF Test
5% Lilliefors Critical Value	0.0968	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	38804	KM Standard Error of Mean	13811
KM SD	133805	95% KM (BCA) UCL	63731
95% KM (t) UCL	61746	95% KM (Percentile Bootstrap) UCL	62844
95% KM (z) UCL	61520	95% KM Bootstrap t UCL	77658
90% KM Chebyshev UCL	80235	95% KM Chebyshev UCL	99002
97.5% KM Chebyshev UCL	125050	99% KM Chebyshev UCL	176216

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.501	Anderson-Darling GOF Test
5% A-D Critical Value	0.917	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.125	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.108	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Gamma Statistics on Detected Data Only

k hat (MLE)	0.198	k star (bias corrected MLE)	0.199
Theta hat (MLE)	221270	Theta star (bias corrected MLE)	220322
nu hat (MLE)	33.32	nu star (bias corrected)	33.46
Mean (detects)	43885		

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	38803
Maximum	800000	Median	1700
SD	134514	CV	3.467
k hat (MLE)	0.155	k star (bias corrected MLE)	0.157
Theta hat (MLE)	250264	Theta star (bias corrected MLE)	246886
nu hat (MLE)	29.46	nu star (bias corrected)	29.86
Adjusted Level of Significance (β)	0.0475		
Approximate Chi Square Value (29.86, α)	18.38	Adjusted Chi Square Value (29.86, β)	18.25
95% Gamma Approximate UCL (use when n>=50)	63028	95% Gamma Adjusted UCL (use when n<50)	63508

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	38804	SD (KM)	133805
Variance (KM)	1.790E+10	SE of Mean (KM)	13811
k hat (KM)	0.0841	k star (KM)	0.0885
nu hat (KM)	15.98	nu star (KM)	16.81
theta hat (KM)	461392	theta star (KM)	438642
80% gamma percentile (KM)	22193	90% gamma percentile (KM)	97502
95% gamma percentile (KM)	226105	99% gamma percentile (KM)	654836

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (16.81, α)	8.535	Adjusted Chi Square Value (16.81, β)	8.444
95% Gamma Approximate KM-UCL (use when n>=50)	76414	95% Gamma Adjusted KM-UCL (use when n<50)	77238

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.9	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	3.0980E-7	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.149	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0968	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	38804	Mean in Log Scale	6.253
SD in Original Scale	134514	SD in Log Scale	4.11
95% t UCL (assumes normality of ROS data)	61730	95% Percentile Bootstrap UCL	61747
95% BCA Bootstrap UCL	70274	95% Bootstrap t UCL	78083
95% H-UCL (Log ROS)	34887796		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	6.289	KM Geo Mean	538.9
KM SD (logged)	4.009	95% Critical H Value (KM-Log)	6.157
KM Standard Error of Mean (logged)	0.414	95% H-UCL (KM -Log)	21257132
KM SD (logged)	4.009	95% Critical H Value (KM-Log)	6.157
KM Standard Error of Mean (logged)	0.414		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	38804	Mean in Log Scale	6.272
SD in Original Scale	134514	SD in Log Scale	4.05
95% t UCL (Assumes normality)	61730	95% H-Stat UCL	25896615

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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

99% KM (Chebyshev) UCL 176216

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

result (cedarwood & vacant & groundwater & trichloroethylene)

General Statistics

Total Number of Observations	93	Number of Distinct Observations	45
Number of Detects	40	Number of Non-Detects	53
Number of Distinct Detects	37	Number of Distinct Non-Detects	12
Minimum Detect	0.78	Minimum Non-Detect	5
Maximum Detect	6300	Maximum Non-Detect	20000
Variance Detects	2517604	Percent Non-Detects	56.99%
Mean Detects	1090	SD Detects	1587
Median Detects	265	CV Detects	1.456
Skewness Detects	1.751	Kurtosis Detects	2.507
Mean of Logged Detects	5.276	SD of Logged Detects	2.398

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.726	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.94	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.262	Lilliefors GOF Test
5% Lilliefors Critical Value	0.139	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	498.9	KM Standard Error of Mean	126.3
KM SD	1177	95% KM (BCA) UCL	730.4
95% KM (t) UCL	708.7	95% KM (Percentile Bootstrap) UCL	717
95% KM (z) UCL	706.6	95% KM Bootstrap t UCL	760.2
90% KM Chebyshev UCL	877.7	95% KM Chebyshev UCL	1049
97.5% KM Chebyshev UCL	1287	99% KM Chebyshev UCL	1755

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.613	Anderson-Darling GOF Test
5% A-D Critical Value	0.839	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.111	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.15	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.385	k star (bias corrected MLE)	0.373
Theta hat (MLE)	2827	Theta star (bias corrected MLE)	2920
nu hat (MLE)	30.83	nu star (bias corrected)	29.85
Mean (detects)	1090		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Minimum	0.01	Mean	472.2
Maximum	6300	Median	0.01
SD	1166	CV	2.469
k hat (MLE)	0.125	k star (bias corrected MLE)	0.128
Theta hat (MLE)	3776	Theta star (bias corrected MLE)	3683
nu hat (MLE)	23.26	nu star (bias corrected)	23.84
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (23.84, α)	13.73	Adjusted Chi Square Value (23.84, β)	13.61
95% Gamma Approximate UCL (use when n>=50)	820	95% Gamma Adjusted UCL (use when n<50)	827.3

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	498.9	SD (KM)	1177
Variance (KM)	1385013	SE of Mean (KM)	126.3
k hat (KM)	0.18	k star (KM)	0.181
nu hat (KM)	33.43	nu star (KM)	33.68
theta hat (KM)	2776	theta star (KM)	2755
80% gamma percentile (KM)	621.3	90% gamma percentile (KM)	1505
95% gamma percentile (KM)	2635	99% gamma percentile (KM)	5800

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (33.68, α)	21.41	Adjusted Chi Square Value (33.68, β)	21.26
95% Gamma Approximate KM-UCL (use when n>=50)	784.9	95% Gamma Adjusted KM-UCL (use when n<50)	790.5

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.139	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	473.3	Mean in Log Scale	2.776
SD in Original Scale	1165	SD in Log Scale	3.033
95% t UCL (assumes normality of ROS data)	674	95% Percentile Bootstrap UCL	676.6
95% BCA Bootstrap UCL	708.8	95% Bootstrap t UCL	727.7
95% H-UCL (Log ROS)	7243		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.975	KM Geo Mean	19.6
KM SD (logged)	2.773	95% Critical H Value (KM-Log)	4.421
KM Standard Error of Mean (logged)	0.389	95% H-UCL (KM -Log)	3294
KM SD (logged)	2.773	95% Critical H Value (KM-Log)	4.421
KM Standard Error of Mean (logged)	0.389		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	815.5	Mean in Log Scale	3.72
SD in Original Scale	1853	SD in Log Scale	2.881
95% t UCL (Assumes normality)	1135	95% H-Stat UCL	10314

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL 784.9

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.

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

result (cedarwood & vacant & groundwater & vinyl chloride)

General Statistics

Total Number of Observations	93	Number of Distinct Observations	19
Number of Detects	5	Number of Non-Detects	88
Number of Distinct Detects	4	Number of Distinct Non-Detects	15
Minimum Detect	12	Minimum Non-Detect	0.5
Maximum Detect	300	Maximum Non-Detect	20000
Variance Detects	13999	Percent Non-Detects	94.62%
Mean Detects	102.6	SD Detects	118.3
Median Detects	79	CV Detects	1.153
Skewness Detects	1.558	Kurtosis Detects	2.547
Mean of Logged Detects	3.949	SD of Logged Detects	1.424

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.826	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.275	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	8.231	KM Standard Error of Mean	5.134
KM SD	38.41	95% KM (BCA) UCL	N/A
95% KM (t) UCL	16.76	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	16.68	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	23.63	95% KM Chebyshev UCL	30.61
97.5% KM Chebyshev UCL	40.29	99% KM Chebyshev UCL	59.31

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.354	Anderson-Darling GOF Test
5% A-D Critical Value	0.695	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.261	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.366	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.862	k star (bias corrected MLE)	0.478
Theta hat (MLE)	119.1	Theta star (bias corrected MLE)	214.6
nu hat (MLE)	8.617	nu star (bias corrected)	4.78
Mean (detects)	102.6		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.526
Maximum	300	Median	0.01
SD	33.91	CV	6.137
k hat (MLE)	0.133	k star (bias corrected MLE)	0.136
Theta hat (MLE)	41.4	Theta star (bias corrected MLE)	40.53
nu hat (MLE)	24.83	nu star (bias corrected)	25.36
Adjusted Level of Significance (β)	0.0474		
Approximate Chi Square Value (25.36, α)	14.89	Adjusted Chi Square Value (25.36, β)	14.76
95% Gamma Approximate UCL (use when n>=50)	9.413	95% Gamma Adjusted UCL (use when n<50)	9.493

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	8.231	SD (KM)	38.41

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Variance (KM)	1475	SE of Mean (KM)	5.134
k hat (KM)	0.0459	k star (KM)	0.0516
nu hat (KM)	8.542	nu star (KM)	9.6
theta hat (KM)	179.2	theta star (KM)	159.5
80% gamma percentile (KM)	1.246	90% gamma percentile (KM)	13.08
95% gamma percentile (KM)	44.26	99% gamma percentile (KM)	176.8

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (9.60, α)	3.693	Adjusted Chi Square Value (9.60, β)	3.635
95% Gamma Approximate KM-UCL (use when n>=50)	21.4	95% Gamma Adjusted KM-UCL (use when n<50)	21.73

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.882	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.248	**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	6.085	Mean in Log Scale	-2.045
SD in Original Scale	33.84	SD in Log Scale	2.678
95% t UCL (assumes normality of ROS data)	11.92	95% Percentile Bootstrap UCL	12.21
95% BCA Bootstrap UCL	15.75	95% Bootstrap t UCL	25.37
95% H-UCL (Log ROS)	15.46		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.293	KM Geo Mean	0.746
KM SD (logged)	1.324	95% Critical H Value (KM-Log)	2.585
KM Standard Error of Mean (logged)	0.193	95% H-UCL (KM -Log)	2.56
KM SD (logged)	1.324	95% Critical H Value (KM-Log)	2.585
KM Standard Error of Mean (logged)	0.193		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	400.7	Mean in Log Scale	3.066
SD in Original Scale	1542	SD in Log Scale	2.433
95% t UCL (Assumes normality)	666.4	95% H-Stat UCL	1133

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	16.76

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.

result (cedarwood & vacant & surface soil 0-2ft & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	1	Number of Non-Detects	12
Number of Distinct Detects	1	Number of Distinct Non-Detects	11

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

The data set for variable result (cedarwood & vacant & surface soil 0-2ft & cis-1,2-dichloroethylene) was not processed!

result (cedarwood & vacant & surface soil 0-2ft & tetrachloroethylene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	13
Number of Detects	10	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	3
Minimum Detect	0.0031	Minimum Non-Detect	0.0042
Maximum Detect	1.2	Maximum Non-Detect	0.0051
Variance Detects	0.141	Percent Non-Detects	23.08%
Mean Detects	0.18	SD Detects	0.376
Median Detects	0.016	CV Detects	2.085
Skewness Detects	2.703	Kurtosis Detects	7.544
Mean of Logged Detects	-3.607	SD of Logged Detects	2.087

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.555	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.353	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	0.14	KM Standard Error of Mean	0.094
KM SD	0.322	95% KM (BCA) UCL	0.289
95% KM (t) UCL	0.307	95% KM (Percentile Bootstrap) UCL	0.299
95% KM (z) UCL	0.294	95% KM Bootstrap t UCL	1.217
90% KM Chebyshev UCL	0.422	95% KM Chebyshev UCL	0.549
97.5% KM Chebyshev UCL	0.727	99% KM Chebyshev UCL	1.075

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.812	Anderson-Darling GOF Test
5% A-D Critical Value	0.804	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.235	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.286	Detected data appear Gamma Distributed at 5% Significance Level

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

Gamma Statistics on Detected Data Only

k hat (MLE)	0.354	k star (bias corrected MLE)	0.315
Theta hat (MLE)	0.509	Theta star (bias corrected MLE)	0.573
nu hat (MLE)	7.085	nu star (bias corrected)	6.293
Mean (detects)	0.18		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0031	Mean	0.141
Maximum	1.2	Median	0.01
SD	0.334	CV	2.369
k hat (MLE)	0.357	k star (bias corrected MLE)	0.326
Theta hat (MLE)	0.395	Theta star (bias corrected MLE)	0.433
nu hat (MLE)	9.277	nu star (bias corrected)	8.469
Adjusted Level of Significance (β)	0.0301		
Approximate Chi Square Value (8.47, α)	3.01	Adjusted Chi Square Value (8.47, β)	2.565
95% Gamma Approximate UCL (use when n>=50)	0.397	95% Gamma Adjusted UCL (use when n<50)	0.466

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.14	SD (KM)	0.322
Variance (KM)	0.103	SE of Mean (KM)	0.094
k hat (KM)	0.188	k star (KM)	0.196
nu hat (KM)	4.899	nu star (KM)	5.102
theta hat (KM)	0.741	theta star (KM)	0.711
80% gamma percentile (KM)	0.182	90% gamma percentile (KM)	0.422
95% gamma percentile (KM)	0.723	99% gamma percentile (KM)	1.553

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (5.10, α)	1.199	Adjusted Chi Square Value (5.10, β)	0.955
95% Gamma Approximate KM-UCL (use when n>=50)	0.594	95% Gamma Adjusted KM-UCL (use when n<50)	0.746

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.896	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.186	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	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	0.139	Mean in Log Scale	-4.179
SD in Original Scale	0.335	SD in Log Scale	2.111
95% t UCL (assumes normality of ROS data)	0.305	95% Percentile Bootstrap UCL	0.308
95% BCA Bootstrap UCL	0.404	95% Bootstrap t UCL	1.249
95% H-UCL (Log ROS)	3.091		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-4.064	KM Geo Mean	0.0172
KM SD (logged)	1.928	95% Critical H Value (KM-Log)	4.625
KM Standard Error of Mean (logged)	0.565	95% H-UCL (KM -Log)	1.444
KM SD (logged)	1.928	95% Critical H Value (KM-Log)	4.625
KM Standard Error of Mean (logged)	0.565		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.139	Mean in Log Scale	-4.169
SD in Original Scale	0.335	SD in Log Scale	2.099
95% t UCL (Assumes normality)	0.305	95% H-Stat UCL	2.946

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Bootstrap t UCL	1.252	95% Hall's Bootstrap	1.444

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.

result (cedarwood & vacant & surface soil 0-2ft & trichloroethylene)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	0	Number of Non-Detects	13
Number of Distinct Detects	0	Number of Distinct Non-Detects	12

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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 result (cedarwood & vacant & surface soil 0-2ft & trichloroethylene) was not processed!

result (cedarwood & vacant & surface soil 0-2ft & vinyl chloride)

General Statistics

Total Number of Observations	13	Number of Distinct Observations	12
Number of Detects	0	Number of Non-Detects	13
Number of Distinct Detects	0	Number of Distinct Non-Detects	12

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 result (cedarwood & vacant & surface soil 0-2ft & vinyl chloride) was not processed!

result (piermont & all soil 0-10ft & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	21
Number of Detects	1	Number of Non-Detects	42
Number of Distinct Detects	1	Number of Distinct Non-Detects	20

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 result (piermont & all soil 0-10ft & cis-1,2-dichloroethylene) was not processed!

result (piermont & all soil 0-10ft & tetrachloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	31
Number of Detects	15	Number of Non-Detects	28
Number of Distinct Detects	14	Number of Distinct Non-Detects	17
Minimum Detect	2.1000E-4	Minimum Non-Detect	0.0047
Maximum Detect	0.013	Maximum Non-Detect	0.0082
Variance Detects	1.3848E-5	Percent Non-Detects	65.12%
Mean Detects	0.00333	SD Detects	0.00372
Median Detects	0.0018	CV Detects	1.116
Skewness Detects	1.758	Kurtosis Detects	2.44
Mean of Logged Detects	-6.245	SD of Logged Detects	1.124

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.76	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.881	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.276	Lilliefors GOF Test
5% Lilliefors Critical Value	0.22	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	0.00227	KM Standard Error of Mean	4.5965E-4
KM SD	0.00243	95% KM (BCA) UCL	0.00309
95% KM (t) UCL	0.00304	95% KM (Percentile Bootstrap) UCL	0.00303
95% KM (z) UCL	0.00303	95% KM Bootstrap t UCL	0.0033

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

90% KM Chebyshev UCL	0.00365	95% KM Chebyshev UCL	0.00427
97.5% KM Chebyshev UCL	0.00514	99% KM Chebyshev UCL	0.00684

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.412	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.176	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.228	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)	1.06	k star (bias corrected MLE)	0.892
Theta hat (MLE)	0.00315	Theta star (bias corrected MLE)	0.00374
nu hat (MLE)	31.79	nu star (bias corrected)	26.76
Mean (detects)	0.00333		

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	2.1000E-4	Mean	0.00767
Maximum	0.013	Median	0.01
SD	0.00387	CV	0.504
k hat (MLE)	1.776	k star (bias corrected MLE)	1.667
Theta hat (MLE)	0.00432	Theta star (bias corrected MLE)	0.0046
nu hat (MLE)	152.7	nu star (bias corrected)	143.4
Adjusted Level of Significance (β)	0.0444		
Approximate Chi Square Value (143.40, α)	116.7	Adjusted Chi Square Value (143.40, β)	115.9
95% Gamma Approximate UCL (use when n>=50)	0.00943	95% Gamma Adjusted UCL (use when n<50)	0.0095

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00227	SD (KM)	0.00243
Variance (KM)	5.9023E-6	SE of Mean (KM)	4.5965E-4
k hat (KM)	0.872	k star (KM)	0.827
nu hat (KM)	75.01	nu star (KM)	71.11
theta hat (KM)	0.0026	theta star (KM)	0.00274
80% gamma percentile (KM)	0.0037	90% gamma percentile (KM)	0.00547
95% gamma percentile (KM)	0.00727	99% gamma percentile (KM)	0.0115

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (71.11, α)	52.7	Adjusted Chi Square Value (71.11, β)	52.15
95% Gamma Approximate KM-UCL (use when n>=50)	0.00306	95% Gamma Adjusted KM-UCL (use when n<50)	0.00309

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0021	Mean in Log Scale	-6.494
SD in Original Scale	0.00239	SD in Log Scale	0.754
95% t UCL (assumes normality of ROS data)	0.00271	95% Percentile Bootstrap UCL	0.00271
95% BCA Bootstrap UCL	0.00293	95% Bootstrap t UCL	0.00327
95% H-UCL (Log ROS)	0.00257		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-6.504	KM Geo Mean	0.0015

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

KM SD (logged)	0.937	95% Critical H Value (KM-Log)	2.294
KM Standard Error of Mean (logged)	0.24	95% H-UCL (KM -Log)	0.00324
KM SD (logged)	0.937	95% Critical H Value (KM-Log)	2.294
KM Standard Error of Mean (logged)	0.24		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00296	Mean in Log Scale	-6.018
SD in Original Scale	0.00218	SD in Log Scale	0.676
95% t UCL (Assumes normality)	0.00352	95% H-Stat UCL	0.00379

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

Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50	0.00309

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

result (piermont & all soil 0-10ft & trichloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	25
Number of Detects	5	Number of Non-Detects	38
Number of Distinct Detects	5	Number of Distinct Non-Detects	20
Minimum Detect	2.8000E-4	Minimum Non-Detect	0.0046
Maximum Detect	6.6000E-4	Maximum Non-Detect	0.0082
Variance Detects	1.8670E-8	Percent Non-Detects	88.37%
Mean Detects	4.4800E-4	SD Detects	1.3664E-4
Median Detects	4.4000E-4	CV Detects	0.305
Skewness Detects	0.773	Kurtosis Detects	2.108
Mean of Logged Detects	-7.748	SD of Logged Detects	0.305

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.294	**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	4.4800E-4	KM Standard Error of Mean	6.1106E-5
KM SD	1.2221E-4	95% KM (BCA) UCL	5.5000E-4
95% KM (t) UCL	5.5078E-4	95% KM (Percentile Bootstrap) UCL	5.5250E-4
95% KM (z) UCL	5.4851E-4	95% KM Bootstrap t UCL	5.9998E-4
90% KM Chebyshev UCL	6.3132E-4	95% KM Chebyshev UCL	7.1436E-4
97.5% KM Chebyshev UCL	8.2961E-4	99% KM Chebyshev UCL	0.00106

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.339	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.679	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.258	**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)	13.7	k star (bias corrected MLE)	5.612

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Theta hat (MLE)	3.2711E-5	Theta star (bias corrected MLE)	7.9834E-5
nu hat (MLE)	137	nu star (bias corrected)	56.12
Mean (detects)	4.4800E-4		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	2.8000E-4	Mean	0.00889
Maximum	0.01	Median	0.01
SD	0.0031	CV	0.349
k hat (MLE)	2.171	k star (bias corrected MLE)	2.035
Theta hat (MLE)	0.00409	Theta star (bias corrected MLE)	0.00437
nu hat (MLE)	186.7	nu star (bias corrected)	175
Adjusted Level of Significance (β)	0.0444		
Approximate Chi Square Value (175.00, α)	145.4	Adjusted Chi Square Value (175.00, β)	144.5
95% Gamma Approximate UCL (use when n>=50)	0.0107	95% Gamma Adjusted UCL (use when n<50)	0.0108

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.4800E-4	SD (KM)	1.2221E-4
Variance (KM)	1.4936E-8	SE of Mean (KM)	6.1106E-5
k hat (KM)	13.44	k star (KM)	12.52
nu hat (KM)	1156	nu star (KM)	1076
theta hat (KM)	3.3339E-5	theta star (KM)	3.5795E-5
80% gamma percentile (KM)	5.4964E-4	90% gamma percentile (KM)	6.1601E-4
95% gamma percentile (KM)	6.7458E-4	99% gamma percentile (KM)	7.9386E-4

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	1001	Adjusted Chi Square Value (N/A, β)	998.7
95% Gamma Approximate KM-UCL (use when n>=50)	4.8163E-4	95% Gamma Adjusted KM-UCL (use when n<50)	4.8284E-4

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
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	4.4041E-4	Mean in Log Scale	-7.748
SD in Original Scale	8.9546E-5	SD in Log Scale	0.202
95% t UCL (assumes normality of ROS data)	4.6338E-4	95% Percentile Bootstrap UCL	4.6275E-4
95% BCA Bootstrap UCL	4.6208E-4	95% Bootstrap t UCL	4.6439E-4
95% H-UCL (Log ROS)	4.6473E-4		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-7.748	KM Geo Mean	4.3175E-4
KM SD (logged)	0.273	95% Critical H Value (KM-Log)	1.753
KM Standard Error of Mean (logged)	0.136	95% H-UCL (KM -Log)	4.8246E-4
KM SD (logged)	0.273	95% Critical H Value (KM-Log)	1.753
KM Standard Error of Mean (logged)	0.136		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00249	Mean in Log Scale	-6.116
SD in Original Scale	8.1762E-4	SD in Log Scale	0.616
95% t UCL (Assumes normality)	0.0027	95% H-Stat UCL	0.00322

DL/2 is not a recommended method, provided for comparisons and historical reasons

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 5.5078E-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.

result (piermont & all soil 0-10ft & vinyl chloride)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	20
Number of Detects	0	Number of Non-Detects	43
Number of Distinct Detects	0	Number of Distinct Non-Detects	20

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable result (piermont & all soil 0-10ft & vinyl chloride) was not processed!

result (piermont & groundwater & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	66	Number of Distinct Observations	47
Number of Detects	48	Number of Non-Detects	18
Number of Distinct Detects	45	Number of Distinct Non-Detects	2
Minimum Detect	0.23	Minimum Non-Detect	5
Maximum Detect	51	Maximum Non-Detect	50
Variance Detects	125.6	Percent Non-Detects	27.27%
Mean Detects	6.092	SD Detects	11.21
Median Detects	1.85	CV Detects	1.84
Skewness Detects	2.952	Kurtosis Detects	8.521
Mean of Logged Detects	0.709	SD of Logged Detects	1.455

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.55	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.305	Lilliefors GOF Test
5% Lilliefors Critical Value	0.127	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	4.892	KM Standard Error of Mean	1.222
KM SD	9.736	95% KM (BCA) UCL	7.024
95% KM (t) UCL	6.93	95% KM (Percentile Bootstrap) UCL	7.043
95% KM (z) UCL	6.901	95% KM Bootstrap t UCL	8.022
90% KM Chebyshev UCL	8.557	95% KM Chebyshev UCL	10.22
97.5% KM Chebyshev UCL	12.52	99% KM Chebyshev UCL	17.05

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.226	Anderson-Darling GOF Test
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.135	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Gamma Statistics on Detected Data Only

k hat (MLE)	0.567	k star (bias corrected MLE)	0.546
Theta hat (MLE)	10.74	Theta star (bias corrected MLE)	11.16
nu hat (MLE)	54.47	nu star (bias corrected)	52.4
Mean (detects)	6.092		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.92
Maximum	51	Median	1.35
SD	9.814	CV	1.995
k hat (MLE)	0.417	k star (bias corrected MLE)	0.408
Theta hat (MLE)	11.81	Theta star (bias corrected MLE)	12.06
nu hat (MLE)	55.01	nu star (bias corrected)	53.84
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (53.84, α)	37.98	Adjusted Chi Square Value (53.84, β)	37.69
95% Gamma Approximate UCL (use when n>=50)	6.974	95% Gamma Adjusted UCL (use when n<50)	7.029

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.892	SD (KM)	9.736
Variance (KM)	94.8	SE of Mean (KM)	1.222
k hat (KM)	0.252	k star (KM)	0.251
nu hat (KM)	33.32	nu star (KM)	33.14
theta hat (KM)	19.38	theta star (KM)	19.49
80% gamma percentile (KM)	7.115	90% gamma percentile (KM)	14.68
95% gamma percentile (KM)	23.65	99% gamma percentile (KM)	47.51

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (33.14, α)	20.98	Adjusted Chi Square Value (33.14, β)	20.76
95% Gamma Approximate KM-UCL (use when n>=50)	7.728	95% Gamma Adjusted KM-UCL (use when n<50)	7.808

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0876	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.127	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.882	Mean in Log Scale	0.551
SD in Original Scale	9.76	SD in Log Scale	1.357
95% t UCL (assumes normality of ROS data)	6.886	95% Percentile Bootstrap UCL	7.028
95% BCA Bootstrap UCL	7.702	95% Bootstrap t UCL	8.147
95% H-UCL (Log ROS)	6.339		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	0.535	KM Geo Mean	1.708
KM SD (logged)	1.352	95% Critical H Value (KM-Log)	2.22
KM Standard Error of Mean (logged)	0.183	95% H-UCL (KM -Log)	6.177
KM SD (logged)	1.352	95% Critical H Value (KM-Log)	2.22
KM Standard Error of Mean (logged)	0.183		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	5.453	Mean in Log Scale	0.8
SD in Original Scale	9.964	SD in Log Scale	1.276
95% t UCL (Assumes normality)	7.5	95% H-Stat UCL	7.09

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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 6.177

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.

result (piermont & groundwater & tetrachloroethylene)

General Statistics

Total Number of Observations	66	Number of Distinct Observations	44
Number of Detects	49	Number of Non-Detects	17
Number of Distinct Detects	43	Number of Distinct Non-Detects	1
Minimum Detect	0.21	Minimum Non-Detect	5
Maximum Detect	4260	Maximum Non-Detect	5
Variance Detects	488067	Percent Non-Detects	25.76%
Mean Detects	271.6	SD Detects	698.6
Median Detects	29	CV Detects	2.572
Skewness Detects	4.487	Kurtosis Detects	23.12
Mean of Logged Detects	3.138	SD of Logged Detects	2.677

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.443	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.947	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.349	Lilliefors GOF Test
5% Lilliefors Critical Value	0.126	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	201.9	KM Standard Error of Mean	75.54
KM SD	607.4	95% KM (BCA) UCL	329.3
95% KM (t) UCL	327.9	95% KM (Percentile Bootstrap) UCL	341.3
95% KM (z) UCL	326.1	95% KM Bootstrap t UCL	514.8
90% KM Chebyshev UCL	428.5	95% KM Chebyshev UCL	531.2
97.5% KM Chebyshev UCL	673.7	99% KM Chebyshev UCL	953.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.348	Anderson-Darling GOF Test
5% A-D Critical Value	0.871	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.15	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.138	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.282	k star (bias corrected MLE)	0.279
Theta hat (MLE)	961.7	Theta star (bias corrected MLE)	974.4
nu hat (MLE)	27.68	nu star (bias corrected)	27.32
Mean (detects)	271.6		

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

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Minimum	0.01	Mean	201.6
Maximum	4260	Median	7.5
SD	612.2	CV	3.036
k hat (MLE)	0.18	k star (bias corrected MLE)	0.182
Theta hat (MLE)	1122	Theta star (bias corrected MLE)	1110
nu hat (MLE)	23.72	nu star (bias corrected)	23.98
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (23.98, α)	13.83	Adjusted Chi Square Value (23.98, β)	13.66
95% Gamma Approximate UCL (use when n>=50)	349.5	95% Gamma Adjusted UCL (use when n<50)	354

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	201.9	SD (KM)	607.4
Variance (KM)	368967	SE of Mean (KM)	75.54
k hat (KM)	0.11	k star (KM)	0.116
nu hat (KM)	14.58	nu star (KM)	15.25
theta hat (KM)	1828	theta star (KM)	1747
80% gamma percentile (KM)	169.4	90% gamma percentile (KM)	565.7
95% gamma percentile (KM)	1157	99% gamma percentile (KM)	2980

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (15.25, α)	7.436	Adjusted Chi Square Value (15.25, β)	7.314
95% Gamma Approximate KM-UCL (use when n>=50)	414	95% Gamma Adjusted KM-UCL (use when n<50)	420.9

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.11	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.126	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	202.1	Mean in Log Scale	2.264
SD in Original Scale	612	SD in Log Scale	2.846
95% t UCL (assumes normality of ROS data)	327.8	95% Percentile Bootstrap UCL	334.3
95% BCA Bootstrap UCL	395	95% Bootstrap t UCL	478.9
95% H-UCL (Log ROS)	1948		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.225	KM Geo Mean	9.257
KM SD (logged)	2.787	95% Critical H Value (KM-Log)	3.478
KM Standard Error of Mean (logged)	0.354	95% H-UCL (KM -Log)	1496
KM SD (logged)	2.787	95% Critical H Value (KM-Log)	3.478
KM Standard Error of Mean (logged)	0.354		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	202.3	Mean in Log Scale	2.566
SD in Original Scale	611.9	SD in Log Scale	2.5
95% t UCL (Assumes normality)	328	95% H-Stat UCL	788.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	673.7

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.

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

result (piermont & groundwater & trichloroethylene)

General Statistics

Total Number of Observations	66	Number of Distinct Observations	33
Number of Detects	31	Number of Non-Detects	35
Number of Distinct Detects	31	Number of Distinct Non-Detects	2
Minimum Detect	0.22	Minimum Non-Detect	5
Maximum Detect	21	Maximum Non-Detect	50
Variance Detects	22.74	Percent Non-Detects	53.03%
Mean Detects	3.302	SD Detects	4.769
Median Detects	1.4	CV Detects	1.444
Skewness Detects	2.37	Kurtosis Detects	5.808
Mean of Logged Detects	0.419	SD of Logged Detects	1.243

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.659	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.929	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.298	Lilliefors GOF Test
5% Lilliefors Critical Value	0.156	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	2.252	KM Standard Error of Mean	0.458
KM SD	3.464	95% KM (BCA) UCL	3.035
95% KM (t) UCL	3.016	95% KM (Percentile Bootstrap) UCL	3.072
95% KM (z) UCL	3.005	95% KM Bootstrap t UCL	3.347
90% KM Chebyshev UCL	3.625	95% KM Chebyshev UCL	4.247
97.5% KM Chebyshev UCL	5.11	99% KM Chebyshev UCL	6.805

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.212	Anderson-Darling GOF Test
5% A-D Critical Value	0.787	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.181	Kolmogorov-Smirnov GOF
5% K-S Critical Value	0.164	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.769	k star (bias corrected MLE)	0.716
Theta hat (MLE)	4.295	Theta star (bias corrected MLE)	4.613
nu hat (MLE)	47.67	nu star (bias corrected)	44.39
Mean (detects)	3.302		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.394
Maximum	21	Median	1.102
SD	3.629	CV	1.516
k hat (MLE)	0.475	k star (bias corrected MLE)	0.464
Theta hat (MLE)	5.034	Theta star (bias corrected MLE)	5.159
nu hat (MLE)	62.76	nu star (bias corrected)	61.25
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (61.25, α)	44.25	Adjusted Chi Square Value (61.25, β)	43.92
95% Gamma Approximate UCL (use when n>=50)	3.313	95% Gamma Adjusted UCL (use when n<50)	3.338

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	2.252	SD (KM)	3.464

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Variance (KM)	12	SE of Mean (KM)	0.458
k hat (KM)	0.423	k star (KM)	0.414
nu hat (KM)	55.81	nu star (KM)	54.6
theta hat (KM)	5.327	theta star (KM)	5.445
80% gamma percentile (KM)	3.648	90% gamma percentile (KM)	6.323
95% gamma percentile (KM)	9.249	99% gamma percentile (KM)	16.58

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (54.60, α)	38.62	Adjusted Chi Square Value (54.60, β)	38.32
95% Gamma Approximate KM-UCL (use when n>=50)	3.184	95% Gamma Adjusted KM-UCL (use when n<50)	3.209

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.09	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.156	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.308	Mean in Log Scale	0.189
SD in Original Scale	3.483	SD in Log Scale	1.101
95% t UCL (assumes normality of ROS data)	3.023	95% Percentile Bootstrap UCL	3.048
95% BCA Bootstrap UCL	3.236	95% Bootstrap t UCL	3.404
95% H-UCL (Log ROS)	3.017		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	0.173	KM Geo Mean	1.189
KM SD (logged)	1.059	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.176	95% H-UCL (KM -Log)	2.803
KM SD (logged)	1.059	95% Critical H Value (KM-Log)	2.263
KM Standard Error of Mean (logged)	0.176		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3.218	Mean in Log Scale	0.717
SD in Original Scale	4.251	SD in Log Scale	0.934
95% t UCL (Assumes normality)	4.091	95% H-Stat UCL	4.097

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL	2.803

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

result (piermont & groundwater & vinyl chloride)

General Statistics

Total Number of Observations	66	Number of Distinct Observations	19
Number of Detects	14	Number of Non-Detects	52
Number of Distinct Detects	14	Number of Distinct Non-Detects	5
Minimum Detect	0.56	Minimum Non-Detect	5
Maximum Detect	12	Maximum Non-Detect	50
Variance Detects	14.55	Percent Non-Detects	78.79%
Mean Detects	2.589	SD Detects	3.814
Median Detects	1.115	CV Detects	1.473

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Skewness Detects	2.225	Kurtosis Detects	3.647
Mean of Logged Detects	0.338	SD of Logged Detects	0.997

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.551	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.418	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.226	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	1.433	KM Standard Error of Mean	0.283
KM SD	1.897	95% KM (BCA) UCL	1.961
95% KM (t) UCL	1.906	95% KM (Percentile Bootstrap) UCL	1.907
95% KM (z) UCL	1.899	95% KM Bootstrap t UCL	2.192
90% KM Chebyshev UCL	2.283	95% KM Chebyshev UCL	2.668
97.5% KM Chebyshev UCL	3.203	99% KM Chebyshev UCL	4.252

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.764	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.313	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.236	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.948	k star (bias corrected MLE)	0.792
Theta hat (MLE)	2.731	Theta star (bias corrected MLE)	3.267
nu hat (MLE)	26.54	nu star (bias corrected)	22.19
Mean (detects)	2.589		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.721
Maximum	12	Median	0.953
SD	2.34	CV	1.36
k hat (MLE)	0.501	k star (bias corrected MLE)	0.488
Theta hat (MLE)	3.435	Theta star (bias corrected MLE)	3.524
nu hat (MLE)	66.14	nu star (bias corrected)	64.46
Adjusted Level of Significance (β)	0.0464		
Approximate Chi Square Value (64.46, α)	46.99	Adjusted Chi Square Value (64.46, β)	46.66
95% Gamma Approximate UCL (use when n>=50)	2.361	95% Gamma Adjusted UCL (use when n<50)	2.378

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.433	SD (KM)	1.897
Variance (KM)	3.599	SE of Mean (KM)	0.283
k hat (KM)	0.571	k star (KM)	0.555
nu hat (KM)	75.36	nu star (KM)	73.27
theta hat (KM)	2.511	theta star (KM)	2.582
80% gamma percentile (KM)	2.361	90% gamma percentile (KM)	3.793
95% gamma percentile (KM)	5.304	99% gamma percentile (KM)	8.986

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (73.27, α)	54.56	Adjusted Chi Square Value (73.27, β)	54.2
95% Gamma Approximate KM-UCL (use when n>=50)	1.925	95% Gamma Adjusted KM-UCL (use when n<50)	1.938

Lognormal GOF Test on Detected Observations Only

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Shapiro Wilk Test Statistic	0.799	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.218	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.617	Mean in Log Scale	0.121
SD in Original Scale	1.977	SD in Log Scale	0.789
95% t UCL (assumes normality of ROS data)	2.023	95% Percentile Bootstrap UCL	2.035
95% BCA Bootstrap UCL	2.224	95% Bootstrap t UCL	2.426
95% H-UCL (Log ROS)	1.889		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	0.0657	KM Geo Mean	1.068
KM SD (logged)	0.628	95% Critical H Value (KM-Log)	1.957
KM Standard Error of Mean (logged)	0.146	95% H-UCL (KM -Log)	1.515
KM SD (logged)	0.628	95% Critical H Value (KM-Log)	1.957
KM Standard Error of Mean (logged)	0.146		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3.201	Mean in Log Scale	0.895
SD in Original Scale	3.577	SD in Log Scale	0.66
95% t UCL (Assumes normality)	3.935	95% H-Stat UCL	3.58

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL 1.515

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

result (piermont & surface soil 0-2ft & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	14
Number of Detects	1	Number of Non-Detects	23
Number of Distinct Detects	1	Number of Distinct Non-Detects	13

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 result (piermont & surface soil 0-2ft & cis-1,2-dichloroethylene) was not processed!

result (piermont & surface soil 0-2ft & tetrachloroethylene)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	18
Number of Detects	10	Number of Non-Detects	14
Number of Distinct Detects	10	Number of Distinct Non-Detects	8
Minimum Detect	2.1000E-4	Minimum Non-Detect	0.0047
Maximum Detect	0.013	Maximum Non-Detect	0.0066
Variance Detects	1.8749E-5	Percent Non-Detects	58.33%

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Mean Detects	0.00361	SD Detects	0.00433
Median Detects	0.0017	CV Detects	1.199
Skewness Detects	1.589	Kurtosis Detects	1.566
Mean of Logged Detects	-6.316	SD of Logged Detects	1.322

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.77	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.255	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	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	0.00248	KM Standard Error of Mean	7.3474E-4
KM SD	0.00299	95% KM (BCA) UCL	0.00376
95% KM (t) UCL	0.00374	95% KM (Percentile Bootstrap) UCL	0.00371
95% KM (z) UCL	0.00369	95% KM Bootstrap t UCL	0.00421
90% KM Chebyshev UCL	0.00469	95% KM Chebyshev UCL	0.00569
97.5% KM Chebyshev UCL	0.00707	99% KM Chebyshev UCL	0.00979

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.273	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.163	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.275	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.85	k star (bias corrected MLE)	0.662
Theta hat (MLE)	0.00425	Theta star (bias corrected MLE)	0.00546
nu hat (MLE)	17	nu star (bias corrected)	13.23
Mean (detects)	0.00361		

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	2.1000E-4	Mean	0.00734
Maximum	0.013	Median	0.01
SD	0.00421	CV	0.573
k hat (MLE)	1.382	k star (bias corrected MLE)	1.237
Theta hat (MLE)	0.00531	Theta star (bias corrected MLE)	0.00593
nu hat (MLE)	66.34	nu star (bias corrected)	59.38
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (59.38, α)	42.66	Adjusted Chi Square Value (59.38, β)	41.66
95% Gamma Approximate UCL (use when n>=50)	0.0102	95% Gamma Adjusted UCL (use when n<50)	0.0105

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00248	SD (KM)	0.00299
Variance (KM)	8.9326E-6	SE of Mean (KM)	7.3474E-4
k hat (KM)	0.691	k star (KM)	0.632
nu hat (KM)	33.14	nu star (KM)	30.33
theta hat (KM)	0.0036	theta star (KM)	0.00393
80% gamma percentile (KM)	0.00409	90% gamma percentile (KM)	0.00638
95% gamma percentile (KM)	0.00877	99% gamma percentile (KM)	0.0145

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (30.33, α)	18.76	Adjusted Chi Square Value (30.33, β)	18.12
95% Gamma Approximate KM-UCL (use when n>=50)	0.00402	95% Gamma Adjusted KM-UCL (use when n<50)	0.00416

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.977	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0983	Lilliefors GOF Test
5% Lilliefors Critical Value	0.262	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	0.00226	Mean in Log Scale	-6.583
SD in Original Scale	0.00299	SD in Log Scale	0.943
95% t UCL (assumes normality of ROS data)	0.00331	95% Percentile Bootstrap UCL	0.00328
95% BCA Bootstrap UCL	0.00374	95% Bootstrap t UCL	0.00515
95% H-UCL (Log ROS)	0.00351		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-6.583	KM Geo Mean	0.00138
KM SD (logged)	1.114	95% Critical H Value (KM-Log)	2.696
KM Standard Error of Mean (logged)	0.354	95% H-UCL (KM -Log)	0.00481
KM SD (logged)	1.114	95% Critical H Value (KM-Log)	2.696
KM Standard Error of Mean (logged)	0.354		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00306	Mean in Log Scale	-6.093
SD in Original Scale	0.00276	SD in Log Scale	0.851
95% t UCL (Assumes normality)	0.00402	95% H-Stat UCL	0.00492

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 0.00374

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.

result (piermont & surface soil 0-2ft & trichloroethylene)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	16
Number of Detects	4	Number of Non-Detects	20
Number of Distinct Detects	4	Number of Distinct Non-Detects	12
Minimum Detect	2.8000E-4	Minimum Non-Detect	0.0046
Maximum Detect	6.6000E-4	Maximum Non-Detect	0.0066
Variance Detects	2.4892E-8	Percent Non-Detects	83.33%
Mean Detects	4.4750E-4	SD Detects	1.5777E-4
Median Detects	4.2500E-4	CV Detects	0.353
Skewness Detects	0.822	Kurtosis Detects	1.715
Mean of Logged Detects	-7.758	SD of Logged Detects	0.351

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.949	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.269	Lilliefors GOF Test

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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	4.4750E-4	KM Standard Error of Mean	7.8885E-5
KM SD	1.3663E-4	95% KM (BCA) UCL	N/A
95% KM (t) UCL	5.8270E-4	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	5.7726E-4	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	6.8416E-4	95% KM Chebyshev UCL	7.9135E-4
97.5% KM Chebyshev UCL	9.4014E-4	99% KM Chebyshev UCL	0.00123

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.262	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.657	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.232	**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)	10.99	k star (bias corrected MLE)	2.914
Theta hat (MLE)	4.0720E-5	Theta star (bias corrected MLE)	1.5356E-4
nu hat (MLE)	87.92	nu star (bias corrected)	23.31
Mean (detects)	4.4750E-4		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	2.8000E-4	Mean	0.00841
Maximum	0.01	Median	0.01
SD	0.00364	CV	0.433
k hat (MLE)	1.566	k star (bias corrected MLE)	1.398
Theta hat (MLE)	0.00537	Theta star (bias corrected MLE)	0.00601
nu hat (MLE)	75.17	nu star (bias corrected)	67.11
Adjusted Level of Significance (β)	0.0392		
Approximate Chi Square Value (67.11, α)	49.25	Adjusted Chi Square Value (67.11, β)	48.18
95% Gamma Approximate UCL (use when n>=50)	0.0115	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.4750E-4	SD (KM)	1.3663E-4
Variance (KM)	1.8669E-8	SE of Mean (KM)	7.8885E-5
k hat (KM)	10.73	k star (KM)	9.414
nu hat (KM)	514.9	nu star (KM)	451.9
theta hat (KM)	4.1718E-5	theta star (KM)	4.7537E-5
80% gamma percentile (KM)	5.6340E-4	90% gamma percentile (KM)	6.4162E-4
95% gamma percentile (KM)	7.1125E-4	99% gamma percentile (KM)	8.5454E-4

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (451.86, α)	403.6	Adjusted Chi Square Value (451.86, β)	400.4
95% Gamma Approximate KM-UCL (use when n>=50)	5.0104E-4	95% Gamma Adjusted KM-UCL (use when n<50)	5.0505E-4

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.217	**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

Table A-2: ProUCL Output
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Mean in Original Scale	4.3857E-4	Mean in Log Scale	-7.758
SD in Original Scale	1.0341E-4	SD in Log Scale	0.233
95% t UCL (assumes normality of ROS data)	4.7474E-4	95% Percentile Bootstrap UCL	4.7170E-4
95% BCA Bootstrap UCL	4.7428E-4	95% Bootstrap t UCL	4.7754E-4
95% H-UCL (Log ROS)	4.7882E-4		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-7.758	KM Geo Mean	4.2730E-4
KM SD (logged)	0.304	95% Critical H Value (KM-Log)	1.829
KM Standard Error of Mean (logged)	0.176	95% H-UCL (KM -Log)	5.0261E-4
KM SD (logged)	0.304	95% Critical H Value (KM-Log)	1.829
KM Standard Error of Mean (logged)	0.176		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.00226	Mean in Log Scale	-6.25
SD in Original Scale	8.5489E-4	SD in Log Scale	0.705
95% t UCL (Assumes normality)	0.00256	95% H-Stat UCL	0.00341

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 5.8270E-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.

result (piermont & surface soil 0-2ft & vinyl chloride)

General Statistics

Total Number of Observations	24	Number of Distinct Observations	13
Number of Detects	0	Number of Non-Detects	24
Number of Distinct Detects	0	Number of Distinct Non-Detects	13

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 result (piermont & surface soil 0-2ft & vinyl chloride) was not processed!

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0066	1		0.0045	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0052	1		0.0044	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0068	4/3/2014	1.25	1.25	1.2	1	D	0.054	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0005	3/31/2014	0.5	0.5	0.054	1		0.0056	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0099	1		0.0045	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0048	1	J	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0016	3/31/2014	0.5	0.5	0.0031	1	J	0.004	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0041	1	J	0.0043	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0064	4/3/2014	0.5	0.5	0.13	1		0.0061	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0011	3/31/2014	0.5	0.5	0.022	1		0.0057	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Tetrachloroethylene	PB-0014	3/31/2014	0.5	0.5	0.37	1	D	0.026	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Trichloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0045	0	U	0.0045	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0021	3/31/2014	1.5	1.5	0.0045	0	U	0.0045	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & Surface Soil 0-2ft & Vinyl chloride	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0066	1		0.0045	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0004	3/31/2014	7.75	7.75	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0066	4/3/2014	3.5	3.5	0.0048	0	U	0.0048	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0006	3/31/2014	8	8	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0067	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0019	3/31/2014	9	9	0.0066	0	U	0.0066	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0062	4/3/2014	3.5	3.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0065	4/3/2014	3	3	0.0055	0	U	0.0055	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0063	4/3/2014	7.5	7.5	0.036	0	UJ	0.036	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0008	3/31/2014	8	8	0.0054	0	U	0.0054	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0418	11/19/2015	7.5	7.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0015	3/31/2014	8	8	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0458	12/1/2015	5.5	5.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0002	3/31/2014	8	8	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0069	4/3/2014	3.5	3.5	0.0075	0	U	0.0075	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0070	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0017	3/31/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0013	3/31/2014	9	9	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0503	12/9/2015	7.5	7.5	0.0053	0	U	0.0053	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0022	3/31/2014	8	8	0.006	0	U	0.006	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0010	3/31/2014	9	9	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0052	1		0.0044	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0068	4/3/2014	1.25	1.25	1.2	1	D	0.054	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0005	3/31/2014	0.5	0.5	0.054	1		0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0099	1		0.0045	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0048	1	J	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0016	3/31/2014	0.5	0.5	0.0031	1	J	0.004	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0041	1	J	0.0043	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0064	4/3/2014	0.5	0.5	0.13	1		0.0061	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0011	3/31/2014	0.5	0.5	0.022	1		0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0014	3/31/2014	0.5	0.5	0.37	1	D	0.026	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0418	11/19/2015	7.5	7.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0002	3/31/2014	8	8	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0006	3/31/2014	8	8	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0013	3/31/2014	9	9	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0070	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0022	3/31/2014	8	8	0.006	0	U	0.006	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0069	4/3/2014	3.5	3.5	0.22	1		0.0075	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0008	3/31/2014	8	8	0.0054	0	U	0.0054	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0066	4/3/2014	3.5	3.5	0.088	1		0.0048	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0062	4/3/2014	3.5	3.5	0.002	1	J	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0010	3/31/2014	9	9	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0065	4/3/2014	3	3	0.25	1	D	0.01	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0063	4/3/2014	7.5	7.5	0.036	0	UJ	0.036	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0004	3/31/2014	7.75	7.75	0.0027	1	J	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0503	12/9/2015	7.5	7.5	0.0053	0	U	0.0053	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0015	3/31/2014	8	8	0.0046	1	J	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0067	4/3/2014	6.5	6.5	0.14	1		0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0458	12/1/2015	5.5	5.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0019	3/31/2014	9	9	0.0066	0	U	0.0066	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Tetrachloroethylene	PB-0017	3/31/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0021	3/31/2014	1.5	1.5	0.0045	0	U	0.0045	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0063	4/3/2014	7.5	7.5	0.036	0	UJ	0.036	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0010	3/31/2014	9	9	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0006	3/31/2014	8	8	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0070	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0418	11/19/2015	7.5	7.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0062	4/3/2014	3.5	3.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0458	12/1/2015	5.5	5.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0019	3/31/2014	9	9	0.0066	0	U	0.0066	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0017	3/31/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0002	3/31/2014	8	8	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0067	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0503	12/9/2015	7.5	7.5	0.0053	0	U	0.0053	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0008	3/31/2014	8	8	0.0054	0	U	0.0054	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0015	3/31/2014	8	8	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0066	4/3/2014	3.5	3.5	0.0048	0	U	0.0048	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0013	3/31/2014	9	9	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0065	4/3/2014	3	3	0.0055	0	U	0.0055	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0004	3/31/2014	7.75	7.75	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0022	3/31/2014	8	8	0.006	0	U	0.006	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Trichloroethylene	PB-0069	4/3/2014	3.5	3.5	0.0075	0	U	0.0075	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0016	3/31/2014	0.5	0.5	0.004	0	U	0.004	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0018	3/31/2014	1	1	0.0042	0	U	0.0042	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0003	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0011	3/31/2014	0.5	0.5	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0064	4/3/2014	0.5	0.5	0.0061	0	U	0.0061	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0007	3/31/2014	0.5	0.5	0.0044	0	U	0.0044	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0021	3/31/2014	1.5	1.5	0.0045	0	U	0.0045	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0061	4/3/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0005	3/31/2014	0.5	0.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0009	3/31/2014	0.5	0.5	0.0043	0	U	0.0043	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0001	3/31/2014	1	1	0.0051	0	U	0.0051	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0014	3/31/2014	0.5	0.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0068	4/3/2014	1.25	1.25	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0070	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0010	3/31/2014	9	9	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0065	4/3/2014	3	3	0.0055	0	U	0.0055	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0069	4/3/2014	3.5	3.5	0.0075	0	U	0.0075	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0008	3/31/2014	8	8	0.0054	0	U	0.0054	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0067	4/3/2014	6.5	6.5	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0066	4/3/2014	3.5	3.5	0.0048	0	U	0.0048	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0004	3/31/2014	7.75	7.75	0.0056	0	U	0.0056	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0022	3/31/2014	8	8	0.006	0	U	0.006	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0019	3/31/2014	9	9	0.0066	0	U	0.0066	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0002	3/31/2014	8	8	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0015	3/31/2014	8	8	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0013	3/31/2014	9	9	0.0057	0	U	0.0057	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0017	3/31/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0006	3/31/2014	8	8	0.0059	0	U	0.0059	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0062	4/3/2014	3.5	3.5	0.005	0	U	0.005	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0503	12/9/2015	7.5	7.5	0.0053	0	U	0.0053	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0063	4/3/2014	7.5	7.5	0.036	0	UJ	0.036	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0418	11/19/2015	7.5	7.5	0.0049	0	U	0.0049	mg/kg
Cedarwood & Vacant & All Soil 0-10ft & Vinyl chloride	PB-0458	12/1/2015	5.5	5.5	0.0056	0	U	0.0056	mg/kg
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	149-1001	2/6/2012	18	18	13.3	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	2600	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	1.2	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	MW-27D-20130516	5/16/2013	70	70	1300	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	MW-27D-20131219	12/19/2013	70	70	1200	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	MW-27S-20130516	5/16/2013	25	25	0.96	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	MW-27S-20131219	12/19/2013	25	25	16	1			ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0223	2/4/2015	41	45	5000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0211	10/2/2014	34	38	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0212	10/2/2014	29	33	22	1	J	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0213	10/2/2014	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0226	2/4/2015	36	40	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0227	2/4/2015	28	32	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0228	2/4/2015	36	40	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0229	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0230	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0231	2/4/2015	36	40	42	1	J	200	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0232	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0233	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0234	2/4/2015	36	40	39	1	J	100	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0235	2/4/2015	28	32	5.1	1	J	100	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0236	2/4/2015	22	26	1.4	1	J	10	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0245	2/5/2015	36	40	40	1	J	100	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0246	2/5/2015	28	32	3.9	1	J	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0247	2/5/2015	22	26	1.3	1	J	10	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0248	2/5/2015	36	40	24	1	J	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0249	2/5/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0250	2/5/2015	22	26	1.6	1	J	25	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0255	4/27/2015	41	45	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0259	4/27/2015	41	45	3.8	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0260	4/27/2015	36	40	4.6	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0262	4/28/2015	41	45	6.4	1	J	13	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0265	4/28/2015	41	45	4.2	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0267	4/28/2015	28	32	2.9	1	J	2000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0269	4/28/2015	41	45	6.8	1		5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0272	4/28/2015	41	45	5.1	1		5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0906	2/22/2016	68	70	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0915	2/22/2016	66.5	68.5	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0918	2/22/2016	30	30	250	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0920	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0921	2/22/2016	69.5	71.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0922	2/22/2016	64.5	66.5	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0927	2/23/2016	71.5	73.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0928	2/23/2016	66.5	68.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0931	2/23/2016	70.5	72.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0932	2/23/2016	65.5	67.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	149-1001	2/6/2012	18	18	266	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	149-1007	2/9/2012	15	15	3.48	1	J		ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	31000	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	1.2	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	MW-27D-20130516	5/16/2013	70	70	22000	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	MW-27D-20131219	12/19/2013	70	70	36000	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	MW-27S-20130516	5/16/2013	25	25	39	1			ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0223	2/4/2015	41	45	55000	1	D	5000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0211	10/2/2014	34	38	65000	1		5000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0212	10/2/2014	29	33	38000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0213	10/2/2014	22	26	6100	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0226	2/4/2015	36	40	73000	1	D	5000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0227	2/4/2015	28	32	19000	1	D	5000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0228	2/4/2015	36	40	130000	1	D	10000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0229	2/4/2015	28	32	12000	1	D	1000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0230	2/4/2015	22	26	3300	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0231	2/4/2015	36	40	23000	1	D	1000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0232	2/4/2015	28	32	16000	1	D	1000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0233	2/4/2015	22	26	3100	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0234	2/4/2015	36	40	4200	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0235	2/4/2015	28	32	6400	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0236	2/4/2015	22	26	930	1	D	250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0245	2/5/2015	36	40	30000	1	E	100	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0246	2/5/2015	28	32	10000	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0247	2/5/2015	22	26	2700	1	D	100	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0248	2/5/2015	36	40	8500	1	D	500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0249	2/5/2015	28	32	34000	1	D	2000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0250	2/5/2015	22	26	4400	1	D	250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0251	4/27/2015	41	45	52000	1		2000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0252	4/27/2015	36	40	78000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0253	4/27/2015	28	32	370000	1		10000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0255	4/27/2015	41	45	19	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0256	4/27/2015	36	40	26	1		5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0257	4/27/2015	28	32	4.7	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0259	4/27/2015	41	45	7.4	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0260	4/27/2015	36	40	29	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0261	4/27/2015	28	32	2.1	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0262	4/28/2015	41	45	300	1		13	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0263	4/28/2015	0	0	74000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0264	4/28/2015	0	0	480	1		13	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0265	4/28/2015	41	45	10	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0266	4/28/2015	36	40	730000	1		20000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0267	4/28/2015	28	32	57000	1		2000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0269	4/28/2015	41	45	140	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0270	4/28/2015	36	40	4.8	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0271	4/28/2015	28	32	4.1	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0272	4/28/2015	41	45	35	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0273	4/28/2015	36	40	6800	1		200	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0274	4/28/2015	28	32	4000	1		100	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0276	4/29/2015	41	45	690000	1	J	20000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0277	4/29/2015	36	40	800000	1		20000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0278	4/29/2015	28	32	8200	1	J	250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0279	4/29/2015	41	45	24	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0280	4/29/2015	36	40	17	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0281	4/29/2015	28	32	7.2	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0282	4/29/2015	41	45	5.2	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0284	4/29/2015	28	32	2	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0288	4/29/2015	0	0	4	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0289	4/29/2015	28	32	2.2	1	J	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0933	2/23/2016	36.5	38.5	9.9	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0936	2/23/2016	66.5	68.5	14	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0906	2/22/2016	68	70	9200	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0907	2/22/2016	69.5	71.5	10	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0908	2/22/2016	64.5	66.5	9.3	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0911	2/22/2016	25	27	29	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0912	2/22/2016	28.5	30.5	20000	1		1000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0913	2/22/2016	23.5	25.5	11000	1		500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0914	2/22/2016	71.5	73.5	22000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0915	2/22/2016	66.5	68.5	20000	1		1000	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0916	2/22/2016	31.5	33.5	8000	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0917	2/22/2016	26.5	28.5	380	1		25	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0918	2/22/2016	30	30	7600	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0919	2/22/2016	31.5	33.5	5400	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0920	2/22/2016	26.5	28.5	430	1		25	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0921	2/22/2016	69.5	71.5	1700	1		250	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0922	2/22/2016	64.5	66.5	830	1		50	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0925	2/23/2016	31.5	33.5	2500	1		500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0926	2/23/2016	26.5	28.5	110	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0927	2/23/2016	71.5	73.5	13000	1		500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0928	2/23/2016	66.5	68.5	24000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0929	2/23/2016	32.5	34.5	9.9	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0930	2/23/2016	27.5	29.5	9.8	1		5	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0931	2/23/2016	70.5	72.5	15000	1		2500	ug/l
Cedarwood & Vacant & Groundwater & Tetrachloroethylene	PB-0932	2/23/2016	65.5	67.5	20000	1		500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	149-1001	2/6/2012	18	18	13.8	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	6300	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	0.78	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	MW-27D-20130516	5/16/2013	70	70	4000	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	MW-27D-20131219	12/19/2013	70	70	4800	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	MW-27S-20130516	5/16/2013	25	25	4.9	1			ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0211	10/2/2014	34	38	640	1	J	1000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0212	10/2/2014	29	33	330	1	J	500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0213	10/2/2014	22	26	26	1	J	50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0223	2/4/2015	41	45	1800	1		1000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0226	2/4/2015	36	40	1600	1		1000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0227	2/4/2015	28	32	110	1	J	250	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0228	2/4/2015	36	40	1300	1	J	2000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0229	2/4/2015	28	32	13	1	J	200	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0230	2/4/2015	22	26	13	1	J	50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0231	2/4/2015	36	40	1600	1		200	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0232	2/4/2015	28	32	200	1	J	200	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0233	2/4/2015	22	26	88	1		50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0234	2/4/2015	36	40	450	1		100	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0235	2/4/2015	28	32	74	1	J	100	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0236	2/4/2015	22	26	20	1		10	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0245	2/5/2015	36	40	2100	1		100	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0246	2/5/2015	28	32	200	1		50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0247	2/5/2015	22	26	80	1		10	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0248	2/5/2015	36	40	610	1		50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0249	2/5/2015	28	32	930	1		200	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0250	2/5/2015	22	26	93	1		25	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0255	4/27/2015	41	45	3.2	1	J	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0259	4/27/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0260	4/27/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0262	4/28/2015	41	45	8.1	1	J	13	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0265	4/28/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0267	4/28/2015	28	32	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0269	4/28/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0272	4/28/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0932	2/23/2016	65.5	67.5	3500	1		500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0905	2/22/2016	24	26	9.3	1		5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0906	2/22/2016	68	70	380	1		250	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0915	2/22/2016	66.5	68.5	2000	1		1000	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0918	2/22/2016	30	30	10	1	L	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0920	2/22/2016	26.5	28.5	46	1		25	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0921	2/22/2016	69.5	71.5	500	1		250	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0922	2/22/2016	64.5	66.5	130	1		50	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0927	2/23/2016	71.5	73.5	2300	1		500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0928	2/23/2016	66.5	68.5	2700	1		500	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Trichloroethylene	PB-0931	2/23/2016	70.5	72.5	4600	1		500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	149-1001	2/6/2012	18	18	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	GW-MW27D-70_07182012	7/18/2012	70	70	300	1			ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	GW-MW27S-25_07182012	7/18/2012	25	25	0.5	0	U	0.5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	MW-27D-20130516	5/16/2013	70	70	79	1			ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	MW-27D-20131219	12/19/2013	70	70	110	1			ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	MW-27S-20130516	5/16/2013	25	25	0.5	0	U	0.5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0223	2/4/2015	41	45	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0211	10/2/2014	34	38	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0212	10/2/2014	29	33	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0213	10/2/2014	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0226	2/4/2015	36	40	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0227	2/4/2015	28	32	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0228	2/4/2015	36	40	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0229	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0230	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0231	2/4/2015	36	40	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0232	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0233	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0234	2/4/2015	36	40	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0235	2/4/2015	28	32	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0236	2/4/2015	22	26	10	0	U	10	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0245	2/5/2015	36	40	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0246	2/5/2015	28	32	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0247	2/5/2015	22	26	10	0	U	10	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0248	2/5/2015	36	40	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0249	2/5/2015	28	32	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0250	2/5/2015	22	26	25	0	U	25	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0255	4/27/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0259	4/27/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0260	4/27/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0262	4/28/2015	41	45	13	0	U	13	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0265	4/28/2015	41	45	12	1		5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0267	4/28/2015	28	32	12	1		2000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0269	4/28/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0272	4/28/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0932	2/23/2016	65.5	67.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0906	2/22/2016	68	70	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0915	2/22/2016	66.5	68.5	1000	0	U	1000	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0918	2/22/2016	30	30	250	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0920	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0921	2/22/2016	69.5	71.5	250	0	U	250	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0922	2/22/2016	64.5	66.5	50	0	U	50	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0927	2/23/2016	71.5	73.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0928	2/23/2016	66.5	68.5	500	0	U	500	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l
Cedarwood & Vacant & Groundwater & Vinyl chloride	PB-0931	2/23/2016	70.5	72.5	500	0	U	500	ug/l
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0135	2/3/2015	0	0.5	0.0047	0	U	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0214	2/3/2015	0	0.5	0.00032	1	J	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0127	2/3/2015	0.5	1	0.0056	0	U	0.0056	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0126	2/3/2015	0	0.5	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & cis-1,2-Dichloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0075	4/7/2014	1	1	0.0021	1	J	0.0048	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0135	2/3/2015	0	0.5	0.0033	1	J	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0126	2/3/2015	0	0.5	0.013	1		0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0216	2/3/2015	1	1.5	0.00083	1	J	0.0049	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0214	2/3/2015	0	0.5	0.0041	1	J	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0127	2/3/2015	0.5	1	0.0097	1		0.0056	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0128	2/3/2015	1.5	2	0.0013	1	J	0.0046	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0136	2/3/2015	1	1.5	0.00021	1	J	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0131	2/3/2015	0	0.5	0.0012	1	J	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0132	2/3/2015	1	1.5	0.00038	1	J	0.0059	mg/kg
Piermont & Surface Soil 0-2ft & Tetrachloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0214	2/3/2015	0	0.5	0.00041	1	J	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0135	2/3/2015	0	0.5	0.00028	1	J	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0126	2/3/2015	0	0.5	0.00044	1	J	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0127	2/3/2015	0.5	1	0.00066	1	J	0.0056	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg
Piermont & Surface Soil 0-2ft & Trichloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0135	2/3/2015	0	0.5	0.0047	0	U	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0126	2/3/2015	0	0.5	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0127	2/3/2015	0.5	1	0.0056	0	U	0.0056	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0214	2/3/2015	0	0.5	0.0054	0	U	0.0054	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & Surface Soil 0-2ft & Vinyl chloride	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0135	2/3/2015	0	0.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0214	2/3/2015	0	0.5	0.00032	1	J	0.0054	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0127	2/3/2015	0.5	1	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0126	2/3/2015	0	0.5	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0133	2/3/2015	2	2.5	0.0058	0	U	0.0058	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0138	2/3/2015	3	3.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0134	2/3/2015	3	3.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0123	2/3/2015	6.5	7	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0137	2/3/2015	2	2.5	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0218	2/3/2015	2	2.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0122	2/3/2015	5.5	6	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0080	4/7/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0129	2/3/2015	3	3.5	0.007	0	U	0.007	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0078	4/7/2014	8.5	8.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0113	4/8/2014	8.5	8.5	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0082	4/7/2014	9	9	0.0082	0	U	0.0082	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0076	4/7/2014	8	8	0.0063	0	U	0.0063	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0102	4/8/2014	8	8	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0074	4/7/2014	8	8	0.006	0	U	0.006	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0124	2/3/2015	2.5	3	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0072	4/7/2014	8.5	8.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0125	2/3/2015	4	4.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & cis-1,2-Dichloroethylene	PB-0115	4/8/2014	8.5	8.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0075	4/7/2014	1	1	0.0021	1	J	0.0048	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0135	2/3/2015	0	0.5	0.0033	1	J	0.0047	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0126	2/3/2015	0	0.5	0.013	1		0.0066	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0216	2/3/2015	1	1.5	0.00083	1	J	0.0049	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0214	2/3/2015	0	0.5	0.0041	1	J	0.0054	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0127	2/3/2015	0.5	1	0.0097	1		0.0056	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0128	2/3/2015	1.5	2	0.0013	1	J	0.0046	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0136	2/3/2015	1	1.5	0.00021	1	J	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0131	2/3/2015	0	0.5	0.0012	1	J	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0132	2/3/2015	1	1.5	0.00038	1	J	0.0059	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0076	4/7/2014	8	8	0.0063	0	U	0.0063	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0074	4/7/2014	8	8	0.006	0	U	0.006	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0078	4/7/2014	8.5	8.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0080	4/7/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0218	2/3/2015	2	2.5	0.0023	1	J	0.0055	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0072	4/7/2014	8.5	8.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0082	4/7/2014	9	9	0.0082	0	U	0.0082	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0124	2/3/2015	2.5	3	0.0013	1	J	0.0053	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0138	2/3/2015	3	3.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0113	4/8/2014	8.5	8.5	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0137	2/3/2015	2	2.5	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0115	4/8/2014	8.5	8.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0122	2/3/2015	5.5	6	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0134	2/3/2015	3	3.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0123	2/3/2015	6.5	7	0.007	1		0.0056	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0133	2/3/2015	2	2.5	0.0058	0	U	0.0058	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0125	2/3/2015	4	4.5	0.0018	1	J	0.0062	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0129	2/3/2015	3	3.5	0.0015	1	J	0.007	mg/kg
Piermont & All Soil 0-10ft & Tetrachloroethylene	PB-0102	4/8/2014	8	8	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0214	2/3/2015	0	0.5	0.00041	1	J	0.0054	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0135	2/3/2015	0	0.5	0.00028	1	J	0.0047	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0126	2/3/2015	0	0.5	0.00044	1	J	0.0066	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0127	2/3/2015	0.5	1	0.00066	1	J	0.0056	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0122	2/3/2015	5.5	6	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0218	2/3/2015	2	2.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0138	2/3/2015	3	3.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0137	2/3/2015	2	2.5	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0134	2/3/2015	3	3.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0133	2/3/2015	2	2.5	0.0058	0	U	0.0058	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0129	2/3/2015	3	3.5	0.007	0	U	0.007	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0125	2/3/2015	4	4.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0124	2/3/2015	2.5	3	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0123	2/3/2015	6.5	7	0.00045	1	J	0.0056	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0115	4/8/2014	8.5	8.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0113	4/8/2014	8.5	8.5	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0078	4/7/2014	8.5	8.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0072	4/7/2014	8.5	8.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0082	4/7/2014	9	9	0.0082	0	U	0.0082	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0074	4/7/2014	8	8	0.006	0	U	0.006	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0080	4/7/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0076	4/7/2014	8	8	0.0063	0	U	0.0063	mg/kg
Piermont & All Soil 0-10ft & Trichloroethylene	PB-0102	4/8/2014	8	8	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0114	4/8/2014	1	1	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0136	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0135	2/3/2015	0	0.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0132	2/3/2015	1	1.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0126	2/3/2015	0	0.5	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0127	2/3/2015	0.5	1	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0128	2/3/2015	1.5	2	0.0046	0	U	0.0046	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0101	4/8/2014	1	1	0.0066	0	U	0.0066	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0081	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0071	4/7/2014	1	1	0.0051	0	U	0.0051	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0222	2/3/2015	1	1.5	0.0047	0	U	0.0047	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0073	4/7/2014	0.5	0.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0221	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0075	4/7/2014	1	1	0.0048	0	U	0.0048	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0220	2/3/2015	1	1.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0077	4/7/2014	1	1	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0219	2/3/2015	0	0.5	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0079	4/7/2014	1	1	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0112	4/8/2014	1	1	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0216	2/3/2015	1	1.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0214	2/3/2015	0	0.5	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0110	4/8/2014	1	1	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0131	2/3/2015	0	0.5	0.0052	0	U	0.0052	mg/kg

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0111	4/8/2014	0	0	0.0057	0	U	0.0057	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0218	2/3/2015	2	2.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0074	4/7/2014	8	8	0.006	0	U	0.006	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0138	2/3/2015	3	3.5	0.0049	0	U	0.0049	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0137	2/3/2015	2	2.5	0.0054	0	U	0.0054	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0076	4/7/2014	8	8	0.0063	0	U	0.0063	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0134	2/3/2015	3	3.5	0.0059	0	U	0.0059	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0133	2/3/2015	2	2.5	0.0058	0	U	0.0058	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0123	2/3/2015	6.5	7	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0080	4/7/2014	8.5	8.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0125	2/3/2015	4	4.5	0.0062	0	U	0.0062	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0124	2/3/2015	2.5	3	0.0053	0	U	0.0053	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0078	4/7/2014	8.5	8.5	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0082	4/7/2014	9	9	0.0082	0	U	0.0082	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0072	4/7/2014	8.5	8.5	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0122	2/3/2015	5.5	6	0.005	0	U	0.005	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0115	4/8/2014	8.5	8.5	0.0052	0	U	0.0052	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0102	4/8/2014	8	8	0.0055	0	U	0.0055	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0113	4/8/2014	8.5	8.5	0.0056	0	U	0.0056	mg/kg
Piermont & All Soil 0-10ft & Vinyl chloride	PB-0129	2/3/2015	3	3.5	0.007	0	U	0.007	mg/kg
Piermont & Groundwater & cis-1,2-Dichloroethylene	149-1004	2/8/2012	20	20	2.39	1	J		ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	149-1005	2/8/2012	25	25	5.76	1			ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0140	9/29/2014	36	40	4.6	1	J	10	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0141	9/29/2014	18	22	0.55	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0142	9/29/2014	18	22	2.2	1	J	20	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0143	9/29/2014	36	40	42	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0144	9/29/2014	26	30	6.3	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0145	9/29/2014	18	22	2.9	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0146	9/29/2014	36	40	16	1	J	25	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0147	9/29/2014	26	30	1.4	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0148	9/29/2014	18	22	0.99	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0150	9/29/2014	36	40	18	1		10	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0151	9/29/2014	26	30	1.8	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0152	9/29/2014	18	22	0.75	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0153	9/29/2014	36	40	2.8	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0154	9/29/2014	26	30	0.25	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0155	9/29/2014	18	22	0.53	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0156	9/30/2014	33	37	0.28	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0157	9/30/2014	28	32	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0158	9/30/2014	23	27	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0159	9/30/2014	33	37	11	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0160	9/30/2014	28	32	0.44	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0161	9/30/2014	23	27	0.51	1	J	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0163	9/30/2014	36	40	15	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0164	9/30/2014	33	37	15	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0165	9/30/2014	28	32	1.3	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0166	9/30/2014	19	23	0.56	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0167	9/30/2014	36	40	8.1	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0168	9/30/2014	26	30	0.95	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0169	9/30/2014	20	24	0.48	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0170	10/1/2014	41	45	0.71	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0172	10/1/2014	36	40	43	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0173	10/1/2014	26	30	1.1	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0174	10/1/2014	21	25	1	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0175	10/1/2014	36	40	3.8	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0176	10/1/2014	26	30	0.61	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0177	10/1/2014	21	25	2.2	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0178	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0179	10/1/2014	31	35	5.7	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0180	10/1/2014	21	25	0.31	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0181	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0182	10/1/2014	31	35	1.9	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0183	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0185	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0186	10/1/2014	31	35	2.7	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0187	10/1/2014	22	26	0.3	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0188	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0189	10/1/2014	31	35	4.7	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0190	10/1/2014	22	26	0.23	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0191	10/1/2014	36	40	0.58	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0192	10/1/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0194	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0195	10/1/2014	31	35	1.6	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0196	10/1/2014	21	25	0.35	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0237	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0239	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0241	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0242	2/5/2015	36	40	51	1		5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0243	2/5/2015	26	30	4.6	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0244	2/5/2015	19	23	3.2	1	J	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0937	2/23/2016	25	27	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0938	2/23/2016	69	71	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0939	2/23/2016	36.5	38.5	50	0	U	50	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0940	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0941	2/23/2016	86.5	88.5	5	0	U	5	ug/l
Piermont & Groundwater & cis-1,2-Dichloroethylene	PB-0942	2/23/2016	81.5	83.5	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & Tetrachloroethylene	149-1004	2/8/2012	20	20	193	1			ug/l
Piermont & Groundwater & Tetrachloroethylene	149-1005	2/8/2012	25	25	4260	1			ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0140	9/29/2014	36	40	880	1		50	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0141	9/29/2014	18	22	140	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0142	9/29/2014	18	22	1200	1		100	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0143	9/29/2014	36	40	140	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0144	9/29/2014	26	30	29	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0145	9/29/2014	18	22	520	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0146	9/29/2014	36	40	2100	1		100	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0147	9/29/2014	26	30	510	1		25	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0148	9/29/2014	18	22	220	1		10	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0150	9/29/2014	36	40	950	1		50	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0151	9/29/2014	26	30	150	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0152	9/29/2014	18	22	66	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0153	9/29/2014	36	40	0.61	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0154	9/29/2014	26	30	0.53	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0155	9/29/2014	18	22	0.88	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0156	9/30/2014	33	37	4.2	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0157	9/30/2014	28	32	1.2	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0158	9/30/2014	23	27	1	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0159	9/30/2014	33	37	43	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0160	9/30/2014	28	32	6.4	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0161	9/30/2014	23	27	5.1	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0163	9/30/2014	36	40	170	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0164	9/30/2014	33	37	260	1		10	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0165	9/30/2014	28	32	52	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0166	9/30/2014	19	23	29	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0167	9/30/2014	36	40	71	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0168	9/30/2014	26	30	57	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0169	9/30/2014	20	24	18	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0170	10/1/2014	41	45	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0172	10/1/2014	36	40	320	1		20	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0173	10/1/2014	26	30	43	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0174	10/1/2014	21	25	8.4	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0175	10/1/2014	36	40	66	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0176	10/1/2014	26	30	10	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0177	10/1/2014	21	25	29	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0178	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0179	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0180	10/1/2014	21	25	0.45	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0181	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0182	10/1/2014	31	35	0.21	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0183	10/1/2014	22	26	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & Tetrachloroethylene	PB-0185	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0186	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0187	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0188	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0189	10/1/2014	31	35	0.32	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0190	10/1/2014	22	26	0.55	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0191	10/1/2014	36	40	1	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0192	10/1/2014	26	30	0.22	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0194	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0195	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0196	10/1/2014	21	25	0.97	1	J	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0237	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0239	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0241	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0242	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0243	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0244	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0937	2/23/2016	25	27	12	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0938	2/23/2016	69	71	9.1	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0939	2/23/2016	36.5	38.5	680	1		50	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0940	2/23/2016	31.5	33.5	34	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0941	2/23/2016	86.5	88.5	8.3	1		5	ug/l
Piermont & Groundwater & Tetrachloroethylene	PB-0942	2/23/2016	81.5	83.5	6.7	1		5	ug/l
Piermont & Groundwater & Trichloroethylene	149-1004	2/8/2012	20	20	1.96	1	J		ug/l
Piermont & Groundwater & Trichloroethylene	149-1005	2/8/2012	25	25	3.28	1	J		ug/l
Piermont & Groundwater & Trichloroethylene	PB-0140	9/29/2014	36	40	12	1		10	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0141	9/29/2014	18	22	1.4	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0142	9/29/2014	18	22	2.5	1	J	20	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0143	9/29/2014	36	40	3.3	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0144	9/29/2014	26	30	0.64	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0145	9/29/2014	18	22	1.9	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0146	9/29/2014	36	40	21	1	J	25	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0147	9/29/2014	26	30	1.7	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0148	9/29/2014	18	22	1.3	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0150	9/29/2014	36	40	9.4	1	J	10	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0151	9/29/2014	26	30	1.1	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0152	9/29/2014	18	22	0.6	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0153	9/29/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0154	9/29/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0155	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0156	9/30/2014	33	37	0.38	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0157	9/30/2014	28	32	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0158	9/30/2014	23	27	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & Trichloroethylene	PB-0159	9/30/2014	33	37	3.4	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0160	9/30/2014	28	32	0.3	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0161	9/30/2014	23	27	0.32	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0163	9/30/2014	36	40	9	1		5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0164	9/30/2014	33	37	13	1		5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0165	9/30/2014	28	32	1.6	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0166	9/30/2014	19	23	0.72	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0167	9/30/2014	36	40	0.86	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0168	9/30/2014	26	30	0.22	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0169	9/30/2014	20	24	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0170	10/1/2014	41	45	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0172	10/1/2014	36	40	5.6	1		5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0173	10/1/2014	26	30	0.55	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0174	10/1/2014	21	25	0.66	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0175	10/1/2014	36	40	2	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0176	10/1/2014	26	30	0.43	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0177	10/1/2014	21	25	1	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0178	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0179	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0180	10/1/2014	21	25	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0181	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0182	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0183	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0185	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0186	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0187	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0188	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0189	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0190	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0191	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0192	10/1/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0194	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0195	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0196	10/1/2014	21	25	0.25	1	J	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0237	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0239	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0241	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0242	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0243	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0244	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0937	2/23/2016	25	27	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0938	2/23/2016	69	71	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0939	2/23/2016	36.5	38.5	50	0	U	50	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & Trichloroethylene	PB-0940	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0941	2/23/2016	86.5	88.5	5	0	U	5	ug/l
Piermont & Groundwater & Trichloroethylene	PB-0942	2/23/2016	81.5	83.5	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	149-1004	2/8/2012	20	20	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	149-1005	2/8/2012	25	25	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0140	9/29/2014	36	40	10	0	U	10	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0141	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0142	9/29/2014	18	22	20	0	U	20	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0143	9/29/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0144	9/29/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0145	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0146	9/29/2014	36	40	25	0	U	25	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0147	9/29/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0148	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0150	9/29/2014	36	40	10	0	U	10	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0151	9/29/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0152	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0153	9/29/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0154	9/29/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0155	9/29/2014	18	22	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0156	9/30/2014	33	37	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0157	9/30/2014	28	32	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0158	9/30/2014	23	27	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0159	9/30/2014	33	37	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0160	9/30/2014	28	32	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0161	9/30/2014	23	27	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0163	9/30/2014	36	40	0.93	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0164	9/30/2014	33	37	0.67	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0165	9/30/2014	28	32	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0166	9/30/2014	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0167	9/30/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0168	9/30/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0169	9/30/2014	20	24	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0170	10/1/2014	41	45	12	1		5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0172	10/1/2014	36	40	1.4	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0173	10/1/2014	26	30	0.59	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0174	10/1/2014	21	25	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0175	10/1/2014	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0176	10/1/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0177	10/1/2014	21	25	0.74	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0178	10/1/2014	36	40	1.8	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0179	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0180	10/1/2014	21	25	5	0	U	5	ug/l

Table A-3: ProUCL Data Input
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Piermont & Groundwater & Vinyl chloride	PB-0181	10/1/2014	36	40	2	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0182	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0183	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0185	10/1/2014	36	40	0.66	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0186	10/1/2014	31	35	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0187	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0188	10/1/2014	36	40	1.9	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0189	10/1/2014	31	35	0.69	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0190	10/1/2014	22	26	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0191	10/1/2014	36	40	11	1		5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0192	10/1/2014	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0194	10/1/2014	36	40	1.3	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0195	10/1/2014	31	35	0.56	1	J	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0196	10/1/2014	21	25	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0237	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0239	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0241	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0242	2/5/2015	36	40	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0243	2/5/2015	26	30	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0244	2/5/2015	19	23	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0937	2/23/2016	25	27	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0938	2/23/2016	69	71	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0939	2/23/2016	36.5	38.5	50	0	U	50	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0940	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0941	2/23/2016	86.5	88.5	5	0	U	5	ug/l
Piermont & Groundwater & Vinyl chloride	PB-0942	2/23/2016	81.5	83.5	5	0	U	5	ug/l

ATTACHMENT B

USEPA REGIONAL SCREENING LEVELS – MAY 2016

CIS-1,2-DCE, PCE, TCE AND VC

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
											1.4E+09		0.013		Chromium, Total	7440-47-3								
				1.3E-02	I						1.4E+09		1	0.1	Clofentezine	74115-24-5					1.0E+03	4.3E+03		8.2E+02
		9.0E-03	P	3.0E-04	P	6.0E-06	P				1.4E+09		1		Cobalt	7440-48-4			4.2E+02	4.2E+02	2.3E+01		8.5E+03	2.3E+01
		6.2E-04	I					V	M				1		Coke Oven Emissions	8007-45-2								
				4.0E-02	H						1.4E+09		1		Copper	7440-50-8					3.1E+03			3.1E+03
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, m-	108-39-4					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, o-	95-48-7					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresol, p-	106-44-5					7.8E+03	3.3E+04	8.5E+08	6.3E+03
				1.0E-01	A						1.4E+09		1	0.1	Cresol, p-chloro-m-	59-50-7					7.8E+03	3.3E+04		6.3E+03
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresols	1319-77-3					7.8E+03	3.3E+04	8.5E+08	6.3E+03
1.9E+00	H			1.0E-03	P			V		1.7E+04	1.4E+09	1.9E+04	1		Crotonaldehyde, trans-	123-73-9	3.7E-01			3.7E-01	7.8E+01			7.8E+01
				1.0E-01	I	4.0E-01	I	V		2.7E+02	1.4E+09	6.2E+03	1		Cumene	98-82-8					7.8E+03		2.6E+03	1.9E+03
2.2E-01	C	6.3E-05	C								1.4E+09		1	0.1	Cupferron	135-20-6	3.2E+00	1.1E+01	6.1E+04	2.5E+00				
8.4E-01	H			2.0E-03	H						1.4E+09		1	0.1	Cyanazine	21725-46-2	8.3E-01	2.9E+00		6.5E-01	1.6E+02	6.6E+02		1.3E+02
															Cyanides									
				1.0E-03	I						1.4E+09		1		~Calcium Cyanide	592-01-8					7.8E+01			7.8E+01
				5.0E-03	I						1.4E+09		1		~Copper Cyanide	544-92-3					3.9E+02			3.9E+02
				6.0E-04	I	8.0E-04	S	V		9.5E+05	1.4E+09	5.3E+04	1		~Cyanide (CN-)	57-12-5					4.7E+01		4.4E+01	2.3E+01
				1.0E-03	I			V			1.4E+09		1		~Cyanogen	460-19-5					7.8E+01			7.8E+01
				9.0E-02	I			V			1.4E+09		1		~Cyanogen Bromide	506-68-3					7.0E+03			7.0E+03
				5.0E-02	I			V			1.4E+09		1		~Cyanogen Chloride	506-77-4					3.9E+03			3.9E+03
				6.0E-04	I	8.0E-04	I	V		1.0E+07	1.4E+09	5.2E+04	1		~Hydrogen Cyanide	74-90-8					4.7E+01		4.4E+01	2.3E+01
				2.0E-03	I						1.4E+09		1		~Potassium Cyanide	151-50-8					1.6E+02			1.6E+02
				5.0E-03	I						1.4E+09		0.04		~Potassium Silver Cyanide	506-61-6					3.9E+02			3.9E+02
				1.0E-01	I						1.4E+09		0.04		~Silver Cyanide	506-64-9					7.8E+03			7.8E+03
				1.0E-03	I						1.4E+09		1		~Sodium Cyanide	143-33-9					7.8E+01			7.8E+01
				2.0E-04	P						1.4E+09		1		~Thiocyanates	NA					1.6E+01			1.6E+01
				2.0E-04	X			V			1.4E+09		1		~Thiocyanic Acid	463-56-9					1.6E+01			1.6E+01
				5.0E-02	I						1.4E+09		1		~Zinc Cyanide	557-21-1					3.9E+03			3.9E+03
						6.0E+00	I	V		1.2E+02	1.4E+09	1.0E+03	1		Cyclohexane	110-82-7							6.5E+03	6.5E+03
2.3E-02	H										1.4E+09		1	0.1	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	3.0E+01	1.1E+02		2.4E+01				
				5.0E+00	I	7.0E-01	P	V		5.1E+03	1.4E+09	4.2E+04	1		Cyclohexanone	108-94-1					3.9E+05		3.0E+04	2.8E+04
				5.0E-03	P	1.0E+00	X	V		2.8E+02	1.4E+09	1.5E+03	1		Cyclohexene	110-83-8					3.9E+02		1.5E+03	3.1E+02
				2.0E-01	I			V		2.9E+05	1.4E+09	7.5E+04	1		Cyclohexylamine	108-91-8					1.6E+04			1.6E+04
				2.5E-02	I						1.4E+09		1	0.1	Cyfluthrin	68359-37-5					2.0E+03	8.2E+03		1.6E+03
				5.0E-03	I						1.4E+09		1	0.1	Cyhalothrin	68085-85-8					3.9E+02	1.6E+03		3.2E+02
				1.0E-02	I						1.4E+09		1	0.1	Cypermethrin	52315-07-8					7.8E+02	3.3E+03		6.3E+02
				7.5E-03	I						1.4E+09		1	0.1	Cyromazine	66215-27-8					5.9E+02	2.5E+03		4.7E+02
2.4E-01	I	6.9E-05	C								1.4E+09		1	0.1	DDD	72-54-8	2.9E+00	1.0E+01	5.5E+04	2.3E+00				
3.4E-01	I	9.7E-05	C					V			1.4E+09	2.1E+06	1		DDE, p,p'-	72-55-9	2.0E+00		6.1E+01	2.0E+00				
3.4E-01	I	9.7E-05	I	5.0E-04	I						1.4E+09		1	0.03	DDT	50-29-3	2.0E+00	2.4E+01	3.9E+04	1.9E+00	3.9E+01	5.5E+02		3.7E+01
				3.0E-02	I						1.4E+09		1	0.1	Dalapon	75-99-0					2.3E+03	9.9E+03		1.9E+03
1.8E-02	C	5.1E-06	C	1.5E-01	I						1.4E+09		1	0.1	Daminozide	1596-84-5	3.9E+01	1.4E+02	7.5E+05	3.0E+01	1.2E+04	4.9E+04		9.5E+03
7.0E-04	I			7.0E-03	I						1.4E+09		1	0.1	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	9.9E+02	3.5E+03		7.8E+02	5.5E+02	2.3E+03		4.4E+02
				4.0E-05	I						1.4E+09		1	0.1	Demeton	8065-48-3					3.1E+00	1.3E+01		2.5E+00
1.2E-03	I			6.0E-01	I						1.4E+09		1	0.1	Di(2-ethylhexyl)adipate	103-23-1	5.8E+02	2.1E+03		4.5E+02	4.7E+04	2.0E+05		3.8E+04
6.1E-02	H										1.4E+09		1	0.1	Diallate	2303-16-4	1.1E+01	4.1E+01		8.9E+00				
				7.0E-04	A						1.4E+09		1	0.1	Diazinon	333-41-5					5.5E+01	2.3E+02		4.4E+01
				1.0E-02	X			V			1.4E+09	5.2E+05	1		Dibenzothiophene	132-65-0					7.8E+02			7.8E+02
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	9.8E+02	1.4E+09	3.2E+04	1		Dibromo-3-chloropropane, 1,2-	96-12-8	1.9E-01		5.4E-03	5.3E-03	1.6E+01		6.7E+00	4.7E+00
				4.0E-04	X			V		1.6E+02	1.4E+09	1.9E+04	1		Dibromobenzene, 1,3-	108-36-1					3.1E+01			3.1E+01
				1.0E-02	I			V			1.4E+09	2.2E+04	1		Dibromobenzene, 1,4-	106-37-6					7.8E+02			7.8E+02
8.4E-02	I			2.0E-02	I			V		8.0E+02	1.4E+09	8.0E+03	1		Dibromochloromethane	124-48-1	8.3E+00			8.3E+00	1.6E+03			1.6E+03
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1.3E+03	1.4E+09	8.6E+03	1		Dibromoethane, 1,2-	106-93-4	3.5E-01		4.0E-02	3.6E-02	7.0E+02		8.1E+01	7.3E+01
						4.0E-03	X	V		2.8E+03	1.4E+09	5.6E+03	1		Dibromomethane (Methylene Bromide)	74-95-3							2.4E+01	2.4E+01
				3.0E-04	P						1.4E+09		1	0.1	Dibutyltin Compounds	NA					2.3E+01	9.9E+01		1.9E+01
				3.0E-02	I						1.4E+09		1	0.1	Dicamba	1918-00-9					2.3E+03	9.9E+03		1.9E+03
		4.2E-03	P					V		5.5E+02	1.4E+09	3.2E+03	1		Dichloro-2-butene, 1,4-	764-41-0			2.1E-03	2.1E-03				
		4.2E-03	P					V		5.2E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, cis-1,4-	1476-11-5			7.4E-03	7.4E-03				
		4.2E-03	P					V		7.6E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, trans-1,4-	110-57-6			7.4E-03	7.4E-03				
5.0E-02	I			4.0E-03	I						1.4E+09		1	0.1	Dichloroacetic Acid	79-43-6	1.4E+01	4.9E+01		1.1E+01	3.1E+02	1.3E+03		2.5E+02
				9.0E-02	I	2.0E-01	H	V		3.8E+02	1.4E+09	1.2E+04	1		Dichlorobenzene, 1,2-	95-50-1					7.0E+03		2.4E+03	1.8E+03
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V			1.4E+09	1.0E+04	1		Dichlorobenzene, 1,4-	106-46-7	1.3E+02		2.7E+00	2.6E+00	5.5E+03		8.7E+03	3.4E+03
4.5E-01	I	3.4E-04	C								1.4E+09		1	0.1	Dichlorobenzidine, 3,3'-	91-94-1	1.5E+00	5.5E+00	1.1E+04	1.2E+00				
				9.0E-03	X						1.4E+09		1	0.1	Dichlorobenzophenone, 4,4'-	90-98-2					7.0E+02	3.0E+03		5.7E+02
				2.0E-01	I	1.0E-01	X	V		8.5E+02	1.4E+09	8.4E+02	1		Dichlorodifluoromethane	75-71-8					1.6E+04		8.8E+01	8.7E+01
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1.7E+03	1.4E+09	2.1E+03	1		Dichloroethane, 1,1-	75-34-3	1.2E+02		3.7E+00	3.6E+00	1.6E+04			1.6E+04
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		3.0E+03	1.4E+09	4.6E+03	1		Dichloroethane, 1,2-	107-06-2	7.6E+00		4.9E-01	4.6E-01	4.7E+02		3.3E+01	3.1E+01
				5.0E-02	I	2.0E-01	I	V		1.2E+03	1.4E+09	1.2E+03	1		Dichloroethylene, 1,1-	75-35-4					3.9E+03		2.4E+02	2.3E+02
				2.0E-03	I			V		2.4E+03	1.4E+09	2.5E+03	1		Dichloroethylene, 1,2-cis-	156-59-2					1.6E+02			1.6E+02
				2.0E-02	I			V		1.9E+03	1.4E+09	1.8E+03	1		Dichloroethylene, 1,2-trans-	156-60-5					1.6E+03			1.6E+03
				3.0E-03	I						1.4E+09		1	0.1	Dichlorophenol, 2,4-	120-83-2					2.3E+02	9.9E+02		1.9E+02
				1.0E-02	I						1.4E+09		1	0.05	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					7.8E+02	6.6E+03		7.0E+02
				8.0E-03	I						1.4E+09		1	0.1	Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6					6.3E+02	2.6E+03		5.1E+02
3.6E-02	C	1.0E-05	C	9.0E-02	A	4.0E-03	I	V		1.4E+03	1.4E+09	3.8E+03	1		Dichloropropane, 1,2-	78-87-5	1.9E+01		1.1E+00	1.0E+00	7.0E+03		1.6E+01	1.6E+01

TR=1E-06
HQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				5.0E-03	I	2.0E-02	C				1.4E+09		1		Selenium	7782-49-2					3.9E+02		2.8E+07	3.9E+02
				5.0E-03	C	2.0E-02	C				1.4E+09		1		Selenium Sulfide	7446-34-6					3.9E+02		2.8E+07	3.9E+02
				9.0E-02	I						1.4E+09		1	0.1	Sethoxydim	74051-80-2					7.0E+03	3.0E+04		5.7E+03
						3.0E-03	C				1.4E+09		1		Silica (crystalline, respirable)	7631-86-9							4.3E+06	4.3E+06
				5.0E-03	I						1.4E+09		0.04		Silver	7440-22-4					3.9E+02			3.9E+02
1.2E-01	H			5.0E-03	I						1.4E+09		1	0.1	Simazine	122-34-9	5.8E+00	2.1E+01		4.5E+00	3.9E+02	1.6E+03		3.2E+02
				1.3E-02	I						1.4E+09		1	0.1	Sodium Acifluorfen	62476-59-9					1.0E+03	4.3E+03		8.2E+02
				4.0E-03	I						1.4E+09		1		Sodium Azide	26628-22-8					3.1E+02			3.1E+02
5.0E-01	C	1.5E-01	C	2.0E-02	C	2.0E-04	C		M		1.4E+09		0.025		Sodium Dichromate	10588-01-9	3.1E-01		9.2E+00	3.0E-01	1.6E+03		2.8E+05	1.6E+03
2.7E-01	H			3.0E-02	I						1.4E+09		1	0.1	Sodium Diethyldithiocarbamate	148-18-5	2.6E+00	9.2E+00		2.0E+00	2.3E+03	9.9E+03		1.9E+03
				5.0E-02	A	1.3E-02	C				1.4E+09		1		Sodium Fluoride	7681-49-4					3.9E+03		1.8E+07	3.9E+03
				2.0E-05	I						1.4E+09		1	0.1	Sodium Fluoroacetate	62-74-8					1.6E+00	6.6E+00		1.3E+00
				1.0E-03	H						1.4E+09		1		Sodium Metavanadate	13718-26-8					7.8E+01			7.8E+01
				8.0E-04	P						1.4E+09		1		Sodium Tungstate	13472-45-2					6.3E+01			6.3E+01
				8.0E-04	P						1.4E+09		1		Sodium Tungstate Dihydrate	10213-10-2					6.3E+01			6.3E+01
2.4E-02	H			3.0E-02	I						1.4E+09		1	0.1	Stirofos (Tetrachlorovinphos)	961-11-5	2.9E+01	1.0E+02		2.3E+01	2.3E+03	9.9E+03		1.9E+03
5.0E-01	C	1.5E-01	C	2.0E-02	C	2.0E-04	C		M		1.4E+09		0.025		Strontium Chromate	7789-06-2	3.1E-01		9.2E+00	3.0E-01	1.6E+03		2.8E+05	1.6E+03
				6.0E-01	I						1.4E+09		1		Strontium, Stable	7440-24-6					4.7E+04			4.7E+04
				3.0E-04	I						1.4E+09		1	0.1	Strychnine	57-24-9					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	I	1.0E+00	I	V		8.7E+02	1.4E+09	9.4E+03	1		Styrene	100-42-5					1.6E+04		9.7E+03	6.0E+03
				3.0E-03	P						1.4E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer	NA					2.3E+02	9.9E+02		1.9E+02
				1.0E-03	P	2.0E-03	X				1.4E+09		1	0.1	Sulfolane	126-33-0					7.8E+01	3.3E+02	2.8E+06	6.3E+01
				8.0E-04	P						1.4E+09		1	0.1	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					6.3E+01	2.6E+02		5.1E+01
						1.0E-03	C	V			1.4E+09		1		Sulfur Trioxide	7446-11-9							1.4E+06	1.4E+06
						1.0E-03	C				1.4E+09		1		Sulfuric Acid	7664-93-9							1.4E+06	1.4E+06
2.5E-02	I	7.1E-06	I	5.0E-02	H						1.4E+09		1	0.1	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	2.8E+01	9.9E+01	5.4E+05	2.2E+01	3.9E+03	1.6E+04		3.2E+03
				3.0E-02	H						1.4E+09		1	0.1	TCMTB	21564-17-0					2.3E+03	9.9E+03		1.9E+03
				7.0E-02	I						1.4E+09		1	0.1	Tebuthiuron	34014-18-1					5.5E+03	2.3E+04		4.4E+03
				2.0E-02	H						1.4E+09		1	0.1	Temephos	3383-96-8					1.6E+03	6.6E+03		1.3E+03
				1.3E-02	I						1.4E+09		1	0.1	Terbacil	5902-51-2					1.0E+03	4.3E+03		8.2E+02
				2.5E-05	H			V		3.1E+01	1.4E+09	2.6E+05	1		Terbufos	13071-79-9					2.0E+00			2.0E+00
				1.0E-03	I						1.4E+09		1	0.1	Terbutryn	886-50-0					7.8E+01	3.3E+02		6.3E+01
				1.0E-04	I						1.4E+09		1	0.1	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					7.8E+00	3.3E+01		6.3E+00
				3.0E-04	I			V			1.4E+09	5.1E+04	1		Tetrachlorobenzene, 1,2,4,5-	95-94-3					2.3E+01			2.3E+01
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		6.8E+02	1.4E+09	5.7E+03	1		Tetrachloroethane, 1,1,1,2-	630-20-6	2.7E+01		2.2E+00	2.0E+00	2.3E+03			2.3E+03
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1.9E+03	1.4E+09	1.5E+04	1		Tetrachloroethane, 1,1,2,2-	79-34-5	3.5E+00		7.3E-01	6.0E-01	1.6E+03			1.6E+03
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		1.7E+02	1.4E+09	2.4E+03	1		Tetrachloroethylene	127-18-4	3.3E+02		2.5E+01	2.4E+01	4.7E+02		9.8E+01	8.1E+01
				3.0E-02	I						1.4E+09		1	0.1	Tetrachlorophenol, 2,3,4,6-	58-90-2					2.3E+03	9.9E+03		1.9E+03
2.0E+01	H							V			1.4E+09	1.1E+05	1		Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	3.5E-02			3.5E-02				
				5.0E-04	I						1.4E+09		1	0.1	Tetraethyl Dithiopyrophosphate	3689-24-5					3.9E+01	1.6E+02		3.2E+01
						8.0E+01	I	V		2.1E+03	1.4E+09	1.2E+03	1		Tetrafluoroethane, 1,1,1,2-	811-97-2							1.0E+05	1.0E+05
				2.0E-03	P						1.4E+09		1	0.0007	Tetryl (Trinitrophenylmethylnitramine)	479-45-8					1.6E+02	1.0E+05		1.6E+02
				2.0E-05	S						1.4E+09		1		Thallic Oxide	1314-32-5					1.6E+00			1.6E+00
				1.0E-05	X						1.4E+09		1		Thallium (I) Nitrate	10102-45-1					7.8E-01			7.8E-01
				1.0E-05	X						1.4E+09		1		Thallium (Soluble Salts)	7440-28-0					7.8E-01			7.8E-01
				1.0E-05	X			V			1.4E+09		1		Thallium Acetate	563-68-8					7.8E-01			7.8E-01
				2.0E-05	X			V			1.4E+09		1		Thallium Carbonate	6533-73-9					1.6E+00			1.6E+00
				1.0E-05	X						1.4E+09		1		Thallium Chloride	7791-12-0					7.8E-01			7.8E-01
				1.0E-05	S						1.4E+09		1		Thallium Selenite	12039-52-0					7.8E-01			7.8E-01
				2.0E-05	X						1.4E+09		1		Thallium Sulfate	7446-18-6					1.6E+00			1.6E+00
				1.3E-02	I						1.4E+09		1	0.1	Thifensulfuron-methyl	79277-27-3					1.0E+03	4.3E+03		8.2E+02
				1.0E-02	I						1.4E+09		1	0.1	Thiobencarb	28249-77-6					7.8E+02	3.3E+03		6.3E+02
				7.0E-02	X						1.4E+09		1	0.0075	Thiodiglycol	111-48-8					5.5E+03	3.1E+05		5.4E+03
				3.0E-04	H						1.4E+09		1	0.1	Thiofanox	39196-18-4					2.3E+01	9.9E+01		1.9E+01
				8.0E-02	I						1.4E+09		1	0.1	Thiophanate, Methyl	23564-05-8					6.3E+03	2.6E+04		5.1E+03
				5.0E-03	I						1.4E+09		1	0.1	Thiram	137-26-8					3.9E+02	1.6E+03		3.2E+02
				6.0E-01	H						1.4E+09		1		Tin	7440-31-5					4.7E+04			4.7E+04
						1.0E-04	A	V			1.4E+09		1		Titanium Tetrachloride	7550-45-0							1.4E+05	1.4E+05
				8.0E-02	I	5.0E+00	I	V		8.2E+02	1.4E+09	4.3E+03	1		Toluene	108-88-3					6.3E+03		2.2E+04	4.9E+03
		1.1E-05	C			8.0E-06	C	V			1.4E+09	7.6E+05	1		Toluene-2,4-diisocyante	584-84-9			1.9E+02	1.9E+02			6.4E+00	6.4E+00
1.8E-01	X			2.0E-04	X						1.4E+09		1	0.1	Toluene-2,5-diamine	95-70-5	3.9E+00	1.4E+01		3.0E+00	1.6E+01	6.6E+01		1.3E+01
		1.1E-05	C			8.0E-06	C	V		1.7E+03	1.4E+09	6.3E+05	1		Toluene-2,6-diisocyante	91-08-7			1.6E+02	1.6E+02			5.3E+00	5.3E+00
1.6E-02	P	5.1E-05	C								1.4E+09		1	0.1	Toluidine, o- (Methylaniline, 2-)	95-53-4	4.3E+01	1.5E+02	7.5E+04	3.4E+01				
3.0E-02	P			4.0E-03	X						1.4E+09		1	0.1	Toluidine, p-	106-49-0	2.3E+01	8.2E+01		1.8E+01	3.1E+02	1.3E+03		2.5E+02
				3.0E+00	P			V		3.4E-01	1.4E+09	1.1E+03	1		Total Petroleum Hydrocarbons (Aliphatic High)	NA					2.3E+05			2.3E+05
						6.0E-01	P	V		1.4E+02	1.4E+09	8.3E+02	1		Total Petroleum Hydrocarbons (Aliphatic Low)	NA							5.2E+02	5.2E+02
				1.0E-02	X	1.0E-01	P	V		6.9E+00	1.4E+09	1.0E+03	1		Total Petroleum Hydrocarbons (Aliphatic Medium)	NA					7.8E+02		1.1E+02	9.6E+01
				4.0E-02	P						1.4E+09		1	0.1	Total Petroleum Hydrocarbons (Aromatic High)	NA					3.1E+03	1.3E+04		2.5E+03
				4.0E-03	P	3.0E-02	P	V		1.8E+03	1.4E+09	3.5E+03	1		Total Petroleum Hydrocarbons (Aromatic Low)	NA					3.1E+02		1.1E+02	8.2E+01
				4.0E-03	P	3.0E-03	P	V			1.4E+09	5.2E+04	1		Total Petroleum Hydrocarbons (Aromatic Medium)	NA					3.1E+02		1.6E+02	1.1E+02
1.1E+00	I	3.2E-04	I								1.4E+09		1	0.1	Toxaphene	8001-35-2	6.3E-01	2.2E+00	1.2E+04	4.9E-01				
				7.5E-03	I						1.4E+09		1	0.1	Tralomethrin	66841-25-6					5.9E+02	2.5E+03		4.7E+02
				3.0E-04	A			V			1.4E+09	3.4E+03	1		Tri-n-butyltin	688-73-3					2.3E+01			2.3E+01
				8.0E+01	X						1.4E+09		1	0.1	Triacetin	102-76-1					6.3E+06	2.6E+07		5.1E+06
				3.0E-02	I						1.4E+09		1	0.1	Triadimefon	43121-43-3					2.3E+03	9.9E+03		1.9E+03

TR=1E-0
THQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				1.3E-02	I			V			1.4E+09	3.6E+05	1		Triallate	2303-17-5					1.0E+03			1.0E+03
				1.0E-02	I						1.4E+09		1	0.1	Triasulfuron	82097-50-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.4E+09		1	0.1	Tribenuron-methyl	101200-48-0					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V			1.4E+09	4.8E+04	1		Tribromobenzene, 1,2,4-	615-54-3					3.9E+02			3.9E+02
9.0E-03	P			1.0E-02	P						1.4E+09		1	0.1	Tributyl Phosphate	126-73-8	7.7E+01	2.7E+02		6.0E+01	7.8E+02	3.3E+03		6.3E+02
				3.0E-04	P						1.4E+09		1	0.1	Tributyltin Compounds	NA					2.3E+01	9.9E+01		1.9E+01
				3.0E-04	I						1.4E+09		1	0.1	Tributyltin Oxide	56-35-9					2.3E+01	9.9E+01		1.9E+01
				3.0E+01	I	3.0E+01	H	V		9.1E+02	1.4E+09	1.3E+03	1		Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					2.3E+06		4.0E+04	4.0E+04
7.0E-02	I			2.0E-02	I						1.4E+09		1	0.1	Trichloroacetic Acid	76-03-9	9.9E+00	3.5E+01		7.8E+00	1.6E+03	6.6E+03		1.3E+03
2.9E-02	H										1.4E+09		1	0.1	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.4E+01	8.5E+01		1.9E+01				
7.0E-03	X			3.0E-05	X						1.4E+09		1	0.1	Trichloroaniline, 2,4,6-	634-93-5	9.9E+01	3.5E+02		7.8E+01	2.3E+00	9.9E+00		1.9E+00
				8.0E-04	X			V			1.4E+09	3.2E+04	1		Trichlorobenzene, 1,2,3-	87-61-6					6.3E+01			6.3E+01
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		4.0E+02	1.4E+09	3.0E+04	1		Trichlorobenzene, 1,2,4-	120-82-1	2.4E+01			2.4E+01	7.8E+02		6.2E+01	5.8E+01
				2.0E+00	I	5.0E+00	I	V		6.4E+02	1.4E+09	1.7E+03	1		Trichloroethane, 1,1,1-	71-55-6					1.6E+05		8.6E+03	8.1E+03
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		2.2E+03	1.4E+09	7.2E+03	1		Trichloroethane, 1,1,2-	79-00-5	1.2E+01		1.3E+00	1.1E+00	3.1E+02		1.5E+00	1.5E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	6.9E+02	1.4E+09	2.2E+03	1		Trichloroethylene	79-01-6	8.8E+00		1.1E+00	9.4E-01	3.9E+01		4.6E+00	4.1E+00
				3.0E-01	I			V		1.2E+03	1.4E+09	1.0E+03	1		Trichlorofluoromethane	75-69-4					2.3E+04			2.3E+04
				1.0E-01	I						1.4E+09		1	0.1	Trichlorophenol, 2,4,5-	95-95-4					7.8E+03	3.3E+04		6.3E+03
1.1E-02	I	3.1E-06	I	1.0E-03	P						1.4E+09		1	0.1	Trichlorophenol, 2,4,6-	88-06-2	6.3E+01	2.2E+02	1.2E+06	4.9E+01	7.8E+01	3.3E+02		6.3E+01
				1.0E-02	I						1.4E+09		1	0.1	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.4E+09		1	0.1	Trichlorophenoxypropionic acid, -2,4,5	93-72-1					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V		1.3E+03	1.4E+09	1.5E+04	1		Trichloropropane, 1,1,2-	598-77-6					3.9E+02			3.9E+02
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1.4E+03	1.4E+09	1.6E+04	1		Trichloropropane, 1,2,3-	96-18-4	5.1E-03			5.1E-03	3.1E+02		4.9E+00	4.8E+00
				3.0E-03	X	3.0E-04	P	V		3.1E+02	1.4E+09	2.3E+03	1		Trichloropropene, 1,2,3-	96-19-5					2.3E+02		7.3E-01	7.3E-01
				2.0E-02	A						1.4E+09		1	0.1	Tricresyl Phosphate (TCP)	1330-78-5					1.6E+03	6.6E+03		1.3E+03
				3.0E-03	I						1.4E+09		1	0.1	Tridiphane	58138-08-2					2.3E+02	9.9E+02		1.9E+02
						7.0E-03	I	V		2.8E+04	1.4E+09	1.6E+04	1		Triethylamine	121-44-8							1.2E+02	1.2E+02
				2.0E+00	P						1.4E+09		1	0.1	Triethylene Glycol	112-27-6					1.6E+05	6.6E+05		1.3E+05
						2.0E+01	P	V		4.8E+03	1.4E+09	7.1E+02	1		Trifluoroethane, 1,1,1-	420-46-2							1.5E+04	1.5E+04
7.7E-03	I			7.5E-03	I			V			1.4E+09	5.1E+05	1		Trifluralin	1582-09-8	9.0E+01			9.0E+01	5.9E+02			5.9E+02
2.0E-02	P			1.0E-02	P						1.4E+09		1	0.1	Trimethyl Phosphate	512-56-1	3.5E+01	1.2E+02		2.7E+01	7.8E+02	3.3E+03		6.3E+02
						5.0E-03	P	V		2.9E+02	1.4E+09	9.4E+03	1		Trimethylbenzene, 1,2,3-	526-73-8							4.9E+01	4.9E+01
						7.0E-03	P	V		2.2E+02	1.4E+09	7.9E+03	1		Trimethylbenzene, 1,2,4-	95-63-6							5.8E+01	5.8E+01
				1.0E-02	X			V		1.8E+02	1.4E+09	6.6E+03	1		Trimethylbenzene, 1,3,5-	108-67-8					7.8E+02			7.8E+02
				1.0E-02	X			V		3.0E+01	1.4E+09	1.0E+03	1		Trimethylpentene, 2,4,4-	25167-70-8					7.8E+02			7.8E+02
				3.0E-02	I						1.4E+09		1	0.019	Trinitrobenzene, 1,3,5-	99-35-4					2.3E+03	5.2E+04		2.2E+03
3.0E-02	I			5.0E-04	I						1.4E+09		1	0.032	Trinitrotoluene, 2,4,6-	118-96-7	2.3E+01	2.6E+02		2.1E+01	3.9E+01	5.2E+02		3.6E+01
				2.0E-02	P						1.4E+09		1	0.1	Triphenylphosphine Oxide	791-28-6					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	A						1.4E+09		1	0.1	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8					1.6E+03	6.6E+03		1.3E+03
				1.0E-02	X						1.4E+09		1	0.1	Tris(1-chloro-2-propyl)phosphate	13674-84-5					7.8E+02	3.3E+03		6.3E+02
2.3E+00	C	6.6E-04	C					V		4.7E+02	1.4E+09	9.0E+05	1		Tris(2,3-dibromopropyl)phosphate	126-72-7	3.0E-01		3.8E+00	2.8E-01				
2.0E-02	P			7.0E-03	P						1.4E+09		1	0.1	Tris(2-chloroethyl)phosphate	115-96-8	3.5E+01	1.2E+02		2.7E+01	5.5E+02	2.3E+03		4.4E+02
3.2E-03	P			1.0E-01	P						1.4E+09		1	0.1	Tris(2-ethylhexyl)phosphate	78-42-2	2.2E+02	7.7E+02		1.7E+02	7.8E+03	3.3E+04		6.3E+03
				8.0E-04	P						1.4E+09		1		Tungsten	7440-33-7					6.3E+01			6.3E+01
				3.0E-03	I	4.0E-05	A				1.4E+09		1		Uranium (Soluble Salts)	NA					2.3E+02		5.7E+04	2.3E+02
1.0E+00	C	2.9E-04	C						M		1.4E+09		1	0.1	Urethane	51-79-6	1.5E-01	6.0E-01	4.8E+03	1.2E-01				
		8.3E-03	P	9.0E-03	I	7.0E-06	P				1.4E+09		0.026		Vanadium Pentoxide	1314-62-1			4.6E+02	4.6E+02	7.0E+02		9.9E+03	6.6E+02
				5.0E-03	S	1.0E-04	A				1.4E+09		0.026		Vanadium and Compounds	7440-62-2					3.9E+02		1.4E+05	3.9E+02
				1.0E-03	I			V			1.4E+09	1.2E+05	1		Vernolate	1929-77-7					7.8E+01			7.8E+01
				2.5E-02	I						1.4E+09		1	0.1	Vinclozolin	50471-44-8					2.0E+03	8.2E+03		1.6E+03
				1.0E+00	H	2.0E-01	I	V		2.8E+03	1.4E+09	4.4E+03	1		Vinyl Acetate	108-05-4					7.8E+04		9.2E+02	9.1E+02
		3.2E-05	H			3.0E-03	I	V		2.5E+03	1.4E+09	1.4E+03	1		Vinyl Bromide	593-60-2			1.2E-01	1.2E-01			4.3E+00	4.3E+00
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	3.9E+03	1.4E+09	9.6E+02	1		Vinyl Chloride	75-01-4	9.4E-02		1.6E-01	5.9E-02	2.3E+02		1.0E+02	7.0E+01
				3.0E-04	I						1.4E+09		1	0.1	Warfarin	81-81-2					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	S	1.0E-01	S	V		3.9E+02	1.4E+09	5.6E+03	1		Xylene, P-	106-42-3					1.6E+04		5.8E+02	5.6E+02
				2.0E-01	S	1.0E-01	S	V		3.9E+02	1.4E+09	5.5E+03	1		Xylene, m-	108-38-3					1.6E+04		5.7E+02	5.5E+02
				2.0E-01	S	1.0E-01	S	V		4.3E+02	1.4E+09	6.5E+03	1		Xylene, o-	95-47-6					1.6E+04		6.7E+02	6.5E+02
				2.0E-01	I	1.0E-01	I	V		2.6E+02	1.4E+09	5.7E+03	1		Xylenes	1330-20-7					1.6E+04		6.0E+02	5.8E+02
				3.0E-04	I						1.4E+09		1		Zinc Phosphide	1314-84-7					2.3E+01			2.3E+01
				3.0E-01	I						1.4E+09		1		Zinc and Compounds	7440-66-6					2.3E+04			2.3E+04
				5.0E-02	I						1.4E+09		1	0.1	Zineb	12122-67-7					3.9E+03	1.6E+04		3.2E+03
				8.0E-05	X						1.4E+09		1		Zirconium	7440-67-7					6.3E+00			6.3E+00

TR=1E-0
HQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information																Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)
		9.0E-03	P	3.0E-04	P	6.0E-06	P				1.4E+09		1		Cobalt	7440-48-4			1.9E+03	1.9E+03	3.5E+02		3.6E+04	3.5E+02
		6.2E-04	I					V	M				1		Coke Oven Emissions	8007-45-2								
				4.0E-02	H						1.4E+09		1		Copper	7440-50-8					4.7E+04			4.7E+04
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, m-	108-39-4					5.8E+04	1.4E+05	3.6E+09	4.1E+04
				5.0E-02	I	6.0E-01	C				1.4E+09		1	0.1	Cresol, o-	95-48-7					5.8E+04	1.4E+05	3.6E+09	4.1E+04
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresol, p-	106-44-5					1.2E+05	2.8E+05	3.6E+09	8.2E+04
				1.0E-01	A						1.4E+09		1	0.1	Cresol, p-chloro-m-	59-50-7					1.2E+05	2.8E+05		8.2E+04
				1.0E-01	A	6.0E-01	C				1.4E+09		1	0.1	Cresols	1319-77-3					1.2E+05	2.8E+05	3.6E+09	8.2E+04
1.9E+00	H			1.0E-03	P			V		1.7E+04	1.4E+09	1.9E+04	1		Crotonaldehyde, trans-	123-73-9	1.7E+00			1.7E+00	1.2E+03			1.2E+03
				1.0E-01	I	4.0E-01	I	V		2.7E+02	1.4E+09	6.2E+03	1		Cumene	98-82-8					1.2E+05		1.1E+04	9.9E+03
2.2E-01	C	6.3E-05	C								1.4E+09		1	0.1	Cupferron	135-20-6	1.5E+01	3.5E+01	2.6E+05	1.0E+01				
8.4E-01	H			2.0E-03	H						1.4E+09		1	0.1	Cyanazine	21725-46-2	3.9E+00	9.2E+00		2.7E+00	2.3E+03	5.5E+03		1.6E+03
															Cyanides									
				1.0E-03	I						1.4E+09		1		~Calcium Cyanide	592-01-8					1.2E+03			1.2E+03
				5.0E-03	I						1.4E+09		1		~Copper Cyanide	544-92-3					5.8E+03			5.8E+03
				6.0E-04	I	8.0E-04	S	V		9.5E+05	1.4E+09	5.3E+04	1		~Cyanide (CN-)	57-12-5					7.0E+02		1.9E+02	1.5E+02
				1.0E-03	I			V			1.4E+09		1		~Cyanogen	460-19-5					1.2E+03			1.2E+03
				9.0E-02	I			V			1.4E+09		1		~Cyanogen Bromide	506-68-3					1.1E+05			1.1E+05
				5.0E-02	I			V			1.4E+09		1		~Cyanogen Chloride	506-77-4					5.8E+04			5.8E+04
				6.0E-04	I	8.0E-04	I	V		1.0E+07	1.4E+09	5.2E+04	1		~Hydrogen Cyanide	74-90-8					7.0E+02		1.8E+02	1.5E+02
				2.0E-03	I						1.4E+09		1		~Potassium Cyanide	151-50-8					2.3E+03			2.3E+03
				5.0E-03	I						1.4E+09		0.04		~Potassium Silver Cyanide	506-61-6					5.8E+03			5.8E+03
				1.0E-01	I						1.4E+09		0.04		~Silver Cyanide	506-64-9					1.2E+05			1.2E+05
				1.0E-03	I						1.4E+09		1		~Sodium Cyanide	143-33-9					1.2E+03			1.2E+03
				2.0E-04	P						1.4E+09		1		~Thiocyanates	NA					2.3E+02			2.3E+02
				2.0E-04	X			V			1.4E+09		1		~Thiocyanic Acid	463-56-9					2.3E+02			2.3E+02
				5.0E-02	I						1.4E+09		1		~Zinc Cyanide	557-21-1					5.8E+04			5.8E+04
						6.0E+00	I	V		1.2E+02	1.4E+09	1.0E+03	1		Cyclohexane	110-82-7							2.7E+04	2.7E+04
2.3E-02	H										1.4E+09		1	0.1	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	1.4E+02	3.4E+02		1.0E+02				
				5.0E+00	I	7.0E-01	P	V		5.1E+03	1.4E+09	4.2E+04	1		Cyclohexanone	108-94-1					5.8E+06		1.3E+05	1.3E+05
				5.0E-03	P	1.0E+00	X	V		2.8E+02	1.4E+09	1.5E+03	1		Cyclohexene	110-83-8					5.8E+03		6.4E+03	3.1E+03
				2.0E-01	I			V		2.9E+05	1.4E+09	7.5E+04	1		Cyclohexylamine	108-91-8					2.3E+05			2.3E+05
				2.5E-02	I						1.4E+09		1	0.1	Cyfluthrin	68359-37-5					2.9E+04	6.9E+04		2.1E+04
				5.0E-03	I						1.4E+09		1	0.1	Cyhalothrin	68085-85-8					5.8E+03	1.4E+04		4.1E+03
				1.0E-02	I						1.4E+09		1	0.1	Cypermethrin	52315-07-8					1.2E+04	2.8E+04		8.2E+03
				7.5E-03	I						1.4E+09		1	0.1	Cyromazine	66215-27-8					8.8E+03	2.1E+04		6.2E+03
2.4E-01	I	6.9E-05	C								1.4E+09		1	0.1	DDD	72-54-8	1.4E+01	3.2E+01	2.4E+05	9.6E+00				
3.4E-01	I	9.7E-05	C					V			1.4E+09	2.1E+06	1		DDE, p,p'-	72-55-9	9.6E+00		2.7E+02	9.3E+00				
3.4E-01	I	9.7E-05	I	5.0E-04	I						1.4E+09		1	0.03	DDT	50-29-3	9.6E+00	7.6E+01	1.7E+05	8.5E+00	5.8E+02	4.6E+03		5.2E+02
				3.0E-02	I						1.4E+09		1	0.1	Dalapon	75-99-0					3.5E+04	8.3E+04		2.5E+04
1.8E-02	C	5.1E-06	C	1.5E-01	I						1.4E+09		1	0.1	Daminozide	1596-84-5	1.8E+02	4.3E+02	3.3E+06	1.3E+02	1.8E+05	4.1E+05		1.2E+05
7.0E-04	I			7.0E-03	I						1.4E+09		1	0.1	Decabromodiphenyl ether; 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	4.7E+03	1.1E+04		3.3E+03	8.2E+03	1.9E+04		5.7E+03
				4.0E-05	I						1.4E+09		1	0.1	Demeton	8065-48-3					4.7E+01	1.1E+02		3.3E+01
1.2E-03	I			6.0E-01	I						1.4E+09		1	0.1	Di(2-ethylhexyl)adipate	103-23-1	2.7E+03	6.4E+03		1.9E+03	7.0E+05	1.7E+06		4.9E+05
6.1E-02	H										1.4E+09		1	0.1	Diallate	2303-16-4	5.4E+01	1.3E+02		3.8E+01				
				7.0E-04	A						1.4E+09		1	0.1	Diazinon	333-41-5					8.2E+02	1.9E+03		5.7E+02
				1.0E-02	X			V			1.4E+09	5.2E+05	1		Dibenzothiophene	132-65-0					1.2E+04			1.2E+04
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	9.8E+02	1.4E+09	3.2E+04	1		Dibromo-3-chloropropane, 1,2-	96-12-8	4.1E+00		6.5E-02	6.4E-02	2.3E+02		2.8E+01	2.5E+01
				4.0E-04	X			V		1.6E+02	1.4E+09	1.9E+04	1		Dibromobenzene, 1,3-	108-36-1					4.7E+02			4.7E+02
				1.0E-02	I			V			1.4E+09	2.2E+04	1		Dibromobenzene, 1,4-	106-37-6					1.2E+04			1.2E+04
8.4E-02	I			2.0E-02	I			V		8.0E+02	1.4E+09	8.0E+03	1		Dibromochloromethane	124-48-1	3.9E+01			3.9E+01	2.3E+04			2.3E+04
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1.3E+03	1.4E+09	8.6E+03	1		Dibromoethane, 1,2-	106-93-4	1.6E+00		1.8E-01	1.6E-01	1.1E+04		3.4E+02	3.3E+02
						4.0E-03	X	V		2.8E+03	1.4E+09	5.6E+03	1		Dibromomethane (Methylene Bromide)	74-95-3							9.9E+01	9.9E+01
				3.0E-04	P						1.4E+09		1	0.1	Dibutyltin Compounds	NA					3.5E+02	8.3E+02		2.5E+02
				3.0E-02	I						1.4E+09		1	0.1	Dicamba	1918-00-9					3.5E+04	8.3E+04		2.5E+04
		4.2E-03	P					V		5.5E+02	1.4E+09	3.2E+03	1		Dichloro-2-butene, 1,4-	764-41-0			9.4E-03	9.4E-03				
		4.2E-03	P					V		5.2E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, cis-1,4-	1476-11-5			3.2E-02	3.2E-02				
		4.2E-03	P					V		7.6E+02	1.4E+09	1.1E+04	1		Dichloro-2-butene, trans-1,4-	110-57-6			3.2E-02	3.2E-02				
5.0E-02	I			4.0E-03	I						1.4E+09		1	0.1	Dichloroacetic Acid	79-43-6	6.5E+01	1.5E+02		4.6E+01	4.7E+03	1.1E+04		3.3E+03
				9.0E-02	I	2.0E-01	H	V		3.8E+02	1.4E+09	1.2E+04	1		Dichlorobenzene, 1,2-	95-50-1					1.1E+05		1.0E+04	9.3E+03
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V			1.4E+09	1.0E+04	1		Dichlorobenzene, 1,4-	106-46-7	6.1E+02		1.2E+01	1.1E+01	8.2E+04		3.7E+04	2.5E+04
4.5E-01	I	3.4E-04	C								1.4E+09		1	0.1	Dichlorobenzidine, 3,3'-	91-94-1	7.3E+00	1.7E+01	4.9E+04	5.1E+00				
				9.0E-03	X						1.4E+09		1	0.1	Dichlorobenzophenone, 4,4'-	90-98-2					1.1E+04	2.5E+04		7.4E+03
				2.0E-01	I	1.0E-01	X	V		8.5E+02	1.4E+09	8.4E+02	1		Dichlorodifluoromethane	75-71-8					2.3E+05		3.7E+02	3.7E+02
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1.7E+03	1.4E+09	2.1E+03	1		Dichloroethane, 1,1-	75-34-3	5.7E+02		1.6E+01	1.6E+01	2.3E+05			2.3E+05
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		3.0E+03	1.4E+09	4.6E+03	1		Dichloroethane, 1,2-	107-06-2	3.6E+01		2.2E+00	2.0E+00	7.0E+03		1.4E+02	1.4E+02
				5.0E-02	I	2.0E-01	I	V		1.2E+03	1.4E+09	1.2E+03	1		Dichloroethylene, 1,1-	75-35-4					5.8E+04		1.0E+03	1.0E+03
				2.0E-03	I			V		2.4E+03	1.4E+09	2.5E+03	1		Dichloroethylene, 1,2-cis-	156-59-2					2.3E+03			2.3E+03
				2.0E-02	I			V		1.9E+03	1.4E+09	1.8E+03	1		Dichloroethylene, 1,2-trans-	156-60-5					2.3E+04			2.3E+04
				3.0E-03	I						1.4E+09		1	0.1	Dichlorophenol, 2,4-	120-83-2					3.5E+03	8.3E+03		2.5E+03
				1.0E-02	I						1.4E+09		1	0.05	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					1.2E+04	5.5E+04		9.6E+03
				8.0E-03	I						1.4E+09		1	0.1	Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6					9.3E+03	2.2E+04		6.6E+03
3.6E-02	C	1.0E-05	C	9.0E-02	A	4.0E-03	I	V		1.4E+03	1.4E+09	3.8E+03	1		Dichloropropane, 1,2-	78-87-5	9.1E+01		4.6E+00	4.4E+00	1.1E+05		6.6E+01	6.6E+01
				2.0E-02	P			V		1.5E+03	1.4E+09	6.8E+03	1		Dichloropropane, 1,3-	142-28-9					2.3E+04			2.3E+04
				3.0E-03	I						1.4E+09		1	0.1	Dichloropropanol, 2,3-	616-23-9					3.5E+03	8.3E+03		2.5E+03
1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		1.6E+03	1.4E+09	3.6E+03	1		Dichloropropene, 1,3-	542-75-6	3.3E+01		1.1E+01	8.2E+00	3.5E+04		3.1E+02	3.1E+02

TR=1E-06
HQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	Key	IUR (ug/m^3)$^{-1}$	Key	RfD_o (mg/kg-day)	Key	RfC_i (mg/m^3)	Key	Vol	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)
2.7E-01	H			3.0E-02	I						1.4E+09		1	0.1	Sodium Diethyldithiocarbamate	148-18-5	1.2E+01	2.9E+01		8.5E+00	3.5E+04	8.3E+04		2.5E+04
				5.0E-02	A	1.3E-02	C				1.4E+09		1		Sodium Fluoride	7681-49-4					5.8E+04		7.7E+07	5.8E+04
				2.0E-05	I						1.4E+09		1	0.1	Sodium Fluoroacetate	62-74-8					2.3E+01	5.5E+01		1.6E+01
				1.0E-03	H						1.4E+09		1		Sodium Metavanadate	13718-26-8					1.2E+03			1.2E+03
				8.0E-04	P						1.4E+09		1		Sodium Tungstate	13472-45-2					9.3E+02			9.3E+02
				8.0E-04	P						1.4E+09		1		Sodium Tungstate Dihydrate	10213-10-2					9.3E+02			9.3E+02
2.4E-02	H			3.0E-02	I						1.4E+09		1	0.1	Stirofos (Tetrachlorovinphos)	961-11-5	1.4E+02	3.2E+02		9.6E+01	3.5E+04	8.3E+04		2.5E+04
5.0E-01	C	1.5E-01	C	2.0E-02	C	2.0E-04	C		M		1.4E+09		0.025		Strontium Chromate	7789-06-2	6.5E+00		1.1E+02	6.2E+00	2.3E+04		1.2E+06	2.3E+04
				6.0E-01	I						1.4E+09		1		Strontium, Stable	7440-24-6					7.0E+05			7.0E+05
				3.0E-04	I						1.4E+09		1	0.1	Strychnine	57-24-9					3.5E+02	8.3E+02		2.5E+02
				2.0E-01	I	1.0E+00	I	V		8.7E+02	1.4E+09	9.4E+03	1		Styrene	100-42-5					2.3E+05		4.1E+04	3.5E+04
				3.0E-03	P						1.4E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer	NA					3.5E+03	8.3E+03		2.5E+03
				1.0E-03	P	2.0E-03	X				1.4E+09		1	0.1	Sulfolane	126-33-0					1.2E+03	2.8E+03	1.2E+07	8.2E+02
				8.0E-04	P						1.4E+09		1	0.1	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					9.3E+02	2.2E+03		6.6E+02
						1.0E-03	C	V			1.4E+09		1		Sulfur Trioxide	7446-11-9							6.0E+06	6.0E+06
						1.0E-03	C				1.4E+09		1		Sulfuric Acid	7664-93-9							6.0E+06	6.0E+06
2.5E-02	I	7.1E-06	I	5.0E-02	H						1.4E+09		1	0.1	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	1.3E+02	3.1E+02	2.3E+06	9.2E+01	5.8E+04	1.4E+05		4.1E+04
				3.0E-02	H						1.4E+09		1	0.1	TCMTB	21564-17-0					3.5E+04	8.3E+04		2.5E+04
				7.0E-02	I						1.4E+09		1	0.1	Tebuthiuron	34014-18-1					8.2E+04	1.9E+05		5.7E+04
				2.0E-02	H						1.4E+09		1	0.1	Temephos	3383-96-8					2.3E+04	5.5E+04		1.6E+04
				1.3E-02	I						1.4E+09		1	0.1	Terbacil	5902-51-2					1.5E+04	3.6E+04		1.1E+04
				2.5E-05	H			V		3.1E+01	1.4E+09	2.6E+05	1		Terbufos	13071-79-9					2.9E+01			2.9E+01
				1.0E-03	I						1.4E+09		1	0.1	Terbutryn	886-50-0					1.2E+03	2.8E+03		8.2E+02
				1.0E-04	I						1.4E+09		1	0.1	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					1.2E+02	2.8E+02		8.2E+01
				3.0E-04	I			V			1.4E+09	5.1E+04	1		Tetrachlorobenzene, 1,2,4,5-	95-94-3					3.5E+02			3.5E+02
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		6.8E+02	1.4E+09	5.7E+03	1		Tetrachloroethane, 1,1,1,2-	630-20-6	1.3E+02		9.4E+00	8.8E+00	3.5E+04			3.5E+04
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1.9E+03	1.4E+09	1.5E+04	1		Tetrachloroethane, 1,1,2,2-	79-34-5	1.6E+01		3.2E+00	2.7E+00	2.3E+04			2.3E+04
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		1.7E+02	1.4E+09	2.4E+03	1		Tetrachloroethylene	127-18-4	1.6E+03		1.1E+02	1.0E+02	7.0E+03		4.1E+02	3.9E+02
				3.0E-02	I						1.4E+09		1	0.1	Tetrachlorophenol, 2,3,4,6-	58-90-2					3.5E+04	8.3E+04		2.5E+04
2.0E+01	H							V			1.4E+09	1.1E+05	1		Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	1.6E-01			1.6E-01				
				5.0E-04	I						1.4E+09		1	0.1	Tetraethyl Dithiopyrophosphate	3689-24-5					5.8E+02	1.4E+03		4.1E+02
						8.0E+01	I	V		2.1E+03	1.4E+09	1.2E+03	1		Tetrafluoroethane, 1,1,1,2-	811-97-2							4.3E+05	4.3E+05
				2.0E-03	P						1.4E+09		1	0.0007	Tetryl (Trinitrophenylmethylnitramine)	479-45-8					2.3E+03	8.5E+05		2.3E+03
				2.0E-05	S						1.4E+09		1		Thallic Oxide	1314-32-5					2.3E+01			2.3E+01
				1.0E-05	X						1.4E+09		1		Thallium (I) Nitrate	10102-45-1					1.2E+01			1.2E+01
				1.0E-05	X						1.4E+09		1		Thallium (Soluble Salts)	7440-28-0					1.2E+01			1.2E+01
				1.0E-05	X			V			1.4E+09		1		Thallium Acetate	563-68-8					1.2E+01			1.2E+01
				2.0E-05	X			V			1.4E+09		1		Thallium Carbonate	6533-73-9					2.3E+01			2.3E+01
				1.0E-05	X						1.4E+09		1		Thallium Chloride	7791-12-0					1.2E+01			1.2E+01
				1.0E-05	S						1.4E+09		1		Thallium Selenite	12039-52-0					1.2E+01			1.2E+01
				2.0E-05	X						1.4E+09		1		Thallium Sulfate	7446-18-6					2.3E+01			2.3E+01
				1.3E-02	I						1.4E+09		1	0.1	Thifensulfuron-methyl	79277-27-3					1.5E+04	3.6E+04		1.1E+04
				1.0E-02	I						1.4E+09		1	0.1	Thiobencarb	28249-77-6					1.2E+04	2.8E+04		8.2E+03
				7.0E-02	X						1.4E+09		1	0.0075	Thiodiglycol	111-48-8					8.2E+04	2.6E+06		7.9E+04
				3.0E-04	H						1.4E+09		1	0.1	Thiofanox	39196-18-4					3.5E+02	8.3E+02		2.5E+02
				8.0E-02	I						1.4E+09		1	0.1	Thiophanate, Methyl	23564-05-8					9.3E+04	2.2E+05		6.6E+04
				5.0E-03	I						1.4E+09		1	0.1	Thiram	137-26-8					5.8E+03	1.4E+04		4.1E+03
				6.0E-01	H						1.4E+09		1		Tin	7440-31-5					7.0E+05			7.0E+05
						1.0E-04	A	V			1.4E+09		1		Titanium Tetrachloride	7550-45-0							6.0E+05	6.0E+05
				8.0E-02	I	5.0E+00	I	V		8.2E+02	1.4E+09	4.3E+03	1		Toluene	108-88-3					9.3E+04		9.4E+04	4.7E+04
		1.1E-05	C			8.0E-06	C	V			1.4E+09	7.6E+05	1		Toluene-2,4-diisocyante	584-84-9			8.5E+02	8.5E+02			2.7E+01	2.7E+01
1.8E-01	X			2.0E-04	X						1.4E+09		1	0.1	Toluene-2,5-diamine	95-70-5	1.8E+01	4.3E+01		1.3E+01	2.3E+02	5.5E+02		1.6E+02
		1.1E-05	C			8.0E-06	C	V		1.7E+03	1.4E+09	6.3E+05	1		Toluene-2,6-diisocyante	91-08-7			7.0E+02	7.0E+02			2.2E+01	2.2E+01
1.6E-02	P	5.1E-05	C								1.4E+09		1	0.1	Toluidine, o- (Methylaniline, 2-)	95-53-4	2.0E+02	4.8E+02	3.3E+05	1.4E+02				
3.0E-02	P			4.0E-03	X						1.4E+09		1	0.1	Toluidine, p-	106-49-0	1.1E+02	2.6E+02		7.7E+01	4.7E+03	1.1E+04		3.3E+03
				3.0E+00	P			V		3.4E-01	1.4E+09	1.1E+03	1		Total Petroleum Hydrocarbons (Aliphatic High)	NA					3.5E+06			3.5E+06
						6.0E-01	P	V		1.4E+02	1.4E+09	8.3E+02	1		Total Petroleum Hydrocarbons (Aliphatic Low)	NA							2.2E+03	2.2E+03
				1.0E-02	X	1.0E-01	P	V		6.9E+00	1.4E+09	1.0E+03	1		Total Petroleum Hydrocarbons (Aliphatic Medium)	NA					1.2E+04		4.6E+02	4.4E+02
				4.0E-02	P						1.4E+09		1	0.1	Total Petroleum Hydrocarbons (Aromatic High)	NA					4.7E+04	1.1E+05		3.3E+04
				4.0E-03	P	3.0E-02	P	V		1.8E+03	1.4E+09	3.5E+03	1		Total Petroleum Hydrocarbons (Aromatic Low)	NA					4.7E+03		4.6E+02	4.2E+02
				4.0E-03	P	3.0E-03	P	V			1.4E+09	5.2E+04	1		Total Petroleum Hydrocarbons (Aromatic Medium)	NA					4.7E+03		6.9E+02	6.0E+02
1.1E+00	I	3.2E-04	I								1.4E+09		1	0.1	Toxaphene	8001-35-2	3.0E+00	7.0E+00	5.2E+04	2.1E+00				
				7.5E-03	I						1.4E+09		1	0.1	Tralomethrin	66841-25-6					8.8E+03	2.1E+04		6.2E+03
				3.0E-04	A			V			1.4E+09	3.4E+03	1		Tri-n-butyltin	688-73-3					3.5E+02			3.5E+02
				8.0E+01	X						1.4E+09		1	0.1	Triacetin	102-76-1					9.3E+07	2.2E+08		6.6E+07
				3.0E-02	I						1.4E+09		1	0.1	Triadimefon	43121-43-3					3.5E+04	8.3E+04		2.5E+04
				1.3E-02	I			V			1.4E+09	3.6E+05	1		Triallate	2303-17-5					1.5E+04			1.5E+04
				1.0E-02	I						1.4E+09		1	0.1	Triasulfuron	82097-50-5					1.2E+04	2.8E+04		8.2E+03
				8.0E-03	I						1.4E+09		1	0.1	Tribenuron-methyl	101200-48-0					9.3E+03	2.2E+04		6.6E+03
				5.0E-03	I			V			1.4E+09	4.8E+04	1		Tribromobenzene, 1,2,4-	615-54-3					5.8E+03			5.8E+03
9.0E-03	P			1.0E-02	P						1.4E+09		1	0.1	Tributyl Phosphate	126-73-8	3.6E+02	8.6E+02		2.6E+02	1.2E+04	2.8E+04		8.2E+03
				3.0E-04	P						1.4E+09		1	0.1	Tributyltin Compounds	NA					3.5E+02	8.3E+02		2.5E+02
				3.0E-04	I						1.4E+09		1	0.1	Tributyltin Oxide	56-35-9					3.5E+02	8.3E+02		2.5E+02
				3.0E+01	I	3.0E+01	H	V		9.1E+02	1.4E+09	1.3E+03	1		Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					3.5E+07		1.7E+05	1.7E+05
7.0E-02	I			2.0E-02	I						1.4E+09		1	0.1	Trichloroacetic Acid	76-03-9	4.7E+01	1.1E+02		3.3E+01	2.3E+04	5.5E+04		1.6E+04
2.9E-02	H										1.4E+09		1	0.1	Trichloroaniline HCl, 2,4,6-	33663-50-2	1.1E+02	2.7E+02		7.9E+01				

TR=1E-06
HQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	Key	IUR (ug/m^3)$^{-1}$	Key	RfD_o (mg/kg-day)	Key	RfC_i (mg/m^3)	Key	Volatile	muta-gen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS	Analyte	CAS No.	Ingestion SL TR=1E-06 (mg/kg)	Dermal SL TR=1E-06 (mg/kg)	Inhalation SL TR=1E-06 (mg/kg)	Carcinogenic SL TR=1E-06 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Noncarcinogenic SL THI=1 (mg/kg)
7.0E-03	X			3.0E-05	X						1.4E+09		1	0.1	Trichloroaniline, 2,4,6-	634-93-5	4.7E+02	1.1E+03		3.3E+02	3.5E+01	8.3E+01		2.5E+01
				8.0E-04	X			V			1.4E+09	3.2E+04	1		Trichlorobenzene, 1,2,3-	87-61-6					9.3E+02			9.3E+02
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		4.0E+02	1.4E+09	3.0E+04	1		Trichlorobenzene, 1,2,4-	120-82-1	1.1E+02			1.1E+02	1.2E+04		2.6E+02	2.6E+02
				2.0E+00	I	5.0E+00	I	V		6.4E+02	1.4E+09	1.7E+03	1		Trichloroethane, 1,1,1-	71-55-6					2.3E+06		3.6E+04	3.6E+04
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		2.2E+03	1.4E+09	7.2E+03	1		Trichloroethane, 1,1,2-	79-00-5	5.7E+01		5.5E+00	5.0E+00	4.7E+03		6.3E+00	6.3E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	6.9E+02	1.4E+09	2.2E+03	1		Trichloroethylene	79-01-6	7.1E+01		6.6E+00	6.0E+00	5.8E+02		1.9E+01	1.9E+01
				3.0E-01	I			V		1.2E+03	1.4E+09	1.0E+03	1		Trichlorofluoromethane	75-69-4					3.5E+05			3.5E+05
				1.0E-01	I						1.4E+09		1	0.1	Trichlorophenol, 2,4,5-	95-95-4					1.2E+05	2.8E+05		8.2E+04
1.1E-02	I	3.1E-06	I	1.0E-03	P						1.4E+09		1	0.1	Trichlorophenol, 2,4,6-	88-06-2	3.0E+02	7.0E+02	5.4E+06	2.1E+02	1.2E+03	2.8E+03		8.2E+02
				1.0E-02	I						1.4E+09		1	0.1	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					1.2E+04	2.8E+04		8.2E+03
				8.0E-03	I						1.4E+09		1	0.1	Trichlorophenoxypropionic acid, -2,4,5	93-72-1					9.3E+03	2.2E+04		6.6E+03
				5.0E-03	I			V		1.3E+03	1.4E+09	1.5E+04	1		Trichloropropane, 1,1,2-	598-77-6					5.8E+03			5.8E+03
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1.4E+03	1.4E+09	1.6E+04	1		Trichloropropane, 1,2,3-	96-18-4	1.1E-01			1.1E-01	4.7E+03		2.1E+01	2.1E+01
				3.0E-03	X	3.0E-04	P	V		3.1E+02	1.4E+09	2.3E+03	1		Trichloropropene, 1,2,3-	96-19-5					3.5E+03		3.1E+00	3.1E+00
				2.0E-02	A						1.4E+09		1	0.1	Tricresyl Phosphate (TCP)	1330-78-5					2.3E+04	5.5E+04		1.6E+04
				3.0E-03	I						1.4E+09		1	0.1	Tridiphane	58138-08-2					3.5E+03	8.3E+03		2.5E+03
						7.0E-03	I	V		2.8E+04	1.4E+09	1.6E+04	1		Triethylamine	121-44-8							4.8E+02	4.8E+02
				2.0E+00	P						1.4E+09		1	0.1	Triethylene Glycol	112-27-6					2.3E+06	5.5E+06		1.6E+06
						2.0E+01	P	V		4.8E+03	1.4E+09	7.1E+02	1		Trifluoroethane, 1,1,1-	420-46-2							6.2E+04	6.2E+04
7.7E-03	I			7.5E-03	I			V			1.4E+09	5.1E+05	1		Trifluralin	1582-09-8	4.2E+02			4.2E+02	8.8E+03			8.8E+03
2.0E-02	P			1.0E-02	P						1.4E+09		1	0.1	Trimethyl Phosphate	512-56-1	1.6E+02	3.9E+02		1.1E+02	1.2E+04	2.8E+04		8.2E+03
						5.0E-03	P	V		2.9E+02	1.4E+09	9.4E+03	1		Trimethylbenzene, 1,2,3-	526-73-8							2.1E+02	2.1E+02
						7.0E-03	P	V		2.2E+02	1.4E+09	7.9E+03	1		Trimethylbenzene, 1,2,4-	95-63-6							2.4E+02	2.4E+02
				1.0E-02	X			V		1.8E+02	1.4E+09	6.6E+03	1		Trimethylbenzene, 1,3,5-	108-67-8					1.2E+04			1.2E+04
				1.0E-02	X			V		3.0E+01	1.4E+09	1.0E+03	1		Trimethylpentene, 2,4,4-	25167-70-8					1.2E+04			1.2E+04
				3.0E-02	I						1.4E+09		1	0.019	Trinitrobenzene, 1,3,5-	99-35-4					3.5E+04	4.4E+05		3.2E+04
3.0E-02	I			5.0E-04	I						1.4E+09		1	0.032	Trinitrotoluene, 2,4,6-	118-96-7	1.1E+02	8.0E+02		9.6E+01	5.8E+02	4.3E+03		5.1E+02
				2.0E-02	P						1.4E+09		1	0.1	Triphenylphosphine Oxide	791-28-6					2.3E+04	5.5E+04		1.6E+04
				2.0E-02	A						1.4E+09		1	0.1	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8					2.3E+04	5.5E+04		1.6E+04
				1.0E-02	X						1.4E+09		1	0.1	Tris(1-chloro-2-propyl)phosphate	13674-84-5					1.2E+04	2.8E+04		8.2E+03
2.3E+00	C	6.6E-04	C					V		4.7E+02	1.4E+09	9.0E+05	1		Tris(2,3-dibromopropyl)phosphate	126-72-7	1.4E+00		1.7E+01	1.3E+00				
2.0E-02	P			7.0E-03	P						1.4E+09		1	0.1	Tris(2-chloroethyl)phosphate	115-96-8	1.6E+02	3.9E+02		1.1E+02	8.2E+03	1.9E+04		5.7E+03
3.2E-03	P			1.0E-01	P						1.4E+09		1	0.1	Tris(2-ethylhexyl)phosphate	78-42-2	1.0E+03	2.4E+03		7.2E+02	1.2E+05	2.8E+05		8.2E+04
				8.0E-04	P						1.4E+09		1		Tungsten	7440-33-7					9.3E+02			9.3E+02
				3.0E-03	I	4.0E-05	A				1.4E+09		1		Uranium (Soluble Salts)	NA					3.5E+03		2.4E+05	3.5E+03
1.0E+00	C	2.9E-04	C						M		1.4E+09		1	0.1	Urethane	51-79-6	3.3E+00	7.7E+00	5.7E+04	2.3E+00				
		8.3E-03	P	9.0E-03	I	7.0E-06	P				1.4E+09		0.026		Vanadium Pentoxide	1314-62-1			2.0E+03	2.0E+03	1.1E+04		4.2E+04	8.4E+03
				5.0E-03	S	1.0E-04	A				1.4E+09		0.026		Vanadium and Compounds	7440-62-2					5.9E+03		6.0E+05	5.8E+03
				1.0E-03	I			V			1.4E+09	1.2E+05	1		Vernolate	1929-77-7					1.2E+03			1.2E+03
				2.5E-02	I						1.4E+09		1	0.1	Vinclozolin	50471-44-8					2.9E+04	6.9E+04		2.1E+04
				1.0E+00	H	2.0E-01	I	V		2.8E+03	1.4E+09	4.4E+03	1		Vinyl Acetate	108-05-4					1.2E+06		3.9E+03	3.8E+03
		3.2E-05	H			3.0E-03	I	V		2.5E+03	1.4E+09	1.4E+03	1		Vinyl Bromide	593-60-2			5.2E-01	5.2E-01			1.8E+01	1.8E+01
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	3.9E+03	1.4E+09	9.6E+02	1		Vinyl Chloride	75-01-4	4.5E+00		2.7E+00	1.7E+00	3.5E+03		4.2E+02	3.7E+02
				3.0E-04	I						1.4E+09		1	0.1	Warfarin	81-81-2					3.5E+02	8.3E+02		2.5E+02
				2.0E-01	S	1.0E-01	S	V		3.9E+02	1.4E+09	5.6E+03	1		Xylene, P-	106-42-3					2.3E+05		2.4E+03	2.4E+03
				2.0E-01	S	1.0E-01	S	V		3.9E+02	1.4E+09	5.5E+03	1		Xylene, m-	108-38-3					2.3E+05		2.4E+03	2.4E+03
				2.0E-01	S	1.0E-01	S	V		4.3E+02	1.4E+09	6.5E+03	1		Xylene, o-	95-47-6					2.3E+05		2.8E+03	2.8E+03
				2.0E-01	I	1.0E-01	I	V		2.6E+02	1.4E+09	5.7E+03	1		Xylenes	1330-20-7					2.3E+05		2.5E+03	2.5E+03
				3.0E-04	I						1.4E+09		1		Zinc Phosphide	1314-84-7					3.5E+02			3.5E+02
				3.0E-01	I						1.4E+09		1		Zinc and Compounds	7440-66-6					3.5E+05			3.5E+05
				5.0E-02	I						1.4E+09		1	0.1	Zineb	12122-67-7					5.8E+04	1.4E+05		4.1E+04
				8.0E-05	X						1.4E+09		1		Zirconium	7440-67-7					9.3E+01			9.3E+01

TR=1E-06
THQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer CHILD Hazard Index (HI) = 1				
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	volatile	mutagen	LOGP	GIABS	FA	In EPD?	Analyte	CAS No.	Ingestion SL TR=1E-06 (µg/L)	Dermal SL TR=1E-06 (µg/L)	Inhalation SL TR=1E-06 (µg/L)	Carcinogenic SL TR=1E-06 (µg/L)	Ingestion SL Child THQ=1 (µg/L)	Dermal SL Child THQ=1 (µg/L)	Inhalation SL Child THQ=1 (µg/L)	Noncarcinogenic SL Child THI=1 (µg/L)	MCL (ug/L)
											0.013	1	Yes	Chromium, Total	7440-47-3									1.0E+02
				1.3E-02	I					3.1	1	0.9	Yes	Clofentezine	74115-24-5					2.6E+02	2.1E+03		2.3E+02	
		9.0E-03	P	3.0E-04	P	6.0E-06	P				1	1	Yes	Cobalt	7440-48-4					6.0E+00	3.4E+03		6.0E+00	
		6.2E-04	I					V	M		1	0		Coke Oven Emissions	8007-45-2									
				4.0E-02	H						1	1	Yes	Copper	7440-50-8					8.0E+02	1.8E+05		8.0E+02	1.3E+03
				5.0E-02	I	6.0E-01	C			1.96	1	1	Yes	Cresol, m-	108-39-4					1.0E+03	1.2E+04		9.3E+02	
				5.0E-02	I	6.0E-01	C			1.95	1	1	Yes	Cresol, o-	95-48-7					1.0E+03	1.2E+04		9.3E+02	
				1.0E-01	A	6.0E-01	C			1.94	1	1	Yes	Cresol, p-	106-44-5					2.0E+03	2.5E+04		1.9E+03	
				1.0E-01	A					3.1	1	1	Yes	Cresol, p-chloro-m-	59-50-7					2.0E+03	5.2E+03		1.4E+03	
				1.0E-01	A	6.0E-01	C			1.95	1	0.9	Yes	Cresols	1319-77-3					2.0E+03	6.7E+03		1.5E+03	
1.9E+00	H			1.0E-03	P			V		0.6	1	1	Yes	Crotonaldehyde, trans-	123-73-9	4.1E-02	2.7E+00		4.0E-02	2.0E+01	1.5E+03		2.0E+01	
				1.0E-01	I	4.0E-01	I	V		3.66	1	1	Yes	Cumene	98-82-8					2.0E+03	1.9E+03	8.3E+02	4.5E+02	
2.2E-01	C	6.3E-05	C							-1.73	1	1	Yes	Cupferron	135-20-6	3.5E-01	1.3E+04		3.5E-01					
8.4E-01	H			2.0E-03	H					2.22	1	1	Yes	Cyanazine	21725-46-2	9.3E-02	1.6E+00		8.8E-02	4.0E+01	7.6E+02		3.8E+01	
														Cyanides										
				1.0E-03	I						1	1	Yes	~Calcium Cyanide	592-01-8					2.0E+01	4.6E+03		2.0E+01	
				5.0E-03	I						1	1	Yes	~Copper Cyanide	544-92-3					1.0E+02	2.3E+04		1.0E+02	
				6.0E-04	I	8.0E-04	S	V			1	1	Yes	~Cyanide (CN-)	57-12-5					1.2E+01	2.7E+03	1.7E+00	1.5E+00	2.0E+02
				1.0E-03	I			V		0.07	1	1	Yes	~Cyanogen	460-19-5					2.0E+01	5.1E+03		2.0E+01	
				9.0E-02	I			V			1	1	Yes	~Cyanogen Bromide	506-68-3					1.8E+03	1.6E+06		1.8E+03	
				5.0E-02	I			V			1	1	Yes	~Cyanogen Chloride	506-77-4					1.0E+03	5.8E+05		1.0E+03	
				6.0E-04	I	8.0E-04	I	V		-0.25	1	1	Yes	~Hydrogen Cyanide	74-90-8					1.2E+01	2.7E+03	1.7E+00	1.5E+00	
				2.0E-03	I						1	1	Yes	~Potassium Cyanide	151-50-8					4.0E+01	4.6E+03		4.0E+01	
				5.0E-03	I						0.04	1	Yes	~Potassium Silver Cyanide	506-61-6					1.0E+02	4.6E+02		8.2E+01	
				1.0E-01	I						0.04	1	Yes	~Silver Cyanide	506-64-9					2.0E+03	1.8E+04		1.8E+03	
				1.0E-03	I						1	1	Yes	~Sodium Cyanide	143-33-9					2.0E+01	4.6E+03		2.0E+01	2.0E+02
				2.0E-04	P						1	0	Yes	~Thiocyanates	NA					4.0E+00	9.1E+02		4.0E+00	
				2.0E-04	X			V		0.58	1	1	Yes	~Thiocyanic Acid	463-56-9					4.0E+00	9.1E+02		4.0E+00	
				5.0E-02	I						1	1	Yes	~Zinc Cyanide	557-21-1					1.0E+03	3.8E+05		1.0E+03	
						6.0E+00	I	V		3.44	1	1	Yes	Cyclohexane	110-82-7							1.3E+04	1.3E+04	
2.3E-02	H									4.72	1	0.9	Yes	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	3.4E+00	8.3E+00		2.4E+00					
				5.0E+00	I	7.0E-01	P	V		0.81	1	1	Yes	Cyclohexanone	108-94-1					1.0E+05	6.5E+06	1.5E+03	1.4E+03	
				5.0E-03	P	1.0E+00	X	V		2.86	1	1	Yes	Cyclohexene	110-83-8					1.0E+02	2.5E+02	2.1E+03	7.0E+01	
				2.0E-01	I			V		1.49	1	1	Yes	Cyclohexylamine	108-91-8					4.0E+03	9.3E+04		3.8E+03	
				2.5E-02	I					5.95	1	0.7	Yes	Cyfluthrin	68359-37-5					5.0E+02	1.6E+02		1.2E+02	
				5.0E-03	I					6.9	1	0.5	No	Cyhalothrin	68085-85-8					1.0E+02			1.0E+02	
				1.0E-02	I					6.6	1	0.7	No	Cypermethrin	52315-07-8					2.0E+02			2.0E+02	
				7.5E-03	I					-0.061	1	1	Yes	Cyromazine	66215-27-8					1.5E+02	1.2E+04		1.5E+02	
2.4E-01	I	6.9E-05	C							6.02	1	0.8	Yes	DDD	72-54-8	3.2E-01	3.5E-02		3.2E-02					
3.4E-01	I	9.7E-05	C					V		6.51	1	0.8	No	DDE, p,p'-	72-55-9	2.3E-01		5.8E-02	4.6E-02					
3.4E-01	I	9.7E-05	I	5.0E-04	I					6.91	1	0.7	No	DDT	50-29-3	2.3E-01			2.3E-01	1.0E+01			1.0E+01	
				3.0E-02	I					0.78	1	1	Yes	Dalapon	75-99-0					6.0E+02	5.5E+04		6.0E+02	2.0E+02
1.8E-02	C	5.1E-06	C	1.5E-01	I					-1.5	1	1	Yes	Daminozide	1596-84-5	4.3E+00	1.3E+04		4.3E+00	3.0E+03	1.0E+07		3.0E+03	
7.0E-04	I			7.0E-03	I					12.11	1	0	No	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	1.1E+02			1.1E+02	1.4E+02			1.4E+02	
				4.0E-05	I					3.21	1	0.8	Yes	Demeton	8065-48-3					8.0E-01	8.8E-01		4.2E-01	
1.2E-03	I			6.0E-01	I					6.11	1	0	Yes	Di(2-ethylhexyl)adipate	103-23-1	6.5E+01			6.5E+01	1.2E+04			1.2E+04	4.0E+02
6.1E-02	H									4.49	1	0.9	Yes	Diallate	2303-16-4	1.3E+00	9.2E-01		5.4E-01					
				7.0E-04	A					3.81	1	0.9	Yes	Diazinon	333-41-5					1.4E+01	3.9E+01		1.0E+01	
				1.0E-02	X			V		4.38	1	1	Yes	Dibenzothiophene	132-65-0					2.0E+02	9.6E+01		6.5E+01	
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	2.96	1	1	Yes	Dibromo-3-chloropropane, 1,2-	96-12-8	3.1E-02	1.7E-01	3.4E-04	3.3E-04	4.0E+00	2.4E+01	4.2E-01	3.7E-01	2.0E-01
				4.0E-04	X			V		3.75	1	0.9	Yes	Dibromobenzene, 1,3-	108-36-1					8.0E+00	1.6E+01		5.3E+00	
				1.0E-02	I			V		3.79	1	0.9	Yes	Dibromobenzene, 1,4-	106-37-6					2.0E+02	3.7E+02		1.3E+02	
8.4E-02	I			2.0E-02	I			V		2.16	1	1	Yes	Dibromochloromethane	124-48-1	9.3E-01	1.4E+01		8.7E-01	4.0E+02	6.7E+03		3.8E+02	8.0E+01(F)
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1.96	1	1	Yes	Dibromoethane, 1,2-	106-93-4	3.9E-02	7.1E-01	9.4E-03	7.5E-03	1.8E+02	3.6E+03	1.9E+01	1.7E+01	5.0E-02
						4.0E-03	X	V		1.7	1	1	Yes	Dibromomethane (Methylene Bromide)	74-95-3							8.3E+00	8.3E+00	
				3.0E-04	P						1	0	No	Dibutyltin Compounds	NA					6.0E+00			6.0E+00	
				3.0E-02	I					2.21	1	1	Yes	Dicamba	1918-00-9					6.0E+02	1.0E+04		5.7E+02	
		4.2E-03	P					V		2.6	1	1	Yes	Dichloro-2-butene, 1,4-	764-41-0			1.3E-03	1.3E-03					
		4.2E-03	P					V		2.6	1	1	Yes	Dichloro-2-butene, cis-1,4-	1476-11-5			1.3E-03	1.3E-03					
		4.2E-03	P					V		2.6	1	1	Yes	Dichloro-2-butene, trans-1,4-	110-57-6			1.3E-03	1.3E-03					
5.0E-02	I			4.0E-03	I					0.92	1	1	Yes	Dichloroacetic Acid	79-43-6	1.6E+00	9.6E+01		1.5E+00	8.0E+01	5.4E+03		7.9E+01	6.0E+01
				9.0E-02	I	2.0E-01	H	V		3.43	1	1	Yes	Dichlorobenzene, 1,2-	95-50-1					1.8E+03	2.9E+03	4.2E+02	3.0E+02	6.0E+02
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V		3.44	1	1	Yes	Dichlorobenzene, 1,4-	106-46-7	1.4E+01	2.1E+01	5.1E-01	4.8E-01	1.4E+03	2.2E+03	1.7E+03	5.7E+02	7.5E+01
4.5E-01	I	3.4E-04	C							3.51	1	1	Yes	Dichlorobenzidine, 3,3'-	91-94-1	1.7E-01	4.5E-01		1.3E-01					
				9.0E-03	X					4.44	1	0.9	Yes	Dichlorobenzophenone, 4,4'-	90-98-2					1.8E+02	1.4E+02		7.8E+01	
				2.0E-01	I	1.0E-01	X	V		2.16	1	1	Yes	Dichlorodifluoromethane	75-71-8					4.0E+03	3.8E+04	2.1E+02	2.0E+02	
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1.79	1	1	Yes	Dichloroethane, 1,1-	75-34-3	1.4E+01	1.8E+02	3.5E+00	2.8E+00	4.0E+03	5.8E+04		3.8E+03	
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		1.48	1	1	Yes	Dichloroethane, 1,2-	107-06-2	8.6E-01	1.8E+01	2.2E-01	1.7E-01	1.2E+02	2.8E+03	1.5E+01	1.3E+01	5.0E+00
				5.0E-02	I	2.0E-01	I	V		2.13	1	1	Yes	Dichloroethylene, 1,1-	75-35-4					1.0E+03	8.5E+03	4.2E+02	2.8E+02	7.0E+00
				2.0E-03	I			V		1.86	1	1	Yes	Dichloroethylene, 1,2-cis-	156-59-2					4.0E+01	3.6E+02		3.6E+01	7.0E+01
				2.0E-02	I			V		2.09	1	1	Yes	Dichloroethylene, 1,2-trans-	156-60-5					4.0E+02	3.6E+03		3.6E+02	1.0E+02
				3.0E-03	I					3.06	1	1	Yes	Dichlorophenol, 2,4-	120-83-2					6.0E+01	1.9E+02		4.6E+01	
				1.0E-02	I					2.81	1	1	Yes	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					2.0E+02	1.4E+03		1.7E+02	7.0E+01
				8.0E-03	I					3.53	1	0.9	Yes	Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6					1.6E+02	4.8E+02		1.2E+02	
3.6E-02	C	1.0E-05	C	9.0E-02	A	4.0E-03	I	V		1.98	1	1	Yes	Dichloropropane, 1,2-	78-87-5	2.2E+00	2.4E+01	5.6E-01	4.4E-01	1.8E+03	2.2E+04	8.3E+00	8.3E+00	5.0E+00

TR=1E-0
THQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information													Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer CHILD Hazard Index (HI) = 1				
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	LOGP	GIABS	FA	In EPD?	Analyte	CAS No.	Ingestion SL TR=1E-06 (µg/L)	Dermal SL TR=1E-06 (µg/L)	Inhalation SL TR=1E-06 (µg/L)	Carcinogenic SL TR=1E-06 (µg/L)	Ingestion SL Child THQ=1 (µg/L)	Dermal SL Child THQ=1 (µg/L)	Inhalation SL Child THQ=1 (µg/L)	Noncarcinogenic SL Child THI=1 (µg/L)	MCL (ug/L)
				5.0E-03	I	2.0E-02	C				1	1	Yes	Selenium	7782-49-2					1.0E+02	2.3E+04		1.0E+02	5.0E+01
				5.0E-03	C	2.0E-02	C				1	1	Yes	Selenium Sulfide	7446-34-6					1.0E+02	2.3E+04		1.0E+02	
				9.0E-02	I					4.38	1	0.9	Yes	Sethoxydim	74051-80-2					1.8E+03	2.4E+03		1.0E+03	
						3.0E-03	C				1	1	Yes	Silica (crystalline, respirable)	7631-86-9									
				5.0E-03	I						0.04	1	Yes	Silver	7440-22-4					1.0E+02	1.5E+03		9.4E+01	
1.2E-01	H			5.0E-03	I					2.18	1	1	Yes	Simazine	122-34-9	6.5E-01	9.3E+00		6.1E-01	1.0E+02	1.6E+03		9.4E+01	4.0E+00
				1.3E-02	I					0.37	1	1	Yes	Sodium Acifluorfen	62476-59-9					2.6E+02	2.1E+05		2.6E+02	
				4.0E-03	I						1	1	Yes	Sodium Azide	26628-22-8					8.0E+01	1.8E+04		8.0E+01	
5.0E-01	C	1.5E-01	C	2.0E-02	C	2.0E-04	C		M		0.025	1	Yes	Sodium Dichromate	10588-01-9	5.0E-02	2.3E-01		4.1E-02	4.0E+02	2.3E+03		3.4E+02	
2.7E-01	H			3.0E-02	I					-1.43	1	1	Yes	Sodium Diethyldithiocarbamate	148-18-5	2.9E-01	8.5E+02		2.9E-01	6.0E+02	1.9E+06		6.0E+02	
				5.0E-02	A	1.3E-02	C				1	1	Yes	Sodium Fluoride	7681-49-4					1.0E+03	2.3E+05		1.0E+03	
				2.0E-05	I					-3.78	1	1	No	Sodium Fluoroacetate	62-74-8					4.0E-01			4.0E-01	
				1.0E-03	H						1	1	Yes	Sodium Metavanadate	13718-26-8					2.0E+01	4.6E+03		2.0E+01	
				8.0E-04	P						1	1	Yes	Sodium Tungstate	13472-45-2					1.6E+01	3.6E+03		1.6E+01	
				8.0E-04	P						1	1	Yes	Sodium Tungstate Dihydrate	10213-10-2					1.6E+01	3.6E+03		1.6E+01	
2.4E-02	H			3.0E-02	I					3.53	1	0.9	Yes	Stirofos (Tetrachlorovinphos)	961-11-5	3.2E+00	1.9E+01		2.8E+00	6.0E+02	3.8E+03		5.2E+02	
5.0E-01	C	1.5E-01	C	2.0E-02	C	2.0E-04	C		M		0.025	1	Yes	Strontium Chromate	7789-06-2	5.0E-02	2.3E-01		4.1E-02	4.0E+02	2.3E+03		3.4E+02	
				6.0E-01	I						1	1	Yes	Strontium, Stable	7440-24-6					1.2E+04	2.7E+06		1.2E+04	
				3.0E-04	I					1.93	1	1	Yes	Strychnine	57-24-9					6.0E+00	3.2E+02		5.9E+00	
				2.0E-01	I	1.0E+00	I	V		2.95	1	1	Yes	Styrene	100-42-5					4.0E+03	1.0E+04	2.1E+03	1.2E+03	1.0E+02
				3.0E-03	P					3.1	1	1	Yes	Styrene-Acrylonitrile (SAN) Trimer	NA					6.0E+01	2.4E+02		4.8E+01	
				1.0E-03	P	2.0E-03	X			-0.77	1	1	Yes	Sulfolane	126-33-0					2.0E+01	1.7E+04		2.0E+01	
				8.0E-04	P					3.9	1	0.9	Yes	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					1.6E+01	3.5E+01		1.1E+01	
						1.0E-03	C	V			1	1	Yes	Sulfur Trioxide	7446-11-9							2.1E+00	2.1E+00	
						1.0E-03	C				1	1	Yes	Sulfuric Acid	7664-93-9									
2.5E-02	I	7.1E-06	I	5.0E-02	H					4.82	1	0.8	Yes	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	3.1E+00	2.3E+00		1.3E+00	1.0E+03	8.2E+02		4.5E+02	
				3.0E-02	H					3.3	1	0.9	Yes	TCMTB	21564-17-0					6.0E+02	2.4E+03		4.8E+02	
				7.0E-02	I					1.79	1	1	Yes	Tebuthiuron	34014-18-1					1.4E+03	4.7E+04		1.4E+03	
				2.0E-02	H					5.96	1	0.7	No	Temephos	3383-96-8					4.0E+02			4.0E+02	
				1.3E-02	I					1.89	1	1	Yes	Terbacil	5902-51-2					2.6E+02	7.0E+03		2.5E+02	
				2.5E-05	H			V		4.48	1	0.9	Yes	Terbufos	13071-79-9					5.0E-01	4.5E-01		2.4E-01	
				1.0E-03	I					3.74	1	0.9	Yes	Terbutryn	886-50-0					2.0E+01	4.1E+01		1.3E+01	
				1.0E-04	I					6.77	1	0.6	No	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					2.0E+00			2.0E+00	
				3.0E-04	I			V		4.64	1	1	Yes	Tetrachlorobenzene, 1,2,4,5-	95-94-3					6.0E+00	2.4E+00		1.7E+00	
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		2.93	1	1	Yes	Tetrachloroethane, 1,1,1,2-	630-20-6	3.0E+00	1.1E+01	7.6E-01	5.7E-01	6.0E+02	2.4E+03		4.8E+02	
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		2.39	1	1	Yes	Tetrachloroethane, 1,1,2,2-	79-34-5	3.9E-01	3.3E+00	9.7E-02	7.6E-02	4.0E+02	3.6E+03		3.6E+02	
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		3.4	1	1	Yes	Tetrachloroethylene	127-18-4	3.7E+01	6.5E+01	2.2E+01	1.1E+01	1.2E+02	2.3E+02	8.3E+01	4.1E+01	5.0E+00
				3.0E-02	I					4.45	1	0.9	Yes	Tetrachlorophenol, 2,3,4,6-	58-90-2					6.0E+02	3.9E+02		2.4E+02	
2.0E+01	H							V		4.54	1	0.9	Yes	Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	3.9E-03	2.0E-03		1.3E-03					
				5.0E-04	I					3.99	1	0.9	Yes	Tetraethyl Dithiopyrophosphate	3689-24-5					1.0E+01	2.4E+01		7.1E+00	
						8.0E+01	I	V		1.68	1	1	Yes	Tetrafluoroethane, 1,1,1,2-	811-97-2							1.7E+05	1.7E+05	
				2.0E-03	P					1.64	1	1	Yes	Tetryl (Trinitrophenylmethylnitramine)	479-45-8					4.0E+01	2.5E+03		3.9E+01	
				2.0E-05	S						1	0.9	Yes	Thallic Oxide	1314-32-5					4.0E-01	9.1E+01		4.0E-01	
				1.0E-05	X						1	1	Yes	Thallium (I) Nitrate	10102-45-1					2.0E-01	4.6E+01		2.0E-01	
				1.0E-05	X						1	1	Yes	Thallium (Soluble Salts)	7440-28-0					2.0E-01	4.6E+01		2.0E-01	2.0E+00
				1.0E-05	X			V		-0.17	1	1	Yes	Thallium Acetate	563-68-8					2.0E-01	1.7E+02		2.0E-01	
				2.0E-05	X			V		-0.86	1	1	Yes	Thallium Carbonate	6533-73-9					4.0E-01	3.7E+03		4.0E-01	
				1.0E-05	X						1	1	Yes	Thallium Chloride	7791-12-0					2.0E-01	4.6E+01		2.0E-01	
				1.0E-05	S						1	1	Yes	Thallium Selenite	12039-52-0					2.0E-01	4.6E+01		2.0E-01	
				2.0E-05	X						1	0.9	Yes	Thallium Sulfate	7446-18-6					4.0E-01	9.1E+01		4.0E-01	
				1.3E-02	I					1.56	1	1	Yes	Thifensulfuron-methyl	79277-27-3					2.6E+02	3.5E+04		2.6E+02	
				1.0E-02	I					3.4	1	0.9	Yes	Thiobencarb	28249-77-6					2.0E+02	7.7E+02		1.6E+02	
				7.0E-02	X					-0.63	1	1	Yes	Thiodiglycol	111-48-8					1.4E+03	9.7E+05		1.4E+03	
				3.0E-04	H					2.16	1	1	Yes	Thiofanox	39196-18-4					6.0E+00	4.4E+01		5.3E+00	
				8.0E-02	I					1.4	1	1	Yes	Thiophanate, Methyl	23564-05-8					1.6E+03	2.1E+05		1.6E+03	
				5.0E-03	I					1.73	1	1	Yes	Thiram	137-26-8					1.0E+02	4.0E+03		9.8E+01	
				6.0E-01	H						1	1	Yes	Tin	7440-31-5					1.2E+04	2.7E+06		1.2E+04	
						1.0E-04	A	V			1	1	Yes	Titanium Tetrachloride	7550-45-0							2.1E-01	2.1E-01	
				8.0E-02	I	5.0E+00	I	V		2.73	1	1	Yes	Toluene	108-88-3					1.6E+03	5.3E+03	1.0E+04	1.1E+03	1.0E+03
		1.1E-05	C			8.0E-06	C	V		3.74	1	1	Yes	Toluene-2,4-diisocyante	584-84-9			5.1E-01	5.1E-01			1.7E-02	1.7E-02	
1.8E-01	X			2.0E-04	X					0.16	1	1	Yes	Toluene-2,5-diamine	95-70-5	4.3E-01	8.2E+01		4.3E-01	4.0E+00	8.3E+02		4.0E+00	
		1.1E-05	C			8.0E-06	C	V		3.74	1	1	Yes	Toluene-2,6-diisocyante	91-08-7			5.1E-01	5.1E-01			1.7E-02	1.7E-02	
1.6E-02	P	5.1E-05	C							1.32	1	1	Yes	Toluidine, o- (Methylaniline, 2-)	95-53-4	4.9E+00	1.4E+02		4.7E+00					
3.0E-02	P			4.0E-03	X					1.39	1	1	Yes	Toluidine, p-	106-49-0	2.6E+00	6.8E+01		2.5E+00	8.0E+01	2.3E+03		7.7E+01	
				3.0E+00	P			V		6.1	1	1	No	Total Petroleum Hydrocarbons (Aliphatic High)	NA					6.0E+04			6.0E+04	
						6.0E-01	P	V		3.9	1	1	Yes	Total Petroleum Hydrocarbons (Aliphatic Low)	NA							1.3E+03	1.3E+03	
				1.0E-02	X	1.0E-01	P	V		5.65	1	1	No	Total Petroleum Hydrocarbons (Aliphatic Medium)	NA					2.0E+02		2.1E+02	1.0E+02	
				4.0E-02	P					5.16	1	1	No	Total Petroleum Hydrocarbons (Aromatic High)	NA					8.0E+02			8.0E+02	
				4.0E-03	P	3.0E-02	P	V		2.13	1	1	Yes	Total Petroleum Hydrocarbons (Aromatic Low)	NA					8.0E+01	6.1E+02	6.3E+01	3.3E+01	
				4.0E-03	P	3.0E-03	P	V		3.58	1	1	Yes	Total Petroleum Hydrocarbons (Aromatic Medium)	NA					8.0E+01	9.0E+01	6.3E+00	5.5E+00	
1.1E+00	I	3.2E-04	I							5.9	1	0.8	No	Toxaphene	8001-35-2	7.1E-02			7.1E-02					3.0E+00
				7.5E-03	I					7.56	1	0.5	No	Tralomethrin	66841-25-6					1.5E+02			1.5E+02	
				3.0E-04	A			V		4.1	1	0.9	Yes	Tri-n-butyltin	688-73-3					6.0E+00	9.9E+00		3.7E+00	
				8.0E+01	X					0.25	1	1	Yes	Triacetin	102-76-1					1.6E+06	5.3E+08		1.6E+06	
				3.0E-02	I					2.77	1	1	Yes	Triadimefon	43121-43-3					6.0E+02	6.9E+03		5.5E+02	

TR=1E-0
THQ=1.0

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = APPENDIX PPRTV SCREEN (See FAQ #27); H = HEAST; F = See FAQ; J = New Jersey; O = EPA Office of Water; E = see user guide Section 2.3.5; L = see user guide on lead; M = mutagen; S = see user guide Section 5; V = volatile; R = RBA applied (See User Guide for Arsenic notice) ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide)

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-06				Noncancer CHILD Hazard Index (HI) = 1				
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volatile	muta-gen	LOGP	GIABS	FA	In EPD?	Analyte	CAS No.	Ingestion SL TR=1E-06 (µg/L)	Dermal SL TR=1E-06 (µg/L)	Inhalation SL TR=1E-06 (µg/L)	Carcinogenic SL TR=1E-06 (µg/L)	Ingestion SL Child THQ=1 (µg/L)	Dermal SL Child THQ=1 (µg/L)	Inhalation SL Child THQ=1 (µg/L)	Noncarcinogenic SL Child THI=1 (µg/L)	MCL (ug/L)
				1.3E-02	I			V		4.6	1	0.9	Yes	Triallate	2303-17-5					2.6E+02	2.2E+02		1.2E+02	
				1.0E-02	I					1.1	1	1	Yes	Triasulfuron	82097-50-5					2.0E+02	6.0E+04		2.0E+02	
				8.0E-03	I					0.78	1	1	Yes	Tribenuron-methyl	101200-48-0					1.6E+02	5.0E+03		1.6E+02	
				5.0E-03	I			V		4.66	1	0.9	Yes	Tribromobenzene, 1,2,4-	615-54-3					1.0E+02	8.1E+01		4.5E+01	
9.0E-03	P			1.0E-02	P					4	1	0.9	Yes	Tributyl Phosphate	126-73-8	8.7E+00	1.3E+01		5.2E+00	2.0E+02	3.3E+02		1.2E+02	
				3.0E-04	P						1	0	No	Tributyltin Compounds	NA					6.0E+00			6.0E+00	
				3.0E-04	I					4.05	1	1	Yes	Tributyltin Oxide	56-35-9					6.0E+00	9.5E+01		5.7E+00	
				3.0E+01	I	3.0E+01	H	V		3.16	1	1	Yes	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					6.0E+05	1.9E+06	6.3E+04	5.5E+04	
7.0E-02	I			2.0E-02	I					1.33	1	1	Yes	Trichloroacetic Acid	76-03-9	1.1E+00	4.6E+01		1.1E+00	4.0E+02	1.8E+04		3.9E+02	6.0E+01
2.9E-02	H									-0.67	1	1	Yes	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.7E+00	3.7E+03		2.7E+00					
7.0E-03	X			3.0E-05	X					3.52	1	1	Yes	Trichloroaniline, 2,4,6-	634-93-5	1.1E+01	2.0E+01		7.1E+00	6.0E-01	1.2E+00		4.0E-01	
				8.0E-04	X			V		4.05	1	1	Yes	Trichlorobenzene, 1,2,3-	87-61-6					1.6E+01	1.3E+01		7.0E+00	
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		4.02	1	1	Yes	Trichlorobenzene, 1,2,4-	120-82-1	2.7E+00	2.0E+00		1.2E+00	2.0E+02	1.6E+02	4.2E+00	4.0E+00	7.0E+01
				2.0E+00	I	5.0E+00	I	V		2.49	1	1	Yes	Trichloroethane, 1,1,1-	71-55-6					4.0E+04	2.5E+05	1.0E+04	8.0E+03	2.0E+02
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		1.89	1	1	Yes	Trichloroethane, 1,1,2-	79-00-5	1.4E+00	2.0E+01	3.5E-01	2.8E-01	8.0E+01	1.3E+03	4.2E-01	4.1E-01	5.0E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	2.42	1	1	Yes	Trichloroethylene	79-01-6	1.2E+00	7.4E+00	9.6E-01	4.9E-01	1.0E+01	6.9E+01	4.2E+00	2.8E+00	5.0E+00
				3.0E-01	I			V		2.53	1	1	Yes	Trichlorofluoromethane	75-69-4					6.0E+03	3.6E+04		5.2E+03	
				1.0E-01	I					3.72	1	1	Yes	Trichlorophenol, 2,4,5-	95-95-4					2.0E+03	2.9E+03		1.2E+03	
1.1E-02	I	3.1E-06	I	1.0E-03	P					3.69	1	1	Yes	Trichlorophenol, 2,4,6-	88-06-2	7.1E+00	9.8E+00		4.1E+00	2.0E+01	3.0E+01		1.2E+01	
				1.0E-02	I					3.31	1	0.9	Yes	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					2.0E+02	8.7E+02		1.6E+02	
				8.0E-03	I					3.8	1	0.9	Yes	Trichlorophenoxypropionic acid, -2,4,5	93-72-1					1.6E+02	3.6E+02		1.1E+02	5.0E+01
				5.0E-03	I			V		2.43	1	1	Yes	Trichloropropane, 1,1,2-	598-77-6					1.0E+02	7.5E+02		8.8E+01	
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	2.27	1	1	Yes	Trichloropropane, 1,2,3-	96-18-4	8.4E-04	7.3E-03		7.5E-04	8.0E+01	7.7E+02	6.3E-01	6.2E-01	
				3.0E-03	X	3.0E-04	P	V		2.78	1	1	Yes	Trichloropropene, 1,2,3-	96-19-5					6.0E+01	2.6E+02	6.3E-01	6.2E-01	
				2.0E-02	A					5.11	1	0.8	Yes	Tricresyl Phosphate (TCP)	1330-78-5					4.0E+02	2.6E+02		1.6E+02	
				3.0E-03	I					5.18	1	0.8	Yes	Tridiphane	58138-08-2					6.0E+01	2.6E+01		1.8E+01	
						7.0E-03	I	V		1.45	1	1	Yes	Triethylamine	121-44-8							1.5E+01	1.5E+01	
				2.0E+00	P					-1.75	1	1	Yes	Triethylene Glycol	112-27-6					4.0E+04	1.8E+08		4.0E+04	
						2.0E+01	P	V		1.74	1	1	Yes	Trifluoroethane, 1,1,1-	420-46-2							4.2E+04	4.2E+04	
7.7E-03	I			7.5E-03	I			V		5.34	1	0.8	Yes	Trifluralin	1582-09-8	1.0E+01	3.4E+00		2.6E+00	1.5E+02	5.5E+01		4.0E+01	
2.0E-02	P			1.0E-02	P					-0.65	1	1	Yes	Trimethyl Phosphate	512-56-1	3.9E+00	2.8E+03		3.9E+00	2.0E+02	1.6E+05		2.0E+02	
						5.0E-03	P	V		3.66	1	1	Yes	Trimethylbenzene, 1,2,3-	526-73-8							1.0E+01	1.0E+01	
						7.0E-03	P	V		3.63	1	1	Yes	Trimethylbenzene, 1,2,4-	95-63-6							1.5E+01	1.5E+01	
				1.0E-02	X			V		3.42	1	1	Yes	Trimethylbenzene, 1,3,5-	108-67-8					2.0E+02	2.8E+02		1.2E+02	
				1.0E-02	X			V		4.08	1	1	Yes	Trimethylpentene, 2,4,4-	25167-70-8					2.0E+02	9.6E+01		6.5E+01	
				3.0E-02	I					1.18	1	1	Yes	Trinitrobenzene, 1,3,5-	99-35-4					6.0E+02	4.7E+04		5.9E+02	
3.0E-02	I			5.0E-04	I					1.6	1	1	Yes	Trinitrotoluene, 2,4,6-	118-96-7	2.6E+00	1.1E+02		2.5E+00	1.0E+01	4.5E+02		9.8E+00	
				2.0E-02	P					2.83	1	1	Yes	Triphenylphosphine Oxide	791-28-6					4.0E+02	3.8E+03		3.6E+02	
				2.0E-02	A					3.65	1	0.9	Yes	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8					4.0E+02	3.2E+03		3.6E+02	
				1.0E-02	X					2.59	1	1	Yes	Tris(1-chloro-2-propyl)phosphate	13674-84-5					2.0E+02	3.8E+03		1.9E+02	
2.3E+00	C	6.6E-04	C					V		4.29	1	1	No	Tris(2,3-dibromopropyl)phosphate	126-72-7	3.4E-02		8.5E-03	6.8E-03					
2.0E-02	P			7.0E-03	P					1.44	1	1	Yes	Tris(2-chloroethyl)phosphate	115-96-8	3.9E+00	3.0E+02		3.8E+00	1.4E+02	1.2E+04		1.4E+02	
3.2E-03	P			1.0E-01	P					9.49	1	0	No	Tris(2-ethylhexyl)phosphate	78-42-2	2.4E+01			2.4E+01	2.0E+03			2.0E+03	
				8.0E-04	P						1	1	Yes	Tungsten	7440-33-7					1.6E+01	3.6E+03		1.6E+01	
				3.0E-03	I	4.0E-05	A				1	1	Yes	Uranium (Soluble Salts)	NA					6.0E+01	1.4E+04		6.0E+01	3.0E+01
1.0E+00	C	2.9E-04	C						M	-0.15	1	1	Yes	Urethane	51-79-6	2.5E-02	6.1E+00		2.5E-02					
		8.3E-03	P	9.0E-03	I	7.0E-06	P				0.026	1	Yes	Vanadium Pentoxide	1314-62-1					1.8E+02	1.1E+03		1.5E+02	
				5.0E-03	S	1.0E-04	A				0.026	1	Yes	Vanadium and Compounds	7440-62-2					1.0E+02	6.0E+02		8.6E+01	
				1.0E-03	I			V		3.84	1	1	Yes	Vernolate	1929-77-7					2.0E+01	2.5E+01		1.1E+01	
				2.5E-02	I					3.1	1	0.9	Yes	Vinclozolin	50471-44-8					5.0E+02	3.7E+03		4.4E+02	
				1.0E+00	H	2.0E-01	I	V		0.73	1	1	Yes	Vinyl Acetate	108-05-4					2.0E+04	1.4E+06	4.2E+02	4.1E+02	
		3.2E-05	H			3.0E-03	I	V		1.57	1	1	Yes	Vinyl Bromide	593-60-2			1.8E-01	1.8E-01			6.3E+00	6.3E+00	
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	1.38	1	1	Yes	Vinyl Chloride	75-01-4	2.1E-02	2.8E-01	3.4E-01	1.9E-02	6.0E+01	8.9E+02	2.1E+02	4.4E+01	2.0E+00
				3.0E-04	I					2.7	1	1	Yes	Warfarin	81-81-2					6.0E+00	8.4E+01		5.6E+00	
				2.0E-01	S	1.0E-01	S	V		3.15	1	1	Yes	Xylene, P-	106-42-3					4.0E+03	7.6E+03	2.1E+02	1.9E+02	
				2.0E-01	S	1.0E-01	S	V		3.2	1	1	Yes	Xylene, m-	108-38-3					4.0E+03	7.1E+03	2.1E+02	1.9E+02	
				2.0E-01	S	1.0E-01	S	V		3.12	1	1	Yes	Xylene, o-	95-47-6					4.0E+03	8.0E+03	2.1E+02	1.9E+02	
				2.0E-01	I	1.0E-01	I	V		3.16	1	1	Yes	Xylenes	1330-20-7					4.0E+03	7.5E+03	2.1E+02	1.9E+02	1.0E+04
				3.0E-04	I						1	1	Yes	Zinc Phosphide	1314-84-7					6.0E+00	2.3E+03		6.0E+00	
				3.0E-01	I						1	1	Yes	Zinc and Compounds	7440-66-6					6.0E+03	2.3E+06		6.0E+03	
				5.0E-02	I					1.3	1	1	Yes	Zineb	12122-67-7					1.0E+03	9.7E+04		9.9E+02	
				8.0E-05	X						1	1	Yes	Zirconium	7440-67-7					1.6E+00	3.6E+02		1.6E+00	

TR=1E-06
HQ=1.0

Contaminant		Molecular Weight		Volatility Parameters					Melting Point		Density		Diffusivity in Air and Water			Partition Coefficients						Water Solubility		Tapwater Dermal Parameters				
Analyte	CAS No.	MW	MW Ref	H` (unitless)	H` (atm-m³/mole)	H` and HLC Ref	VP	VP Ref	MP	MP Ref	Density (g/cm³)	Density Ref	D_{ia} (cm²/s)	D_{iw} (cm²/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K Ref
Dibromo-3-chloropropane, 1,2-	96-12-8	2.4E+02	PHYSPROP	6.0E-03	1.5E-04	EPI	5.8E-01	PHYSPROP	6.0E+00	PHYSPROP	2.1E+00	CRC89	3.2E-02	8.9E-06	WATER9			1.2E+02	EPI	3.0E+00	PHYSPROP	1.2E+03	PHYSPROP	4.1E-02	2.2E+00	5.3E+00	6.9E-03	EPI
Dibromobenzene, 1,3	108-36-1	2.4E+02	PHYSPROP	5.1E-02	1.2E-03	EPI	2.7E-01	PHYSPROP	-7.0E+00	PHYSPROP	2.0E+00	CRC89	3.1E-02	8.5E-06	WATER9			3.8E+02	EPI	3.8E+00	PHYSPROP	6.8E+01	PHYSPROP	1.4E-01	2.2E+00	5.3E+00	2.3E-02	EPI
Dibromobenzene, 1,4-	106-37-6	2.4E+02	PHYSPROP	3.7E-02	8.9E-04	EPI	5.8E-02	PHYSPROP	8.7E+01	PHYSPROP	2.3E+00	CRC89	3.3E-02	9.3E-06	WATER9			3.8E+02	EPI	3.8E+00	PHYSPROP	2.0E+01	PHYSPROP	1.4E-01	2.2E+00	5.3E+00	2.5E-02	EPI
Dibromochloromethane	124-48-1	2.1E+02	PHYSPROP	3.2E-02	7.8E-04	PHYSPROP	5.5E+00	PHYSPROP	-2.0E+01	PHYSPROP	2.5E+00	CRC89	3.7E-02	1.1E-05	WATER9			3.2E+01	EPI	2.2E+00	PHYSPROP	2.7E+03	PHYSPROP	1.6E-02	1.5E+00	3.7E+00	2.9E-03	EPI
Dibromoethane, 1,2	106-93-4	1.9E+02	PHYSPROP	2.7E-02	6.5E-04	PHYSPROP	1.1E+01	PHYSPROP	9.9E+00	PHYSPROP	2.2E+00	CRC89	4.3E-02	1.0E-05	WATER9			4.0E+01	EPI	2.0E+00	PHYSPROP	3.9E+03	PHYSPROP	1.5E-02	1.2E+00	2.8E+00	2.8E-03	EPI
Dibromomethane (Methylene Bromide)	74-95-3	1.7E+02	PHYSPROP	3.4E-02	8.2E-04	PHYSPROP	4.4E+01	PHYSPROP	-5.3E+01	PHYSPROP	2.5E+00	CRC89	5.5E-02	1.2E-05	WATER9			2.2E+01	EPI	1.7E+00	PHYSPROP	1.2E+04	PHYSPROP	1.1E-02	9.9E-01	2.4E+00	2.2E-03	EPI
Dibutyltin Compounds	NA																											
Dicamba	1918-00-9	2.2E+02	PHYSPROP	8.9E-08	2.2E-09	EPI	1.3E-05	PHYSPROP	1.2E+02	PHYSPROP	1.6E+00	CRC89	2.9E-02	7.8E-06	WATER9			2.9E+01	EPI	2.2E+00	PHYSPROP	8.3E+03	PHYSPROP	1.5E-02	1.8E+00	4.4E+00	2.7E-03	EPI
Dichloro-2-butene, 1,4-	764-41-0	1.3E+02	PHYSPROP	3.5E-01	8.5E-03	PHYSPROP	3.0E+00	EPI	3.5E+00	PHYSPROP	1.2E+00	LANGE	6.7E-02	9.3E-06	WATER9			1.3E+02	EPI	2.6E+00	PHYSPROP	5.8E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
Dichloro-2-butene, cis-1,4-	1476-11-5	1.3E+02	PHYSPROP	2.7E-02	6.6E-04	EPI	4.1E+00	PHYSPROP	-4.8E+01	PHYSPROP	1.2E+00	CRC89	6.7E-02	9.3E-06	WATER9			1.3E+02	EPI	2.6E+00	PHYSPROP	5.8E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
Dichloro-2-butene, trans-1,4	110-57-6	1.3E+02	PHYSPROP	2.7E-02	6.6E-04	EPI	3.4E+00	PHYSPROP	2.0E+00	PHYSPROP	1.2E+00	CRC89	6.6E-02	9.3E-06	WATER9			1.3E+02	EPI	2.6E+00	PHYSPROP	8.5E+02	PHYSPROP	7.1E-02	5.3E-01	1.3E+00	1.7E-02	EPI
Dichloroacetic Acid	79-43-6	1.3E+02	PHYSPROP	3.4E-07	8.4E-09	PHYSPROP	1.8E-01	PHYSPROP	1.4E+01	PHYSPROP	1.6E+00	CRC89	7.2E-02	1.1E-05	WATER9			2.3E+00	EPI	9.2E-01	PHYSPROP	1.0E+06	PHYSPROP	5.3E-03	5.5E-01	1.3E+00	1.2E-03	EPI
Dichlorobenzene, 1,2-	95-50-1	1.5E+02	PHYSPROP	7.8E-02	1.9E-03	PHYSPROP	1.4E+00	PHYSPROP	-1.7E+01	PHYSPROP	1.3E+00	CRC89	5.6E-02	8.9E-06	WATER9			3.8E+02	EPI	3.4E+00	PHYSPROP	1.6E+02	PHYSPROP	2.1E-01	7.0E-01	1.7E+00	4.5E-02	EPI
Dichlorobenzene, 1,4-	106-46-7	1.5E+02	PHYSPROP	9.9E-02	2.4E-03	PHYSPROP	1.7E+00	PHYSPROP	5.2E+01	PHYSPROP	1.2E+00	CRC89	5.5E-02	8.7E-06	WATER9			3.8E+02	EPI	3.4E+00	PHYSPROP	8.1E+01	PHYSPROP	2.1E-01	7.0E-01	1.7E+00	4.5E-02	EPI
Dichlorobenzidine, 3,3'-	91-94-1	2.5E+02	PHYSPROP	1.2E-09	2.8E-11	PHYSPROP	2.6E-07	PHYSPROP	1.3E+02	PHYSPROP			4.7E-02	5.5E-06	WATER9			3.2E+03	EPI	3.5E+00	PHYSPROP	3.1E+00	PHYSPROP	7.8E-02	2.8E+00	6.6E+00	1.3E-02	EPI
Dichlorobenzophenone, 4,4'-	90-98-2	2.5E+02	PHYSPROP	4.4E-05	1.1E-06	PHYSPROP	6.4E-06	PHYSPROP	1.5E+02	PHYSPROP	1.5E+00	CRC89	2.6E-02	6.9E-06	WATER9			2.9E+03	EPI	4.4E+00	PHYSPROP	8.3E-01	PHYSPROP	3.3E-01	2.7E+00	6.4E+00	5.4E-02	EPI
Dichlorodifluoromethane	75-71-8	1.2E+02	PHYSPROP	1.4E+01	3.4E-01	PHYSPROP	4.8E+03	PHYSPROP	-1.6E+02	PHYSPROP	1.5E+00	PERRY	7.6E-02	1.1E-05	WATER9			4.4E+01	EPI	2.2E+00	PHYSPROP	2.8E+02	PHYSPROP	3.8E-02	5.0E-01	1.2E+00	9.0E-03	EPI
Dichloroethane, 1,1-	75-34-3	9.9E+01	PHYSPROP	2.3E-01	5.6E-03	PHYSPROP	2.3E+02	PHYSPROP	-9.7E+01	PHYSPROP	1.2E+00	CRC89	8.4E-02	1.1E-05	WATER9			3.2E+01	EPI	1.8E+00	PHYSPROP	5.0E+03	PHYSPROP	2.6E-02	3.8E-01	9.0E-01	6.8E-03	EPI
Dichloroethane, 1,2-	107-06-2	9.9E+01	PHYSPROP	4.8E-02	1.2E-03	PHYSPROP	7.9E+01	PHYSPROP	-3.6E+01	PHYSPROP	1.2E+00	CRC89	8.6E-02	1.1E-05	WATER9			4.0E+01	EPI	1.5E+00	PHYSPROP	8.6E+03	PHYSPROP	1.6E-02	3.8E-01	9.0E-01	4.2E-03	EPI
Dichloroethylene, 1,1-	75-35-4	9.7E+01	PHYSPROP	1.1E+00	2.6E-02	PHYSPROP	6.0E+02	PHYSPROP	-1.2E+02	PHYSPROP	1.2E+00	CRC89	8.6E-02	1.1E-05	WATER9			3.2E+01	EPI	2.1E+00	PHYSPROP	2.4E+03	PHYSPROP	4.4E-02	3.7E-01	8.8E-01	1.2E-02	EPI
Dichloroethylene, 1,2-cis-	156-59-2	9.7E+01	PHYSPROP	1.7E-01	4.1E-03	PHYSPROP	2.0E+02	PHYSPROP	-8.0E+01	PHYSPROP	1.3E+00	CRC89	8.8E-02	1.1E-05	WATER9			4.0E+01	EPI	1.9E+00	PHYSPROP	6.4E+03	PHYSPROP	4.2E-02	3.7E-01	8.8E-01	1.1E-02	EPI
Dichloroethylene, 1,2-trans-	156-60-5	9.7E+01	PHYSPROP	3.8E-01	9.4E-03	PHYSPROP	3.3E+02	EPI	-5.0E+01	PHYSPROP	1.3E+00	CRC89	8.8E-02	1.1E-05	WATER9			4.0E+01	EPI	2.1E+00	PHYSPROP	4.5E+03	PHYSPROP	4.2E-02	3.7E-01	8.8E-01	1.1E-02	EPI
Dichlorophenol, 2,4-	120-83-2	1.6E+02	PHYSPROP	1.8E-04	4.3E-06	EPI	9.0E-02	PHYSPROP	4.5E+01	PHYSPROP	1.4E+00	PERRY	4.9E-02	8.7E-06	WATER9			1.5E+02	SSL	3.1E+00	PHYSPROP	5.6E+03	PHYSPROP	1.0E-01	8.6E-01	2.1E+00	2.1E-02	EPI
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	2.2E+02	PHYSPROP	1.4E-06	3.5E-08	EPI	8.3E-05	PHYSPROP	1.4E+02	PHYSPROP	1.4E+00	PubChem	2.8E-02	7.3E-06	WATER9			3.0E+01	EPI	2.8E+00	PHYSPROP	6.8E+02	PHYSPROP	3.8E-02	1.8E+00	4.4E+00	6.6E-03	EPI
Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6	2.5E+02	PHYSPROP	9.4E-08	2.3E-09	PHYSPROP	1.1E-05	PHYSPROP	1.2E+02	PHYSPROP	1.4E+00	ChemNet	2.6E-02	6.7E-06	WATER9			3.7E+02	PubChem	3.5E+00	PHYSPROP	4.6E+01	PHYSPROP	8.4E-02	2.6E+00	6.3E+00	1.4E-02	EPI
Dichloropropane, 1,2-	78-87-5	1.1E+02	PHYSPROP	1.2E-01	2.8E-03	PHYSPROP	5.3E+01	PHYSPROP	-1.0E+02	PHYSPROP	1.2E+00	PERRY	7.3E-02	9.7E-06	WATER9			6.1E+01	EPI	2.0E+00	PHYSPROP	2.8E+03	PHYSPROP	3.1E-02	4.5E-01	1.1E+00	7.5E-03	EPI
Dichloropropane, 1,3-	142-28-9	1.1E+02	PHYSPROP	4.0E-02	9.8E-04	PHYSPROP	1.8E+01	PHYSPROP	-1.0E+02	PHYSPROP	1.2E+00	CRC89	7.4E-02	9.8E-06	WATER9			7.2E+01	EPI	2.0E+00	PHYSPROP	2.8E+03	PHYSPROP	3.2E-02	4.5E-01	1.1E+00	7.8E-03	EPI
Dichloropropanol, 2,3-	616-23-9	1.3E+02	PHYSPROP	1.5E-07	3.6E-09	PHYSPROP	1.8E-01	PHYSPROP	-2.5E+01	EPI	1.4E+00	CRC89	6.8E-02	9.9E-06	WATER9			5.6E+00	EPI	7.8E-01	PHYSPROP	6.4E+04	PHYSPROP	4.3E-03	5.5E-01	1.3E+00	9.8E-04	EPI
Dichloropropene, 1,3-	542-75-6	1.1E+02	PHYSPROP	1.5E-01	3.6E-03	PHYSPROP	3.4E+01	PHYSPROP	-5.0E+01	PHYSPROP	1.2E+00	LANGE	7.6E-02	1.0E-05	WATER9			7.2E+01	EPI	2.0E+00	PHYSPROP	2.8E+03	PHYSPROP	3.4E-02	4.4E-01	1.1E+00	8.3E-03	EPI
Dichlorvos	62-73-7	2.2E+02	PHYSPROP	2.4E-05	5.7E-07	EPI	1.6E-02	PHYSPROP	-6.0E+01	PHYSPROP	1.4E+00	CRC89	2.8E-02	7.3E-06	WATER9			5.4E+01	EPI	1.4E+00	PHYSPROP	8.0E+03	PHYSPROP	4.6E-03	1.8E+00	4.4E+00	8.0E-04	EPI
Dicrotophos	141-66-2	2.4E+02	PHYSPROP	2.1E-09	5.0E-11	PHYSPROP	1.6E-04	PHYSPROP	7.9E+01	EPI	1.2E+00	CRC89	2.5E-02	6.4E-06	WATER9			1.7E+01	EPI	0.0E+00	PHYSPROP	1.0E+06	PHYSPROP	4.3E-04	2.2E+00	5.4E+00	7.3E-05	EPI
Dicyclopentadiene	77-73-6	1.3E+02	PHYSPROP	2.6E+00	6.3E-02	PHYSPROP	2.3E+00	EPI	-1.0E+00	PHYSPROP	9.3E-01	LANGE	5.6E-02	7.8E-06	WATER9			1.5E+03	EPI	3.2E+00	PHYSPROP	2.6E+01	PHYSPROP	1.6E-01	5.8E-01	1.4E+00	3.6E-02	EPI
Dieldrin	60-57-1	3.8E+02	PHYSPROP	4.1E-04	1.0E-05	PHYSPROP	5.9E-06	PHYSPROP	1.8E+02	PHYSPROP	1.8E+00	CRC89	2.3E-02	6.0E-06	WATER9			2.0E+04	EPI	5.4E+00	PHYSPROP	2.0E-01	PHYSPROP	2.4E-01	1.4E+01	3.4E+01	3.3E-02	EPI
Diesel Engine Exhaust	NA																											
Diethanolamine	111-42-2	1.1E+02	PHYSPROP	1.6E-09	3.9E-11	EPI	2.8E-04	PHYSPROP	2.8E+01	PHYSPROP	1.1E+00	CRC89	7.7E-02	9.8E-06	WATER9			1.0E+00	EPI	-1.4E+00	PHYSPROP	1.0E+06	PHYSPROP	1.8E-04	4.1E-01	9.8E-01	4.5E-05	EPI
Diethylene Glycol Monobutyl Ether	112-34-5	1.6E+02	PHYSPROP	2.9E-07	7.2E-09	PHYSPROP	2.2E-02	PHYSPROP	-6.8E+01	PHYSPROP	9.6E-01	CRC89	4.1E-02	7.0E-06	WATER9			1.0E+01	EPI	5.6E-01	PHYSPROP	1.0E+06	PHYSPROP	2.2E-03	8.5E-01	2.0E+00	4.5E-04	EPI
Diethylene Glycol Monoethyl Ether	111-90-0	1.3E+02	PHYSPROP	9.1E-07	2.2E-08	EPI	1.3E-01	PHYSPROP	-7.6E+01	PHYSPROP	9.9E-01	CRC89	5.6E-02	8.0E-06	WATER9			1.0E+00	EPI	-5.4E-01	PHYSPROP	1.0E+06	PHYSPROP	5.4E-04	5.9E-01	1.4E+00	1.2E-04	EPI
Diethylformamide	617-84-5	1.0E+02	PHYSPROP	5.3E-06	1.3E-07	PHYSPROP	1.2E+00	EPI	-7.6E+00	EPI	9.1E-01	CRC89	7.3E-02	9.0E-06	WATER9			2.1E+00	EPI	5.0E-02	PHYSPROP	1.0E+06	PHYSPROP	1.8E-03	3.9E-01	9.3E-01	4.6E-04	EPI
Diethylstilbestrol	56-53-1	2.7E+02	PHYSPROP	2.4E-10	5.8E-12	PHYSPROP	1.4E-08	PHYSPROP	1.7E+02	PHYSPROP			4.6E-02	5.3E-06	WATER9			2.7E+05	EPI	5.1E+00	PHYSPROP	1.2E+01	PHYSPROP	7.2E-01	3.3E+00	1.3E+01	1.1E-01	EPI
Difenzoquat	43222-48-6	3.6E+02	PHYSPROP				4.1E-12	PHYSPROP	1.6E+02	PHYSPROP			3.8E-02	4.4E-06	WATER9			7.8E+04	EPI	6.5E-01	PHYSPROP	8.2E+05	PHYSPROP	2.9E-04	1.1E+01	2.6E+01	4.0E-05	EPI
Diflubenzuron	35367-38-5	3.1E+02	PHYSPROP	1.9E-07	4.6E-09	EPI	9.0E-10	PHYSPROP	2.4E+02	PHYSPROP			4.1E-02	4.8E-06	WATER9			4.6E+02	EPI	3.9E+00	PHYSPROP	8.0E-02	PHYSPROP	7.3E-02	5.8E+00	1.4E+01	1.1E-02	EPI
Difluoroethane, 1,1-	75-37-6	6.6E+01	PHYSPROP	8.3E-01	2.0E-02	PHYSPROP	4.6E+03	PHYSPROP	-1.2E+02	PHYSPROP	9.0E-01	CRC89	1.0E-01	1.2E-05	WATER9			3.2E+01	EPI	7.5E-01	PHYSPROP	3.2E+03	PHYSPROP	6.6E-03	2.5E-01	5.9E-01	2.1E-03	EPI
Dihydrosafrole	94-58-6	1.6E+02	PHYSPROP	5.0E-04	1.2E-05	PHYSPROP	5.6E-02	PHYSPROP	4.4E+01	EPI	1.1E+00	PubChem	4.3E-02	7.4E-06	WATER9			2.1E+02	EPI	3.6E+00	PHYSPROP	5.7E+01	PHYSPROP	2.2E-01	8.7E-01	2.1E+00	4.5E-02	EPI
Diisopropyl Ether	108-20-3	1.0E+02	PHYSPROP	1.0E-01	2.6E-03	PHYSPROP	1.5E+02	PHYSPROP	-8.7E+01	PHYSPROP	7.2E-01	CRC89	6.5E-02	7.8E-06	WATER9			2.3E+01	EPI	1.5E+00	PHYSPROP	8.8E+03	PHYSPROP	1.7E-02	3.9E-01	9.4E-01	4.3E-03	EPI
Diisopropyl Methylphosphonate	1445-75-6	1.8E+02	PHYSPROP	1.8E-03	4.4E-05	EPI	2.3E-01	PHYSPROP	-2.4E+01	EPI	9.8E-01	ATSDR	3.4E-02	6.6E-06	WATER9			4.2E+01	EPI	1.0E+00	PHYSPROP	1.5E+03	PHYSPROP	3.8E-03	1.1E+00	2.6E+00	7.4E-04	EPI
Dimethipin	55290-64-7	2.1E+02	PHYSPROP	9.4E-10	2.3E-11	EPI	3.8E-07	PHYSPROP	1.7E+02	PHYSPROP			5.4E-02	6.3E-06	WATER9			1.0E+01	EPI	-1.7E-01	PHYSPROP	4.6E+03	PHYSPROP	4.5E-04	1.6E+00	3.8E+00	8.0E-05	EPI
Dimethoate	60-51-5	2.3E+02	PHYSPROP	9.9E-09	2.4E-10	EPI	1.9E-05	PHYSPROP	5.2E+01	PHYSPROP	1.3E+00	CRC89	2.6E-02	6.7E-06	WATER9			1.3E+01	EPI	7.8E-01	PHYSPROP	2.3E+04	PHYSPROP	1.6E-03	2.0E+00	4.9E+00	2.7E-04	EPI
Dimethoxybenzidine, 3,3'-	119-90-4	2.4E+02	PHYSPROP	1.9E-09	4.7E-11	PHYSPROP	1.3E-07	PHYSPROP	1.4E+02	PHYSPROP			4.9E-02	5.7E-06	WATER9			5.1E+02	EPI	1.8E+00	PHYSPROP	6.0E+01	PHYSPROP	6.4E-03	2.5E+00	5.9E+00	1.1E-03	EPI
Dimethyl methylphosphonate	756-79-6	1.2E+02	PHYSPROP	5.6E-06	1.4E-07	PHYSPROP	8.3E-01	PHYSPROP	-4.8E+01	EPI	1.2E+00	CRC89	6.7E-02	9.2E-06	WATER9			5.4E+00	EPI	-6.1E-01	PHYSPROP	1.0E+06	PHYSPROP	5.3E-04	5.2E-01	1.2E+00	1.2E-04	EPI
Dimethylamino azobenzene [p-	60-11-7	2.3E+02	PHYSPROP	1.6E-08	4.0E-10	PHYSPROP	7.0E-08	EPI	1.2E+02	PHYSPROP			5.1E-02	6.0E-06	WATER9			2.0E+03	EPI	4.6E+00	PHYSPROP	2.3E-01	PHYSPROP	5.4E-01	1.9E+00	4.6E+00	9.4E-02	EPI
Dimethylaniline HCl, 2,4-	21436-96-4	1.2E+02	PHYSPROP	9.5E-05	2.3E-06	PHYSPROP	1.8E-01	PHYSPROP	1.6E+02	EPI			7.8E-02	9.1E-06	WATER9			3.5E+02	EPI	2.2E+00	PHYSPROP	3.7E+03	PHYSPROP	8.6E-05	5.0E-01	1.2E+00	2.0E-05	EPI
Dimethylaniline, 2,4-	95-68-1	1.2E+02	PHYSPROP	1.0E-04	2.5E-06	PHYSPROP	1.3E-01	PHYSPROP	-1.4E+01	PHYSPROP	9.7E-01	CRC89	6.3E-02	8.4E-06	WATER9			1.8E+02	EPI	1.7E+00	PHYSPROP	6.1E+03	PHYSPROP	1.8E-02	5.0E-01	1.2E+00	4.3E-03	EPI
Dimethylaniline, N,N	121-69-7	1.2E+02	PHYSPROP	2.3E-03	5.7E-05	EPI	7.0E-01	PHYSPROP	2.5E+00	PHYSPROP	9.6E-01	CRC89	6.3E-02	8.3E-06	WATER9			7.9E+01	EPI	2.3E+00	PHYSPROP	1.5E+03	PHYSPROP	4.7E-02	5.0E-01	1.2E+00	1.1E-02	EPI
Dimethylbenzidine, 3,3'-	119-93-7	2.1E+02	PHYSPROP	2.6E-09	6.3E-11	PHYSPROP	6.9E-07	PHYSPROP	1.3E+02	PHYSPROP			5.3E-02	6.2E-06	WATER9			3.2E+03	EPI	2.3E+00	PHYSPROP	1.3E+03	PHYSPROP	2.0E-02	1.6E+00	3.9E+00	3.6E-03	EPI
Dimethylformamide	68-12-2	7.3E+01	PHYSPROP	3.0E-06	7.4E-08	PHYSPROP	3.9E+00	PHYSPROP	-6.0E+01	PHYSPROP	9.4E-01	CRC89	9.7E-02	1.1E-05	WATER9			1.0E+00	EPI	-1.0E+00	PHYSPROP	1.0E+06	PHYSPROP	4.3E-04	2.7E-01	6.5E-01	1.3E-04	EPI
Dimethylhydrazine, 1,1-	57-14-7	6.0E+01	PHYSPROP	5.3E-04	1.3E-05	PHYSPROP	1.6E+02	PHYSPROP	-5.8E+01	PHYSPROP	7.9E-01	CRC89	1.0E-01	1.1E-05	WATER9			1.2E+01	EPI	-1.2E+00	PHYSPROP	1.0E+06	PHYSPROP	2.2E-04	2.3E-01	5.5E-01	7.3E-05	RAGS
Dimethylhydrazine, 1,2-	540-73-8	6.0E+01	PHYSPROP	2.8E-06	7.0E-08	PHYSPROP	7.0E+01	PHYSPROP	-9.0E+00	PHYSPROP	8.3E-01	CRC89	1.1E-01	1.2E-05	WATER9			1.5E+01	EPI	-5.4E-01	PHYSPROP	1.0E+06	PHYSPROP	9.5E-04	2.3E-01	5.5E-01	3.2E-04	EPI
Dimethylphenol, 2,4-	105-67-9	1.2E+02	PHYSPROP	3.9E-05	9.5E-07	PHYSPROP	1.0E-01	PHYSPROP	2.5E+01	PHYSPROP	9.7E-01	CRC89	6.2E-02	8.3E-06	WATER9			4.9E+02	EPI	2.3E+00	PHYSPROP	7.9E+03	PHYSPROP	4.6E-02	5.1E-01	1.2E+00	1.1E-02	EPI
Dimethylphenol, 2,6	576-26-1	1.2E+02	PHYSPROP	2.7E-04	6.7E-06	PHYSPROP	1.7E-01	EPI	4.6E+01	PHYSPROP			7.7E-02	9.0E-06	WATER9			5.0E+02	EPI	2.4E+00	PHYSPROP	6.1E+03	PHYSPROP	5.1E-02	5.1E-01	1.2E+00	1.2E-02	EPI
Dimethylphenol, 3,4-	95-65-8	1.2E+02	PHYSPROP	1.7E-05	4.2E-07	PHYSPROP	3.6E-02	EPI	6.1E+01	PHYSPROP	9.8E-01	CRC89	6.3E-02	8.4E-06	WATER9			4.9E+02	EPI	2.2E+00	PHYSPROP	4.8E+03	PHYSPROP	4.2E-02	5.1E-01	1.2E+00	9.8E-03	EPI
Dimethylvinylchloride	513-37-1	9.1E+01	PHYSPROP	4.8E-02	1.2E-03	CRC89	2.1E+02	PHYSPROP	-1.0E+02	EPI	9.2E-01	CRC89	8.1E-02	9.7E-06	WATER9			6.1E+01	EPI	2.6E+00	PHYSPROP	1.0E+03	PHYSPROP	9.3E-02	3.4E-01	8.1E-01	2.5E-02	EPI
Dinitro-o-cresol, 4,6-	534-52-1	2.0E+02	PHYSPROP	5.7E-05	1.4E-06	PHYSPROP	1.2E-04	PHYSPROP	8.7E+01	PHYSPROP			5.6E-02	6.5E-06	WATER9			7.5E+02	EPI	2.1E+00	PHYSPROP	2.0E+02	PHYSPROP	1.7E-02	1.4E+00	3.2E+00	3.2E-03	EPI
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	2.7E+02	PHYSPROP	2.3E-06	5.5E-08	PHYSPROP	4.2E-08	PHYSPROP	1.1E+02	PHYSPROP			4.6E-02	5.4E-06	WATER9			1.7E+04	EPI	4.1E+00	PHYSPROP	1.5E+01	PHYSPROP	1.7E-01	3.3E+00	7.8E+00	2.8E-02	EPI
Dinitrobenzene, 1,2-	528-29-0	1.7E+02	PHYSPROP	2.2E-06	5.3E-08	EPI	4.6E-05	EPI	1.2E+02	PHYSPROP	1.3E+00	CRC89	4.5E-02	8.3E-06	WATER9			3.6E+02	EPI	1.7E+00	PHYSPROP	1.3E+02	PHYSPROP	1.2E-02	9.2E-01	2.2E+00	2.4E-03	EPI
Dinitrobenzene, 1,3-	99-65-0	1.7E+02	PHYSPROP	2.0E-06	4.9E-08	PHYSPROP	9.0E-04	EPI	9.0E+01	PHYSPROP	1.6E+00	CRC89	4.8E-02	9.2E-06	WATER9			3.5E+02	EPI	1.5E+00	PHYSPROP	5.3E+02	PHYSPROP	8.7E-03	9.2E-01	2.2E+00	1.7E-03	EPI
Dinitrobenzene, 1,4-	100-25-4	1.7E+02	PHYSPROP	3.4E-06	8.4E-08	PHYSPROP	2.6E-05	PHYSPROP	1.7E+02	PHYSPROP	1.6E+00	CRC89	4.9E-02	9.4E-06	WATER9			3.5E+02	EPI	1.5E+00	PHYSPROP	6.9E+01	PHYSPROP	8.3E-03	9.2E-01	2.2E+00	1.7E-03	EPI
Dinitrophenol, 2,4-	51-28-5	1.8E+02	PHYSPROP	3.5E-06	8.6E-08	PHYSPROP	3.9E-04	PHYSPROP	1.1E+02	PHYSPROP	1.7E+00	CRC89	4.1E-02	9.1E-06	WATER9			4.6E+02	EPI	1.7E+00	PHYSPROP	2.8E+03	PHYSPROP	9.8E-03	1.1E+00	2.7E+00	1.9E-03	EPI
Dinitrotoluene Mixture, 2,4/2,6	NA	1.8E+02	EPI	1.6E-05	4.0E-07	EPI	2.2E-03	EPI	6.0E+01	EPI			5.9E-02	6.9E-06	WATER9			5.9E+02	EPI	2.2E+00	EPI	2.7E+02	EPI	2.2E-02	1.1E+00	2.6E+00	4.2E-03	EPI
Dinitrotoluene, 2,4-	121-14-2	1.8E+02	PHYSPROP	2.2E-06	5.4E-08	PHYSPROP	1.5E-04	PHYSPROP	7.1E+01	PHYSPROP	1.3E+00	CRC89	3.8E-02	7.9E-06	WATER9			5.8E+02	EPI	2.0E+00	PHYSPROP	2.0E+02	PHYSPROP	1.6E-02	1.1E+00	2.6E+00	3.1E-03	EPI
Dinitrotoluene, 2,6-	606-20-2	1.8E+02	PHYSPROP	3.1E-05	7.5E-07	EPI	5.7E-04	PHYSPROP	6.6E+01	PHYSPROP	1.3E+00	CRC89	3.7E-02	7.8E-06	WATER9			5.9E+02	EPI	2.1E+00	PHYSPROP	1.8E+02	PHYSPROP	1.9E-02	1.1E+00	2.6E+00	3.7E-03	EPI
Dinitrotoluene, 2-Amino-4,6	35572-78-2	2.0E+02	PHYSPROP	1.3E-09	3.3E-11	PHYSPROP	1.1E-05	PHYSPROP	1.7E+02	PHYSPROP			5.6E-02	6.6E-06	WATER9			2.8E+02	EPI	1.8E+00	PHYSPROP	1.2E+03	PHYSPROP	1.1E-02	1.3E+00	3.2E+00	2.0E-03	EPI
Dinitrotoluene, 4-Amino-2,6-	19406-51-0	2.0E+02	PHYSPROP	1.3E-09	3.3E-11	PHYSPROP	1.1E-05	PHYSPROP	1.7E+02	PHYSPROP			5.6E-02	6.6E-06	WATER9			2.8E+02	EPI	1.8E+00	PHYSPROP	1.2E+03	PHYSPROP	1.1E-02	1.3E+00	3.2E+00	2.0E-03	EPI
Dinitrotoluene, Technical grade	25321-14-6	5.5E+02	PHYSPROP	3.8E-06	9.3E-08	PHYSPROP	4.0E-04	PHYSPROP	6.0E+01	EPI			2.8E-02	3.3E-06	WATER9			5.9E+02	EPI	2.2E+00	PHYSPROP	2.7E+02	PHYSPROP	3.7E-02	1.2E+02	2.9E+02	4.2E-03	EPI
Dinoseb	88-85-7	2.4E+02	PHYSPROP	1.9E-05	4.6E-07	EPI	7.5E-05	PHYSPROP	4.0E+01	PHYSPROP	1.3E+00	CRC89	2.5E-02	6.5E-06	WATER9			4.3E+03	EPI	3.6E+00	PHYSPROP	5.2E+01	PHYSPROP	9.7E-02	2.3E+00	5.6E+00	1.6E-02	EPI
Dioxane, 1,4-	123-91-1	8.8E+01	PHYSPROP	2.0E-04	4.8E-06	PHYSPROP	3.8E+01	PHYSPROP	1.2E+01	PHYSPROP	1.0E+00	CRC89	8.7E-02	1.1E-05	WATER9			2.6E+00	EPI	-2.7E-01	PHYSPROP	1.0E+06	PHYSPROP	1.2E-03	3.3E-01	7.9E-01	3.3E-04	EPI
Dioxins																												
~Hexachlorodibenzo-p-dioxin, Mixture	NA	3.9E+02	EPI	2.3E-04	5.7E-06	EPI	4.4E-11	EPI	2.5E+02	EPI			4.3E-02	4.2E-06	WATER9			7.0E+05	EPI	8.2E+00	EPI	4.0E-06	EPI	2.2E+01	1.6E+01	7.5E+01	2.9E+00	EPI
~TCDD, 2,3,7,8-	1746-01-6	3.2E+02	PHYSPROP	2.0E-03	5.0E-05	EPI	1.5E-09	PHYSPROP	3.1E+02	PHYSPROP	1.8E+00	PubChem	4.7E-02	6.8E-06	WATER9			2.5E+05	EPI	6.8E+00	PHYSPROP	2.0E-04	PHYSPROP	5.6E+00	6.7E+00	2.9E+01	8.1E-01	EPI
Diphenamid	957-51-7	2.4E+02	PHYSPROP	1.5E-09	3.6E-11	EPI	3.0E-08	PHYSPROP	1.4E+02	PHYSPROP	1.2E+00	CRC89	2.4E-02	6.2E-06	WATER9			4.8E+03	EPI	2.2E+00	PHYSPROP	2.6E+02	PHYSPROP	3.3E-02	2.3E+00	5.5E+00	5.6E-03	EPI
Diphenyl Sulfone	127-63-9	2.2E+02	PHYSPROP	1.0E-05	2.5E-07	PHYSPROP	1.5E-05	PHYSPROP	1.3E+02	PHYSPROP	1.3E+00	CRC89	2.7E-02	6.9E-06	WATER9			1.1E+03	EPI	2.4E+00	PHYSPROP	3.1E+02	PHYSPROP	2.1E-02	1.8E+00	4.2E+00	3.7E-03	EPI
Diphenylamine	122-39-4	1.7E+02	PHYSPROP	1.1E-04	2.7E-06	EPI	6.7E-04	PHYSPROP	5.3E+01	PHYSPROP	1.2E+00	CRC89	4.2E-02	7.6E-06	WATER9			8.3E+02	EPI	3.5E+00	PHYSPROP	5.3E+01	PHYSPROP	1.9E-01	9.3E-01	2.2E+00	3.7E-02	EPI
Diphenylhydrazine, 1,2-	122-66-7	1.8E+02	PHYSPROP	2.0E-05	4.8E-07	EPI	4.4E-04	EPI	1.3E+02	PHYSPROP	1.2E+00	CRC89	3.4E-02	7.2E-06	WATER9			1.5E+03	EPI	2.9E+00	PHYSPROP	2.2E+02	PHYSPROP	6.8E-02	1.1E+00	2.7E+00	1.3E-02	EPI
Diquat	85-00-7	3.4E+02	PHYSPROP	5.8E-12	1.4E-13	PHYSPROP	1.8E-06	PHYSPROP	3.4E+02	PHYSPROP	1.2E+00	CRC89	2.1E-02	5.2E-06	WATER9			9.3E+03	EPI	-4.6E+00	PHYSPROP	7.1E+05	PHYSPROP	1.7E-06	8.9E+00	2.1E+01	2.4E-07	EPI
Direct Black 38	1937-37-7	7.8E+02	PHYSPROP	3.4E-38	8.2E-40	PHYSPROP	1.5E-36	PHYSPROP	3.5E+02	EPI			2.2E-02	2.6E-06	WATER9			2.4E+08	EPI	4.9E+00	PHYSPROP	3.0E+03	PHYSPROP	2.2E-03	2.4E+03	5.9E+03	2.1E-04	EPI
Direct Blue 6	2602-46-2	9.3E+02	PHYSPROP	3.7E-42	9.1E-44	PHYSPROP	9.5E-39	PHYSPROP	3.5E+02	EPI			2.0E-02	2.3E-06	WATER9			7.9E+08	EPI	2.6E+00	PHYSPROP	1.4E-04	PHYSPROP	2.0E-08	1.8E+04	4.2E+04	1.7E-09	EPI
Direct Brown 95	16071-86-6	7.6E+02	PHYSPROP				1.4E-41	PHYSPROP	3.5E+02	EPI			2.3E-02	2.7E-06	WATER9			7.0E+06	EPI	-6.5E+00	PHYSPROP	1.0E+06	PHYSPROP	4.1E-11	1.9E+03	4.6E+03	3.9E-12	EPI
Disulfoton	298-04-4	2.7E+02	PHYSPROP	8.8E-05	2.2E-06	EPI	9.8E-05	PHYSPROP	-2.5E+01	PHYSPROP	1.1E+00	CRC89	2.3E-02	5.7E-06	WATER9			8.4E+02	EPI	4.0E+00	PHYSPROP	1.6E+01	PHYSPROP	1.4E-01	3.6E+00	8.7E+00	2.1E-02	EPI
Dithiane, 1,4-	505-29-3	1.2E+02	PHYSPROP	1.7E-03	4.2E-05	EPI	8.0E-02	PHYSPROP	1.1E+02	PHYSPROP	1.1E+00	ChemNet	6.8E-02	9.3E-06	WATER9			1.5E+02	EPI	7.7E-01	PHYSPROP	3.0E+03	PHYSPROP	4.6E-03	5.0E-01	1.2E+00	1.1E-03	EPI
Diuron	330-54-1	2.3E+02	PHYSPROP	2.1E-08	5.0E-10	EPI	6.9E-08	PHYSPROP	1.6E+02	PHYSPROP			5.0E-02	5.9E-06	WATER9			1.1E+02	EPI	2.7E+00	PHYSPROP	4.2E+01	PHYSPROP	2.7E-02	2.1E+00	5.1E+00	4.7E-03	EPI
Dodine	2439-10-3	2.9E+02	PHYSPROP	3.7E-09	9.0E-11	EPI	1.5E-07	PHYSPROP	1.4E+02	PHYSPROP			4.4E-02	5.1E-06	WATER9			2.5E+03	EPI	1.2E+00	PHYSPROP	6.3E+02	PHYSPROP	1.4E-03	4.3E+00	1.0E+01	2.2E-04	EPI
EPTC	759-94-4	1.9E+02	PHYSPROP	6.5E-04	1.6E-05	EPI	2.4E-02	PHYSPROP	6.1E+01	EPI	9.5E-01	CRC89	2.9E-02	6.4E-06	WATER9			1.6E+02	EPI	3.2E+00	PHYSPROP	3.8E+02	PHYSPROP	9.7E-02	1.2E+00	2.9E+00	1.8E-02	EPI
Endosulfan	115-29-7	4.1E+02	PHYSPROP	2.7E-03	6.5E-05	PHYSPROP	1.7E-07	PHYSPROP	1.1E+02	PHYSPROP	1.7E+00	CRC89	2.2E-02	5.8E-06	WATER9			6.8E+03	EPI	3.8E+00	PHYSPROP	3.3E-01	PHYSPROP	2.2E-02	2.0E+01	4.8E+01	2.9E-03	EPI
Endothall	145-73-3	1.9E+02	PHYSPROP	1.6E-14	3.9E-16	EPI	1.6E-10	PHYSPROP	1.4E+02	PHYSPROP	1.4E+00	CRC89	3.7E-02	8.2E-06	WATER9			1.9E+01	EPI	1.9E+00	PHYSPROP	1.0E+05	PHYSPROP	1.4E-02	1.2E+00	2.8E+00	2.6E-03	EPI
Endrin	72-20-8	3.8E+02	PHYSPROP	2.6E-04	6.4E-06	PHYSPROP	3.0E-06	PHYSPROP	2.3E+02	PHYSPROP			3.6E-02	4.2E-06	WATER9			2.0E+04	EPI	5.2E+00	PHYSPROP	2.5E-01	PHYSPROP	2.4E-01	1.4E+01	3.4E+01	3.3E-02	EPI
Epichlorohydrin	106-89-8	9.3E+01	PHYSPROP	1.2E-03	3.0E-05	EPI	1.6E+01	PHYSPROP	-5.7E+01	PHYSPROP	1.2E+00	PERRY	8.9E-02	1.1E-05	WATER9			9.9E+00	EPI	4.5E-01	PHYSPROP	6.6E+04	PHYSPROP	3.5E-03	3.5E-01	8.3E-01	9.4E-04	EPI
Epoxybutane, 1,2-	106-88-7	7.2E+01	PHYSPROP	7.4E-03	1.8E-04	EPI	1.8E+02	PHYSPROP	-1.5E+02	PHYSPROP	8.3E-01	CRC89	9.3E-02	1.0E-05	WATER9			9.9E+00	EPI	8.6E-01	PHYSPROP	9.5E+04	PHYSPROP	7.5E-03	2.7E-01	6.4E-01	2.3E-03	EPI
Ethanol, 2-(2-methoxyethoxy)-	111-77-3	1.2E+02	PHYSPROP	6.7E-10	1.7E-11	PHYSPROP	2.5E-01	PHYSPROP	-1.5E+01	EPI			7.8E-02	9.1E-06	WATER9			1.0E+00	EPI	-1.2E+00	PHYSPROP	1.0E+06	PHYSPROP	7.4E-04	5.0E-01	1.2E+00	1.7E-04	RAGS
Ethephon	16672-87-0	1.4E+02	PHYSPROP	2.3E-10	5.7E-12	PHYSPROP	9.8E-08	PHYSPROP	7.4E+01	PHYSPROP	1.2E+00	CRC89	5.5E-02	8.6E-06	WATER9			5.0E+00	EPI	-2.2E-01	PHYSPROP	1.0E+06	PHYSPROP	8.0E-04	6.8E-01	1.6E+00	1.7E-04	EPI
Ethion	563-12-2	3.8E+02	PHYSPROP	1.6E-05	3.8E-07	EPI	1.5E-06	PHYSPROP	-1.3E+01	PHYSPROP	1.2E+00	CRC89	1.9E-02	4.8E-06	WATER9			8.8E+02	EPI	5.1E+00	PHYSPROP	2.0E+00	PHYSPROP	1.9E-01	1.5E+01	3.6E+01	2.6E-02	EPI

Contaminant		Molecular Weight		Volatility Parameters					Melting Point		Density		Diffusivity in Air and Water			Partition Coefficients						Water Solubility		Tapwater Dermal Parameters				
Analyte	CAS No.	MW	MW Ref	H` (unitless)	(atm-m^3/mole)	H` and HLC Ref	VP	VP Ref	MP	MP Ref	Density (g/cm^3)	Density Ref	Dia (cm^2/s)	Diw (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t* (hr)	K_p (cm/hr)	K Ref
Styrene	100-42-5	1.0E+02	PHYSPRO	1.1E-01	2.8E-03	PHYSPROP	6.4E+00	PHYSPROP	-3.1E+01	PHYSPROP	9.0E-01	CRC89	7.1E-02	8.8E-06	WATER9			4.5E+02	EPI	3.0E+00	PHYSPRO	3.1E+02	PHYSPROP	1.5E-01	4.0E-01	9.7E-01	3.7E-02	EPI
Styrene-Acrylonitrile (SAN) Trime	NA	2.1E+02	OTHEF								1.1E+00	PPRTV	2.6E-02	6.5E-06	WATER9					3.1E+00	OTHEF	8.5E+01	PPRTV	6.6E-02	1.6E+00	3.8E+00	1.2E-02	RAGS
Sulfolane	126-33-0	1.2E+02	PHYSPRO	2.0E-04	4.9E-06	PHYSPROP	4.1E-03	EPI	2.8E+01	PHYSPROP	1.3E+00	CRC89	7.2E-02	9.9E-06	WATER9			9.1E+00	EPI	-7.7E-01	PHYSPRO	1.0E+06	PHYSPROP	4.3E-04	5.0E-01	1.2E+00	1.0E-04	EPI
Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	2.9E+02	PHYSPRO	5.6E-06	1.4E-07	PHYSPROP	8.1E-07	PHYSPROP	1.5E+02	PHYSPROP			4.4E-02	5.1E-06	WATER9			2.9E+03	EPI	3.9E+00	PHYSPRO	2.4E+00	PHYSPROP	9.7E-02	4.3E+00	1.0E+01	1.5E-02	EPI
Sulfur Trioxide	7446-11-9	8.0E+01	PHYSPRC				2.6E+02	PHYSPROF	1.7E+01	PHYSPROF	1.9E+00	CRC89	1.2E-01	1.6E-05	WATER9									3.4E-03	3.0E-01	7.1E-01	1.0E-03	RAGS
Sulfuric Acid	7664-93-9	9.8E+01	PHYSPRO				5.9E-05	PHYSPROP	1.0E+01	PHYSPROP	1.8E+00	CRC89										1.0E+06	PHYSPROP	3.8E-03	3.7E-01	8.9E-01	1.0E-03	RAGS
Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl	140-57-8	3.3E+02	PHYSPRO	7.8E-06	1.9E-07	PHYSPROP	2.2E-07	PHYSPROP	-3.2E+01	PHYSPROP	1.1E+00	CRC89	2.0E-02	5.0E-06	WATER9			5.6E+03	EPI	4.8E+00	PHYSPRO	5.9E-01	PHYSPROP	2.3E-01	7.9E+00	1.9E+01	3.3E-02	EPI
TCMTE	21564-17-0	2.4E+02	PHYSPRC	2.7E-10	6.5E-12	PHYSPROF	3.1E-07	PHYSPROF	1.5E+02	EPI			4.9E-02	5.8E-06	WATER9			3.4E+03	EPI	3.3E+00	PHYSPRC	1.3E+02	PHYSPROF	6.7E-02	2.3E+00	5.5E+00	1.1E-02	EPI
Tebuthiuron	34014-18-1	2.3E+02	PHYSPRO	4.9E-09	1.2E-10	PHYSPROP	3.0E-07	PHYSPROP	1.6E+02	PHYSPROP			5.1E-02	5.9E-06	WATER9			4.2E+01	EPI	1.8E+00	PHYSPRO	2.5E+03	PHYSPROP	7.4E-03	2.0E+00	4.8E+00	1.3E-03	EPI
Temephos	3383-96-8	4.7E+02	PHYSPRO	8.0E-08	2.0E-09	PHYSPROP	7.9E-08	PHYSPROP	3.0E+01	PHYSPROP	1.3E+00	CRC89	1.8E-02	4.5E-06	WATER9			9.5E+04	EPI	6.0E+00	PHYSPRO	2.7E-01	PHYSPROP	2.9E-01	4.3E+01	1.0E+02	3.5E-02	EPI
Terbacil	5902-51-2	2.2E+02	PHYSPRC	4.9E-09	1.2E-10	EPI	4.7E-07	PHYSPROF	1.8E+02	PHYSPROF	1.3E+00	CRC89	2.7E-02	7.2E-06	WATER9			5.0E+01	EPI	1.9E+00	PHYSPRC	7.1E+02	PHYSPROF	9.7E-03	1.7E+00	4.1E+00	1.7E-03	EPI
Terbufos	13071-79-9	2.9E+02	PHYSPRO	9.8E-04	2.4E-05	EPI	3.2E-04	PHYSPROP	-2.9E+01	PHYSPROP	1.1E+00	CRC89	2.2E-02	5.4E-06	WATER9			1.0E+03	EPI	4.5E+00	PHYSPRO	5.1E+00	PHYSPROP	2.3E-01	4.3E+00	1.0E+01	3.6E-02	EPI
Terbutryn	886-50-0	2.4E+02	PHYSPRO	8.8E-07	2.2E-08	EPI	1.7E-06	PHYSPROP	1.0E+02	PHYSPROP	1.1E+00	CRC89	2.4E-02	6.0E-06	WATER9			6.1E+02	EPI	3.7E+00	PHYSPRO	2.5E+01	PHYSPROP	1.3E-01	2.4E+00	5.7E+00	2.1E-02	EPI
Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47	5436-43-1	4.9E+02	PHYSPRC	1.2E-04	3.0E-06	PHYSPROF	7.0E-08	EPI	1.6E+02	EPI			3.1E-02	3.6E-06	WATER9			1.3E+04	EPI	6.8E+00	PHYSPRC	1.5E-03	PHYSPROF	7.9E-01	5.5E+01	2.1E+02	9.3E-02	EPI
Tetrachlorobenzene, 1,2,4,5-	95-94-3	2.2E+02	PHYSPRO	4.1E-02	1.0E-03	PHYSPROP	5.4E-03	EPI	1.4E+02	PHYSPROP	1.9E+00	CRC89	3.2E-02	8.8E-06	WATER9			2.2E+03	EPI	4.6E+00	PHYSPRO	6.0E-01	PHYSPROP	6.6E-01	1.7E+00	6.7E+00	1.2E-01	EPI
Tetrachloroethane, 1,1,1,2-	630-20-6	1.7E+02	PHYSPRO	1.0E-01	2.5E-03	PHYSPROP	1.2E+01	PHYSPROP	-7.0E+01	PHYSPROP	1.5E+00	CRC89	4.8E-02	9.1E-06	WATER9			8.6E+01	EPI	2.9E+00	PHYSPRO	1.1E+03	PHYSPROP	7.9E-02	9.2E-01	2.2E+00	1.6E-02	EPI
Tetrachloroethane, 1,1,2,2	79-34-5	1.7E+02	PHYSPRC	1.5E-02	3.7E-04	PHYSPROF	4.6E+00	PHYSPROF	-4.4E+01	PHYSPROF	1.6E+00	CRC89	4.9E-02	9.3E-06	WATER9			9.5E+01	EPI	2.4E+00	PHYSPRC	2.8E+03	PHYSPROF	3.5E-02	9.2E-01	2.2E+00	6.9E-03	EPI
Tetrachloroethylene	127-18-4	1.7E+02	PHYSPRO	7.2E-01	1.8E-02	PHYSPROP	1.9E+01	PHYSPROP	-2.2E+01	PHYSPROP	1.6E+00	CRC89	5.0E-02	9.5E-06	WATER9			9.5E+01	EPI	3.4E+00	PHYSPRO	2.1E+02	PHYSPROP	1.7E-01	8.9E-01	2.1E+00	3.3E-02	EPI
Tetrachlorophenol, 2,3,4,6-	58-90-2	2.3E+02	PHYSPRO	3.6E-04	8.8E-06	EPI	6.7E-04	EPI	7.0E+01	PHYSPROP			5.0E-02	5.9E-06	WATER9			2.8E+02	SSL	4.5E+00	PHYSPRO	2.3E+01	PHYSPROP	4.2E-01	2.1E+00	5.0E+00	7.1E-02	EPI
Tetrachlorotoluene, p- alpha, alpha, alph	5216-25-1	2.3E+02	PHYSPRC	7.9E-03	1.9E-04	PHYSPROF	3.8E-02	PHYSPROF	4.0E+01	EPI	1.4E+00	CRC89	2.8E-02	7.3E-06	WATER9			1.6E+03	EPI	4.5E+00	PHYSPRC	4.0E+00	PHYSPROF	4.9E-01	2.0E+00	4.9E+00	8.4E-02	EPI
Tetraethyl Dithiopyrophosphate	3689-24-5	3.2E+02	PHYSPRO	1.8E-04	4.5E-06	EPI	1.1E-04	PHYSPROP	-3.2E+01	EPI	1.2E+00	CRC89	2.1E-02	5.3E-06	WATER9			2.7E+02	EPI	4.0E+00	PHYSPRO	3.0E+01	PHYSPROP	7.5E-02	6.7E+00	1.6E+01	1.1E-02	EPI
Tetrafluoroethane, 1,1,1,2-	811-97-2	1.0E+02	PHYSPRO	2.0E+00	5.0E-02	PHYSPROP	5.0E+03	PHYSPROP	-1.0E+02	PHYSPROP	1.2E+00	CRC89	8.2E-02	1.1E-05	WATER9			8.6E+01	EPI	1.7E+00	PHYSPRO	2.0E+03	PHYSPROP	2.1E-02	3.9E-01	9.4E-01	5.5E-03	EPI
Tetryl (Trinitrophenylmethylnitramine	479-45-8	2.9E+02	PHYSPRC	1.1E-07	2.7E-09	PHYSPROF	5.7E-08	PHYSPROF	1.3E+02	PHYSPROF	1.6E+00	CRC89	2.6E-02	6.7E-06	WATER9			4.6E+03	EPI	1.6E+00	PHYSPRC	7.4E+01	PHYSPROF	3.1E-03	4.3E+00	1.0E+01	4.7E-04	EPI
Thallic Oxide	1314-32-5	4.6E+02	CRC89						8.3E+02	CRC89	1.0E+01	CRC89												8.2E-03	3.8E+01	9.1E+01	1.0E-03	RAGS
Thallium (I) Nitrate	10102-45-1	2.7E+02	PHYSPRO						2.1E+02	PHYSPROP	5.6E+00	CRC89										9.6E+04	PHYSPROP	6.3E-03	3.3E+00	7.9E+00	1.0E-03	RAGS
Thallium (Soluble Salts	7440-28-0	2.1E+02	PHYSPRC						3.0E+02	PHYSPROF	1.2E+01	CRC89				7.1E+01	SSL							5.5E-03	1.5E+00	3.6E+00	1.0E-03	RAGS
Thallium Acetate	563-68-8	2.6E+02	PHYSPRO				1.5E+01	PHYSPROP	1.3E+02	CRC89	3.7E+00	CRC89	3.9E-02	1.2E-05	WATER9			1.5E+00	EPI	-1.7E-01	PHYSPRO	2.8E+04	PHYSPROP	2.5E-04	3.1E+00	7.5E+00	4.0E-05	EPI
Thallium Carbonate	6533-73-9	4.7E+02	PHYSPRO				5.8E+00	PHYSPROP	2.7E+02	PHYSPROP	7.1E+00	CRC89	3.9E-02	1.2E-05	WATER9			2.9E+00	EPI	-8.6E-01	PHYSPRO	5.2E+04	PHYSPROP	8.2E-06	4.4E+01	1.1E+02	9.8E-07	EPI
Thallium Chloride	7791-12-0	2.4E+02	PHYSPRC						4.3E+02	PHYSPROF	7.0E+00	CRC89	5.2E-02	1.8E-05	WATER9							2.9E+03	PHYSPROF	6.0E-03	2.3E+00	5.6E+00	1.0E-03	RAGS
Thallium Selenite	12039-52-0	2.8E+02	EPI						3.3E+02	CRC89														6.5E-03	4.1E+00	9.7E+00	1.0E-03	RAGS
Thallium Sulfate	7446-18-6	5.0E+02	PHYSPRO						6.3E+02	PHYSPROP	6.8E+00	CRC89										5.5E+04	CRC89	8.6E-03	7.1E+01	1.7E+02	1.0E-03	RAGS
Thifensulfuron-methy	79277-27-3	3.9E+02	PHYSPRC	1.7E-12	4.1E-14	PHYSPROF	1.3E-10	PHYSPROF	1.8E+02	PHYSPROF			3.6E-02	4.2E-06	WATER9			5.1E+01	EPI	1.6E+00	PHYSPRC	2.2E+03	PHYSPROF	8.6E-04	1.6E+01	3.7E+01	1.1E-04	EPI
Thiobencarb	28249-77-6	2.6E+02	PHYSPRO	1.1E-05	2.7E-07	EPI	2.2E-05	PHYSPROP	3.3E+00	PHYSPROP	1.2E+00	CRC89	2.3E-02	5.9E-06	WATER9			1.6E+03	EPI	3.4E+00	PHYSPRO	2.8E+01	PHYSPROP	6.3E-02	2.9E+00	7.0E+00	1.0E-02	EPI
Thiodiglycol	111-48-8	1.2E+02	PHYSPRO	7.6E-08	1.9E-09	PHYSPROP	3.2E-03	PHYSPROP	-1.0E+01	PHYSPROP	1.2E+00	CRC89	6.8E-02	9.4E-06	WATER9			1.0E+00	EPI	-6.3E-01	PHYSPRO	1.0E+06	PHYSPROP	5.2E-04	5.1E-01	1.2E+00	1.2E-04	EPI
Thiofanox	39196-18-4	2.2E+02	PHYSPRC	3.8E-07	9.4E-09	EPI	1.7E-04	PHYSPROF	5.7E+01	PHYSPROF			5.2E-02	6.1E-06	WATER9			7.2E+01	EPI	2.2E+00	PHYSPRC	5.2E+03	PHYSPROF	3.6E-02	1.8E+00	4.2E+00	6.3E-03	EPI
Thiophanate, Methyl	23564-05-8	3.4E+02	PHYSPRO	4.9E-08	1.2E-09	EPI	7.1E-08	PHYSPROP	1.7E+02	EPI			3.9E-02	4.5E-06	WATER9			3.3E+02	EPI	1.4E+00	PHYSPRO	2.7E+01	PHYSPROP	1.1E-03	8.7E+00	2.1E+01	1.6E-04	EPI
Thiram	137-26-8	2.4E+02	PHYSPRO	7.4E-06	1.8E-07	EPI	1.7E-05	PHYSPROP	1.6E+02	PHYSPROP	1.3E+00	PERRY	2.6E-02	6.6E-06	WATER9			6.1E+02	EPI	1.7E+00	PHYSPRO	3.0E+01	PHYSPROP	5.9E-03	2.3E+00	5.6E+00	9.9E-04	EPI
Tin	7440-31-5	1.2E+02	CRC89				0.0E+00	NIOSH	1.3E+01	CRC89	7.3E+00	CRC89				2.5E+02	BAES							4.2E-03	4.9E-01	1.2E+00	1.0E-03	RAGS
Titanium Tetrachloride	7550-45-0	1.9E+02	CRC89				1.0E+01	ATSDR	-2.4E+01	CRC89	1.7E+00	CRC89	3.8E-02	9.1E-06	WATER9									5.3E-03	1.2E+00	2.9E+00	1.0E-03	RAGS
Toluene	108-88-3	9.2E+01	PHYSPRO	2.7E-01	6.6E-03	PHYSPROP	2.8E+01	PHYSPROP	-9.5E+01	PHYSPROP	8.6E-01	CRC89	7.8E-02	9.2E-06	WATER9			2.3E+02	EPI	2.7E+00	PHYSPRO	5.3E+02	PHYSPROP	1.1E-01	3.5E-01	8.3E-01	3.1E-02	EPI
Toluene-2,4-diisocyante	584-84-9	1.7E+02	EPI	4.5E-04	1.1E-05	EPI	8.0E-03	EPI	2.1E+01	EPI	1.2E+00	CRC89	4.0E-02	7.8E-06	WATER9			7.4E+03	EPI	3.7E+00	EPI	3.8E+01	EPI	2.6E+00	9.9E-01	4.1E+00	5.1E-01	EPI
Toluene-2,5-diamine	95-70-5	1.2E+02	PHYSPRO	3.0E-07	7.4E-09	PHYSPROP	3.4E-03	PHYSPROP	6.4E+01	PHYSPROP			7.7E-02	9.0E-06	WATER9			5.5E+01	EPI	1.6E-01	PHYSPRO	7.7E+04	PHYSPROP	1.7E-03	5.1E-01	1.2E+00	4.1E-04	EPI
Toluene-2,6-diisocyante	91-08-7	1.7E+02	EPI	4.5E-04	1.1E-05	EPI	2.1E-02	EPI	1.8E+01	EPI			6.1E-02	7.1E-06	WATER9			7.6E+03	EPI	3.7E+00	EPI	3.8E+01	EPI	2.6E-01	9.9E-01	2.4E+00	5.1E-02	EPI
Toluidine, o- (Methylaniline, 2-	95-53-4	1.1E+02	PHYSPRC	8.1E-05	2.0E-06	PHYSPROF	2.6E-01	PHYSPROF	-1.4E+01	PHYSPROF	1.0E+00	CRC89	7.2E-02	9.2E-06	WATER9			1.2E+02	EPI	1.3E+00	PHYSPRC	1.7E+04	PHYSPROF	1.2E-02	4.2E-01	1.0E+00	3.0E-03	EPI
Toluidine, p-	106-49-0	1.1E+02	PHYSPRO	8.3E-05	2.0E-06	PHYSPROP	2.9E-01	PHYSPROP	4.4E+01	PHYSPROP	9.6E-01	CRC89	7.1E-02	9.0E-06	WATER9			1.1E+02	EPI	1.4E+00	PHYSPRO	6.5E+03	PHYSPROP	1.3E-02	4.2E-01	1.0E+00	3.3E-03	EPI
Total Petroleum Hydrocarbons (Aliphatic High)	NA	1.7E+02	EPI	3.3E+02	8.2E+00	EPI	1.4E-01	EPI	-9.6E+00	EPI			6.2E-02	7.2E-06	WATER9			4.8E+03	EPI	6.1E+00	EPI	3.7E-03	EPI	9.8E+00	9.5E-01	4.3E+00	2.0E+00	EPI
Total Petroleum Hydrocarbons (Aliphatic Low	NA	8.6E+01	EPI	7.4E+01	1.8E+00	EPI	1.5E+02	EPI	-9.5E+01	EPI	6.6E-01	CRC89	7.3E-02	8.2E-06	WATER9			1.3E+02	EPI	3.9E+00	EPI	9.5E+00	EPI	7.2E-01	3.2E-01	1.2E+00	2.0E-01	EPI
Total Petroleum Hydrocarbons (Aliphatic Medium)	NA	1.3E+02	EPI	1.4E+02	3.4E+00	EPI	4.5E+00	EPI	-5.4E+01	EPI	7.2E-01	CRC89	5.1E-02	6.8E-06	WATER9			8.0E+02	EPI	5.7E+00	EPI	2.2E-01	EPI	7.4E+00	5.5E-01	2.5E+00	1.7E+00	EPI
Total Petroleum Hydrocarbons (Aromatic High)	NA	2.0E+02	EPI	3.6E-04	8.9E-06	EPI	9.2E-06	EPI	1.1E+02	EPI	1.3E+00	CRC89	2.8E-02	7.2E-06	WATER9			5.5E+04	EPI	5.2E+00	EPI	2.6E-01	EPI	1.7E+00	1.4E+00	5.7E+00	3.1E-01	EPI
Total Petroleum Hydrocarbons (Aromatic Low	NA	7.8E+01	EPI	2.3E-01	5.6E-03	EPI	9.5E+01	EPI	5.5E+00	EPI	8.8E-01	CRC89	9.0E-02	1.0E-05	WATER9			1.5E+02	EPI	2.1E+00	EPI	1.8E+03	EPI	5.1E-02	2.9E-01	6.9E-01	1.5E-02	EPI
Total Petroleum Hydrocarbons (Aromatic Medium)	NA	1.4E+02	EPI	2.0E-02	4.8E-04	EPI	7.0E-02	EPI	5.7E+01	EPI	1.0E+00	CRC89	5.6E-02	8.1E-06	WATER9			2.0E+03	EPI	3.6E+00	EPI	2.8E+01	EPI	3.1E-01	6.0E-01	1.4E+00	6.9E-02	EPI
Toxaphene	8001-35-2	4.5E+02	PHYSPRO	2.5E-04	6.0E-06	PHYSPROP	6.7E-06	PHYSPROP	7.7E+01	PHYSPROP			3.2E-02	3.8E-06	WATER9			7.7E+04	EPI	5.9E+00	PHYSPRO	5.5E-01	PHYSPROP	4.2E-01	3.4E+01	8.2E+01	5.2E-02	EPI
Tralomethrin	66841-25-6	6.7E+02	PHYSPRC	1.6E-08	3.9E-10	EPI	3.6E-11	PHYSPROF	1.4E+02	PHYSPROF			2.5E-02	2.9E-06	WATER9			1.9E+05	EPI	7.6E+00	PHYSPRC	8.0E-02	PHYSPROF	3.0E-01	5.6E+02	1.3E+03	3.1E-02	EPI
Tri-n-butyltin	688-73-3	2.9E+02	PHYSPRO	6.2E+01	1.5E+00	PHYSPROP	4.0E-02	PHYSPROP	2.9E+01	EPI	1.1E+00	CRC89	2.1E-02	5.4E-06	WATER9			8.1E+03	EPI	4.1E+00	PHYSPRO	7.3E-03	PHYSPROP	1.3E-01	4.5E+00	1.1E+01	1.9E-02	EPI
Triacetin	102-76-1	2.2E+02	PHYSPRO	5.0E-07	1.2E-08	EPI	2.5E-03	PHYSPROP	7.8E+01	PHYSPROP	1.2E+00	CRC89	2.6E-02	6.6E-06	WATER9			4.1E+01	EPI	2.5E-01	PHYSPRO	5.8E+04	PHYSPROP	7.8E-04	1.8E+00	4.2E+00	1.4E-04	EPI
Triadimefon	43121-43-3	2.9E+02	PHYSPRC	3.3E-09	8.1E-11	EPI	1.5E-08	PHYSPROF	8.2E+01	PHYSPROF	1.2E+00	CRC89	2.2E-02	5.7E-06	WATER9			3.0E+02	EPI	2.8E+00	PHYSPRC	7.2E+01	PHYSPROF	1.6E-02	4.6E+00	1.1E+01	2.4E-03	EPI
Triallate	2303-17-5	3.0E+02	PHYSPRO	4.9E-04	1.2E-05	EPI	1.2E-04	PHYSPROP	2.9E+01	PHYSPROP	1.3E+00	CRC89	2.2E-02	5.7E-06	WATER9			1.0E+03	EPI	4.6E+00	PHYSPRO	4.0E+00	PHYSPROP	2.3E-01	5.3E+00	1.3E+01	3.5E-02	EPI
Triasulfuron	82097-50-5	4.0E+02	PHYSPRO	1.3E-11	3.2E-13	PHYSPROP	5.5E-12	PHYSPROP	1.9E+02	PHYSPROP			3.5E-02	4.1E-06	WATER9			4.3E+02	EPI	1.1E+00	PHYSPRO	3.2E+01	PHYSPROP	3.6E-04	1.9E+01	4.5E+01	4.7E-05	EPI
Tribenuron-methy	101200-48-	4.0E+02	PHYSPRC	4.2E-12	1.0E-13	PHYSPROF	3.9E-10	PHYSPROF	1.4E+02	PHYSPROF			3.5E-02	4.1E-06	WATER9			9.5E+01	EPI	7.8E-01	PHYSPRC	5.0E+01	PHYSPROF	3.6E-03	1.7E+01	4.1E+01	4.7E-04	EPI
Tribromobenzene, 1,2,4-	615-54-3	3.1E+02	PHYSPRO	1.4E-02	3.4E-04	PHYSPROP	5.5E-03	PHYSPROP	4.5E+01	PHYSPROP	2.3E+00	ChemNet	2.9E-02	7.9E-06	WATER9			6.1E+02	EPI	4.7E+00	PHYSPRO	4.9E+00	PHYSPROP	2.3E-01	6.1E+00	1.5E+01	3.4E-02	EPI
Tributyl Phosphate	126-73-8	2.7E+02	PHYSPRO	5.8E-05	1.4E-06	EPI	1.1E-03	PHYSPROP	-7.9E+01	PHYSPROP	9.7E-01	CRC89	2.1E-02	5.2E-06	WATER9			2.4E+03	EPI	4.0E+00	PHYSPRO	2.8E+02	PHYSPROP	1.4E-01	3.3E+00	7.8E+00	2.3E-02	EPI
Tributyltin Compound	NA																											
Tributyltin Oxide	56-35-9	6.0E+02	PHYSPRO	1.2E-05	3.0E-07	EPI	7.5E-06	PHYSPROP	-4.5E+01	PHYSPROP	1.2E+00	CRC89	1.5E-02	3.6E-06	WATER9			2.6E+07	EPI	4.1E+00	PHYSPRO	2.0E+01	PHYSPROP	2.4E-03	2.3E+02	5.5E+02	2.5E-04	EPI
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	1.9E+02	PHYSPRO	2.2E+01	5.3E-01	EPI	3.6E+02	PHYSPROP	-3.5E+01	PHYSPROP	1.6E+00	CRC89	3.8E-02	8.6E-06	WATER9			2.0E+02	EPI	3.2E+00	PHYSPRO	1.7E+02	PHYSPROP	9.2E-02	1.2E+00	2.8E+00	1.8E-02	EPI
Trichloroacetic Acid	76-03-9	1.6E+02	PHYSPRC	5.5E-07	1.4E-08	PHYSPROF	6.0E-02	EPI	5.8E+01	PHYSPROF	1.6E+00	CRC89	5.2E-02	9.5E-06	WATER9			3.2E+00	EPI	1.3E+00	PHYSPRC	5.5E+04	PHYSPROF	7.1E-03	8.6E-01	2.1E+00	1.5E-03	EPI
Trichloroaniline HCl, 2,4,6-	33663-50-2	2.3E+02	EPI	2.9E-12	7.2E-14	EPI	6.1E-08	EPI	1.8E+02	EPI			5.0E-02	5.9E-06	WATER9			1.3E+03	EPI	-6.7E-01	EPI	2.1E+01	EPI	1.6E-04	2.1E+00	5.1E+00	2.8E-05	EPI
Trichloroaniline, 2,4,6-	634-93-5	2.0E+02	PHYSPRO	5.5E-05	1.3E-06	PHYSPROP	4.4E-03	PHYSPROP	7.9E+01	PHYSPROP			5.6E-02	6.6E-06	WATER9			4.4E+03	EPI	3.5E+00	PHYSPRO	4.0E+01	PHYSPROP	1.5E-01	1.3E+00	3.2E+00	2.7E-02	EPI
Trichlorobenzene, 1,2,3	87-61-6	1.8E+02	PHYSPRC	5.1E-02	1.3E-03	PHYSPROF	2.1E-01	PHYSPROF	5.4E+01	PHYSPROF	1.5E+00	CRC89	4.0E-02	8.4E-06	WATER9			1.4E+03	EPI	4.1E+00	PHYSPRC	1.8E+01	PHYSPROF	3.8E-01	1.1E+00	2.6E+00	7.4E-02	EPI
Trichlorobenzene, 1,2,4-	120-82-1	1.8E+02	PHYSPRO	5.8E-02	1.4E-03	PHYSPROP	4.6E-01	PHYSPROP	1.7E+01	PHYSPROP	1.5E+00	CRC89	4.0E-02	8.4E-06	WATER9			1.4E+03	EPI	4.0E+00	PHYSPRO	4.9E+01	PHYSPROP	3.7E-01	1.1E+00	2.6E+00	7.1E-02	EPI
Trichloroethane, 1,1,1-	71-55-6	1.3E+02	PHYSPRO	7.0E-01	1.7E-02	PHYSPROP	1.2E+02	PHYSPROP	-3.0E+01	PHYSPROP	1.3E+00	CRC89	6.5E-02	9.6E-06	WATER9			4.4E+01	EPI	2.5E+00	PHYSPRO	1.3E+03	PHYSPROP	5.6E-02	5.9E-01	1.4E+00	1.3E-02	EPI
Trichloroethane, 1,1,2	79-00-5	1.3E+02	PHYSPRC	3.4E-02	8.2E-04	PHYSPROF	2.3E+01	PHYSPROF	-3.7E+01	PHYSPROF	1.4E+00	CRC89	6.7E-02	1.0E-05	WATER9			6.1E+01	EPI	1.9E+00	PHYSPRC	4.6E+03	PHYSPROF	2.2E-02	5.9E-01	1.4E+00	5.0E-03	EPI
Trichloroethylene	79-01-6	1.3E+02	PHYSPRO	4.0E-01	9.9E-03	PHYSPROP	6.9E+01	PHYSPROP	-8.5E+01	PHYSPROP	1.5E+00	CRC89	6.9E-02	1.0E-05	WATER9			6.1E+01	EPI	2.4E+00	PHYSPRO	1.3E+03	PHYSPROP	5.1E-02	5.7E-01	1.4E+00	1.2E-02	EPI
Trichlorofluoromethane	75-69-4	1.4E+02	PHYSPRO	4.0E+00	9.7E-02	PHYSPROP	8.0E+02	PHYSPROP	-1.1E+02	PHYSPROP	1.5E+00	CRC89	6.5E-02	1.0E-05	WATER9			4.4E+01	EPI	2.5E+00	PHYSPRO	1.1E+03	PHYSPROP	5.7E-02	6.2E-01	1.5E+00	1.3E-02	EPI
Trichlorophenol, 2,4,5	95-95-4	2.0E+02	PHYSPRC	6.6E-05	1.6E-06	EPI	7.5E-03	EPI	6.9E+01	PHYSPROF	1.5E+00	PERRY	3.1E-02	8.1E-06	WATER9			1.6E+03	SSL	3.7E+00	PHYSPRC	1.2E+03	PHYSPROF	2.0E-01	1.3E+00	3.2E+00	3.6E-02	EPI
Trichlorophenol, 2,4,6-	88-06-2	2.0E+02	PHYSPRO	1.1E-04	2.6E-06	EPI	8.0E-03	EPI	6.9E+01	PHYSPROP	1.5E+00	CRC89	3.1E-02	8.1E-06	WATER9			3.8E+02	SSL	3.7E+00	PHYSPRO	8.0E+02	PHYSPROP	1.9E-01	1.3E+00	3.2E+00	3.5E-02	EPI
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	2.6E+02	PHYSPRO	3.5E-07	8.7E-09	PHYSPROP	3.8E-05	EPI	1.5E+02	PHYSPROP	1.8E+00	PubChem	2.9E-02	7.8E-06	WATER9			1.1E+02	EPI	3.3E+00	PHYSPRO	2.8E+02	PHYSPROP	5.6E-02	2.8E+00	6.8E+00	9.1E-03	EPI
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	2.7E+02	PHYSPRC	3.7E-07	9.1E-09	PHYSPROF	1.0E-05	PHYSPROF	1.8E+02	PHYSPROF	1.2E+00	PubChem	2.3E-02	5.9E-06	WATER9			1.8E+02	EPI	3.8E+00	PHYSPRC	7.1E+01	PHYSPROF	1.0E-01	3.4E+00	8.2E+00	1.6E-02	EPI
Trichloropropane, 1,1,2-	598-77-6	1.5E+02	PHYSPRO	1.3E-02	3.2E-04	EPI	3.1E+00	PHYSPROP	-6.5E+01	EPI	1.4E+00	CRC89	5.7E-02	9.2E-06	WATER9			9.5E+01	EPI	2.4E+00	PHYSPRO	1.9E+03	PHYSPROP	4.5E-02	7.0E-01	1.7E+00	9.6E-03	EPI
Trichloropropane, 1,2,3-	96-18-4	1.5E+02	PHYSPRO	1.4E-02	3.4E-04	PHYSPROP	3.7E+00	PHYSPROP	-1.5E+01	PHYSPROP	1.4E+00	CRC89	5.7E-02	9.2E-06	WATER9			1.2E+02	EPI	2.3E+00	PHYSPRO	1.8E+03	PHYSPROP	3.5E-02	7.0E-01	1.7E+00	7.5E-03	EPI
Trichloropropene, 1,2,3	96-19-5	1.5E+02	PHYSPRC	7.2E-01	1.8E-02	PHYSPROF	4.4E+00	PHYSPROF	-5.6E+01	EPI	1.4E+00	CRC89	5.9E-02	9.4E-06	WATER9			1.2E+02	EPI	2.8E+00	PHYSPRC	3.3E+02	PHYSPROF	7.8E-02	6.9E-01	1.6E+00	1.7E-02	EPI
Tricresyl Phosphate (TCP)	1330-78-5	3.7E+02	PHYSPRO	3.3E-05	8.1E-07	EPI	6.0E-07	EPI	-3.3E+01	PHYSPROP	1.2E+00	Yaws	1.9E-02	4.8E-06	WATER9			4.7E+04	EPI	5.1E+00	PHYSPRO	3.6E-01	PHYSPROP	2.5E-01	1.2E+01	2.9E+01	3.3E-02	EPI
Tridiphane	58138-08-2	3.2E+02	PHYSPRO	1.7E-05	4.1E-07	PHYSPROP	3.9E-04	PHYSPROP	4.3E+01	PHYSPROP			4.1E-02	4.7E-06	WATER9			3.4E+03	EPI	5.2E+00	PHYSPRO	1.1E+00	PHYSPROP	4.7E-01	6.6E+00	1.6E+01	6.9E-02	EPI
Triethylamine	121-44-8	1.0E+02	PHYSPRC	6.1E-03	1.5E-04	PHYSPROF	5.7E+01	PHYSPROF	-1.1E+02	PHYSPROF	7.3E-01	CRC89	6.6E-02	7.9E-06	WATER9			5.1E+01	EPI	1.5E+00	PHYSPRC	6.9E+04	PHYSPROF	1.5E-02	3.9E-01	9.3E-01	3.9E-03	EPI
Triethylene Glycol	112-27-6	1.5E+02	PHYSPRO	1.3E-09	3.2E-11	PHYSPROP	1.3E-03	PHYSPROP	-7.0E+00	PHYSPROP	1.1E+00	CRC89	5.1E-02	8.1E-06	WATER9			1.0E+01	EPI	-1.8E+00	PHYSPRO	1.0E+06	PHYSPROP	7.3E-05	7.3E-01	1.8E+00	1.6E-05	EPI
Trifluoroethane, 1,1,1-	420-46-2	8.4E+01	PHYSPRO	3.1E+01	7.7E-01	PHYSPROP	9.5E+03	PHYSPROP	-1.1E+02	PHYSPROP			9.9E-02	1.2E-05	WATER9			4.4E+01	EPI	1.7E+00	PHYSPRO	7.6E+02	PHYSPROP	2.7E-02	3.1E-01	7.5E-01	7.6E-03	EPI
Trifluralin	1582-09-8	3.4E+02	PHYSPRC	4.2E-03	1.0E-04	PHYSPROF	4.6E-05	PHYSPROF	4.9E+01	PHYSPROF	1.4E+00	PubChem	2.2E-02	5.6E-06	WATER9			1.6E+04	EPI	5.3E+00	PHYSPRC	1.8E-01	PHYSPROF	5.1E-01	7.9E+00	1.9E+01	7.3E-02	EPI
Trimethyl Phosphate	512-56-1	1.4E+02	PHYSPRO	2.9E-07	7.2E-09	PHYSPROP	8.5E-01	EPI	-4.6E+01	PHYSPROP	1.2E+00	CRC89	5.8E-02	8.8E-06	WATER9			1.1E+01	EPI	-6.5E-01	PHYSPRO	5.0E+05	PHYSPROP	4.3E-04	6.4E-01	1.5E+00	9.5E-05	EPI
Trimethylbenzene, 1,2,3-	526-73-8	1.2E+02	PHYSPRO	1.8E-01	4.4E-03	PHYSPROP	1.7E+00	PHYSPROP	-2.5E+01	PHYSPROP	8.9E-01	CRC89	6.1E-02	8.0E-06	WATER9			6.3E+02	EPI	3.7E+00	PHYSPRO	7.5E+01	PHYSPROP	3.8E-01	5.0E-01	1.2E+00	9.0E-02	EPI
Trimethylbenzene, 1,2,4	95-63-6	1.2E+02	PHYSPRC	2.5E-01	6.2E-03	PHYSPROF	2.1E+00	PHYSPROF	-4.4E+01	PHYSPROF	8.8E-01	CRC89	6.1E-02	7.9E-06	WATER9			6.1E+02	EPI	3.6E+00	PHYSPRC	5.7E+01	PHYSPROF	3.6E-01	5.0E-01	1.2E+00	8.6E-02	EPI
Trimethylbenzene, 1,3,5-	108-67-8	1.2E+02	PHYSPRO	3.6E-01	8.8E-03	PHYSPROP	2.5E+00	PHYSPROP	-4.5E+01	PHYSPROP	8.6E-01	CRC89	6.0E-02	7.8E-06	WATER9			6.0E+02	EPI	3.4E+00	PHYSPRO	4.8E+01	PHYSPROP	2.6E-01	5.0E-01	1.2E+00	6.2E-02	EPI
Trimethylpentene, 2,4,4-	25167-70-8	1.1E+02	PHYSPRO	3.0E+01	7.5E-01	PHYSPROP	7.1E+01	PHYSPROP	-8.4E+01	EPI	7.2E-01	PubChem	6.0E-02	7.3E-06	WATER9			2.4E+02	EPI	4.1E+00	PHYSPRO	4.0E+00	PHYSPROP	7.7E-01	4.5E-01	1.7E+00	1.9E-01	RAGS
Trinitrobenzene, 1,3,5	99-35-4	2.1E+02	PHYSPRC	2.7E-07	6.5E-09	EPI	6.4E-06	EPI	1.2E+02	PHYSPROF	1.5E+00	CRC89	2.9E-02	7.7E-06	WATER9			1.7E+03	EPI	1.2E+00	PHYSPRC	2.8E+02	PHYSPROF	3.4E-03	1.6E+00	3.9E+00	6.1E-04	EPI
Trinitrotoluene, 2,4,6-	118-96-7	2.3E+02	PHYSPRO	8.5E-07	2.1E-08	EPI	8.0E-06	PHYSPROP	8.0E+01	PHYSPROP	1.7E+00	CRC89	3.0E-02	7.9E-06	WATER9			2.8E+03	EPI	1.6E+00	PHYSPRO	1.2E+02	PHYSPROP	5.6E-03	2.0E+00	4.7E+00	9.6E-04	EPI
Triphenylphosphine Oxide	791-28-6	2.8E+02	PHYSPRO	2.2E-08	5.3E-10	PHYSPROP	2.6E-09	EPI	1.6E+02	PHYSPROP	1.2E+00	CRC89	2.3E-02	5.8E-06	WATER9			2.0E+03	EPI	2.8E+00	PHYSPRO	6.3E+01	PHYSPROP	2.1E-02	3.8E+00	9.1E+00	3.3E-03	EPI
Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	4.3E+02	PHYSPRC	1.1E-07	2.6E-09	PHYSPROF	7.4E-08	PHYSPROF	2.7E+01	PHYSPROF			3.3E-02	3.9E-06	WATER9			1.1E+04	EPI	3.7E+00	PHYSPRC	7.0E+00	PHYSPROF	1.3E-02	2.7E+01	6.5E+01	1.6E-03	EPI
Tris(1-chloro-2-propyl)phosphate	13674-84-5	3.3E+02	PHYSPRO	2.4E-06	6.0E-08	PHYSPROP	2.0E-05	PHYSPROP	-4.0E+01	PHYSPROP			4.0E-02	4.7E-06	WATER9			1.6E+03	EPI	2.6E+00	PHYSPRO	1.2E+03	PHYSPROP	8.4E-03	7.2E+00	1.7E+01	1.2E-03	EPI
Tris(2,3-dibromopropyl)phosphate	126-72-7	7.0E+02	PHYSPRO	8.9E-04	2.2E-05	EPI	1.9E-04	PHYSPROP	5.5E+00	PHYSPROP	2.3E+00	PubChem	1.9E-02	4.9E-06	WATER9			9.7E+03	EPI	4.3E+00	PHYSPRO	8.0E+00	PHYSPROP	1.4E-03	8.5E+02	2.0E+03	1.4E-04	EPI
Tris(2-chloroethyl)phosphate	115-96-8	2.9E+02	PHYSPRC	1.3E-04	3.3E-06	EPI	6.1E-02	PHYSPROF	-5.5E+01	PHYSPROF	1.4E+00	CRC89	2.4E-02	6.2E-06	WATER9			3.9E+02	EPI	1.4E+00	PHYSPRC	7.0E+03	PHYSPROF	2.3E-03	4.2E+00	1.0E+01	3.6E-04	EPI
Tris(2-ethylhexyl)phosphate	78-42-2	4.3E+02	PHYSPRO	3.2E-06	7.9E-08	EPI	8.3E-08	PHYSPROP	-7.4E+01	PHYSPROP	9.9E-01	CRC89	1.6E-02	3.9E-06	WATER9			2.5E+06	EPI	9.5E+00	PHYSPRO	6.0E-01	PHYSPROP	9.3E+01	2.9E+01	1.3E+02	1.2E+01	EPI

Contaminant		Molecular Weight		Volatility Parameters					Melting Point		Density		Diffusivity in Air and Water			Partition Coefficients						Water Solubility		Tapwater Dermal Parameters				
Analyte	CAS No.	MW	MW Ref	H' (unitless)	(atm-m^3/mole)	H' and HLC Ref	VP	VP Ref	MP	MP Ref	Density (g/cm^3)	Density Ref	Dia (cm^2/s)	Diw (cm^2/s)	D_{ia} and D_{iw} Ref	K_d (L/kg)	K_d Ref	K_{oc} (L/kg)	K_{oc} Ref	log K_{ow} (unitless)	log K_{ow} Ref	S (mg/L)	S Ref	B (unitless)	τ_{event} (hr/event)	t^* (hr)	K_p (cm/hr)	K Ref
Tungsten	7440-33-7	1.8E+02	PHYSPRO				0.0E+00	NIOSH	3.4E+03	PHYSPROP	1.9E+01	CRC89				1.5E+02	BAES							5.2E-03	1.1E+00	2.7E+00	1.0E-03	RAGS
Uranium (Soluble Salts	NA	2.4E+02	CRC89				0.0E+00	NIOSH	1.1E+03	CRC89	1.9E+01	CRC89				4.5E+02	BAES							5.9E-03	2.3E+00	5.4E+00	1.0E-03	RAGS
Urethane	51-79-6	8.9E+01	PHYSPRO	2.6E-06	6.4E-08	EPI	2.6E-01	EPI	4.9E+01	PHYSPROP	9.9E-01	CRC89	8.5E-02	1.0E-05	WATER9			1.2E+01	EPI	-1.5E-01	PHYSPRO	4.8E+05	PHYSPROP	1.4E-03	3.3E-01	8.0E-01	3.9E-04	EPI
Vanadium Pentoxide	1314-62-1	1.8E+02	EPI				0.0E+00	NIOSH	6.8E+02	CRC89	3.4E+00	CRC89										7.0E+02	CRC89	5.2E-03	1.1E+00	2.6E+00	1.0E-03	RAGS
Vanadium and Compound	7440-62-2	5.1E+01	EPI						1.9E+03	CRC89	6.0E+00	CRC89				1.0E+03	SSL							2.7E-03	2.0E-01	4.9E-01	1.0E-03	RAGS
Vernolate	1929-77-7	2.0E+02	PHYSPRO	1.3E-03	3.1E-05	EPI	1.0E-02	PHYSPROP	7.1E+01	EPI	9.5E-01	CRC89	2.4E-02	6.1E-06	WATER9			3.0E+02	EPI	3.8E+00	PHYSPRO	9.0E+01	PHYSPROP	2.2E-01	1.4E+00	3.5E+00	4.0E-02	EPI
Vinclozolin	50471-44-8	2.9E+02	PHYSPRO	7.1E-07	1.7E-08	EPI	1.2E-07	PHYSPROP	1.1E+02	PHYSPROP	1.5E+00	CRC89	2.5E-02	6.5E-06	WATER9			2.8E+02	EPI	3.1E+00	PHYSPRO	2.6E+00	PHYSPROP	2.9E-02	4.2E+00	1.0E+01	4.5E-03	EPI
Vinyl Acetate	108-05-4	8.6E+01	PHYSPRO	2.1E-02	5.1E-04	EPI	9.0E+01	PHYSPROP	-9.3E+01	PHYSPROP	9.3E-01	CRC89	8.5E-02	1.0E-05	WATER9			5.6E+00	EPI	7.3E-01	PHYSPRO	2.0E+04	PHYSPROP	5.6E-03	3.2E-01	7.7E-01	1.6E-03	EPI
Vinyl Bromide	593-60-2	1.1E+02	PHYSPRO	5.0E-01	1.2E-02	PHYSPROP	1.0E+03	PHYSPROP	-1.4E+02	PHYSPROP	1.5E+00	CRC89	8.6E-02	1.2E-05	WATER9			2.2E+01	EPI	1.6E+00	PHYSPRO	7.6E+03	PHYSPROP	1.7E-02	4.2E-01	1.0E+00	4.4E-03	EPI
Vinyl Chloride	75-01-4	6.2E+01	PHYSPRO	1.1E+00	2.8E-02	PHYSPROP	3.0E+03	EPI	-1.5E+02	PHYSPROP	9.1E-01	CRC89	1.1E-01	1.2E-05	WATER9			2.2E+01	EPI	1.4E+00	CRC89	8.8E+03	PHYSPROP	2.5E-02	2.4E-01	5.7E-01	8.4E-03	EPI
Warfarin	81-81-2	3.1E+02	PHYSPRO	1.1E-07	2.8E-09	EPI	1.2E-07	PHYSPROP	1.6E+02	PHYSPROP			4.2E-02	4.9E-06	WATER9			4.3E+02	EPI	2.7E+00	PHYSPRO	1.7E+01	PHYSPROP	1.2E-02	5.6E+00	1.3E+01	1.8E-03	EPI
Xylene, P-	106-42-3	1.1E+02	PHYSPRO	2.8E-01	6.9E-03	PHYSPROP	8.8E+00	PHYSPROP	1.3E+01	PHYSPROP	8.6E-01	CRC89	6.8E-02	8.4E-06	WATER9			3.8E+02	EPI	3.2E+00	PHYSPRO	1.6E+02	PHYSPROP	2.0E-01	4.1E-01	9.9E-01	4.9E-02	EPI
Xylene, m-	108-38-3	1.1E+02	PHYSPRO	2.9E-01	7.2E-03	PHYSPROP	8.3E+00	PHYSPROP	-4.8E+01	PHYSPROP	8.6E-01	CRC89	6.8E-02	8.4E-06	WATER9			3.8E+02	EPI	3.2E+00	PHYSPRO	1.6E+02	PHYSPROP	2.1E-01	4.1E-01	9.9E-01	5.3E-02	EPI
Xylene, o-	95-47-6	1.1E+02	PHYSPRO	2.1E-01	5.2E-03	PHYSPROP	6.6E+00	PHYSPROP	-2.5E+01	PHYSPROP	8.8E-01	CRC89	6.9E-02	8.5E-06	WATER9			3.8E+02	EPI	3.1E+00	PHYSPRO	1.8E+02	PHYSPROP	1.9E-01	4.1E-01	9.9E-01	4.7E-02	EPI
Xylenes	1330-20-7	1.1E+02	PHYSPRO	2.7E-01	6.6E-03	PHYSPROP	8.0E+00	PHYSPROP	-2.5E+01	EPI	8.6E-01	ATSDR	6.9E-02	8.5E-06	WATER9			3.8E+02	EPI	3.2E+00	PHYSPRO	1.1E+02	PHYSPROP	2.0E-01	4.1E-01	9.9E-01	5.0E-02	EPI
Zinc Phosphide	1314-84-7	2.6E+02	CRC89						1.2E+03	CRC89	4.6E+00	CRC89												3.7E-03	2.9E+00	7.0E+00	6.0E-04	RAGS
Zinc and Compounds	7440-66-6	6.5E+01	PHYSPRO						4.2E+02	PHYSPROP	7.1E+00	CRC89				6.2E+01	SSL							1.9E-03	2.4E-01	5.9E-01	6.0E-04	RAGS
Zineb	12122-67-7	2.8E+02	PHYSPRO	1.1E-07	2.7E-09	PHYSPROP	7.5E-08	PHYSPROP	1.6E+02	EPI			4.5E-02	5.2E-06	WATER9			1.3E+03	EPI	1.3E+00	PHYSPRO	1.0E+01	PHYSPROP	2.1E-03	3.7E+00	8.8E+00	3.3E-04	EPI
Zirconium	7440-67-7	9.1E+01	EPI				0.0E+00	NIOSH	1.9E+03	CRC89	6.5E+00	CRC89				3.0E+03	BAES							3.7E-03	3.4E-01	8.2E-01	1.0E-03	RAGS

ATTACHMENT C

USEPA RSL CALCULATOR DOCUMENTATION

CONSTRUCTION WORKER – OTHER CONSTRUCTION ACTIVITIES SCENARIO

Attachment C-1
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
TR (target cancer risk) unitless	0.000001	
THQ (target hazard quotient) unitless	1	HQ of 1
EFcw (exposure frequency - construction worker) day/yr	250	
EDcw (exposure duration - construction worker) yr	1	
ETcw (exposure time - construction worker) hr/day	8	
LT (lifetime) yr	70	
BWcw (body weight - construction worker) kg	80	
IRcw (soil ingestion rate - construction worker) mg/day	330	
SAcw (surface area - construction worker) cm2/day	3527	
AFcw (skin adherence factor - construction worker) mg/cm2	0.3	
ATcw (averaging time - construction worker)	365	
EWcw (overall duration of construction) weeks/year	50	
DWcw (days worked - construction worker) days/week	5	
Ac (acres)	1.115	Site-Specific
Atill (areal extent of tilling) acres	1.115	Site-Specific
Aexcav (area of excavation site) m2	4512.3	Site-Specific
Ac-grade (areal extent of grading) acres	1.115	Site-Specific
Ac-doz (areal extent of dozing) acres	1.115	Site-Specific
Mm-doz (Gravimetric soil moisture content) %	7.9	
Mm-excav (Gravimetric soil moisture content) %	12	
ρsoil (density) g/cm3 - chemical-specific	1.68	
NA-dump (number of times soil is dumped)	2	
NA-till (number of times soil is tilled)	2	
still (soil silt content) %	18	
sdoz (soil silt content) %	6.9	
Bl (dozing blade length) m	2.337	Site-Specific
Bl (grading blade length) m	1.524	Site-Specific
NA-doz (number of times site was dozed)	1	Site-Specific
NA-grade (number of times site was graded)	1	Site-Specific
Sdoz (dozing speed) kph	11.4	
Sgrade (dozing speed) kph	11.4	
dexcav (average depth of excavation site) m	3.048	Site-Specific
V (fraction of vegetative cover)	0	
Um (mean annual wind speed) m/s	4.69	
Ut (equivalent threshold value) m/s	11.32	
tc (overall duration of construction) hours	8400	
FD Unitless Dispersion Correction Factor	0.185837208	
T (time over which traffic occurs) s	7200000	
J`T (g/m2s)	9.92406E-07	
F(x) (function dependant on Um/Ut derived using Cowherd et al. (1985))	0.194	
Mwind (dust emitted by wind erosion) g	19632.72721	
Mdoz (dust emitted from dozing operations) g	57.37384998	
Mtill (dust emitted from tilling operations) g	5623.338872	
Mgrade (dust emitted from grading operations) g	1292.921284	
Mexcav (dust emitted from excavation soil dumping) g	5635.126801	
ΣVKTdoz (sum of fleet vehicle km traveled) km	1.930853659	

Attachment C-1
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
ΣVKTgrade (sum of fleet vehicle km traveled) km	2.960895669	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	12.30146759	
PEF`sc (particulate emission factor) m3/kg	66701365.04	
A (PEF Dispersion Constant)	2.4538	
B (PEF Dispersion Constant)	17.566	
C (PEF Dispersion Constant)	189.0426	
Asurf (areal extent of site) m2	4512.2489	
As (VFulim-sc acres)	0.5	
T (temperature) °C	25	
foc (fraction organic carbon in soil) g/g	0.006	
ρb (dry soil bulk density) g/cm3	1.5	
ρs (soil particle density) g/cm3	2.65	
θw (water-filled soil porosity) Lwater/Lsoil	0.15	
A (VF Dispersion Constant)	2.4538	
B (VF Dispersion Constant)	17.566	
C (VF Dispersion Constant)	189.0426	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31407	
n (total soil porosity) Lpore/Lsoil	0.43396	
θa (air-filled soil porosity) Lair/Lsoil	0.28396	
As (VFmlim-sc acres)	0.5	
ρb (dry soil bulk density) g/cm3	1.5	
ds (average source depth) m	.	
Q/Cvol (inverse of the ratio of the geometric mean air concentration to the emission fl	14.31407	
VFmlim-sc (volatilization factor) m3air/kgsoil	0	

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Attachment C-2
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide),
sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		-		2.00E-02	P
Tetrachloroethylene	127-18-4	No	Yes	2.10E-03	I	2.60E-07	I	1.00E-01	H
Trichloroethylene	79-01-6	Yes	Yes	4.60E-02	I	4.10E-06	I	5.00E-04	I
Vinyl Chloride	75-01-4	Yes	Yes	7.20E-01	I	4.40E-06	I	3.00E-03	I

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Attachment C-2
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide),
sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		1	-	1
Tetrachloroethylene	127-18-4	No	Yes	4.00E-02	I	1	-	1
Trichloroethylene	79-01-6	Yes	Yes	2.00E-03	I	1	-	1
Vinyl Chloride	75-01-4	Yes	Yes	7.67E-02	A	1	-	1

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Attachment C-2
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide),
sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Volatilization Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-6 (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	5.42E+02	2.37E+03	6.67E+07	-
Tetrachloroethylene	127-18-4	No	Yes	5.09E+02	1.66E+02	6.67E+07	1.18E+04
Trichloroethylene	79-01-6	Yes	Yes	4.79E+02	6.92E+02	6.67E+07	5.39E+02
Vinyl Chloride	75-01-4	Yes	Yes	2.07E+02	3.92E+03	6.67E+07	3.44E+01

Output generated 11JUL2016:10:47:15

Attachment C-2
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide),
sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Dermal SL TR=1.0E-6 (mg/kg)	Inhalation SL TR=1.0E-6 (mg/kg)	Applied in Risk Screening Carcinogenic SL TR=1.0E-6 (mg/kg)	Ingestion SL THQ=1 (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-	-	-	6.79E+03
Tetrachloroethylene	127-18-4	No	Yes	-	1.66E+02	1.64E+02	3.39E+04
Trichloroethylene	79-01-6	Yes	Yes	-	3.58E+01	3.36E+01	1.70E+02
Vinyl Chloride	75-01-4	Yes	Yes	-	1.44E+01	1.02E+01	1.02E+03

Output generated 11JUL2016:10:47:15

Attachment C-2
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 100% of Site Area

Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide),
sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Applied in Risk Screening Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-	-	6.79E+03	6.79E+03 sat
Tetrachloroethylene	127-18-4	No	Yes	-	8.56E+01	8.54E+01	8.54E+01 Ssat
Trichloroethylene	79-01-6	Yes	Yes	-	4.03E+00	3.93E+00	3.93E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	-	6.68E+01	6.27E+01	1.02E+01 ca**

Output generated 11JUL2016:10:47:15

Attachment C-3
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
TR (target cancer risk) unitless	0.000001	
THQ (target hazard quotient) unitless	1	HQ of 1
EFcw (exposure frequency - construction worker) day/yr	250	
EDcw (exposure duration - construction worker) yr	1	
ETcw (exposure time - construction worker) hr/day	8	
LT (lifetime) yr	70	
BWcw (body weight - construction worker) kg	80	
IRcw (soil ingestion rate - construction worker) mg/day	330	
SAcw (surface area - construction worker) cm2/day	3527	
AFcw (skin adherence factor - construction worker) mg/cm2	0.3	
ATcw (averaging time - construction worker)	365	
EWcw (overall duration of construction) weeks/year	50	
DWcw (days worked - construction worker) days/week	5	
Ac (acres)	0.5	Site-Specific
Atill (areal extent of tilling) acres	0.17	Site-Specific
Aexcav (area of excavation site) m2	687	Site-Specific
Ac-grade (areal extent of grading) acres	0.17	Site-Specific
Ac-doz (areal extent of dozing) acres	0.17	Site-Specific
Mm-doz (Gravimetric soil moisture content) %	7.9	
Mm-excav (Gravimetric soil moisture content) %	12	
ρsoil (density) g/cm3 - chemical-specific	1.68	
NA-dump (number of times soil is dumped)	2	
NA-till (number of times soil is tilled)	2	
still (soil silt content) %	18	
sdoz (soil silt content) %	6.9	
Bl (dozing blade length) m	2.337	Site-Specific
Bl (grading blade length) m	1.524	Site-Specific
NA-doz (number of times site was dozed)	1	Site-Specific
NA-grade (number of times site was graded)	1	Site-Specific
Sdoz (dozing speed) kph	11.4	
Sgrade (dozing speed) kph	11.4	
dexcav (average depth of excavation site) m	3.048	Site-Specific
V (fraction of vegetative cover)	0	
Um (mean annual wind speed) m/s	4.69	
Ut (equivalent threshold value) m/s	11.32	
tc (overall duration of construction) hours	8400	
FD Unitless Dispersion Correction Factor	0.185837208	
T (time over which traffic occurs) s	7200000	
J`T (g/m2s)	7.36175E-07	
F(x) (function dependant on Um/Ut derived using Cowherd et al. (1985))	0.194	
Mwind (dust emitted by wind erosion) g	8803.913546	
Mdoz (dust emitted from dozing operations) g	8.747582509	
Mtill (dust emitted from tilling operations) g	857.3700523	
Mgrade (dust emitted from grading operations) g	197.1270119	
Mexcav (dust emitted from excavation soil dumping) g	857.9509591	
ΣVKTdoz (sum of fleet vehicle km traveled) km	0.294390244	

Attachment C-3
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
ΣVKTgrade (sum of fleet vehicle km traveled) km	0.451437008	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31406677	
PEF`sc (particulate emission factor) m3/kg	104628338.1	
A (PEF Dispersion Constant)	2.4538	
B (PEF Dispersion Constant)	17.566	
C (PEF Dispersion Constant)	189.0426	
Asurf (areal extent of site) m2	2023.43	
As (VFulim-sc acres)	0.5	
T (temperature) °C	25	
foc (fraction organic carbon in soil) g/g	0.006	
ρb (dry soil bulk density) g/cm3	1.5	
ρs (soil particle density) g/cm3	2.65	
θw (water-filled soil porosity) Lwater/Lsoil	0.15	
A (VF Dispersion Constant)	2.4538	
B (VF Dispersion Constant)	17.566	
C (VF Dispersion Constant)	189.0426	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31407	
n (total soil porosity) Lpore/Lsoil	0.43396	
θa (air-filled soil porosity) Lair/Lsoil	0.28396	
As (VFmlim-sc acres)	0.5	
ρb (dry soil bulk density) g/cm3	1.5	
ds (average source depth) m	.	
Q/Cvol (inverse of the ratio of the geometric mean air concentration to the emission fl	14.31407	
VFmlim-sc (volatilization factor) m3air/kgsoil	0	

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Attachment C-4
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref	Subchronic RfC (mg/m^3)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		-		2.00E-02	P	-
Tetrachloroethylene	127-18-4	No	Yes	2.10E-03	I	2.60E-07	I	1.00E-01	H	4.00E-02
Trichloroethylene	79-01-6	Yes	Yes	4.60E-02	I	4.10E-06	I	5.00E-04	I	2.00E-03
Vinyl Chloride	75-01-4	Yes	Yes	7.20E-01	I	4.40E-06	I	3.00E-03	I	7.67E-02

Output generated 11JUL2016:10:50:18

Attachment C-4
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Subchronic RfC Ref	GIABS	ABS	RBA	Volatilization Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes		1	-	1	5.42E+02	2.37E+03
Tetrachloroethylene	127-18-4	No	Yes	I	1	-	1	5.09E+02	1.66E+02
Trichloroethylene	79-01-6	Yes	Yes	I	1	-	1	4.79E+02	6.92E+02
Vinyl Chloride	75-01-4	Yes	Yes	A	1	-	1	2.07E+02	3.92E+03

Output generated 11JUL2016:10:50:18

Attachment C-4
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Applied in Risk Screening

Chemical	CAS Number	Mutagen?	VOC?	**Particulate** Emission Factor (m^3/kg)	**Ingestion SL TR=1.0E-6 (mg/kg)**	**Dermal SL TR=1.0E-6 (mg/kg)**	**Inhalation SL TR=1.0E-6 (mg/kg)**	**Carcinogenic SL TR=1.0E-6 (mg/kg)**
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	1.05E+08	-	-	-	-
Tetrachloroethylene	127-18-4	No	Yes	1.05E+08	1.18E+04	-	1.66E+02	1.64E+02
Trichloroethylene	79-01-6	Yes	Yes	1.05E+08	5.39E+02	-	3.58E+01	3.36E+01
Vinyl Chloride	75-01-4	Yes	Yes	1.05E+08	3.44E+01	-	1.44E+01	1.02E+01

Output generated 11JUL2016:10:50:18

Attachment C-4
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 100% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)	Applied in Risk Screening Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	6.79E+03	-	-	6.79E+03	6.79E+03 sat
Tetrachloroethylene	127-18-4	No	Yes	3.39E+04	-	8.56E+01	8.54E+01	8.54E+01 Ssat
Trichloroethylene	79-01-6	Yes	Yes	1.70E+02	-	4.03E+00	3.93E+00	3.93E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	1.02E+03	-	6.68E+01	6.27E+01	1.02E+01 ca**

Output generated 11JUL2016:10:50:18

Attachment C-5
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
TR (target cancer risk) unitless	0.000001	
THQ (target hazard quotient) unitless	1	HQ of 1
EFcw (exposure frequency - construction worker) day/yr	250	
EDcw (exposure duration - construction worker) yr	1	
ETcw (exposure time - construction worker) hr/day	8	
LT (lifetime) yr	70	
BWcw (body weight - construction worker) kg	80	
IRcw (soil ingestion rate - construction worker) mg/day	330	
SAcw (surface area - construction worker) cm2/day	3527	
AFcw (skin adherence factor - construction worker) mg/cm2	0.3	
ATcw (averaging time - construction worker)	365	
EWcw (overall duration of construction) weeks/year	50	
DWcw (days worked - construction worker) days/week	5	
Ac (acres)	0.55751	Site-Specific
Atill (areal extent of tilling) acres	0.55751	Site-Specific
Aexcav (area of excavation site) m2	2256.1	Site-Specific
Ac-grade (areal extent of grading) acres	0.55751	Site-Specific
Ac-doz (areal extent of dozing) acres	0.55751	Site-Specific
Mm-doz (Gravimetric soil moisture content) %	7.9	
Mm-excav (Gravimetric soil moisture content) %	12	
ρsoil (density) g/cm3 - chemical-specific	1.68	
NA-dump (number of times soil is dumped)	2	
NA-till (number of times soil is tilled)	2	
still (soil silt content) %	18	
sdoz (soil silt content) %	6.9	
Bl (dozing blade length) m	2.337	Site-Specific
Bl (grading blade length) m	1.524	Site-Specific
NA-doz (number of times site was dozed)	1	Site-Specific
NA-grade (number of times site was graded)	1	Site-Specific
Sdoz (dozing speed) kph	11.4	
Sgrade (dozing speed) kph	11.4	
dexcav (average depth of excavation site) m	3.048	Site-Specific
V (fraction of vegetative cover)	0	
Um (mean annual wind speed) m/s	4.69	
Ut (equivalent threshold value) m/s	11.32	
tc (overall duration of construction) hours	8400	
FD Unitless Dispersion Correction Factor	0.185837208	
T (time over which traffic occurs) s	7200000	
J`T (g/m2s)	9.92399E-07	
F(x) (function dependant on Um/Ut derived using Cowherd et al. (1985))	0.194	
Mwind (dust emitted by wind erosion) g	9816.539682	
Mdoz (dust emitted from dozing operations) g	28.68743955	
Mtill (dust emitted from tilling operations) g	2811.71987	
Mgrade (dust emitted from grading operations) g	646.4722377	
Mexcav (dust emitted from excavation soil dumping) g	2817.500959	
ΣVKTdoz (sum of fleet vehicle km traveled) km	0.965444146	

Attachment C-5
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
ΣVKTgrade (sum of fleet vehicle km traveled) km	1.48047439	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.01704426	
PEF`sc (particulate emission factor) m3/kg	76004145.93	
A (PEF Dispersion Constant)	2.4538	
B (PEF Dispersion Constant)	17.566	
C (PEF Dispersion Constant)	189.0426	
Asurf (areal extent of site) m2	2256.164919	
As (VFulim-sc acres)	0.5	
T (temperature) °C	25	
foc (fraction organic carbon in soil) g/g	0.006	
ρb (dry soil bulk density) g/cm3	1.5	
ρs (soil particle density) g/cm3	2.65	
θw (water-filled soil porosity) Lwater/Lsoil	0.15	
A (VF Dispersion Constant)	2.4538	
B (VF Dispersion Constant)	17.566	
C (VF Dispersion Constant)	189.0426	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31407	
n (total soil porosity) Lpore/Lsoil	0.43396	
θa (air-filled soil porosity) Lair/Lsoil	0.28396	
As (VFmlim-sc acres)	0.5	
ρb (dry soil bulk density) g/cm3	1.5	
ds (average source depth) m	.	
Q/Cvol (inverse of the ratio of the geometric mean air concentration to the emission fl	14.31407	
VFmlim-sc (volatilization factor) m3air/kgsoil	0	

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Attachment C-6
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		-		2.00E-02	P
Tetrachloroethylene	127-18-4	No	Yes	2.10E-03	I	2.60E-07	I	1.00E-01	H
Trichloroethylene	79-01-6	Yes	Yes	4.60E-02	I	4.10E-06	I	5.00E-04	I
Vinyl Chloride	75-01-4	Yes	Yes	7.20E-01	I	4.40E-06	I	3.00E-03	I

Output generated 11JUL2016:10:48:53

Attachment C-6
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		1	-	1
Tetrachloroethylene	127-18-4	No	Yes	4.00E-02	I	1	-	1
Trichloroethylene	79-01-6	Yes	Yes	2.00E-03	I	1	-	1
Vinyl Chloride	75-01-4	Yes	Yes	7.67E-02	A	1	-	1

Output generated 11JUL2016:10:48:53

Attachment C-6
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Volatilization Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-6 (mg/kg)	Dermal SL TR=1.0E-6 (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	5.42E+02	2.37E+03	7.60E+07	-	-
Tetrachloroethylene	127-18-4	No	Yes	5.09E+02	1.66E+02	7.60E+07	1.18E+04	-
Trichloroethylene	79-01-6	Yes	Yes	4.79E+02	6.92E+02	7.60E+07	5.39E+02	-
Vinyl Chloride	75-01-4	Yes	Yes	2.07E+02	3.92E+03	7.60E+07	3.44E+01	-

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Attachment C-6
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

					Applied in Risk Screening			
Chemical	**CAS Number**	**Mutagen?**	**VOC?**	**Inhalation SL TR=1.0E-6 (mg/kg)**	**Carcinogenic SL TR=1.0E-6 (mg/kg)**	**Ingestion SL THQ=1 (mg/kg)**	**Dermal SL THQ=1 (mg/kg)**	**Inhalation SL THQ=1 (mg/kg)**
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-	-	6.79E+03	-	-
Tetrachloroethylene	127-18-4	No	Yes	1.66E+02	1.64E+02	3.39E+04	-	8.56E+01
Trichloroethylene	79-01-6	Yes	Yes	3.58E+01	3.36E+01	1.70E+02	-	4.03E+00
Vinyl Chloride	75-01-4	Yes	Yes	1.44E+01	1.02E+01	1.02E+03	-	6.68E+01

Output generated 11JUL2016:10:48:53

Attachment C-6
USEPA Regional Screening Level Calculator, May 2016
Site-specific Cedarwood Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Applied in Risk Screening Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	6.79E+03	6.79E+03 sat
Tetrachloroethylene	127-18-4	No	Yes	8.54E+01	8.54E+01 Ssat
Trichloroethylene	79-01-6	Yes	Yes	3.93E+00	3.93E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	6.27E+01	1.02E+01 ca**

Output generated 11JUL2016:10:48:53

Attachment C-7
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
TR (target cancer risk) unitless	0.000001	
THQ (target hazard quotient) unitless	1	HQ of 1
EFcw (exposure frequency - construction worker) day/yr	250	
EDcw (exposure duration - construction worker) yr	1	
ETcw (exposure time - construction worker) hr/day	8	
LT (lifetime) yr	70	
BWcw (body weight - construction worker) kg	80	
IRcw (soil ingestion rate - construction worker) mg/day	330	
SAcw (surface area - construction worker) cm2/day	3527	
AFcw (skin adherence factor - construction worker) mg/cm2	0.3	
ATcw (averaging time - construction worker)	365	
EWcw (overall duration of construction) weeks/year	50	
DWcw (days worked - construction worker) days/week	5	
Ac (acres)	0.5	Site-Specific
Atill (areal extent of tilling) acres	0.085	Site-Specific
Aexcav (area of excavation site) m2	344	Site-Specific
Ac-grade (areal extent of grading) acres	0.085	Site-Specific
Ac-doz (areal extent of dozing) acres	0.085	Site-Specific
Mm-doz (Gravimetric soil moisture content) %	7.9	
Mm-excav (Gravimetric soil moisture content) %	12	
ρsoil (density) g/cm3 - chemical-specific	1.68	
NA-dump (number of times soil is dumped)	2	
NA-till (number of times soil is tilled)	2	
still (soil silt content) %	18	
sdoz (soil silt content) %	6.9	
Bl (dozing blade length) m	2.337	Site-Specific
Bl (grading blade length) m	1.524	Site-Specific
NA-doz (number of times site was dozed)	1	Site-Specific
NA-grade (number of times site was graded)	1	Site-Specific
Sdoz (dozing speed) kph	11.4	
Sgrade (dozing speed) kph	11.4	
dexcav (average depth of excavation site) m	3.048	Site-Specific
V (fraction of vegetative cover)	0	
Um (mean annual wind speed) m/s	4.69	
Ut (equivalent threshold value) m/s	11.32	
tc (overall duration of construction) hours	8400	
FD Unitless Dispersion Correction Factor	0.185837208	
T (time over which traffic occurs) s	7200000	
J`T (g/m2s)	6.70282E-07	
F(x) (function dependant on Um/Ut derived using Cowherd et al. (1985))	0.194	
Mwind (dust emitted by wind erosion) g	8803.913546	
Mdoz (dust emitted from dozing operations) g	4.373791254	
Mtill (dust emitted from tilling operations) g	428.6850262	
Mgrade (dust emitted from grading operations) g	98.56350595	
Mexcav (dust emitted from excavation soil dumping) g	429.599898	
ΣVKTdoz (sum of fleet vehicle km traveled) km	0.147195122	
ΣVKTgrade (sum of fleet vehicle km traveled) km	0.225718504	

Attachment C-7
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Equation Inputs for Soil - Other Construction Activities

Variable	Value	Site-Specific?
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31406677	
PEF`sc (particulate emission factor) m3/kg	114913952.3	
A (PEF Dispersion Constant)	2.4538	
B (PEF Dispersion Constant)	17.566	
C (PEF Dispersion Constant)	189.0426	
Asurf (areal extent of site) m2	2023.43	
As (VFulim-sc acres)	0.5	
T (temperature) °C	25	
foc (fraction organic carbon in soil) g/g	0.006	
ρb (dry soil bulk density) g/cm3	1.5	
ρs (soil particle density) g/cm3	2.65	
θw (water-filled soil porosity) Lwater/Lsoil	0.15	
A (VF Dispersion Constant)	2.4538	
B (VF Dispersion Constant)	17.566	
C (VF Dispersion Constant)	189.0426	
Q/Csa (inverse of the ratio of the geometric mean air concentration to the emission flu	14.31407	
n (total soil porosity) Lpore/Lsoil	0.43396	
θa (air-filled soil porosity) Lair/Lsoil	0.28396	
As (VFmlim-sc acres)	0.5	
ρb (dry soil bulk density) g/cm3	1.5	
ds (average source depth) m	.	
Q/Cvol (inverse of the ratio of the geometric mean air concentration to the emission fl	14.31407	
VFmlim-sc (volatilization factor) m3air/kgsoil	0	

Output generated 11JUL2016:10:51:10

Attachment C-8
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Ingestion SF $(mg/kg\text{-}day)^{-1}$	SFO Ref	Inhalation Unit Risk $(ug/m^3)^{-1}$	IUR Ref	Subchronic RfD (mg/kg-day)	Subchronic RfD Ref
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		-		2.00E-02	P
Tetrachloroethylene	127-18-4	No	Yes	2.10E-03	I	2.60E-07	I	1.00E-01	H
Trichloroethylene	79-01-6	Yes	Yes	4.60E-02	I	4.10E-06	I	5.00E-04	I
Vinyl Chloride	75-01-4	Yes	Yes	7.20E-01	I	4.40E-06	I	3.00E-03	I

Output generated 11JUL2016:10:51:10

Attachment C-8
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Subchronic RfC (mg/m^3)	Subchronic RfC Ref	GIABS	ABS	RBA
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-		1	-	1
Tetrachloroethylene	127-18-4	No	Yes	4.00E-02	I	1	-	1
Trichloroethylene	79-01-6	Yes	Yes	2.00E-03	I	1	-	1
Vinyl Chloride	75-01-4	Yes	Yes	7.67E-02	A	1	-	1

Output generated 11JUL2016:10:51:10

Attachment C-8
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Volatilization Factor (m^3/kg)	Soil Saturation Concentration (mg/kg)	Particulate Emission Factor (m^3/kg)	Ingestion SL TR=1.0E-6 (mg/kg)	Dermal SL TR=1.0E-6 (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	5.42E+02	2.37E+03	1.15E+08	-	-
Tetrachloroethylene	127-18-4	No	Yes	5.09E+02	1.66E+02	1.15E+08	1.18E+04	-
Trichloroethylene	79-01-6	Yes	Yes	4.79E+02	6.92E+02	1.15E+08	5.39E+02	-
Vinyl Chloride	75-01-4	Yes	Yes	2.07E+02	3.92E+03	1.15E+08	3.44E+01	-

Output generated 11JUL2016:10:51:10

Attachment C-8
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Inhalation SL TR=1.0E-6 (mg/kg)	Applied in Risk Screening Carcinogenic SL TR=1.0E-6 (mg/kg)	Ingestion SL THQ=1 (mg/kg)	Dermal SL THQ=1 (mg/kg)	Inhalation SL THQ=1 (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	-	-	6.79E+03	-	-
Tetrachloroethylene	127-18-4	No	Yes	1.66E+02	1.64E+02	3.39E+04	-	8.56E+01
Trichloroethylene	79-01-6	Yes	Yes	3.58E+01	3.36E+01	1.70E+02	-	4.03E+00
Vinyl Chloride	75-01-4	Yes	Yes	1.44E+01	1.02E+01	1.02E+03	-	6.68E+01

Output generated 11JUL2016:10:51:10

Attachment C-8
USEPA Regional Screening Level Calculator, May 2016
Site-specific Piermont Cleaners, 50% of Site Area
Construction Worker Screening Levels (RSL) for Soil - Other Construction Activities

ca=Cancer, nc=Noncancer, ca* (Where nc SL < 100 x ca SL),
ca** (Where nc SL < 10 x ca SL), max=SL exceeds ceiling limit (see User's Guide), sat=SL exceeds csat,
Smax=Soil SL exceeds ceiling limit and has been substituted with the max value (see User's Guide),
Ssat=Soil inhalation SL exceeds csat and has been substituted with the csat
CSAT substitution for soil inhalation pathway has been enabled.
Substitution for threshold maximum in soil has been enabled.

Chemical	CAS Number	Mutagen?	VOC?	Applied in Risk Screening Noncarcinogenic SL THI=1 (mg/kg)	Screening Level (mg/kg)
Dichloroethylene, 1,2-cis-	156-59-2	No	Yes	6.79E+03	6.79E+03 sat
Tetrachloroethylene	127-18-4	No	Yes	8.54E+01	8.54E+01 Ssat
Trichloroethylene	79-01-6	Yes	Yes	3.93E+00	3.93E+00 nc
Vinyl Chloride	75-01-4	Yes	Yes	6.27E+01	1.02E+01 ca**

Output generated 11JUL2016:10:51:10

ATTACHMENT D

SENSITIVITY ANALYSIS

CEDARWOOD AND VACANT LOT GROUNDWATER

Table D-1: Exposure Point Concentrations
Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	Detection Ratio	Detection Frequency (%)	Max Detect	Qualifier	Location of Max Detect	Detection Limit Range	95% UCL	UCL Method	EPC	EPC Type
Cedarwood	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	17 / 43	40	2600		MW-27D	5 - 1000	581.7	97.5% KM (Chebyshev) UCL	582	UCL
Cedarwood	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	39 / 43	91	65000		ERT-GW-22	5 - 5000	15388	Gamma Adjusted KM-UCL	15388	UCL
Cedarwood	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	29 / 43	67	6300		MW-27D	5 - 1000	1473	Gamma Adjusted KM-UCL	1473	UCL
Cedarwood	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	3 / 43	7	300		MW-27D	0.5 - 1000	34.8	95% KM (t) UCL	35	UCL
Vacant Lot	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	7 / 50	14	6.8		ERT-GW-36	5 - 20000	4.7	95% KM (t) UCL	4.7	UCL
Vacant Lot	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	45 / 52	87	800000		ERT-GW-38	5 - 20000	309334	99% KM (Chebyshev) UCL	309334	UCL
Vacant Lot	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	11 / 50	22	2000		ERT-MW-04D	5 - 20000	383.3	95% KM Approximate Gamma UCL	383	UCL
Vacant Lot	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	2 / 50	4	12		ERT-GW-35	5 - 20000	NA	ProUCL did not calculate UCL	12	Max

Notes:
1. Concentrations are presented in ug/L for groundwater.
2. Upper Confidence Limits (UCLs) are calculated using ProUCL 5.1 with a 95% confidence level and 2,000 bootstrap operations. The maximum of the parent and field duplicate sample results was applied. See Attachment A.
3. The UCL was applied as the EPC, except for when the UCL is greater than the maximum detected concentration, as indicated by the ProUCL output.

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
KM -- Kaplan Meier
NA -- Not applicable
UCL -- Upper confidence limit

References:
EPA. 2016. ProUCL Version 5.1.00. Last Updated May 18. Available online: https://www.epa.gov/land-research/proucl-software
EPA. 2015. ProUCL Version 5.1 Technical Guide. EPA/600/R-07/041. October. Available online: https://www.epa.gov/sites/production/files/2016-05/documents/proucl_5.1_tech-guide.pdf

Table D-2: Exposure Factors
Peninsula Boulevard OU2, Hempstead, NY

		Current/Future	
		Resident Child [1]	Resident Adult [1,2]
Groundwater Ingestion			
Drinking Rate (L/d)	DR	0.78	2.5
Exposure Frequency (d/yr)	EF	350	350
Exposure Duration (yr)	ED	6	26
Body Weight (kg-bw)	BW	15	80
Averaging Time, canc (d)	AT_c	25,550	25,550
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490
Groundwater Dermal Contact			
Dose Absorbed (ug/cm^2-event)	DA_{event}	chem-specific	chem-specific
Dermal Permeability Constant (cm/h)	Kp	chem-specific	chem-specific
Fraction Absorbed	FA	chem-specific	chem-specific
Exposure Time for organics (h)	ET	0.54	0.71
Exposure Frequency (d/yr)	EF	350	350
Exposure Duration (yr)	ED	6	26
Body Weight (kg-bw)	BW	15	80
Averaging Time, canc (d)	AT_c	25,550	25,550
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490
Groundwater Vapor Inhalation			
Andelman Volatilization Factor (L/m^3)	K	0.5	0.5
Exposure Time (h)	ET	24	24
Exposure Frequency (d/yr)	EF	350	350
Exposure Duration (yr)	ED	6	26
Averaging Time, canc (d)	AT_c	25,550	25,550
Averaging Time, noncanc (d)	AT_{nc}	2,190	9,490

Note:

1. The exposure factors for a resident are from the May 2016 USEPA Standard Default Factors in Table 1 of the User's Guide (https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide-may-2016), which reflect the new exposure factors presented in the February 2014 OSWER Directive 9200.1-120 Update of Standard Default Exposure Factors.

2. The exposure duration for an adult is applied as 20 years for the cancer scenario and 26 years for a noncancer scenario, as presented in the May 2016 USEPA RSL equations: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-may-2016

Table D-3: Toxicity Values
Peninsula Boulevard OU2, Hempstead, NY

			Cancer					Noncancer			
Chem Group	COPC	CASRN	Mutagen	Oral Slope Factor (SF_o) $(mg/kg\text{-}day)^{-1}$	GIABS	Dermal Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk (IUR) $(ug/m3)^{-1}$	Oral Reference Dose (RfD_o) (mg/kg-day)	GIABS	Dermal Reference Dose (mg/kg-day)	Inhalation Reference Concentration (RfC_i) (mg/m^3)
VOC	cis-1,2-Dichloroethylene	156-59-2	No		1			0.002	1	0.002	
VOC	Tetrachloroethylene	127-18-4	No	0.0021	1	0.0021	0.00000026	0.006	1	0.006	0.04
VOC	Trichloroethylene	79-01-6	Yes	0.046	1	0.046	0.0000041	0.0005	1	0.0005	0.002
VOC	Vinyl chloride	75-01-4	Yes	0.72	1	0.72	0.0000044	0.003	1	0.003	0.1

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
NA -- Not available

Notes:
The absorbed RfD for dermal is calculated by the following equation: RfD-oral x GIABS.
The absorbed SFd for dermal is calculated by the following equation: SF-oral / GIABS.

Reference:
USEPA 2016. Regional Screening Level (RSL) Generic Tables. May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls

Table D-4: Cancer Risks and Noncancer Hazard Quotients in Groundwater Sensitivity Analysis
Cedarwood Cleaners; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Groundwater			
								Future Resident			
								USEPA RSL Residential Tapwater		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ
Cedarwood	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	5.8E+02	UCL	NA	3.6E+01	No RSL	1.6E+01
Cedarwood	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	1.5E+04	UCL	1.1E+01	4.1E+01	1.4E-03	3.8E+02
Cedarwood	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	1.5E+03	UCL	4.9E-01	2.8E+00	3.0E-03	5.3E+02
Cedarwood	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	3.5E+01	UCL	1.9E-02	4.4E+01	1.8E-03	7.9E-01
Cumulative Risk Estimates for Selected COPCs:										**6.2E-03**	**9.2E+02**

Notes:
1. Concentrations and RSLs are presented in ug/L for groundwater.
2. This sensitivity analysis evaluates groundwater samples collected at Cedarwood Cleaners and does not include groundwater samples collected from Vacant Lot.
3. Groundwater concentrations at Cedarwood Cleaners include concentrations that were historically collected in nearby offsite monitoring well MW-27D/S as part of of the OU1 Remedial Design.
4. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
5. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shaded bold.

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ *\ 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ *1}{RSL_{nc}}$$

Table D-5: Cancer Risks and Noncancer Hazard Quotients in Groundwater Sensitivity Analysis
Vacant Lot; Peninsula Boulevard OU2, Hempstead, NY

Facility	Matrix	Chem Group	COPC	CASRN	Units	EPC	EPC Type	Groundwater			
								Future Resident			
								USEPA RSL Residential Tapwater		Risk Estimates	
								Cancer	Noncancer	Cancer Risk	Noncancer HQ
Vacant Lot	Groundwater	VOC	cis-1,2-Dichloroethylene	156-59-2	ug/l	4.7E+00	UCL	NA	3.6E+01	No RSL	1.3E-01
Vacant Lot	Groundwater	VOC	Tetrachloroethylene	127-18-4	ug/l	3.1E+05	UCL	1.1E+01	4.1E+01	2.8E-02	7.5E+03
Vacant Lot	Groundwater	VOC	Trichloroethylene	79-01-6	ug/l	3.8E+02	UCL	4.9E-01	2.8E+00	7.8E-04	1.4E+02
Vacant Lot	Groundwater	VOC	Vinyl chloride	75-01-4	ug/l	1.2E+01	Max	1.9E-02	4.4E+01	6.3E-04	2.7E-01
Cumulative Risk Estimates for Selected COPCs:										**3.0E-02**	**7.7E+03**

Notes:
1. Concentrations and RSLs are presented in ug/L for groundwater.
2. This sensitivity analysis evaluates groundwater samples collected at Vacant Lot and does not include groundwater samples collected from Cedarwood Cleaners.
3. The May 2016 USEPA Regional Screening Levels (RSLs) are calculated at a target cancer risk of 1x10-6 and hazard quotient (HQ) of 1.
4. Risk estimates greater than the acceptable range of 1x10-4 to 1x10-6 for cumulative cancer risk and 1 for noncancer HI are shaded bold.

Abbreviations:
Chem Group -- Chemical group
COPC -- Contaminants of potential concern
EPC -- Exposure point concentration
HQ -- Hazard quotient
ND -- Not detected
RSL -- Regional screening level
UCL -- Upper confidence limit
USEPA -- United States Environmental Protection Agency
VOC -- Volatile organic compound

Equations:

$$Cancer\ Risk = \frac{EPC\ *\ 1x10^{-6}}{RSL_c}$$

$$Noncancer\ HQ = \frac{EPC\ *1}{RSL_{nc}}$$

Table D-6: 95% Upper Confidence Limits for COPCs Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Site	Matrix	COPC	UCL	UCL Method	Warning	Sample Count	Detect Count	% Detects
Cedarwood Cleaners	Groundwater	cis-1,2-Dichloroethene	581.7	97.5% KM (Chebyshev) UCL		43	17	40
		Tetrachloroethene	15388	Gamma Adjusted KM-UCL		43	39	91
		Trichloroethene	1473	Gamma Adjusted KM-UCL		43	29	67
		Vinyl Chloride	34.82	95% KM (t) UCL	d	43	3	7
Vacant Lot	Groundwater	cis-1,2-Dichloroethene	4.661	95% KM (t) UCL		50	7	14
		Tetrachloroethene	309334	99% KM (Chebyshev) UCL		52	45	87
		Trichloroethene	383.3	95% KM Approximate Gamma UCL		50	11	22
		Vinyl Chloride	NA	ProUCL did not calculate UCL	b, e	50	2	4

Notes:
1. Concentrations and UCLs for groundwater are presented in units of ug/L.
2. Upper Confidence Limits (UCLs) were calculated using ProUCL 5.1 with a 95% confidence level and 2,000 bootstrap operations.

Abbreviations:
COPC -- Contaminants of potential concern
NA -- Not applicable
UCL -- Upper confidence limit

ProUCL Warnings:
b. Only one distinct data value was detected.
d. Data set has only 3 Detected Values.
e. The data set was not processed.

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

User Selected Options
Date/Time of Computation ProUCL 5.16/24/2016 2:03:53 PM
From File WorkSheet.xls
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

result (cedarwood & groundwater & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	24
Number of Detects	17	Number of Non-Detects	26
Number of Distinct Detects	17	Number of Distinct Non-Detects	7
Minimum Detect	0.96	Minimum Non-Detect	5
Maximum Detect	2600	Maximum Non-Detect	1000
Variance Detects	514796	Percent Non-Detects	60.47%
Mean Detects	312.5	SD Detects	717.5
Median Detects	16	CV Detects	2.296
Skewness Detects	2.543	Kurtosis Detects	6.331
Mean of Logged Detects	2.885	SD of Logged Detects	2.525

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.505	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.47	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	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	127.5	KM Standard Error of Mean	72.74
KM SD	462.6	95% KM (BCA) UCL	270.5
95% KM (t) UCL	249.8	95% KM (Percentile Bootstrap) UCL	248.8
95% KM (z) UCL	247.1	95% KM Bootstrap t UCL	369.2
90% KM Chebyshev UCL	345.7	95% KM Chebyshev UCL	444.5
97.5% KM Chebyshev UCL	581.7	99% KM Chebyshev UCL	851.2

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.858	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.864	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.353	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.229	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)	0.249	k star (bias corrected MLE)	0.244
Theta hat (MLE)	1257	Theta star (bias corrected MLE)	1281
nu hat (MLE)	8.453	nu star (bias corrected)	8.295
Mean (detects)	312.5		

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	129.1
Maximum	2600	Median	0.01
SD	468.2	CV	3.626
k hat (MLE)	0.132	k star (bias corrected MLE)	0.139
Theta hat (MLE)	975.8	Theta star (bias corrected MLE)	931.7
nu hat (MLE)	11.38	nu star (bias corrected)	11.92
Adjusted Level of Significance (β)	0.0444		

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Approximate Chi Square Value (11.92, α)	5.174	Adjusted Chi Square Value (11.92, β)	5.02
95% Gamma Approximate UCL (use when n>=50)	297.5	95% Gamma Adjusted UCL (use when n<50)	306.6

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	127.5	SD (KM)	462.6
Variance (KM)	214001	SE of Mean (KM)	72.74
k hat (KM)	0.0759	k star (KM)	0.0861
nu hat (KM)	6.529	nu star (KM)	7.406
theta hat (KM)	1679	theta star (KM)	1480
80% gamma percentile (KM)	69.57	90% gamma percentile (KM)	315.7
95% gamma percentile (KM)	742.6	99% gamma percentile (KM)	2179

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (7.41, α)	2.396	Adjusted Chi Square Value (7.41, β)	2.298
95% Gamma Approximate KM-UCL (use when n>=50)	393.9	95% Gamma Adjusted KM-UCL (use when n<50)	410.7

95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.207	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	127.2	Mean in Log Scale	1.741
SD in Original Scale	468.1	SD in Log Scale	2.114
95% t UCL (assumes normality of ROS data)	247.3	95% Percentile Bootstrap UCL	248.1
95% BCA Bootstrap UCL	307.8	95% Bootstrap t UCL	363.3
95% H-UCL (Log ROS)	185.7		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.733	KM Geo Mean	5.657
KM SD (logged)	2.015	95% Critical H Value (KM-Log)	3.685
KM Standard Error of Mean (logged)	0.37	95% H-UCL (KM -Log)	135.6
KM SD (logged)	2.015	95% Critical H Value (KM-Log)	3.685
KM Standard Error of Mean (logged)	0.37		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	183.4	Mean in Log Scale	3.124
SD in Original Scale	465.4	SD in Log Scale	2.192
95% t UCL (Assumes normality)	302.7	95% H-Stat UCL	954.1

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

97.5% KM (Chebyshev) UCL 581.7

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.

result (cedarwood & groundwater & tetrachloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	39
Number of Detects	39	Number of Non-Detects	4
Number of Distinct Detects	38	Number of Distinct Non-Detects	1

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Minimum Detect	1.2	Minimum Non-Detect	5
Maximum Detect	65000	Maximum Non-Detect	5
Variance Detects	2.134E+8	Percent Non-Detects	9.302%
Mean Detects	11298	SD Detects	14608
Median Detects	5400	CV Detects	1.293
Skewness Detects	1.77	Kurtosis Detects	3.535
Mean of Logged Detects	7.504	SD of Logged Detects	2.988

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.778	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	10248	KM Standard Error of Mean	2181
KM SD	14119	95% KM (BCA) UCL	13925
95% KM (t) UCL	13916	95% KM (Percentile Bootstrap) UCL	14002
95% KM (z) UCL	13835	95% KM Bootstrap t UCL	14621
90% KM Chebyshev UCL	16791	95% KM Chebyshev UCL	19755
97.5% KM Chebyshev UCL	23870	99% KM Chebyshev UCL	31951

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.543	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.843	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0872	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.152	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.365	k star (bias corrected MLE)	0.354
Theta hat (MLE)	30941	Theta star (bias corrected MLE)	31902
nu hat (MLE)	28.48	nu star (bias corrected)	27.62
Mean (detects)	11298		

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	1.2	Mean	10321
Maximum	65000	Median	4200
SD	14234	CV	1.379
k hat (MLE)	0.368	k star (bias corrected MLE)	0.357
Theta hat (MLE)	28083	Theta star (bias corrected MLE)	28880
nu hat (MLE)	31.61	nu star (bias corrected)	30.74
Adjusted Level of Significance (β)	0.0444		
Approximate Chi Square Value (30.74, α)	19.07	Adjusted Chi Square Value (30.74, β)	18.75
95% Gamma Approximate UCL (use when n>=50)	16633	95% Gamma Adjusted UCL (use when n<50)	16917

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	10248	SD (KM)	14119
Variance (KM)	1.993E+8	SE of Mean (KM)	2181
k hat (KM)	0.527	k star (KM)	0.506
nu hat (KM)	45.3	nu star (KM)	43.48
theta hat (KM)	19453	theta star (KM)	20271
80% gamma percentile (KM)	16838	90% gamma percentile (KM)	27662
95% gamma percentile (KM)	39211	99% gamma percentile (KM)	67584

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (43.48, α)	29.36	Adjusted Chi Square Value (43.48, β)	28.95
95% Gamma Approximate KM-UCL (use when n>=50)	15176	95% Gamma Adjusted KM-UCL (use when n<50)	15388

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.863	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.939	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	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	10248	Mean in Log Scale	6.991
SD in Original Scale	14286	SD in Log Scale	3.281
95% t UCL (assumes normality of ROS data)	13912	95% Percentile Bootstrap UCL	13995
95% BCA Bootstrap UCL	14122	95% Bootstrap t UCL	14691
95% H-UCL (Log ROS)	4004565		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	6.872	KM Geo Mean	964.9
KM SD (logged)	3.436	95% Critical H Value (KM-Log)	5.826
KM Standard Error of Mean (logged)	0.533	95% H-UCL (KM -Log)	7759565
KM SD (logged)	3.436	95% Critical H Value (KM-Log)	5.826
KM Standard Error of Mean (logged)	0.533		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	10248	Mean in Log Scale	6.891
SD in Original Scale	14286	SD in Log Scale	3.439
95% t UCL (Assumes normality)	13912	95% H-Stat UCL	8033156

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

Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 15388

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

result (cedarwood & groundwater & trichloroethylene)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	31
Number of Detects	29	Number of Non-Detects	14
Number of Distinct Detects	28	Number of Distinct Non-Detects	4
Minimum Detect	0.78	Minimum Non-Detect	5
Maximum Detect	6300	Maximum Non-Detect	500
Variance Detects	3159738	Percent Non-Detects	32.56%
Mean Detects	1253	SD Detects	1778
Median Detects	330	CV Detects	1.418
Skewness Detects	1.515	Kurtosis Detects	1.307
Mean of Logged Detects	5.522	SD of Logged Detects	2.333

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.734	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.29	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.161	Detected Data Not Normal at 5% Significance Level

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	849.5	KM Standard Error of Mean	240.3
KM SD	1548	95% KM (BCA) UCL	1288
95% KM (t) UCL	1254	95% KM (Percentile Bootstrap) UCL	1257
95% KM (z) UCL	1245	95% KM Bootstrap t UCL	1421
90% KM Chebyshev UCL	1570	95% KM Chebyshev UCL	1897
97.5% KM Chebyshev UCL	2350	99% KM Chebyshev UCL	3240

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.45	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.832	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.119	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.174	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.407	k star (bias corrected MLE)	0.388
Theta hat (MLE)	3079	Theta star (bias corrected MLE)	3231
nu hat (MLE)	23.61	nu star (bias corrected)	22.5
Mean (detects)	1253		

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	845.3
Maximum	6300	Median	74
SD	1568	CV	1.855
k hat (MLE)	0.167	k star (bias corrected MLE)	0.171
Theta hat (MLE)	5047	Theta star (bias corrected MLE)	4935
nu hat (MLE)	14.4	nu star (bias corrected)	14.73
Adjusted Level of Significance (β)	0.0444		
Approximate Chi Square Value (14.73, α)	7.075	Adjusted Chi Square Value (14.73, β)	6.89
95% Gamma Approximate UCL (use when n>=50)	1760	95% Gamma Adjusted UCL (use when n<50)	1807

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	849.5	SD (KM)	1548
Variance (KM)	2395931	SE of Mean (KM)	240.3
k hat (KM)	0.301	k star (KM)	0.296
nu hat (KM)	25.9	nu star (KM)	25.43
theta hat (KM)	2821	theta star (KM)	2873
80% gamma percentile (KM)	1298	90% gamma percentile (KM)	2510
95% gamma percentile (KM)	3904	99% gamma percentile (KM)	7534

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (25.43, α)	14.94	Adjusted Chi Square Value (25.43, β)	14.66
95% Gamma Approximate KM-UCL (use when n>=50)	1446	95% Gamma Adjusted KM-UCL (use when n<50)	1473

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.953	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0972	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.161	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	847.9	Mean in Log Scale	4.169

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

SD in Original Scale	1567	SD in Log Scale	2.85
95% t UCL (assumes normality of ROS data)	1250	95% Percentile Bootstrap UCL	1253
95% BCA Bootstrap UCL	1348	95% Bootstrap t UCL	1366
95% H-UCL (Log ROS)	32679		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	4.07	KM Geo Mean	58.57
KM SD (logged)	2.926	95% Critical H Value (KM-Log)	5.041
KM Standard Error of Mean (logged)	0.505	95% H-UCL (KM -Log)	41200
KM SD (logged)	2.926	95% Critical H Value (KM-Log)	5.041
KM Standard Error of Mean (logged)	0.505		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	857.8	Mean in Log Scale	4.349
SD in Original Scale	1562	SD in Log Scale	2.74
95% t UCL (Assumes normality)	1258	95% H-Stat UCL	24668

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

Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50 1473

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

result (cedarwood & groundwater & vinyl chloride)

General Statistics

Total Number of Observations	43	Number of Distinct Observations	13
Number of Detects	3	Number of Non-Detects	40
Number of Distinct Detects	3	Number of Distinct Non-Detects	10
Minimum Detect	79	Minimum Non-Detect	0.5
Maximum Detect	300	Maximum Non-Detect	1000
Variance Detects	14317	Percent Non-Detects	93.02%
Mean Detects	163	SD Detects	119.7
Median Detects	110	CV Detects	0.734
Skewness Detects	1.602	Kurtosis Detects	N/A
Mean of Logged Detects	4.925	SD of Logged Detects	0.695

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.853	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.338	**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	15.69	KM Standard Error of Mean	11.38
KM SD	54.02	95% KM (BCA) UCL	N/A
95% KM (t) UCL	34.82	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	34.4	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	49.82	95% KM Chebyshev UCL	65.28
97.5% KM Chebyshev UCL	86.73	99% KM Chebyshev UCL	128.9

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	3.112	k star (bias corrected MLE)	N/A
Theta hat (MLE)	52.38	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	18.67	nu star (bias corrected)	N/A
Mean (detects)	163		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	11.38
Maximum	300	Median	0.01
SD	49.47	CV	4.346
k hat (MLE)	0.124	k star (bias corrected MLE)	0.131
Theta hat (MLE)	91.85	Theta star (bias corrected MLE)	87.04
nu hat (MLE)	10.66	nu star (bias corrected)	11.25
Adjusted Level of Significance (β)	0.0444		
Approximate Chi Square Value (11.25, α)	4.735	Adjusted Chi Square Value (11.25, β)	4.588
95% Gamma Approximate UCL (use when n>=50)	27.03	95% Gamma Adjusted UCL (use when n<50)	N/A

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	15.69	SD (KM)	54.02
Variance (KM)	2918	SE of Mean (KM)	11.38
k hat (KM)	0.0843	k star (KM)	0.094
nu hat (KM)	7.253	nu star (KM)	8.081
theta hat (KM)	186	theta star (KM)	167
80% gamma percentile (KM)	9.906	90% gamma percentile (KM)	40.62
95% gamma percentile (KM)	91.31	99% gamma percentile (KM)	257

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (8.08, α)	2.782	Adjusted Chi Square Value (8.08, β)	2.675
95% Gamma Approximate KM-UCL (use when n>=50)	45.57	95% Gamma Adjusted KM-UCL (use when n<50)	47.4

95% Gamma Adjusted KM-UCL (use when k<=1 and 15 < n < 50)

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.293	**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	20.26	Mean in Log Scale	2.002
SD in Original Scale	48.27	SD in Log Scale	1.294
95% t UCL (assumes normality of ROS data)	32.64	95% Percentile Bootstrap UCL	34.2
95% BCA Bootstrap UCL	39.76	95% Bootstrap t UCL	55.18
95% H-UCL (Log ROS)	29.34		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	-0.13	KM Geo Mean	0.878
KM SD (logged)	1.683	95% Critical H Value (KM-Log)	3.219
KM Standard Error of Mean (logged)	0.379	95% H-UCL (KM -Log)	8.339
KM SD (logged)	1.683	95% Critical H Value (KM-Log)	3.219
KM Standard Error of Mean (logged)	0.379		

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	84.64	Mean in Log Scale	3.097
SD in Original Scale	112.2	SD in Log Scale	2.04
95% t UCL (Assumes normality)	113.4	95% H-Stat UCL	571.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL 34.82

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

result (vacant & groundwater & cis-1,2-dichloroethylene)

General Statistics

Total Number of Observations	50	Number of Distinct Observations	20
Number of Detects	7	Number of Non-Detects	43
Number of Distinct Detects	7	Number of Distinct Non-Detects	13
Minimum Detect	2.9	Minimum Non-Detect	5
Maximum Detect	6.8	Maximum Non-Detect	20000
Variance Detects	1.942	Percent Non-Detects	86%
Mean Detects	4.829	SD Detects	1.394
Median Detects	4.6	CV Detects	0.289
Skewness Detects	0.262	Kurtosis Detects	-0.907
Mean of Logged Detects	1.538	SD of Logged Detects	0.297

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.156	**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	4.098	KM Standard Error of Mean	0.336
KM SD	0.925	95% KM (BCA) UCL	4.672
95% KM (t) UCL	4.661	95% KM (Percentile Bootstrap) UCL	4.687
95% KM (z) UCL	4.651	95% KM Bootstrap t UCL	4.739
90% KM Chebyshev UCL	5.107	95% KM Chebyshev UCL	5.564
97.5% KM Chebyshev UCL	6.198	99% KM Chebyshev UCL	7.444

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.193	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.167	**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)	13.7	k star (bias corrected MLE)	7.925
Theta hat (MLE)	0.352	Theta star (bias corrected MLE)	0.609
nu hat (MLE)	191.8	nu star (bias corrected)	111
Mean (detects)	4.829		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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	2.287	Mean	4.033
Maximum	6.8	Median	3.968
SD	0.862	CV	0.214
k hat (MLE)	23.14	k star (bias corrected MLE)	21.77
Theta hat (MLE)	0.174	Theta star (bias corrected MLE)	0.185
nu hat (MLE)	2314	nu star (bias corrected)	2177
Adjusted Level of Significance (β)	0.0452		
Approximate Chi Square Value (N/A, α)	2069	Adjusted Chi Square Value (N/A, β)	2066
95% Gamma Approximate UCL (use when n>=50)	4.242	95% Gamma Adjusted UCL (use when n<50)	4.249

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	4.098	SD (KM)	0.925
Variance (KM)	0.855	SE of Mean (KM)	0.336
k hat (KM)	19.63	k star (KM)	18.46
nu hat (KM)	1963	nu star (KM)	1846
theta hat (KM)	0.209	theta star (KM)	0.222
80% gamma percentile (KM)	4.871	90% gamma percentile (KM)	5.357
95% gamma percentile (KM)	5.782	99% gamma percentile (KM)	6.636

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	1748	Adjusted Chi Square Value (N/A, β)	1745
95% Gamma Approximate KM-UCL (use when n>=50)	4.329	95% Gamma Adjusted KM-UCL (use when n<50)	4.336

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.144	**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	4.017	Mean in Log Scale	1.371
SD in Original Scale	0.832	SD in Log Scale	0.2
95% t UCL (assumes normality of ROS data)	4.214	95% Percentile Bootstrap UCL	4.214
95% BCA Bootstrap UCL	4.223	95% Bootstrap t UCL	4.226
95% H-UCL (Log ROS)	4.231		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	1.386	KM Geo Mean	4
KM SD (logged)	0.218	95% Critical H Value (KM-Log)	1.823
KM Standard Error of Mean (logged)	0.0886	95% H-UCL (KM -Log)	4.335
KM SD (logged)	0.218	95% Critical H Value (KM-Log)	1.823
KM Standard Error of Mean (logged)	0.0886		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	712.5	Mean in Log Scale	3.077
SD in Original Scale	2087	SD in Log Scale	2.781
95% t UCL (Assumes normality)	1207	95% H-Stat UCL	6859

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	4.661

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

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

result (vacant & groundwater & tetrachloroethylene)

General Statistics

Total Number of Observations	52	Number of Distinct Observations	43
Number of Detects	45	Number of Non-Detects	7
Number of Distinct Detects	42	Number of Distinct Non-Detects	1
Minimum Detect	2	Minimum Non-Detect	5
Maximum Detect	800000	Maximum Non-Detect	5
Variance Detects	3.629E+10	Percent Non-Detects	13.46%
Mean Detects	72126	SD Detects	190496
Median Detects	480	CV Detects	2.641
Skewness Detects	3.172	Kurtosis Detects	9.096
Mean of Logged Detects	6.515	SD of Logged Detects	4.33

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.426	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.377	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	62417	KM Standard Error of Mean	24816
KM SD	176951	95% KM (BCA) UCL	108574
95% KM (t) UCL	103991	95% KM (Percentile Bootstrap) UCL	103771
95% KM (z) UCL	103236	95% KM Bootstrap t UCL	127463
90% KM Chebyshev UCL	136865	95% KM Chebyshev UCL	170588
97.5% KM Chebyshev UCL	217393	99% KM Chebyshev UCL	309334

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.164	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.947	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.213	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.148	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)	0.163	k star (bias corrected MLE)	0.167
Theta hat (MLE)	443597	Theta star (bias corrected MLE)	433011
nu hat (MLE)	14.63	nu star (bias corrected)	14.99
Mean (detects)	72126		

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	62417
Maximum	800000	Median	32
SD	178678	CV	2.863
k hat (MLE)	0.13	k star (bias corrected MLE)	0.135
Theta hat (MLE)	479430	Theta star (bias corrected MLE)	460644
nu hat (MLE)	13.54	nu star (bias corrected)	14.09
Adjusted Level of Significance (β)	0.0454		
Approximate Chi Square Value (14.09, α)	6.634	Adjusted Chi Square Value (14.09, β)	6.488
95% Gamma Approximate UCL (use when n>=50)	132579	95% Gamma Adjusted UCL (use when n<50)	135569

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	62417	SD (KM)	176951
Variance (KM)	3.131E+10	SE of Mean (KM)	24816
k hat (KM)	0.124	k star (KM)	0.13
nu hat (KM)	12.94	nu star (KM)	13.53
theta hat (KM)	501654	theta star (KM)	479892
80% gamma percentile (KM)	59661	90% gamma percentile (KM)	180416
95% gamma percentile (KM)	352182	99% gamma percentile (KM)	866381

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (13.53, α)	6.249	Adjusted Chi Square Value (13.53, β)	6.107
95% Gamma Approximate KM-UCL (use when n>=50)	135117	95% Gamma Adjusted KM-UCL (use when n<50)	138246

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.874	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.131	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	62417	Mean in Log Scale	5.655
SD in Original Scale	178678	SD in Log Scale	4.628
95% t UCL (assumes normality of ROS data)	103928	95% Percentile Bootstrap UCL	105034
95% BCA Bootstrap UCL	121324	95% Bootstrap t UCL	129532
95% H-UCL (Log ROS)	1.610E+9		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	5.794	KM Geo Mean	328.4
KM SD (logged)	4.384	95% Critical H Value (KM-Log)	7.091
KM Standard Error of Mean (logged)	0.615	95% H-UCL (KM -Log)	3.813E+8
KM SD (logged)	4.384	95% Critical H Value (KM-Log)	7.091
KM Standard Error of Mean (logged)	0.615		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	62417	Mean in Log Scale	5.761
SD in Original Scale	178678	SD in Log Scale	4.461
95% t UCL (Assumes normality)	103928	95% H-Stat UCL	6.006E+8

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

99% KM (Chebyshev) UCL 309334

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

result (vacant & groundwater & trichloroethylene)

General Statistics

Total Number of Observations	50	Number of Distinct Observations	18
Number of Detects	11	Number of Non-Detects	39
Number of Distinct Detects	10	Number of Distinct Non-Detects	10
Minimum Detect	3.2	Minimum Non-Detect	5
Maximum Detect	2000	Maximum Non-Detect	20000
Variance Detects	688624	Percent Non-Detects	78%

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Mean Detects	657.9	SD Detects	829.8
Median Detects	110	CV Detects	1.261
Skewness Detects	0.74	Kurtosis Detects	-1.505
Mean of Logged Detects	4.627	SD of Logged Detects	2.56

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.756	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.291	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	173.5	KM Standard Error of Mean	79.31
KM SD	493.3	95% KM (BCA) UCL	309.1
95% KM (t) UCL	306.4	95% KM (Percentile Bootstrap) UCL	305.7
95% KM (z) UCL	303.9	95% KM Bootstrap t UCL	379.9
90% KM Chebyshev UCL	411.4	95% KM Chebyshev UCL	519.2
97.5% KM Chebyshev UCL	668.8	99% KM Chebyshev UCL	962.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.818	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.808	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.265	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.274	Detected data appear Gamma Distributed at 5% Significance Level

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

Gamma Statistics on Detected Data Only

k hat (MLE)	0.36	k star (bias corrected MLE)	0.322
Theta hat (MLE)	1829	Theta star (bias corrected MLE)	2042
nu hat (MLE)	7.911	nu star (bias corrected)	7.087
Mean (detects)	657.9		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	146
Maximum	2000	Median	0.01
SD	464.8	CV	3.184
k hat (MLE)	0.109	k star (bias corrected MLE)	0.116
Theta hat (MLE)	1342	Theta star (bias corrected MLE)	1263
nu hat (MLE)	10.88	nu star (bias corrected)	11.56
Adjusted Level of Significance (β)	0.0452		
Approximate Chi Square Value (11.56, α)	4.94	Adjusted Chi Square Value (11.56, β)	4.811
95% Gamma Approximate UCL (use when n>=50)	341.7	95% Gamma Adjusted UCL (use when n<50)	350.8

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	173.5	SD (KM)	493.3
Variance (KM)	243321	SE of Mean (KM)	79.31
k hat (KM)	0.124	k star (KM)	0.13
nu hat (KM)	12.37	nu star (KM)	12.96
theta hat (KM)	1403	theta star (KM)	1339
80% gamma percentile (KM)	165.2	90% gamma percentile (KM)	500.9
95% gamma percentile (KM)	979.3	99% gamma percentile (KM)	2413

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (12.96, α)	5.863	Adjusted Chi Square Value (12.96, β)	5.722
95% Gamma Approximate KM-UCL (use when n>=50)	383.3	95% Gamma Adjusted KM-UCL (use when n<50)	392.8

Table D-7: ProUCL Output Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

UCL Statistics for Data Sets with Non-Detects

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.848	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.244	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	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	147.2	Mean in Log Scale	0.897
SD in Original Scale	464.3	SD in Log Scale	2.927
95% t UCL (assumes normality of ROS data)	257.3	95% Percentile Bootstrap UCL	261.9
95% BCA Bootstrap UCL	283.1	95% Bootstrap t UCL	327.2
95% H-UCL (Log ROS)	1423		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.094	KM Geo Mean	8.114
KM SD (logged)	1.968	95% Critical H Value (KM-Log)	3.575
KM Standard Error of Mean (logged)	0.32	95% H-UCL (KM -Log)	153.6
KM SD (logged)	1.968	95% Critical H Value (KM-Log)	3.575
KM Standard Error of Mean (logged)	0.32		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	779.2	Mean in Log Scale	3.18
SD in Original Scale	2086	SD in Log Scale	2.916
95% t UCL (Assumes normality)	1274	95% H-Stat UCL	13300

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL 383.3

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.

result (vacant & groundwater & vinyl chloride)

General Statistics

Total Number of Observations	50	Number of Distinct Observations	13
Number of Detects	2	Number of Non-Detects	48
Number of Distinct Detects	1	Number of Distinct Non-Detects	12

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 result (vacant & groundwater & vinyl chloride) was not processed!

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0232	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	MW-27S-20131219	12/19/2013	25	25	16	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	MW-27S-20130516	5/16/2013	25	25	0.96	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	MW-27D-20131219	12/19/2013	70	70	1200	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	MW-27D-20130516	5/16/2013	70	70	1300	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0932	2/23/2016	65.5	67.5	500	0	U	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	1.2	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	2600	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0233	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0918	2/22/2016	30	30	250	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0928	2/23/2016	66.5	68.5	500	0	U	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0927	2/23/2016	71.5	73.5	500	0	U	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0920	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0921	2/22/2016	69.5	71.5	250	0	U	250	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0922	2/22/2016	64.5	66.5	50	0	U	50	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0931	2/23/2016	70.5	72.5	500	0	U	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0248	2/5/2015	36	40	24	1	J	50	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0245	2/5/2015	36	40	40	1	J	100	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0211	10/2/2014	34	38	1000	0	U	1000	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0246	2/5/2015	28	32	3.9	1	J	50	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0212	10/2/2014	29	33	22	1	J	500	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0231	2/4/2015	36	40	42	1	J	200	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0213	10/2/2014	22	26	50	0	U	50	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0236	2/4/2015	22	26	1.4	1	J	10	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0249	2/5/2015	28	32	200	0	U	200	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0235	2/4/2015	28	32	5.1	1	J	100	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0250	2/5/2015	22	26	1.6	1	J	25	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0247	2/5/2015	22	26	1.3	1	J	10	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	149-1001	2/6/2012	18	18	13.3	1			ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0234	2/4/2015	36	40	39	1	J	100	ug/l
Cedarwood & Groundwater & cis-1,2-Dichloroethylene	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Groundwater & Tetrachloroethylene	PB-0918	2/22/2016	30	30	7600	1		250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0247	2/5/2015	22	26	2700	1	D	100	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0248	2/5/2015	36	40	8500	1	D	500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0919	2/22/2016	31.5	33.5	5400	1		250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0920	2/22/2016	26.5	28.5	430	1		25	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0921	2/22/2016	69.5	71.5	1700	1		250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0250	2/5/2015	22	26	4400	1	D	250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0922	2/22/2016	64.5	66.5	830	1		50	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0925	2/23/2016	31.5	33.5	2500	1		500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0249	2/5/2015	28	32	34000	1	D	2000	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0211	10/2/2014	34	38	65000	1		5000	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0233	2/4/2015	22	26	3100	1	D	500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0235	2/4/2015	28	32	6400	1	D	500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0232	2/4/2015	28	32	16000	1	D	1000	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0236	2/4/2015	22	26	930	1	D	250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	MW-27D-20131219	12/19/2013	70	70	36000	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0246	2/5/2015	28	32	10000	1	D	500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	MW-27D-20130516	5/16/2013	70	70	22000	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0917	2/22/2016	26.5	28.5	380	1		25	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	1.2	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0245	2/5/2015	36	40	30000	1	E	100	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	31000	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0234	2/4/2015	36	40	4200	1	D	500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	149-1007	2/9/2012	15	15	3.48	1	J		ug/l
Cedarwood & Groundwater & Tetrachloroethylene	MW-27S-20130516	5/16/2013	25	25	39	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0916	2/22/2016	31.5	33.5	8000	1		250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	149-1001	2/6/2012	18	18	266	1			ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0930	2/23/2016	27.5	29.5	9.8	1		5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0213	10/2/2014	22	26	6100	1		250	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0929	2/23/2016	32.5	34.5	9.9	1		5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0933	2/23/2016	36.5	38.5	9.9	1		5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0231	2/4/2015	36	40	23000	1	D	1000	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0928	2/23/2016	66.5	68.5	24000	1		2500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0212	10/2/2014	29	33	38000	1		2500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0932	2/23/2016	65.5	67.5	20000	1		500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0926	2/23/2016	26.5	28.5	110	1		5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0931	2/23/2016	70.5	72.5	15000	1		2500	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0936	2/23/2016	66.5	68.5	14	1		5	ug/l
Cedarwood & Groundwater & Tetrachloroethylene	PB-0927	2/23/2016	71.5	73.5	13000	1		500	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Groundwater & Trichloroethylene	GW-MW27S-25_07182012	7/18/2012	25	25	0.78	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0932	2/23/2016	65.5	67.5	3500	1		500	ug/l
Cedarwood & Groundwater & Trichloroethylene	MW-27D-20130516	5/16/2013	70	70	4000	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0249	2/5/2015	28	32	930	1		200	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0250	2/5/2015	22	26	93	1		25	ug/l
Cedarwood & Groundwater & Trichloroethylene	MW-27D-20131219	12/19/2013	70	70	4800	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0232	2/4/2015	28	32	200	1	J	200	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0211	10/2/2014	34	38	640	1	J	1000	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0931	2/23/2016	70.5	72.5	4600	1		500	ug/l
Cedarwood & Groundwater & Trichloroethylene	MW-27S-20130516	5/16/2013	25	25	4.9	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0236	2/4/2015	22	26	20	1		10	ug/l
Cedarwood & Groundwater & Trichloroethylene	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0231	2/4/2015	36	40	1600	1		200	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0235	2/4/2015	28	32	74	1	J	100	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0234	2/4/2015	36	40	450	1		100	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0233	2/4/2015	22	26	88	1		50	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0920	2/22/2016	26.5	28.5	46	1		25	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0212	10/2/2014	29	33	330	1	J	500	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0246	2/5/2015	28	32	200	1		50	ug/l
Cedarwood & Groundwater & Trichloroethylene	GW-MW27D-70_07182012	7/18/2012	70	70	6300	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0921	2/22/2016	69.5	71.5	500	1		250	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0928	2/23/2016	66.5	68.5	2700	1		500	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0918	2/22/2016	30	30	10	1	L	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0927	2/23/2016	71.5	73.5	2300	1		500	ug/l
Cedarwood & Groundwater & Trichloroethylene	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & Trichloroethylene	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0248	2/5/2015	36	40	610	1		50	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0213	10/2/2014	22	26	26	1	J	50	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0922	2/22/2016	64.5	66.5	130	1		50	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0245	2/5/2015	36	40	2100	1		100	ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0247	2/5/2015	22	26	80	1		10	ug/l
Cedarwood & Groundwater & Trichloroethylene	149-1001	2/6/2012	18	18	13.8	1			ug/l
Cedarwood & Groundwater & Trichloroethylene	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Cedarwood & Groundwater & Vinyl chloride	PB-0245	2/5/2015	36	40	100	0	U	100	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0231	2/4/2015	36	40	200	0	U	200	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0936	2/23/2016	66.5	68.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0234	2/4/2015	36	40	100	0	U	100	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0235	2/4/2015	28	32	100	0	U	100	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0246	2/5/2015	28	32	50	0	U	50	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0236	2/4/2015	22	26	10	0	U	10	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0925	2/23/2016	31.5	33.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0247	2/5/2015	22	26	10	0	U	10	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0249	2/5/2015	28	32	200	0	U	200	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0211	10/2/2014	34	38	1000	0	U	1000	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0248	2/5/2015	36	40	50	0	U	50	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0250	2/5/2015	22	26	25	0	U	25	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0213	10/2/2014	22	26	50	0	U	50	ug/l
Cedarwood & Groundwater & Vinyl chloride	149-1001	2/6/2012	18	18	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	MW-27S-20131219	12/19/2013	25	25	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0917	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0933	2/23/2016	36.5	38.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	MW-27D-20130516	5/16/2013	70	70	79	1			ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0932	2/23/2016	65.5	67.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	GW-MW27D-70_07182012	7/18/2012	70	70	300	1			ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0931	2/23/2016	70.5	72.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	149-1007	2/9/2012	15	15	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0930	2/23/2016	27.5	29.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	149-1006	2/9/2012	14.8	14.8	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	MW-27D-20131219	12/19/2013	70	70	110	1			ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0929	2/23/2016	32.5	34.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	GW-MW27S-25_07182012	7/18/2012	25	25	0.5	0	U	0.5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0918	2/22/2016	30	30	250	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0928	2/23/2016	66.5	68.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0919	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0927	2/23/2016	71.5	73.5	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0920	2/22/2016	26.5	28.5	25	0	U	25	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0926	2/23/2016	26.5	28.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0921	2/22/2016	69.5	71.5	250	0	U	250	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0922	2/22/2016	64.5	66.5	50	0	U	50	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0916	2/22/2016	31.5	33.5	250	0	U	250	ug/l
Cedarwood & Groundwater & Vinyl chloride	MW-27S-20130516	5/16/2013	25	25	0.5	0	U	0.5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0233	2/4/2015	22	26	50	0	U	50	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0232	2/4/2015	28	32	200	0	U	200	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0212	10/2/2014	29	33	500	0	U	500	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0935	2/23/2016	71.5	73.5	5	0	U	5	ug/l
Cedarwood & Groundwater & Vinyl chloride	PB-0934	2/23/2016	31.5	33.5	5	0	U	5	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0223	2/4/2015	41	45	5000	0	U	1000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0226	2/4/2015	36	40	1000	0	U	1000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0265	4/28/2015	41	45	4.2	1	J	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0272	4/28/2015	41	45	5.1	1		5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0269	4/28/2015	41	45	6.8	1		5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0915	2/22/2016	66.5	68.5	1000	0	U	1000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0229	2/4/2015	28	32	200	0	U	200	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0230	2/4/2015	22	26	50	0	U	50	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0906	2/22/2016	68	70	250	0	U	250	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0260	4/27/2015	36	40	4.6	1	J	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0228	2/4/2015	36	40	2000	0	U	2000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0255	4/27/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0262	4/28/2015	41	45	6.4	1	J	13	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0227	2/4/2015	28	32	250	0	U	250	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0267	4/28/2015	28	32	2.9	1	J	2000	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0259	4/27/2015	41	45	3.8	1	J	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Vacant & Groundwater & cis-1,2-Dichloroethylene	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0279	4/29/2015	41	45	24	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0280	4/29/2015	36	40	17	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0907	2/22/2016	69.5	71.5	10	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0906	2/22/2016	68	70	9200	1		250	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0278	4/29/2015	28	32	8200	1	J	250	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0288	4/29/2015	0	0	4	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0277	4/29/2015	36	40	800000	1		20000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0911	2/22/2016	25	27	29	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0912	2/22/2016	28.5	30.5	20000	1		1000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0913	2/22/2016	23.5	25.5	11000	1		500	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0914	2/22/2016	71.5	73.5	22000	1		2500	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0281	4/29/2015	28	32	7.2	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0908	2/22/2016	64.5	66.5	9.3	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0284	4/29/2015	28	32	2	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0915	2/22/2016	66.5	68.5	20000	1		1000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0282	4/29/2015	41	45	5.2	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0289	4/29/2015	28	32	2.2	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0276	4/29/2015	41	45	690000	1	J	20000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0252	4/27/2015	36	40	78000	1		2500	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0270	4/28/2015	36	40	4.8	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0264	4/28/2015	0	0	480	1		13	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0223	2/4/2015	41	45	55000	1	D	5000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0263	4/28/2015	0	0	74000	1		2500	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0269	4/28/2015	41	45	140	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0229	2/4/2015	28	32	12000	1	D	1000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0226	2/4/2015	36	40	73000	1	D	5000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0267	4/28/2015	28	32	57000	1		2000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0259	4/27/2015	41	45	7.4	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0266	4/28/2015	36	40	730000	1		20000	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Vacant & Groundwater & Tetrachloroethylene	PB-0261	4/27/2015	28	32	2.1	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0251	4/27/2015	41	45	52000	1		2000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0265	4/28/2015	41	45	10	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0230	2/4/2015	22	26	3300	1	D	500	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0262	4/28/2015	41	45	300	1		13	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0253	4/27/2015	28	32	370000	1		10000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0260	4/27/2015	36	40	29	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0227	2/4/2015	28	32	19000	1	D	5000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0271	4/28/2015	28	32	4.1	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0257	4/27/2015	28	32	4.7	1	J	5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0274	4/28/2015	28	32	4000	1		100	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0228	2/4/2015	36	40	130000	1	D	10000	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0272	4/28/2015	41	45	35	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0273	4/28/2015	36	40	6800	1		200	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0255	4/27/2015	41	45	19	1		5	ug/l
Vacant & Groundwater & Tetrachloroethylene	PB-0256	4/27/2015	36	40	26	1		5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0262	4/28/2015	41	45	8.1	1	J	13	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0230	2/4/2015	22	26	13	1	J	50	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0906	2/22/2016	68	70	380	1		250	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0272	4/28/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0255	4/27/2015	41	45	3.2	1	J	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0259	4/27/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0905	2/22/2016	24	26	9.3	1		5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0260	4/27/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0226	2/4/2015	36	40	1600	1		1000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Vacant & Groundwater & Trichloroethylene	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0223	2/4/2015	41	45	1800	1		1000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0228	2/4/2015	36	40	1300	1	J	2000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0227	2/4/2015	28	32	110	1	J	250	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0267	4/28/2015	28	32	2000	0	U	2000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0269	4/28/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0229	2/4/2015	28	32	13	1	J	200	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0265	4/28/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Vacant & Groundwater & Trichloroethylene	PB-0915	2/22/2016	66.5	68.5	2000	1		1000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0252	4/27/2015	36	40	2500	0	U	2500	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0227	2/4/2015	28	32	250	0	U	250	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0228	2/4/2015	36	40	2000	0	U	2000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0908	2/22/2016	64.5	66.5	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0911	2/22/2016	25	27	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0226	2/4/2015	36	40	1000	0	U	1000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0914	2/22/2016	71.5	73.5	2500	0	U	2500	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0912	2/22/2016	28.5	30.5	1000	0	U	1000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0230	2/4/2015	22	26	50	0	U	50	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0229	2/4/2015	28	32	200	0	U	200	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0251	4/27/2015	41	45	2000	0	U	2000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0915	2/22/2016	66.5	68.5	1000	0	U	1000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0913	2/22/2016	23.5	25.5	500	0	U	500	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0223	2/4/2015	41	45	1000	0	U	1000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0281	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0260	4/27/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0284	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0266	4/28/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0283	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0267	4/28/2015	28	32	12	1		2000	ug/l

Table D-8: ProUCL Data Input Sensitivity Analysis
Peninsula Boulevard OU2, Hempstead, NY

Dataset	Sample ID	Sample Date	Start Depth (ft)	End Depth (ft)	Result	d_result for ProUCL	Qualifier	Reporting Detection Limit	Unit
Vacant & Groundwater & Vinyl chloride	PB-0282	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0286	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0270	4/28/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0264	4/28/2015	0	0	13	0	U	13	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0271	4/28/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0280	4/29/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0272	4/28/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0279	4/29/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0273	4/28/2015	36	40	200	0	U	200	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0277	4/29/2015	36	40	20000	0	U	20000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0274	4/28/2015	28	32	100	0	U	100	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0269	4/28/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0903	2/22/2016	60.5	62.5	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0907	2/22/2016	69.5	71.5	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0906	2/22/2016	68	70	250	0	U	250	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0255	4/27/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0905	2/22/2016	24	26	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0256	4/27/2015	36	40	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0257	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0265	4/28/2015	41	45	12	1		5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0259	4/27/2015	41	45	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0253	4/27/2015	28	32	10000	0	U	10000	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0902	2/22/2016	31.5	33.5	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0261	4/27/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0901	2/22/2016	26.5	28.5	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0262	4/28/2015	41	45	13	0	U	13	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0289	4/29/2015	28	32	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0263	4/28/2015	0	0	2500	0	U	2500	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0288	4/29/2015	0	0	5	0	U	5	ug/l
Vacant & Groundwater & Vinyl chloride	PB-0904	2/22/2016	65.5	67.5	5	0	U	5	ug/l