pepco
An Exelon Company

# Appendix W

# Background Data Evaluation

# BACKGROUND DATA EVALUATION

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# List of Acronyms

| | |
|---|---|
| µg/kg | Microgram per Kilogram |
| 95UTL | 95% upper tolerance limit |
| ANOVA | Analysis of Variance |
| ARSP | Anacostia River Sediment Project |
| ASTM | American Society for Testing and Materials |
| BAP-TE | Benzo(a)pyrene toxic equivalent |
| BAZ | Bioactive Zone |
| BERA | Baseline Ecological Risk Assessment |
| bgs | Below ground surface |
| BHHRA | Baseline Human Health Risk Assessment |
| BTV | Background Threshold Value |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COPC | Constituent of Potential Concern |
| DC | District of Columbia |
| DDT | Dichlorodiphenyltrichloroethane |
| DOC | Dissolved Organic Carbon |
| DOEE | Department of Energy and Environment |
| DRO | Diesel Range Organics |
| ESV | Ecological Screening Value |
| FOD | Frequency of Detection |
| FS | Feasibility Study |
| ft | Feet |
| GOF | Goodness of Fit |
| $H_A$ | alternative hypothesis |
| HMW | High Molecular Weight |
| $H_O$ | null hypothesis |
| HOC | Hydrophobic Organic Compounds |
| HpCDD | Heptachlorodibenzo-p-dioxin |
| HpCDF | Heptachlorodibenzofuran |
| HxCDD | Hexachlorodibenzo-p-dioxin |
| HxCDF | Hexachlorodibenzofuran |
| IQR | Interquartile Range |
| mg/kg | Milligrams per Kilogram |
| MTBE | methyl tert-butyl ether |
| NAVFAC | Naval Facilities Engineering Command |
| NOAA | National Oceanic and Atmospheric Administration |
| OCDD | Octachlorodibenzo-p-dioxin |

| | |
|---|---|
| ORO | Oil Range Organics |
| OSWER | USEPA Office of Solid Waste and Emergency Response |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCBs | Polychlorinated Biphenyls |
| PeCDD | Pentachlorodibenzo-p-dioxin |
| PeCDF | Pentachlorodibenzofuran |
| Pepco | Potomac Electric Power Company |
| POC | Particulate Organic Carbon |
| RI | Remedial Investigation |
| RI/FS | Remedial Investigation/Feasibility Study |
| RL | RL |
| RSL | Regional Screening Level (USEPA) |
| SPI | Sediment Profile Imagery |
| SPME | Solid Phase Microextraction |
| SRC | Syracuse Research Corporation |
| SVOC | Semivolatile Organic Compound |
| TCDD | 2,3,7,8-Tetrachlorodibenzo-p-dioxin |
| TCDF | Tetrachlorodibenzofuran |
| TEQ | Toxicity Equivalent |
| TPH | Total Petroleum Hydrocarbons |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| WMW | Wilcoxon-Mann-Whitney |

# 1 Introduction

AECOM has prepared this background evaluation on behalf of the Potomac Electric Power Company and Pepco Energy Services, Inc. (collectively “Pepco”) to evaluate the contribution from background conditions to constituents in environmental media within the Study Area for the Benning Road Remedial Investigation that Pepco has agreed to perform pursuant to a consent decree that was entered by the U.S. District Court for the District of Columbia (DC) on December 1, 2011 (the Consent Decree). The Study Area consists of a Landside Investigation Area comprised of the Benning Service Center facility (the Site) and a Waterside Investigation Area comprised of a segment of the Anacostia River extending from approximately 1,000 ft upstream of the River Cove (i.e., the cove where the Benning Road Facility’s main stormwater outfall discharges) to approximately 2,800 feet downstream of the River Cove.

The objective of the background evaluation is to develop statistically defensible estimates of the concentrations of constituents of potential concern (COPCs) present in the regional environment that have not been influenced by Site-related activities. The results of this background evaluation were used to assess how concentrations of constituents detected in environmental samples collected from multiple media in the Study Area compare to background concentrations of these same constituents in these same media. The COPCs and media included in this background evaluation were identified in Section 4 of the Remedial Investigation (RI) Report based on comparisons of COPC concentrations in Study Area media to the project screening levels. The findings of this background evaluation will inform other evaluations conducted for the RI/FS, including but not limited to the Baseline Human Health Risk Assessment (BHHRA) and Baseline Ecological Risk Assessment (BERA) (Appendices AA and BB of the RI Report, respectively). The findings of this background evaluation also will be used to define areas of contamination attributable past activities or operations at Site and to identify areas of elevated contaminant concentrations relative to Site-specific background that may be appropriate for early remedial action.

The Draft RI Report describing the Phase I field investigation conducted between January 2013 and December 2014 was finalized on February 26, 2016 (AECOM, 2016a). A Preliminary Background Evaluation was included as Appendix V to the Draft RI Report. Pepco prepared three technical memoranda to define additional data needs and prepare for additional site characterization:

- Technical Memorandum #1 – Conceptual Site Model (AECOM, 2016b) provided a detailed description of the operational Site history, with a focus on the use, storage, disposal, release, and cleanup of various chemicals and waste materials, and identified data gaps and uncertainties in the Site characterization conducted to date as part of the RI/FS.

- Technical Memorandum #2 – Refined Background Evaluation Work Plan (AECOM, 2016c) described the rationale and procedures for revising the background data evaluation originally presented in the Draft RI Report.
- Technical Memorandum #3 – Baseline Human Health and Ecological Risk Assessment Work Plan (AECOM, 2016d) described the rationale and procedures for revising the Preliminary BHHRA and Preliminary BERA originally presented in the Draft RI Report.

Work Plan Addendum #3 (AECOM, 2016e) was developed in conjunction with the three technical memos to detail the Phase II field investigation to address the remaining data gaps and uncertainties identified. Work Plan Addendum #3 was approved by DOEE in October 2016 and formed the basis for the Phase II RI. This Refined Background Evaluation is based on the results of the Preliminary Background Evaluation and the results of additional field investigation in 2017.

## 1.1 Purpose

The purpose of this evaluation was to identify the concentrations of COPCs that reflect the background conditions of the Study Area based on the United States Environmental Protection Agency (USEPA) guidance (2002a,b). According to USEPA (2002a), background conditions are defined as: “Substances or locations that are not influenced by the releases from a site and are usually described as naturally occurring or anthropogenic: (1) Naturally occurring substances are present in the environment in forms that have not been influenced by human activity; (2) Anthropogenic substances are natural and human-made substances present in the environment as a result of human activities (not specifically related to the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] site in question).”

As detailed in the Preliminary Background Evaluation, there are many sources of potential contaminants to the Anacostia River including:

- Surface runoff from paved areas
- Stormwater discharges
- Combined sewer system outflows
- Discharges from other industrial, commercial, or manufacturing facilities
- Atmospheric deposition

- Tributary inputs.

These sources have been well-documented (Syracuse Research Corporation [SRC] and National Oceanic and Atmospheric Administration [NOAA], 2000; Velinsky et al., 2011; Tetra Tech, 2018). Several constituents including polycyclic aromatic hydrocarbons (PAHs), metals, polychlorinated biphenyls (PCBs), and pesticides are distributed throughout the river (Wade et al., 1994; Velinsky and Cummins, 1996; Velinsky et al., 2011). A river-wide investigation, the Anacostia River Sediment Project (ARSP), is being conducted by Tetra Tech on behalf of DOEE and has identified COPCs in surface water and sediments in the river both upstream and downstream of the Study Area (Tetra Tech, 2018). In addition, Tetra Tech evaluated fish tissue based on whole body fish tissue samples collected by Tetra Tech in 2014 and 2015, and fillet tissue samples collected by the United States Fish and Wildlife Service (USFWS) in 2013 (Pinkney, 2017[1]) and Tetra Tech in 2016 (Tetra Tech, 2018). Contaminants were detected in fish tissue throughout the river with no consistent spatial trend in concentrations, i.e., the sample locations of the highest concentrations varied based on the contaminant and fish species (Tetra Tech, 2018).

Based on the above-mentioned contamination that has been documented in abiotic and biotic media throughout the river, a detailed background evaluation is required to evaluate the relative contributions from regional background conditions to COPCs detected in the Study Area. This evaluation provides context for the potential risks identified in the BHHRA and BERA and the overall discussion of the nature and extent of COPCs provided in this RI Report.

### 1.2 Background Evaluation Approach

As detailed in Technical Memorandum #2 of the Work Plan Addendum (AECOM, 2016c), the background evaluation was conducted using both qualitative and quantitative methods in accordance with USEPA guidance (USEPA 2002a,b) and the *Navy Guidance for Environmental Background Analysis* (Naval Facilities Engineering Command [NAVFAC], 2002 and 2003), specifically Volumes I (Soil) and II (Sediment). Background threshold levels for COPCs were calculated and Study Area and background population comparisons were conducted using prescribed statistical analyses. Supporting graphics such as boxplots, index plots, and probability plots are provided to describe the background data and for qualitative comparisons to Study Area data.

The background evaluations presented herein are based on soil, sediment, groundwater, and pore water samples that were collected by Pepco as part of the RI field investigations. These “Site-specific”

[1] Report was originally published in September 2014 and revised in November 2017.

background datasets were supplemented with sediment sampling data collected by DOEE for the ARSP, which are reported in the ARSP RI Report (Tetra Tech, 2018).

Regional data for soil and fish tissue that were collected and sampled by others were also considered in this background evaluation. These data provide a regional context for both Site data and Site-specific background data.

### 1.3 Document Organization

This document is organized in the following manner:

- Section 2 provides a summary of the background data for each medium.
- Section 3 describes the methodology of the background evaluation for each medium.
- Section 4 presents the background evaluation results for soil, sediment, groundwater, pore water, and fish tissue.
- Section 5 presents a summary of the background evaluation results.
- Section 6 provides a list of references.

# 2 Summary of Background Data

This section describes the soils, sediment, groundwater, and pore water data collected to represent background conditions of the Study Area. The analytical data are included in **Attachment A**. Fish tissue data included in the BHHRA and BERA (Appendices AA and BB of the RI Report, respectively) are based on regional studies of fish tissue conducted to evaluate potential risks to human health and the environment. The fish tissue data are summarized in Section 2.5.

The Preliminary Background Evaluation included an evaluation of surface water data collected at the Site and from Site-specific background sampling locations in 2013. Because no potential for risk was determined for surface water exposure in the Preliminary BERA, and Site and Site-specific background surface water concentrations were found to be consistent in the Preliminary Background Evaluation, surface water data and exposure pathways were not identified as a data gap. Therefore, additional surface water samples were not collected in the Study Area or from Site-specific background locations during the Phase II RI field investigation in 2017. The Preliminary Background Evaluation for surface water is presented in **Attachment B** and discussed in Section 4.6.

Background media are described in the following sections. Supporting graphics for each matrix are presented in **Attachment C** through **Attachment G**.

## 2.1 Soil

Surface (0 to 1 feet below ground surface [ft bgs]) and subsurface (3 to 4 ft bgs) Site-specific background soil samples were collected in February and April 2017, from 20 locations in the vicinity of the Site (**Figure 2-1**). These locations were selected away from known or suspected sources of contamination, and were considered to be representative of urban background conditions within northeast Washington, DC. The list of Site-specific background samples is presented in **Table 2-1**.

Regional background soil samples were identified from publically available databases and Site characterization reports that were compiled in the preliminary soil background evaluation from Smith et al. (2013). The regional soil samples and analytical data for each sample are presented in **Table 2-2**; the regional sample locations are presented on **Figure 2-2**.

## 2.2 Sediment

A total of 31 surface sediment samples are included in the Site-specific background dataset (**Table 2-3**). Surface sediment samples were collected by Pepco at three upstream locations in November and December 2013, and at four additional background/reference sampling locations upstream of the Waterside Investigation Area in June 2017, to determine the nature and extent of contamination in sediment at upstream locations unaffected by Site-related activities. The surface samples were collected from 0 to 10 cm (0 to 4 inches) based on the results of the Sediment Profile Imagery (SPI) Reconnaissance Survey at the 15 near-Site locations within the Waterside Investigation Area[2] and an evaluation of the five upstream reference locations in 2017 (Diaz and Daughters, 2017). These evaluations indicated that the depth of the bioactive zone (BAZ) in this portion of the river is 0 to 10 cm, which is consistent with the BAZ reported for most estuarine and freshwater tidal environments (USEPA, 2015a).

The Site-specific background data collected by Pepco were supplemented with data collected by DOEE for the ARSP, which are reported in the ARSP RI Report (Tetra Tech, 2018). Twenty-four samples were collected upstream of SEDBACK20 in 2014 and 2016 from a depth of 0 to 6 inches below sediment surface. The surficial sediment samples collected by DOEE/Tetra Tech that were selected to represent background sediment conditions include the following:

- Seventeen surficial sediment samples (including one field duplicate) collected by Tetra Tech in 2014 to support the ARSP Phase I RI; and
- Seven surficial sediment samples collected by DOEE/Tetra Tech in 2016 to support the ARSP Phase II RI.

The background sediment samples included in this evaluation from both Pepco and DOEE are presented in **Table 2-3** and depicted in **Figure 2-3**. The initial selection of the upstream Site-specific background locations is addressed in Technical Memorandum #2 which was approved by DOEE on October 14, 2016. The Site-specific surface sediment background dataset was recently revised to exclude Pepco and DOEE samples collected in ARSP Reach 7 where coarse-grained sandy sediment dominates the river substrate. The 31 Pepco and DOEE samples described above are in ARSP Reach 67 where finer-grained silt and clay sediments are dominant, which is more consistent with the

[2] Estimation of Biologically Active Zone at Pepco-Benning Road Facility, Washington, DC, Using Sediment Profile Imaging, May 2017 (Appendix BB of the RI Report, Attachment C).

predominantly fine-grained surface sediment in the Waterside Investigation Area. This revised dataset was presented to DOEE in a May 29, 2019 memorandum (**Attachment H**).

As part of this background evaluation, Pepco performed a further analysis of potential tidal influence to confirm that all sediment sampling locations included in the Site-specific background dataset were upstream of any potential influence from the Site. Pepco reviewed a report on Sediment Trend Analysis® (STA) for the Anacostia River (Hill and McLaren, 2000) prepared by GeoSea to evaluate general direction of sediment movement within the Waterside Investigation Area under normal conditions. Pepco also estimated an approximate distance for upstream transport of fine-grained sediment particles (which typically carry contaminants) from the Waterside Investigation Area under worst case tidal and storm surge conditions.

GeoSea used sediment characteristics and STA methodology to determine sediment transport under normal conditions. Results of the analysis indicate that the Anacostia reach between Beaver Dam Creek to East Capitol Street Bridge (which includes the Waterside Investigation Area) is a “Total Depositional” area where existing sediments were regularly covered by new sediments from up-river areas; and there is erosion of sediments from the confluence of Watts Branch to the River Cove within the Waterside Investigation Area, where Pepco’s outfall 013 and two other non-Pepco outfalls discharge (0.3 mile long) with a downstream transport direction. Examination of the newer grain size data collected during 2014 and 2017 and its distribution suggests that the net sediment transport direction would be southerly, consistent with the earlier determination by the GeoSea STA.

Pepco used a combination of model inputs (river flows and tides stages), and sediment transport computations to determine a reasonable maximum upstream transport distance. A one-dimensional (1-D) hydraulic model (HEC-RAS Ver 4.1) was used to compute water level variations and 1-D velocity field along the Anacostia River. The velocities were computed for a condition when the downstream river flows are low and tidal stages are maximum (highest 77-year tidal stage is 11.05 ft MLLW) to yield the highest upriver tidal currents. Transport distance for mobilized particles were calculated using velocity computed by the 1-D model. It is assumed that the cross-section average velocities computed by the hydraulic model are representative of the river velocities. The computations also conservatively assume unobstructed movement of eroded fine-grained sediment particles up-river, ignoring flocculation of sediment particles that would reduce upstream travel distance.

Tidal currents during a 100-yr storm event and during storm surges will be stronger, but the net direction of flow will be downstream due to high volume of river discharge from upstream areas. The semi-diurnal tidal flux will be less dominant during extreme river flow events. An incoming tide during a low river flow event, on the other hand, would present the most favorable conditions for the mobilization and upstream transport of fine-grained sediments. Under these conditions, it is estimated that fines (silt and clay) from the River Cove could potentially be carried upstream with the tide and then settle out from the water column during slack tide. Based on the modeling of reasonable worst-case conditions described above, the most upstream location where these fines would be carried by the tide is estimated to be approximately 2,376 feet from the Cove, at which point these would be carried back downstream for the next 6 hours during the ebb tide. The nearest upstream sediment sampling location used for the calculation of background threshold values, SEDBACK 20, is approximately 4,716 feet upstream of the Cove. The modeling effort is described further in **Attachment K**.

Pepco's analysis thus confirms that the background location SEDBACK 20 and background locations upstream of SEDBACK 20 will not be influenced by any Site-related contaminants as a result of tidal exchanges. No sampling locations downstream of SEDBACK 20 were included in the dataset for the purpose of calculating site-specific background values.

### 2.3 Groundwater

Background groundwater samples were collected via direct Push Technology drilling and temporary well sampling methods at 10 background locations in the vicinity of the Site in March and April 2017, and August 2017. The background groundwater samples included in this evaluation are presented in **Table 2-4** and depicted in **Figure 2-1**. Similar to the background soil sample locations, the background groundwater sample locations were selected away from known or suspected sources of contamination, and were considered to be representative of urban background conditions within northeast Washington, DC. Attempts to collect groundwater samples at six additional locations were not successful due to shallow refusal and/or a non-producing (clay) formation. Attempts were made to collect groundwater samples from both the upper and lower aquifers at each location; however, lower aquifer samples were only collected at four of the 10 sampled locations due to refusal.

### 2.4 Pore Water

Pore water was sampled at the five background/reference sampling locations upstream of the Waterside Investigation Area, co-located with the background sediment sample locations described in Section 2.2, to support the benthic macroinvertebrate community risk analysis presented in the BERA. Specifically, pore water concentrations were compared to ecological screening values (ESVs) considered indicative of a potential for ecological risks and were used to help evaluate the Study Area-specific toxicity and macroinvertebrate data presented in the BERA. Sediment for pore water analysis was collected in June 2017, using the same grab sampling techniques for bulk sediment chemistry, from the agreed BAZ interval (surficial 10 cm). **Table 2-5** and **Figure 2-2** present the five background pore water samples selected for the background evaluation.

After receipt at the laboratories, the following methods were used for pore water analysis:

- **Centrifugation/Filtration**: Pore water for metals, dissolved organic carbon (DOC), particulate organic carbon (POC), hardness, and ammonia were obtained via centrifugation of sediment. The POC sample was collected from the post-centrifugation supernatant. The remaining supernatant was filtered via a 0.45-micron filter, and the filtrate was then analyzed.
- **Solid Phase Microextraction (SPME)**: Pore water samples for PAHs were collected and analyzed ex situ in accordance with American Society for Testing and Materials (ASTM) Method 7263, a method that involves centrifugation, flocculation, and SPME of the pore water.
- **Sorbent Sampling**: The dissolved PCBs in pore water were determined by ex situ sorbent sampling methods. USEPA Method 1668 was used to measure PCBs sorbed to polyoxymethylene or polyethylene sorbents after tumbling and equilibration of a sediment/water/sorbent mixture. Literature values for PCB congener sorbent partition coefficients were used to calculate pore water concentrations from the sorbent concentrations.

The organic COPC data from the pore water samples collected by Tetra Tech (2018) to support the ARSP were not included in the background pore water dataset because they were collected and analyzed using different techniques than those used by Pepco, which resulted in datasets that are not directly comparable. Passive sampling techniques using sorbents such as polyethylene sheets or polydimethylsiloxane on SPME fibers (which are the methods used by Pepco) are regarded by USEPA and academia as the best available techniques to measure truly dissolved concentrations of hydrophobic organic compounds (HOCs) such as PAHs and PCBs in pore water (Ghosh et al., 2014; Lydy et al., 2014; USEPA, 2012; USEPA, 2017a; Hawthorne et al., 2005). Results from traditional centrifugation and whole water extraction of supernatant water (which are the methods used by DOEE) can include HOCs on colloidal solids or attached to dissolved macromolecular natural organic matter. Given the extremely low water solubility of some HOCs, these traditional method results can be orders of magnitude higher than the truly dissolved fraction that is most relevant to risk assessment based on the bioavailability and chemical activity of the HOCs in pore water. Combining results from these very different methods would be inappropriate because they are not comparable datasets. However, because the sampling and analyses for inorganic COPCs are comparable, the data from pore water samples collected by Tetra Tech (2018) are included in boxplots with the Pepco near-Site and Site-specific pore water samples for comparison (boxplots are presented in **Attachment F**).

### 2.5 Fish Tissue

The BHHRA and BERA (Appendices AA and BB of the RI Report, respectively) both incorporated regional fish tissue data to evaluate potential risks to human health and the environment. As agreed with DOEE, samples of fish tissue were not collected during this program (AECOM, 2012). Rather, as specified in the Risk Assessment Work Plan (AECOM, 2012), other studies conducted in the Anacostia River and the Potomac River were evaluated to determine whether relevant and appropriate fish tissue data were available. This section provides a summary of regional fish tissue data that were considered in the BHHRA and BERA, respectively.

#### 2.5.1 Fish Tissue Evaluation – BHHRA

Several investigations of chemical contaminants in fish tissue data have been conducted for the Anacostia and Potomac Rivers, including data summarized by Velinsky and Cummins (1996), SRC and NOAA (2000), Haywood and Buchanan (2007), Pinkney et al. (2001), and Pinkney (2009, 2017). Fish tissue data collected within the last 10 years were considered for inclusion in the BHHRA based on the assumption that tissue collected recently will better reflect current conditions. Two sources of recent fish tissue data were identified: 1) sampling conducted in 2013 by USFWS in the District's stretch of the Anacostia and Potomac Rivers and reported in Pinkney (2017), and 2) sampling conducted by Tetra Tech in 2016 in the upstream non-tidal portion of Anacostia River above the DC-Maryland state line and the northeast and northwest tributaries. The available fish tissue data were evaluated according to the following five areas:

- Upper Anacostia River Area (upstream of the CSX bridge); includes the Waterside Investigation Area
- Lower Anacostia River Area (downstream of the CSX bridge)
- Upper Potomac River (upstream of the 14th Street bridge)
- Lower Potomac River (downstream of the 14th street bridge)
- Upstream non-tidal Anacostia River (north of the Maryland state line)

The BHHRA fish tissue data included in this evaluation are summarized in **Table 2-6** and presented in **Figures 2-4, 2-5**, and **2-6**.

With the exception of the DOEE data for the upstream non-tidal Anacostia River, fish tissue data evaluated in the BHHRA were collected in support of the District's fish consumption advisories, not as part of an RI, and therefore were not intended to assign attribution to any upland source. It is unknown if the samples collected in the Upper Anacostia River reflect conditions in within the Waterside Investigation Area or simply reflect the several-mile-long river reach that was sampled (or the possibly larger home range for the fish species sampled).

### 2.5.2 Fish Tissue Evaluation – BERA

Whole body fish tissue samples were collected by Tetra Tech in 2014 and 2015 to support the ARSP (Tetra Tech, 2018). Tetra Tech divided the Lower Anacostia River into seven exposure units, and the Waterside Investigation Area is located in Exposure Unit 3. Whole body fish tissue samples used in the BERA and included in this evaluation were collected from within Exposure Unit 3, which includes samples collected from an area ranging from approximately 1.4 miles upstream of the Waterside Investigation Area to New York Avenue and approximately 1.4 miles downstream to the CSX bridge (2.8 miles total), including Kingman Lake (East Capitol Bridge to Amtrak Bridge). The fish tissue sample locations are presented on **Figure 2-7**.

Whole body fish tissue samples collected by Tetra Tech downstream of the CSX bridge and upstream of New York Avenue were included to represent fish tissue concentrations downstream and upstream of the Study Area, respectively. For forage fish with smaller forage or home ranges, these upstream and downstream tissue samples may be representative of regional fish tissue concentrations. For upper trophic level fish with larger home ranges, there is likely overlap in exposure among sampling areas (i.e., these fish likely move throughout the Lower Anacostia River and do not necessarily only represent exposure in Exposure Unit 3).

The tissue samples available for Exposure Unit 3 and upstream and downstream of Exposure Unit 3 are presented in **Table 2-7** and illustrated on **Figure 2-7**. A total of 48 whole body composite fish tissue samples were available in Exposure Unit 3, 45 samples in the upstream area, and 25 samples in the downstream area.

In the BERA, forage fish and mid-trophic level fish samples were used to represent fish as prey in the food web model, and lower trophic level (forage) fish, mid-trophic level fish, and upper trophic level (predator) fish samples were used to represent fish for the critical body residue evaluation. The species in these trophic groupings include:

| Trophic Level Tissue Sample | Species |
|---|---|
| Forage fish | Banded killfish, bluegill, creek chubsucker, eastern mosquitofish, eastern silvery minnow, green sunfish, golden shiner, inland silverside, mummichog, pumpkinseed, quillback, redbreast sunfish, spottail shiner, tessellated darter, white perch |
| Mid-level trophic fish | Bluegill, pumpkinseed, redbreast sunfish, yellow perch |
| Top-level or predator fish | Black crappie, largemouth bass, smallmouth bass, striped bass, snakehead |

Source: Tetra Tech (2018)

Although tissue data from the ARSP RI were included in this evaluation, per the direction of DOEE, these data were collected by the DOEE to evaluate overall conditions in the Anacostia River, and there is insufficient information to define any relationship between fish tissue data collected in support of the ARSP RI and the Waterside Investigation Area.

# 3 Background Evaluation Methodology

The refined background evaluation was performed using the methodology outlined in the approved Work Plan (AECOM, 2016e). A variety of graphical and statistical analyses were used, including outlier identification, population tests, background threshold value (BTV) calculation, and boxplot comparisons. The sections below describe the methodology for the graphical and statistical analyses conducted on the Site and Site-specific background datasets.

## 3.1 Selection of COPCs

Soil, sediment, groundwater, and pore water COPCs were selected for inclusion in the background evaluation for the Benning Road Facility on the basis of detection and magnitude in Site samples and Site-specific background samples. The COPCs included in the background soil, sediment, and groundwater evaluations were based on the target analyte list presented in the Background Evaluation Work Plan (AECOM, 2016c) and exclude the following:

- Constituents that were not measured or not detected in background samples
- Constituents that were not detected in Site samples
- Constituents that lack risk-based screening levels
- Constituents that were detected in Site samples at concentrations less than applicable screening levels

This COPC selection process and the resulting list of selected COPCs for soil, sediment, and groundwater were reviewed and approved by DOEE prior to proceeding with the background evaluations.

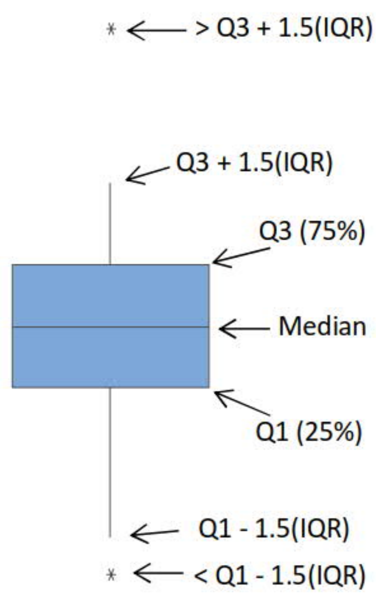
For the fish tissue evaluation, COPCs were selected in the BHHRA and BERA (Appendices AA and BB of the RI Report, respectively).

## 3.2 Graphical Evaluation

Several graphs were used to evaluate the background datasets in terms of the distribution and presence of outlier values and to compare the background and Site datasets. The various graphs are described in the following sections. For all graphs, if a dataset included non-detect concentrations, those values were represented by the full value of the reporting limit (RL) for that COPC.

### 3.2.1 Boxplots

Boxplots were used to evaluate the range of concentrations detected in the background dataset (including non-detect concentrations at the full value of the RL) and to compare Site and background data for each medium. Boxplots were created in Minitab (Version 17.3.1). The box represents the interquartile range (IQR), where the top of the box corresponds to the third quartile (Q3), or the 75th percentile, and the bottom of the box corresponds to the first quartile (Q1), or the 25th percentile (see example figure below). The line between the lower and upper quartiles represents the median, or the 50th percentile (where 50% of the data are greater than this value and 50% of the data are less than this value). The “whiskers” above and below the box represent the sum of Q3 and the product of 1.5 and the IQR and the difference of Q1 and the product of 1.5 and the IQR, respectively, and the asterisks above and below the whiskers are any result that is greater or less than the whisker values. In some cases, the box plots are displayed on a logarithmic scale to better illustrate the range of data. A footnote is added to the plot to indicate when a log scale was used.




The boxplots were first used to describe the background datasets and include the full background datasets, i.e., including outliers and non-detect concentrations at the full value of the RL. Next, boxplots were used to compare the Site and background datasets and exclude any outliers identified in the background datasets.

### 3.2.2 Probability Plots

Probability plots aided in determining whether the background datasets were normally distributed and in identifying the number of suspected outliers. These plots were created in Minitab using a cumulative frequency distribution of the dataset and associated 95% confidence intervals. These plots present the full background datasets (i.e., including outliers and non-detect concentrations at the full value of the RL). If the background data roughly follow the normal distribution line and/or fall within the confidence interval, then the distribution of the data is likely normal. Goodness-of-fit (GOF) statistics (Anderson-Darling test) and associated p-value were also calculated on these graphs; however, the results of the GOF test statistics produced from ProUCL were used to determine the distribution of the data (see Section 3.3 for more discussion on the GOF test). The number of suspected outliers was identified as those data points that fall outside of the 95% confidence interval lines.

### 3.2.3 Index Plots

The index plots (created with the statistical software R) present the full range of background concentrations (i.e., including outliers and non-detect concentrations at the full value of the RL) relative to the selected BTV (as discussed in Section 3.3.4). The background data are ranked from lowest to highest concentration and displayed with the BTV, which is presented as a straight line at the value of the selected BTV.

## 3.3 Statistical Evaluations

Statistical tests were used to evaluate the distribution of the background dataset, the presence of outliers, the similarity among depth intervals (where applicable), and the comparison of Site and background datasets. COPCs considered appropriate for quantitative background statistical evaluation were those with a minimum of eight samples in both the Study Area and background datasets, based on best professional judgment and agency guidance (USEPA, 2002a; 2015b). In some cases (e.g., groundwater), statistical tests were conducted on less than eight samples due to the small size of the datasets.

The statistical tests were performed in the order presented in **Figure 3-1** and follow these general steps:

1. Determine the distribution of the raw background dataset.
    - If the data are normally distributed, then performed the outlier test on the raw dataset (skip Step 2 and proceed to Step 3).
    - If the data are not normal, then performed a log-transformation (proceed to Step 2).

2. Transform datasets that do not follow a normal distribution using a log transformation and test if the log-transformed data follow a normal distribution;

3. Evaluate the presence of outliers on the raw data (if normal or no discernible distribution) or the log-transformed data (if normal following log-transformation).

4. Following the removal of outlier values, perform BTV statistical analysis on the raw dataset and select the BTV based on the distribution of the raw dataset.

Each of these steps and associated statistical tests are further described in the following sections. All statistical tests were performed in ProUCL, Version 5.1 (USEPA, 2015b, 2016), except where noted. The ProUCL output is presented in **Attachment I**.

### 3.3.1 Distribution

The distributions of the background datasets were evaluated using the GOF statistics in ProUCL. GOF tests were performed on the raw dataset and following the log data transformation, when applicable. The results of the Shapiro-Wilk test were evaluated to determine whether the data were normally or lognormally distributed at a confidence level of 0.05. The results of the Anderson-Darling test or Kolmogorov-Smirnov test were evaluated to determine whether the data were gamma distributed at a confidence level of 0.05. Before conducting the outlier test, the GOF test results were evaluated on the basis of non-detect concentrations included at the full value of the RL for those datasets that included non-detects. The probability plots (Section 3.2.2) were used to support and interpret these results. Following the outlier test, the GOF test was performed as part of the BTV statistics (i.e., the results are included in the BTV output), and the distribution is based on the detected concentrations. If the dataset included non-detects, the BTV statistics were selected on the basis of the distribution of the detected concentrations and using the Kaplan-Meier estimates for non-detects.

### 3.3.2 Outlier Test

Outliers are concentrations that are higher or lower than the majority of concentrations of the background dataset that may distort the calculation of background statistics such as the BTV or population tests (USEPA, 2015b). Outliers may be the result of errors related to laboratory analyses or coding or they may be related to an anomaly in the background sampling area, e.g., unrelated contaminated sites. Outlier values (both upper- and lower-tail) identified based on the results the ProUCL default outlier tests for this evaluation were assumed to not be representative of the background datasets and were removed from the evaluation. This is a conservative measure because there is no evidence of laboratory anomalies and background sampling locations were selected with DOEE approval in uncontaminated areas.

Either Rosner's test, which is the default outlier test in ProUCL for datasets with 25 samples or more, or Dixon's test, which is the default outlier test in ProUCL for datasets with less than 25 samples, were conducted on the background datasets. Non-detect values were included at the full value of the RL[3]. Both the Rosner and Dixon tests assume that the dataset without suspected outliers is normally distributed. Therefore, a log-transformation was performed on any datasets that were not normally distributed (as detailed in Section 3.3.1 and **Figure 3-1**). Per ProUCL Technical Guidance (USEPA, 2015b), the outlier test results were supplemented with graphs, including boxplots and probability plots, both of which present full datasets (i.e., including outliers and non-detect concentrations at the full value of the RL). As detailed in Section 3.2.1, the asterisks identified in the boxplots are not the result of the outlier tests performed in ProUCL, and therefore may not directly correspond with the outlier test results. Any values identified as outliers were evaluated on the basis of the supporting graphs (i.e., boxplots), and if any values were determined to be outliers, those values were removed from the dataset before processing additional statistics such as BTVs and population tests.

### 3.3.3 Comparisons within Background Datasets

After the outlier values in the background soil dataset were removed, an Analysis of Variance (ANOVA) test comparing background surface and subsurface mean soil concentrations was conducted to determine if surface and subsurface soil datasets represent the same (or different) populations of data. A parametric ANOVA was selected for COPCs that are normally distributed and for which surface and subsurface datasets for all COPCs have equal variances (see Test for Equal Variances plots created in Minitab, Version 17.3.1, in **Attachment C**). A nonparametric ANOVA (Kruskal-Wallis) was selected for COPCs that were not normally distributed and/or surface and subsurface datasets that had unequal variances. As stated above, non-detect concentrations were included in all tests at the full value RL.

### 3.3.4 BTV Statistics

BTV statistics were calculated in ProUCL for COPCs in each background dataset (following removal of outliers) with sufficient detected concentrations available. The BTVs are used in the RI, BHHRA, and BERA in comparison with Site data to identify any COPCs for which concentrations are elevated

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[3] Attachment I presents the results of a sensitivity analysis on the inclusion of non-detect values at the full value of the RL for the background soil and sediment datasets. The results of the analysis are also briefly discussed below in Section 4.1.6 (soil) and Section 4.2.5 (sediment).

relative to background. This comparison of Site data with BTVs provides important information for the RI in understanding the magnitude and spatial patterns of COPCs in Site media.

The 95% upper tolerance limit (95UTL), which is calculated such that 95% of observations from the background dataset are less than or equal to the statistic (which is the 95% upper confidence limit of the 95th percentile of the dataset) with 95% confidence, was selected preferentially as the BTV statistic per the request of DOEE. The 95UTL statistic selected was based on the distribution of the raw dataset (e.g., if the detected concentrations followed a normal, lognormal, or gamma distribution, then the normal, lognormal, or gamma 95UTL was selected, respectively), or in cases of no discernible distribution, the nonparametric 95UTL statistic was selected. If the dataset included non-detects, the Kaplan-Meier BTV statistics were selected on the basis of the distribution of the detected concentrations.

### 3.3.5 Population Tests

A two-sample hypothesis test (or population test) was conducted to compare the mean or median of the Study Area and background[4] datasets. The two-sample hypothesis test determines if COPC concentrations measured in Site samples (i.e., the Site population) is different from COPC concentrations measured in background (i.e., the background population). The population test provides information on identifying the COPCs for which Site and background concentrations are consistent overall, and the BTVs (described in Section 3.3.4) are used for understanding the magnitude and spatial patterns of Site concentrations of COPCs.

The two-sample hypothesis test was based on the null hypothesis ($H_O$) and alternative hypothesis ($H_A$) of Test Form 2 of USEPA (2002a) and put the burden of proof on determining consistency of Study Area and background datasets such that:

- $H_O$ = Mean/Median of Site Data ≥ Mean/Median Background Data + S
- $H_A$ = Mean/Median of Site Data < Mean/Median Background Data + S

The statistical factor “S” (substantial difference) was included in the hypothesis test for this evaluation. The value of S for this evaluation is the standard deviation of the background dataset, which is identified in guidance (USEPA, 2002a) as a means of taking into account variability in background

[4] The background dataset used in the population tests did not include outliers identified as described in Section 3.3.2.

and is conservative. The value of S for each COPC was added to the value of each background sample prior to conducting the two-sample hypothesis tests.

Population tests were only conducted when a minimum of eight samples with six detected concentrations in both the Site and Site-specific background datasets were available. The statistical tests selected for each COPC and medium was determined by the distributions of the Site and background data (following removal of outliers in the background dataset) based on GOF statistics in ProUCL. If both datasets were normally distributed, then a t-test was selected, which is a test of the means of both populations. If either was dataset not normal, then a nonparametric test of the medians of both populations (Wilcoxon-Mann-Whitney [WMW] or Gehan) was selected. The WMW test was selected for datasets with all detected results (with non-normal distributions), or in cases of datasets with non-detect concentrations where the RLs were equal. The Gehan test was selected for datasets that included non-detect samples with unequal RLs.

For each test (t-test, Gehan's, or WMW), if the p-value of the two-sample hypothesis test was greater than the alpha (0.05), then the null hypothesis was not rejected and it was concluded that Site concentrations were greater than or equal to background. If the p-value was less than alpha (0.05), then the null hypothesis was rejected and it was concluded that Site concentrations are not greater than background.

Boxplots comparing Site and background data (described in Section 3.2.1) were used to support and clarify these findings, and in particular, to identify when Site and background overlapped such that two populations of data appeared equal. The boxplot comparisons of Site and background do not present the results of the two-sample tests because the background concentrations presented in the boxplots were not adjusted with the value of S. Therefore, the comparison of unadjusted background and Site concentrations presented in the boxplots provide a visual comparison of actual results.

# 4 Results

The background evaluation results for soil, sediment, groundwater, pore water, and fish tissue are presented in the following sections.

## 4.1 Background Evaluation Results for Soil

The background evaluation for soil followed the procedure outlined in Section 3 and illustrated in **Figure 3-1**, including:

- Identification of soil COPCs
- Evaluation of distribution of the background soil datasets
- Identification of outliers in the background soil datasets
- Calculation of soil BTVs for each COPC

An additional step was conducted to determine if the combination of surface and subsurface soil datasets was appropriate as described in Section 3.3.3. Site and background soil was also compared using population tests. The results of each of these steps are presented in the following sections. The supporting graphics for soil are presented in **Attachment C**.

### 4.1.1 Identification of Soil COPCs

The first step of this evaluation was to select soil COPCs for inclusion in the background evaluation for the Benning Road Facility. Soil COPCs were selected for evaluation using the process outlined in Section 3.1. Due to the industrial nature of the facility, on-Site soils are not evaluated in the BERA, and are evaluated in the BHHRA based on non-residential exposure pathways. Therefore, USEPA Regional Screening Levels (RSLs) for industrial soil were used in the COPC selection process; the version of the RSLs current at the time of COPC selection for the background evaluation was used (USEPA, 2017b). This COPC selection process and the resulting list of selected COPCs was reviewed and approved by DOEE in August 2017.[5] Use of the current version of the RSL table (USEPA, 2018a) did not result in any additional COPCs identified in the BHHRA.

[5] Email from Apurva Patil (DOEE) to Fariba Mahvi (Pepco) dated August 23, 2017.

The resulting eight inorganic and 12 organic constituents included in the background soil evaluation and their toxic equivalents are presented in **Table 4-1**. **Table 4-2** presents the rationale for selecting constituents based on the criteria presented above, including whether each constituent was detected, not detected, or not measured in background soil samples for each analytical method. The maximum detected concentrations in Site soil samples for constituents detected in background samples are presented in **Table 4-2** and compared to the applicable screening level. When the maximum detected concentration was less than the screening level, the constituent was not selected for inclusion in the background evaluation. When the maximum detected concentration was greater than the screening level, the constituent was selected for inclusion in the background evaluation.

### 4.1.2 Comparison of Background Surface and Subsurface Soil

Background surface and subsurface soil COPC concentrations were compared in boxplots presented in **Attachment C**. Because the range of concentrations in surface and subsurface soil does not appear to significantly overlap, the datasets for each COPC were statistically compared to determine if they were similar or not.

As a first step, the combined surface and subsurface datasets were evaluated to determine the distribution (both raw and log-transformed where applicable; further described in Section 4.1.3) and whether there were outliers present in the combined dataset. After removing the outlier values, an ANOVA test comparing background surface and subsurface mean soil concentrations was conducted to determine if surface and subsurface soil datasets represent the same (or different) populations of data. A parametric ANOVA was selected for COPCs that were normally distributed and for which surface and subsurface datasets for all COPCs had equal variances (see Test for Equal Variances plots created in Minitab, Version 17.3.1, in **Attachment C**). A nonparametric ANOVA (Kruskal-Wallis) was selected for COPCs that were not normally distributed. As stated above, non-detect concentrations were included in all tests at the full value of the RL. The boxplot comparisons of surface versus subsurface supported the statistical tests conducted.

The results of the ANOVA tests (at a significance level of 5%) indicate that there are no significant differences in surface and subsurface soil for 12 COPCs. Boxplot comparisons of surface versus subsurface concentrations (presented in **Attachment C**) indicate that most to all subsurface concentrations fall within the range of surface concentrations for these COPCs. Therefore, the surface and subsurface background soil analytical data were combined into one dataset for these COPCs. Surface and subsurface concentrations for several COPCs were found to be significantly different, and therefore surface and subsurface data were analyzed separately for these COPCs. The table below indicates whether the surface and subsurface datasets were combined for each COPC and the rationale.

| COPC | Surface and Subsurface Combined? | Rationale |
|---|---|---|
| Arsenic | Yes | Concentrations not significantly different. |
| Chromium | Yes | Concentrations not significantly different. |
| Cobalt | Yes | Concentrations not significantly different. |
| Lead | No | Concentrations significantly different. |
| Manganese | No | Concentrations significantly different. |
| Nickel | Yes | Concentrations not significantly different. |
| Thallium | Yes | Concentrations not significantly different. |
| Vanadium | Yes | Concentrations not significantly different. |
| Benzo(a)pyrene toxic equivalent (BAP-TE) | No | Concentrations significantly different. |
| Benzo(a)anthracene | No | Concentrations significantly different. |
| Benzo(a)pyrene | No | Concentrations significantly different. |
| Benzo(b)fluoranthene | No | Concentrations significantly different. |
| Dibenzo(a,h)anthracene | Yes | Concentrations not significantly different. |
| Indeno(1,2,3-cd)pyrene | No | Concentrations significantly different. |
| Naphthalene | Yes | Concentrations not significantly different. |
| PCB, Total Aroclors | Yes | Concentrations not significantly different. Total PCBs were not detected in subsurface soil. |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) | Yes | Concentrations not significantly different. |
| TCDD Toxicity Equivalent (TEQ) HH [(a)] | No | Concentrations significantly different. |
| Diesel Range Organics (DRO) (C10-C20) | Yes | ANOVA resulted in significant difference, but due to only one detect in subsurface soil and the boxplot evaluation showing similar ranges, considered one dataset. |
| Oil Range Organics (ORO) (C20-C36) | Yes | Concentrations not significantly different. |

[(a)] TEQ calculated for human health (HH). Referred to as 2,3,7,8-TCDD-TEQ in the BHHRA.

### 4.1.3 Evaluation of Distribution of Background Soil Datasets

The GOF statistics of the raw background soil dataset (including non-detects at the full value of the RL) indicate that most COPCs are not normally distributed and most organic COPCs had no discernible distribution (**Table 4-3**). The probability plots presented in **Attachment C** support these findings. Following the log transformation, several metals, some PAHs in surface soil, and TCDD-TEQ followed a normal or approximately normal distribution, or in some cases where the raw dataset did not follow a discernible distribution, the log-transformed data followed a lognormal or gamma distribution. Therefore, the outlier test was performed on the log-transformed datasets for these

COPCs. The log transformation did not improve the distribution of the remaining organic COPCs, and the raw dataset was used for the outlier test for these COPCs. Based on these GOF results, the raw and log-transformed data were used to perform the outlier tests for the following COPCs:

| Selected Dataset for the Outlier Test | COPCs |
|---|---|
| Raw dataset | Vanadium, total PCB Aroclors, DRO, benzo(a)anthracene (subsurface), benzo(a)pyrene (subsurface), benzo(b)fluoranthene (subsurface), dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene |
| Log-transformed dataset | Arsenic, chromium, cobalt, lead, manganese, nickel, thallium, ORO, benzo(a)anthracene (surface), benzo(a)pyrene (surface), benzo(b)fluoranthene (surface), BAP-TE, 2,3,7,8-TCDD, and TCDD TEQ HH |

### 4.1.4 Identification of Outliers in Background Soil Datasets

Upper-tail outliers in boxplots were identified as the maximum detected concentrations for chromium, lead (subsurface), thallium, and total PCBs. One lower-tail outlier was identified for thallium. In addition, the four highest concentrations for vanadium and the three highest concentrations for diesel range organics (DRO) were identified as outliers. For semivolatile organic compounds (SVOCs), the maximum detected concentration was identified as an outlier in the subsurface dataset of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene toxic equivalent (BAP-TE) and the combined datasets for dibenzo(a,h)anthracene and naphthalene. The values and the sample identification numbers of the outliers are presented in **Table 4-3**.

The boxplots and probability plots presented in **Attachment C** generally support the outlier test results. As described in Section 3.2.1, the elevated values identified with asterisks on the boxplots are based on a different calculation than the ProUCL outlier tests, and in some cases, more or fewer elevated values (both high and low tails) were identified in the boxplots than in the outlier tests. In the probability plots, the outliers typically fell outside the 95% confidence intervals. Outlier values identified based on the ProUCL outlier test results were confirmed with the boxplots and probability plots, and were removed from the dataset for the remaining statistical evaluations. Not all elevated values identified in the boxplots were removed: only those that were identified as outliers by the default ProUCL test.

Outlier tests were conducted on soil datasets with a minimum of six detected concentrations, and the non-detected values were included at the full value of the RL. For some organic COPCs (total PCB Aroclors and PAH compounds in subsurface soil), there were only six detected concentrations. The outlier test was conducted on these datasets and, in most cases, identified the maximum detected concentration as an outlier. For all of these COPCs, due to the lack of a discernable distribution and the large number of non-detect results, iterative outlier testing in ProUCL generally resulted in elimination of all detected concentrations. There is uncertainty in BTVs based on RLs, especially for ubiquitous compounds like PAHs, given the range of concentrations detected in background surface and subsurface soil samples. Therefore, the outlier test was not repeated on these datasets after the maximum detected concentration was removed.

For total PCBs, the maximum detected concentration in background soil (0.39 micrograms per kilogram [µg/kg]) was identified as an outlier. The boxplot and probability plot confirm this value is an outlier based on the cluster of detected concentrations below 0.04 milligrams per kilogram (mg/kg). ProUCL also identified the next two highest concentrations as outliers; however, these results may have been influenced by the low values of the RLs that were included in the dataset to represent non-detect concentrations, and as such, these values are not true outliers (see the discussion of a sensitivity analysis on the RL values presented below). Therefore, the maximum detected concentration was removed from the dataset for the calculation of the BTV, but the next two highest concentrations were retained in the background dataset.

The maximum concentration for all PAHs were detected in one subsurface sample (SOBACK04) with concentrations elevated well above the rest of the background dataset for each PAH compound (ranging from 1.8 to 13 mg/kg). These concentrations were identified as outliers based on the default ProUCL tests and removed from the dataset used in BTV calculations. In some cases, ProUCL identified additional upper tail values as outliers, which is likely because of the influence of the low values of the RLs included in the dataset to represent non-detect concentrations, and consequently they are not true outliers (see the discussion of a sensitivity analysis on the RL values presented below). Numerous studies have documented concentrations of individual carcinogenic PAH compounds in urban background soil at concentrations of 2 mg/kg and higher (MADEP, 2002; AMEC, 2012; Illinois EPA, 2005; Teaf, 2008; EPRI, 2008; and Bradley et al., 1994), including properties in the Site vicinity and District region (Johnson Company, 2012). A background and off-site soil analysis performed by the National Park Service as part of the RI/FS for the Kenilworth Park Landfill found levels as high as 1 mg/kg for benzo(a)pyrene in surface soil, and concluded that these are typical of urban soils and soils impacted by fossil fuel emissions (Johnson Company, 2012). Therefore, these results were not removed as outliers from the dataset used for the BTV calculations for PAHs in surface soil.

#### 4.1.5 Calculation of BTVs in Soil

BTVs for soil were calculated for each COPC using the background datasets excluding the outliers identified in Section 4.1.4. The BTV statistic selected was the 95UTL based on the distribution of the raw dataset as described in Section 3.3.4. BTVs are presented in **Table 4-3** and in the index plots in **Attachment C**.

#### 4.1.6 Sensitivity Analysis - Soil

A sensitivity analysis was conducted (using the statistical software R) for the treatment of non-detect values in the background soil dataset. This analysis evaluated whether including the full RL for NDs at the same or similar value increases the skew of the background dataset and influences the outlier test results. A previous sensitivity analysis was conducted on two constituents. However, following discussion with DOEE, the sensitivity analysis was expanded to include:

- Additional constituents with a range of detection frequencies including constituents for which there is overlap among detected concentrations and reporting limits.
- An evaluation of distributions and BTVs of these constituents.

This analysis was conducted based on a Monte Carlo sampling approach in which ND concentrations were simulated in each dataset for a total of 10,000 datasets, and the ProUCL default outlier test was conducted to determine the number of outliers for each simulated dataset. The number of outliers and the distribution for each simulated dataset was tallied and the BTV based on each outlier scenario identified was calculated and compared to the results of the outlier, distribution, and BTV calculations presented for soil in this section (Section 4.1).

Nine constituents were evaluated in background soil based either on the combined surface and subsurface soil datasets or subsurface soil data only, as follows:

- Thallium (combined surface and subsurface soil data)
- Total PCBs (combined surface and subsurface soil data)
- Diesel Range Organics (combined surface and subsurface soil data)
- Oil Range Organics (C20-C36) (combined surface and subsurface soil data)
- Benzo(a)anthracene (subsurface data only)
- Benzo(a)pyrene (subsurface only)

- Dibenzo(a,h)anthracene (combined surface and subsurface soil data)
- Naphthalene (combined surface and subsurface soil data)
- 2,3,7,8-TCDD (combined surface and subsurface soil data)

The results of the sensitivity analysis are presented in **Attachment J**. Scenarios with low-tail outliers (frequently a simulated ND value) were more frequent than high-tail outliers, which is likely due to the effect of reducing the ND values below the RL. Several combinations of outliers were identified for each of the soil COPCs included in the analysis. The outlier scenarios that corresponded with the outlier results presented in Section 4.1.4 were not the most frequent of all outlier scenarios identified. However, there was relatively low variation among the BTVs calculated for each scenario (with the exception of "no outlier" scenarios, e.g., DRO). The results of this sensitivity analysis indicated that removing outliers had relatively low impact on the BTVs calculated for each background dataset.[6] Accordingly, the BTV analysis for background soil is based on the results of the outlier identification approach described in Section 3.3.4 (i.e., using the full RL for NDs), with results presented in Section 4.1.5.

### 4.1.7 Population Tests for Soil

A two-sample hypothesis test was conducted for each COPC for which sufficient data were available. The tests selected for each COPC was determined by the distributions of the Site and background datasets. All of Site and the majority of the background datasets were non-normally distributed. Therefore, WMW or Gehan tests were selected based on the presence of non-detects in the dataset as detailed in Section 3.3.5.

The results of the population test for the soil COPCs are presented in **Table 4-4**. The following table presents a summary of the COPCs for which the null hypothesis was rejected (i.e., median Site concentration was less than the median background) and the COPCs for which the null hypothesis was accepted (i.e., median Site concentration was greater than or equal to background).

| Population Test Outcome | COPCs |
|---|---|
| Null hypothesis rejected: Site concentration < background | Arsenic, chromium, cobalt, lead (surface), lead (subsurface), manganese (surface), manganese (subsurface), nickel, thallium, benzo(a)pyrene (surface), indeno(1,2,3-cd)pyrene (surface), BAP-TE (surface), and TCDD TEQ HH (subsurface) |
| Null hypothesis accepted: Site concentration ≥ background | Vanadium, DRO, ORO, benzo(a)anthracene (surface and subsurface), benzo(b)fluoranthene (surface), BAP-TE (subsurface), dibenzo(a,h)anthracene, naphthalene, TCDD TEQ HH (surface), and 2,3,7,8-TCDD |

[6] The exception is PAHs, which are discussed in Section 4.1.4.

Boxplot comparisons of Site and background concentrations (**Attachment C**) support the findings of the population tests. The majority of Site concentrations, i.e., the IQR represented in the boxplot by the "box" that includes all concentrations between the 25th and 75th percentiles, overlap with the background IQR. In some cases, the Site and background medians are comparable, and in other cases, the Site median is higher than the background median but less than the background 75th percentile.

A population test could not be conducted for three COPCs that had low frequency of detection (FOD) in the background dataset: Total PCB Aroclors, benzo(a)pyrene in subsurface, and benzo(b)fluoranthene in subsurface. Boxplot comparisons for these COPCs illustrate that Site medians and IQRs are higher than background medians and IQRs.

Based on this evaluation, Site and background soil concentrations are comparable or Site concentrations are less than background for the following COPCs:

- Inorganic COPCs: Arsenic, chromium, cobalt, lead (surface and subsurface), manganese (surface and subsurface), nickel, and thallium
- Organic COPCs: benzo(a)pyrene (surface), indeno(1,2,3-cd)pyrene (surface), BAP-TE (surface), and TCDD TEQ HH (subsurface)

Site soil concentrations are greater than background for the following COPCs:

- Inorganic COPCs: Vanadium
- Organic COPCs: Total PCBs, DRO, ORO, benzo(a)anthracene (surface and subsurface), benzo(a)pyrene (subsurface), benzo(b)fluoranthene (surface and subsurface), BAP-TE (subsurface), dibenzo(a,h)anthracene, naphthalene, TCDD TEQ HH (surface), and 2,3,7,8-TCDD

#### 4.1.8 Comparisons with Regional Soil Data

Comparisons of Site, Site-specific background, and regional soil concentrations for inorganic COPCs are presented in boxplots in **Attachment C**. Concentrations of arsenic, chromium, cobalt, thallium, and vanadium available for regional soil samples are in the same range as the Site and Site-specific background soil concentrations. Most of the regional concentrations (i.e., the IQR represented in the boxplot by the "box" that includes all concentrations between the 25th and 75th percentiles) for cobalt and thallium range higher than both Site and Site-specific background concentrations. Aside from some elevated Site and regional concentrations, the IQRs and/or medians of all metals overlap among the three areas. Therefore, Site and Site-specific background concentrations of arsenic, chromium, cobalt, thallium, and vanadium are consistent with regional soil concentrations.

## 4.2 Background Evaluation Results for Sediment

The background evaluation for sediment followed the procedure outlined in Section 3 and illustrated in **Figure 3-1**, including:

- Identification of sediment COPCs
- Evaluation of distribution of the background sediment datasets
- Identification of outliers in the background sediment datasets
- Calculation of sediment BTVs for each COPC

Site and background sediment was also compared using population tests. The results of each of these steps are presented in the following sections. The supporting graphics for sediment are presented in **Attachment D**.

### 4.2.1 Identification of Sediment COPCs

Sediment COPCs were selected for evaluation using the process outlined in Section 3.1. Sediment is evaluated in both the BHHRA and the BERA. Therefore, both human health and ecological screening levels were used to identify COPCs. There are no sediment screening levels for human health; therefore, USEPA residential soil RSLs (USEPA, 2017b) were conservatively used. For ecological screening, low-effect ESVs were selected based on a hierarchy of freshwater values from NOAA Screening Quick Reference tables (Buchman, 2008), USEPA Region 3 freshwater sediment (USEPA, 2006), USEPA Region 5 Ecological Screening Levels for sediment (USEPA, 2003), and USEPA Region 4 Sediment Screening Values (USEPA, 2018b).

For those constituents detected in background, the maximum detected concentration in Site sediment samples was compared to the applicable screening levels. When the maximum detected concentration was less than the screening level, the constituent was not selected for inclusion in the background evaluation. When the maximum detected concentration was greater than the screening level, the constituent was selected for further evaluation. Based on the above rationale, 80 constituents were identified, consisting all of the COPCs identified for the BHHRA and the BERA. The list of COPCs identified based solely on the BERA (i.e., were not identified as COPCs for the BHHRA) was further refined based on the results of the COPC refinement step of the BERA (i.e., comparisons of the maximum and average exposure point concentrations to ecological screening levels), resulting in a list of 49 constituents. The resulting list of constituents includes ten metals, cyanide, two pesticides, total Aroclor PCBs, DRO, TPH-C10-28, 13 PAHs and SVOCs, total high molecular weight (HMW) PAHs via two methods (SW8270D and ID0016), 17 dioxin and furan compounds, and TCDD TEQ values (**Table 4-5**). Total PCB congeners were also included per the request of DOEE. **Table 4-6** provides the rationale for the selected sediment COPCs.

### 4.2.2 Evaluation of Distribution of Background Sediment Datasets

The GOF statistics of the raw background sediment dataset (including non-detects at the full value of the RL) indicate that most COPCs follow a normal or gamma/lognormal distribution (**Table 4-7**). The probability plots presented in **Attachment D** support these findings. A log transformation was applied to those COPC datasets that are not normally distributed (i.e., with gamma or lognormal distributions or no discernible distribution). As described further below, in most cases the log transformation resulted in a normal distribution.

For the following COPCs, the log transformation of these datasets resulted in a normal distribution, and therefore the log-transformed data were used in the outlier tests for these COPCs:

- Two inorganic COPCs (antimony and cyanide)
- Total PCB Aroclors and total PCB congeners
- Seven SVOCs via SW8270D (bis-(2-ethylhexyl)phthalate, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-cd]pyrene, and total HMW PAHs) and TPH-C10-28
- Fifteen dioxin/furan COPCs (2,3,7,8-TCDD, 1,2,3,7,8- Pentachlorodibenzo-p-dioxin [PeCDD], 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [HxCDD], 1,2,3,4,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [HpCDD], octachlorodibenzo-p-dioxin [OCDD], 2,3,7,8-Tetrachlorodibenzofuran [TCDF], 1,2,3,7,8-Pentachlorodibenzofuran [PeCDF], 1,2,3,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,4,6,7,8-Heptachlorodibenzofuran [HpCDF], 1,2,3,4,7,8,9-HpCDF, octachlorodibenzofuran [OCDF], and TCDD TEQ HH).

For five COPCs (4,4'-DDT, chrysene, dibenzo(a,h)anthracene, total HMW PAHs (ID0016), and 1,2,3,7,8,9- Hexachlorodibenzofuran [HxCDF]), the log transformation did not result in a normal distribution and the raw dataset was used for the outlier test for these constituents.

### 4.2.3 Identification of Outliers in Background Sediment Dataset

Upper-tail outliers were identified as the maximum detected concentrations for aluminum, barium, chrysene, dibenzo(a,h)anthracene, 2,6-dimethylnaphthalene, and 1,2,3,7,8,9-HxCDF. Two upper-tail outliers were identified for 4,4'-dichlorodiphenyltrichloroethane (DDT). One lower-tail outlier was identified as the minimum non-detect (i.e., RL) value for 1,2,3,4,7,8,9-HpCDF. An outlier test was not conducted for three SVOCs with low FOD (i.e., only one to three detected concentrations): 4-methylphenol, acetophenone, and di-n-octylphthalate. The values and the sample identification numbers of the outliers are presented in **Table 4-7**.

The boxplots and probability plots presented in **Attachment D** generally support the outlier test results. As described in Section 3.2.1, the elevated values identified with asterisks in the boxplots are based on a different calculation from the ProUCL outlier tests, and in some cases, identified more elevated values (both high and low tail) than the outlier tests and identified fewer elevated values in other cases. In the probability plots, the outliers typically fell outside the 95% confidence intervals. Outlier values identified based on the ProUCL outlier test results were confirmed with the boxplots and probability plots and were removed from the dataset for the remaining statistical evaluations. Not all elevated values identified in the boxplots were removed, but only those that were identified as outliers by the default ProUCL test.

### 4.2.4 Calculation of BTVs in Sediment

BTVs for sediment were calculated for each COPC using the background datasets excluding outliers identified in Section 4.2.3. The BTV statistic selected was the 95UTL based on the distribution of the raw dataset as described in Section 3.3.4. BTVs are presented in **Table 4-7** and in the index plots in **Attachment D**.

A BTV also was calculated for total PCB Aroclors using a background dataset that included sediment sampling results from the Kenilworth Park Landfill Remedial Investigation. The BTV for total PCB Aroclors using this larger dataset (0.57 mg/kg) was significantly higher than the BTV for the dataset limited to Site-specific sampling locations (0.18 mg/kg), indicating that the total PCB Aroclor BTV presented in this evaluation represents a conservative estimate of local background PCB Aroclor concentrations in sediment.

### 4.2.5 Sensitivity Analysis - Sediment

A sensitivity analysis was conducted for the original background dataset identified in Technical Memo #2 (using the statistical software R) for the treatment of non-detect values in the background sediment dataset. This analysis evaluated whether including the full RL for NDs at the same similar value increases the skew of the background dataset and influences the outlier test results. A previous sensitivity analysis was conducted on two constituents in soil. However, following discussion with DOEE, the sensitivity analysis was expanded to include:

- Additional constituents with a range of detection frequencies including constituents for which there is overlap among detected concentrations and reporting limits.
- An evaluation of distributions and BTVs of these constituents.

A description of the methodology used for this sensitivity analysis is presented in Section 4.1.6. Four constituents were evaluated in background sediment:

- 2,3,7,8-TCDD
- 4,4'-DDT
- Total PCB Aroclors
- Cyanide

The results of the sensitivity analysis are presented in **Attachment J**. As described for soil, scenarios with low-tail outliers (frequently a simulated ND value) were frequent, which is likely due to the effect of reducing the ND values below the RL. No high-tail outliers were identified. At least two scenarios were identified for each of the sediment COPCs included in the analysis. Like soil, the outlier scenarios that corresponded with the outlier results presented in Section 4.1.4 were not the most frequent of all outlier scenarios identified for some COPCs. However, there was relatively low variation among the BTVs calculated for each scenario. The results of this sensitivity analysis indicated that removing outliers had relatively low impact on the BTVs calculated for each background dataset. Accordingly, the BTV analysis for background sediment is based on the results of the outlier identification approach described in Section 3.3.4 (i.e., using the full RL for NDs), with results presented in Section 4.2.4.

### 4.2.6 Population Tests for Sediment

A two-sample hypothesis test was conducted for each COPC for which sufficient sediment data were available. The test selected for each COPC was determined by the distributions of the Site and background datasets. The majority of Site and background datasets are non-normally distributed, and therefore, either the WMW test or Gehan test was selected based on the presence of non-detects in the dataset as detailed in Section 3.3.5. Both Site and background data are normally distributed for cobalt; a t-test was conducted for this COPC.

The results of the population test for the soil COPCs are presented in **Table 4-8**. The following table presents a summary of the COPCs for which the null hypothesis was rejected (i.e., the mean/median Site concentration was less than the mean/median background) and the COPCs for which the null hypothesis was accepted (i.e., the mean/median Site concentration was greater than or equal to mean/median background).

| Population Test Outcome | COPCs |
|---|---|
| Null hypothesis rejected: Site concentration < background | Aluminum, manganese, chlordane, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, total HMW PAHs (8270), and OCDD |
| Null hypothesis accepted: Site concentration ≥ background | Antimony, arsenic, barium, beryllium, cobalt, cyanide, nickel, thallium, vanadium, 4,4'-DDT, chlordane, total PCB Aroclors, total PCB congeners, bis-(2-ethylhexyl)phthalate, total HMW PAHs (ID-0016), TPH-C10-C28, and all dioxin/furan compounds except OCDD |

Boxplot comparisons of Site and background sediment concentrations (**Attachment D**) support the findings of the population tests. Most Site concentrations (i.e., the IQR represented in the boxplot by the “box” that includes all concentrations between the 25th and 75th percentiles) overlap with the background IQR. This describes the results for most inorganic COPCs, pesticides, total PCBs, and dioxin and furan compounds. The Site median is typically higher than the background median, but in some cases is less than the 75th percentile of the background dataset (e.g., aluminum, cyanide, chlordane).

For SVOCs, Site and background medians are close in value. Aside from some elevated values in the Site dataset, the bulk of Site concentrations appear to overlap with background, which is consistent with the results of the population tests. These findings suggest that most PAHs levels in sediment within the Study Area are consistent with background.

A population test could not be conducted for seven COPCs that had low FOD in the background dataset: 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, 4-methylphenol, acetophenone, di-n-octylphthalate, DRO, and 1,2,3,7,8,9-HxCDF. Boxplot comparisons illustrate that Site concentrations range higher than background for these COPCs.

Based on this evaluation, Site and background sediment concentrations are comparable or Site concentrations are less than background for the following COPCs:

- Aluminum, manganese, chlordane, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, total HMW PAHs (8270), and OCDD

Site sediment concentrations are greater than background for the following COPCs:

- Inorganic COPCs: Antimony, arsenic, barium, beryllium, cobalt, cyanide, nickel, thallium, and vanadium
- Organic COPCs: 4,4'-DDT, chlordane, Total PCBs (Aroclors and congeners), bis-(2-ethylhexyl)phthalate, total HMW PAHs (ID-0016), 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, DRO, TPH-C10-C28, and all dioxin/furan compounds except OCDD

### 4.3 Background Evaluation Results for Groundwater

The background evaluation for groundwater followed the procedure outlined in Section 3 and illustrated in **Figure 3-1** including:

- Identification of groundwater COPCs
- Evaluation of distribution of the background groundwater datasets
- Identification of outliers in the background groundwater datasets
- Calculation of groundwater BTVs for each COPC

In addition, Site and Site-specific background groundwater datasets were compared using population tests. The results of each of these steps are presented in the following sections. The supporting graphics for groundwater are presented in **Attachment E**.

#### 4.3.1 Identification of Groundwater COPCs

Groundwater COPCs were selected for evaluation using the process outlined in Section 3.1. While groundwater is not used as a source of drinking water in the Study Area, screening levels for drinking water were conservatively used to select COPCs for the background evaluation. The selected screening level for each constituent is the lower of the DOEE Water Quality Standards (2014) and the National Primary Drinking Water Regulations, Maximum Contaminant Level (USEPA, 2017c), where available. The USEPA RSL for tapwater (USEPA, 2017b) was used for constituents lacking DOEE or national values.

The resulting list of 22 inorganic constituents and five organic constituents included in the background groundwater evaluation is presented in **Table 4-9**. Constituents were identified separately based on samples representing the upper and lower aquifer zones. Similar constituents were identified for both zones, including five to six dissolved phase metals, 16 total recoverable phase metals (with 15 in each zone), DRO, and methyl tert-butyl ether (MTBE) for both the upper and lower zones, and BAP-TE, benzo(b)fluoranthene, and bis(2-ethylhexyl)phthalate for the upper zone.

**Table 4-10** presents the rationale for selecting constituents for the upper and lower zones based on the criteria presented above, including whether each constituent was detected, not detected, or not measured in background groundwater samples for each analytical method. The maximum detected concentrations in Site groundwater samples for constituents detected in background samples are presented in **Table 4-10** and compared to the applicable screening level. When the maximum detected concentration was less than the screening level, the constituent was not selected for inclusion in the background evaluation. When the maximum detected concentration was greater than the screening level, the constituent was selected for inclusion in the background evaluation.

### 4.3.2 Comparison of Upper and Lower Aquifer Zone Datasets

Boxplot comparisons of COPC concentrations detected in upper versus lower aquifer zone background samples are presented in **Attachment E**. Due to the small number of samples available for the lower aquifer zone (n = 4 background samples), statistical comparisons were not conducted to determine whether upper and lower zone datasets could be considered the same population. Therefore, the boxplot comparisons were evaluated to determine whether the upper and lower zone samples could be combined into one dataset for the background evaluation. If the range of detected values in the lower dataset overlapped with the upper dataset, e.g., had similar median and/or IQR, then the two datasets were combined. If the datasets did not overlap, then the upper and lower zone datasets remained separated for the calculation of BTVs and comparisons with Study Area groundwater.

The table below presents the COPCs that were identified for both the upper and lower zone datasets. The IQRs of all dissolved metals, DRO, and MTBE for lower and upper zone samples overlapped and/or the medians were similar. Therefore, upper and lower zone datasets were combined for these COPCs. The means and/or ranges of six out of 14 total recoverable phase metals (arsenic, cadmium, cobalt, iron, manganese, and thallium) also overlapped, and these datasets were also combined for BTV statistics. The means and ranges of concentrations for the remaining eight total recoverable phase metals were found to be dissimilar among lower and upper zone datasets, and therefore these datasets were evaluated separately for BTV and population statistics.

| COPC | Lower and Upper Aquifer Zone Samples Combined? | Rationale |
|---|---|---|
| Dissolved Cadmium | Yes | Lower zone IQR overlaps with upper zone |
| Dissolved Cobalt | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Dissolved Iron | Yes | Similar medians and IQRs |
| Dissolved Manganese | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Dissolved Nickel | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Total Aluminum | No | Dissimilar medians and lack of IQR overlap |
| Total Arsenic | Yes | Lower zone IQR overlaps with upper zone |
| Total Barium | No | Dissimilar medians and lack of IQR overlap |
| Total Beryllium | No | Dissimilar medians and lack of IQR overlap |
| Total Cadmium | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Total Chromium | No | Dissimilar medians and lack of IQR overlap |
| Total Cobalt | Yes | Lower zone IQR overlaps with upper zone |
| Total Iron | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Total Lead | No | Dissimilar medians and lack of IQR overlap |
| Total Manganese | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Total Nickel | No | Dissimilar medians and lack of IQR overlap |
| Total Thallium | Yes | Lower zone IQR overlaps with upper zone |
| Total Vanadium | No | Dissimilar medians |
| Total Zinc | No | Dissimilar medians and lack of IQR overlap |
| Diesel Range Organics (DRO) (C10-C20) | Yes | Similar medians and lower zone IQR overlaps with upper zone |
| Methyl tert-Butyl Ether (MTBE) | Yes | Lower zone IQR overlaps with upper zone |

### 4.3.3 Evaluation of Distribution of Background Groundwater Datasets

The GOF statistics of the raw background groundwater datasets (including non-detects at the full value of the RL) indicate that most COPCs are non-normally distributed or had no discernible distribution. The probability plots presented in **Attachment E** support these findings. The GOF statistics are presented in **Table 4-11** for the upper aquifer zone datasets, **Table 4-12** for the lower aquifer zone datasets, and **Table 4-13** for the combined zone datasets.

Following the log transformation, the majority of metals followed a normal distribution, and therefore the outlier test was performed on the log-transformed datasets for these COPCs. The log transformation did not improve the distribution for cadmium, thallium, DRO, and MTBE for the combined dataset, and the raw dataset was used for the outlier test for these COPCs.

### 4.3.4 Identification of Outliers in Background Groundwater Datasets

One lower-tail outlier was identified as the only non-detect concentration for total recoverable phase lead for the upper zone datasets (**Table 4-11**). Because only four samples were available for the lower zone groundwater datasets (**Table 4-12**), the outlier test was not conducted. For the combined upper and lower groundwater datasets (**Table 4-13**), one lower-tail outlier was identified for total cadmium. These outliers were removed from the upper and combined datasets, and the outlier test was conducted again to determine if additional outliers were present. No additional outliers were identified.

The boxplots and probability plots presented in **Attachment E** generally support the outlier test results. The boxplots illustrate the presence of elevated values (presented as asterisks) that are calculated as 1.5 times the IQR of the dataset and generally correspond with the outlier test results. However, in some cases (e.g., COPCs with low FOD), more elevated values (both upper- and low-tail) were identified on the boxplots than by the outlier tests. The outlier values identified based on the ProUCL outlier test results were removed from the datasets for the remaining evaluation described below. The elevated values identified in the boxplots were not removed from the datasets and were included in the evaluations below.

### 4.3.5 Calculations of BTVs in Groundwater

BTVs for groundwater were calculated for each COPC using the background datasets excluding the outliers identified in Section 4.3.4. The BTV statistic selected was the 95UTL based on the distribution of the raw dataset as described in Section 3.3.4. BTVs calculated for the upper aquifer zone are presented in **Table 4-11** and for the combined upper and lower aquifer zone datasets in **Table 4-13**. Due to the small sample size of the lower aquifer zone dataset, BTVs were not calculated for this zone. **Table 4-12** presents the summary statistics of these COPCs. All BTVs are presented relative to the rest of the background dataset in the index plots in **Attachment E**.

### 4.3.6 Population Tests for Groundwater

A two-sample hypothesis test was conducted to compare Site upper and lower aquifer zone datasets with the upper aquifer datasets and the combined upper and lower aquifer zone datasets for background for each COPC for which sufficient data were available. The two-sample hypothesis test was not conducted on the background lower aquifer datasets because there were only four samples available for this dataset. The test selected for each COPC was determined by the distributions of the Site and background datasets. All of Site and background datasets were non-normally distributed. Therefore, the either WMW or Gehan tests was selected based on the presence of non-detects in the dataset as detailed in Section 3.3.5.

The results of the population test for the groundwater COPCs are presented in the following tables:

- **Table 4-14** – presents the comparisons of the upper aquifer zone datasets in both Site and background.
- **Table 4-15** – presents the comparisons of the Site upper aquifer datasets with the combined upper and lower zone datasets for background.
- **Table 4-16** – presents the comparisons of the Site lower aquifer datasets with the combined upper and lower zone datasets for background.

The Site upper and lower aquifer zone datasets were evaluated separately in this background evaluation to be consistent with how these data are treated in the RI.

A summary of the COPCs for which the null hypothesis was rejected (i.e., the median Site concentration was less than the median background) and the COPCs for which the null hypothesis was accepted (i.e., the median Site concentration was greater than or equal to background) is presented below.

The following are the COPCs for which Site upper aquifer concentrations were all less than background upper aquifer concentrations:

| Population Test Outcome | COPCs |
|---|---|
| Null hypothesis rejected: Site concentration < background | Total aluminum, total barium, total beryllium, total chromium, total lead, total nickel, total vanadium, and total zinc |

The following are the COPCs for which Site upper aquifer concentrations are less than the combined upper and lower aquifer concentrations in background:

| Population Test Outcome | COPCs |
|---|---|
| Null hypothesis rejected: Site concentration < background | Dissolved cobalt, dissolved iron, dissolved manganese, dissolved nickel, total arsenic, total cadmium, total cobalt, total iron, total manganese |

The following are the COPCs for which Site lower aquifer concentrations were less than (or greater than or equal to) the combined upper and lower aquifer concentrations in background:

| Population Test Outcome | COPCs |
|---|---|
| Null hypothesis rejected: Site concentration < background | Dissolved cobalt, dissolved iron, dissolved manganese, total arsenic, total cadmium, total iron, total manganese |
| Null hypothesis accepted: Site concentration ≥ background | Dissolved nickel, total cobalt |

Boxplot comparisons of Site and background groundwater concentrations (**Attachment E**) support the findings of the population tests. The IQRs of Site concentrations of COPCs in the upper aquifer zone are lower than the IQR of the background upper or combined upper and lower aquifer datasets. Most of the IQRs of Site COPC concentrations in the lower aquifer zone are less than the IQR of the background combined upper and lower aquifer datasets. Site IQRs of dissolved nickel and total cobalt overlap with but range higher than background IQRs.

A population test could not be conducted for several COPCs due to low FOD in the background and/or Site datasets: BAP-TE, bis-(2-ethylhexyl)phthalate, and benzo(b)fluoranthene in the upper aquifer zone; and dissolved cadmium, total thallium, DRO, and MTBE in the Site upper and lower and background combined aquifer zones. Boxplot comparisons for these COPCs illustrate that aside from elevated concentrations detected in Site and/or background groundwater datasets, the IQRs of both Site and background overlap for the following COPCs:

| Boxplot Outcome | COPCs |
|---|---|
| Site and background upper zone are comparable | BAP-TE, bis-(2-ethylhexyl)phthalate, and benzo(b)fluoranthene |
| Site upper and background combined zone are comparable | Dissolved cadmium, total thallium, DRO, and MTBE |
| Site lower and background combined zone are comparable | Dissolved cadmium, total thallium, DRO, and MTBE |

Based on this evaluation, Site and background groundwater concentrations are comparable or Site concentrations are less than background for the following COPCs:

- Upper aquifer: Dissolved cadmium, dissolved cobalt, dissolved iron, dissolved manganese, dissolved nickel, total aluminum, total arsenic, total barium, total beryllium, total cadmium, total chromium, total cobalt, total iron, total lead, total manganese, total nickel, total thallium, total vanadium, total zinc, BAP-TE, bis-(2-ethylhexyl)phthalate, benzo(b)fluoranthene, DRO, and MTBE.
- Lower aquifer: Dissolved cadmium, dissolved cobalt, dissolved iron, dissolved manganese, dissolved nickel, total arsenic, total cadmium, total cobalt, total iron, total manganese, total thallium, DRO, and MTBE.

## 4.4 Background Evaluation Results for Pore Water

### 4.4.1 Identification of Pore Water COPCs

Pore water COPCs were selected for evaluation using the process outlined in Section 3.1. Only ecological screening values were used because pore water is not evaluated in the BHHRA. The selected screening levels are chronic surface water screening levels. The resulting list of constituents includes three dissolved phase metals (barium, iron, and manganese), one total recoverable phase metal (iron), and pyrene.

**Table 4-17** presents the rationale for selecting constituents based on the criteria described above for sediment, including whether or not each constituent was detected in background pore water samples. For those constituents detected in background, the maximum detected concentration in Site pore water samples is presented in **Table 4-17** and compared to the applicable surface water screening level. When the maximum detected concentration was less than the screening level, the constituent was not selected for inclusion in the background evaluation. When the maximum detected concentration was greater than the screening level, the constituent was selected for inclusion in the background evaluation.

### 4.4.2 Boxplot Comparisons of Pore Water in Site and Background

Site and background pore water concentrations were compared for the COPCs identified above in boxplots in **Attachment F**. Due to the small number of samples available for background pore water (n = 5), statistical comparisons were not conducted. Concentrations of dissolved barium, dissolved and total iron, and dissolved manganese in the five reference samples ranged higher than in the 15 Site pore water samples. The median of reference concentrations was greater than the Site median, and in some cases the Site IQR, for all metals. The Site IQR for pyrene ranged slightly higher than reference; these results appear to be driven by one high pyrene concentration measured in a Site sample. Aside from this one elevated concentration, the remainder of Site concentrations overlapped with the range of reference concentrations.

A comparison of metals concentrations detected in Site and reference pore water samples collected by Pepco and in samples collected by DOEE in Site and background areas are presented in boxplots in **Attachment F**. DOEE pore water samples include five samples collected in the Waterside Investigation Area and three samples collected upstream in the area consistent with the sediment background area. The same trend observed above in which background metals concentrations ranged higher than Site was also observed for the DOEE Site and background pore water data. For all four metals (dissolved barium, dissolved manganese, and total and dissolved iron), background concentrations were higher than Site, and in the case of dissolved iron, the background median was higher than the Site median.

### 4.5 Background Evaluation for Fish Tissue

As detailed in Section 2.5, the BHHRA and BERA (Appendices AA and BB of the RI Report, respectively) both incorporated regional fish tissue data to evaluate potential risks to human health and the environment. A summary of the results of the regional fish tissue evaluations presented in the BHHRA and BERA are provided in the sections below.

#### 4.5.1 Fish Tissue Evaluation – BHHRA

**Attachment G** provides a graphical comparison of fish fillet tissue concentrations between the Study Area reaches and the background reaches. The reaches are:

- Upper Anacostia River Area (upstream of the CSX bridge); including the Waterside Investigation Area
- Lower Anacostia River Area (downstream of the CSX bridge); downstream of the Site
- Upper Potomac River (upstream of the 14th Street bridge)
- Lower Potomac River (downstream of the 14th street bridge)
- Upstream non-tidal Anacostia River (north of the Maryland state line)

Fillet fish tissue concentrations are highest in the Upper Potomac River and lowest in the upstream non-tidal Anacostia River. Concentrations in the tidal Anacostia fall within the range of concentrations in the reference areas (i.e., Upper Potomac at the high end and non-tidal Anacostia at the low end).

### 4.5.2 Fish Tissue Evaluation – BERA

In the BERA, a comparison of whole body fish tissue concentrations for several COPCs was conducted between fish tissue samples collected in the vicinity of the Study Area (i.e., samples collected by Tetra Tech [2018] from Exposure Unit 3, which is an approximately 2.8-mile area centered on the Study Area) to samples collected downstream (i.e., downstream of the CSX bridge) and upstream (i.e., upstream of the Kenilworth Park Landfill) of the Study Area. This comparison indicates that the range of fish tissue concentrations detected in samples collected in the vicinity of the Study Area are generally similar to ranges of concentrations detected in fish tissue samples collected downstream and upstream of the Study Area (**Attachment G**).

## 4.6 Background Evaluation Results for Surface Water

The Preliminary Background Evaluation presented an evaluation of surface water data collected at Site and Site-specific background sampling locations in 2013 and is included in **Attachment B**. Because no potential for risk was determined for surface water exposure in the Preliminary BERA, and Site and Site-specific background surface water concentrations were found to be consistent in the Preliminary Background Evaluation, surface water data and related exposure pathways were not identified as a data gap that required further evaluation and data collection. Therefore, additional surface water samples were not collected in the Waterside Investigation Area or at Site-specific background locations in 2017.

The background surface water data and the population test results are presented in Tables 1 and 2 of **Attachment B**. Four constituents were identified as COPCs in surface water based on the results of the Preliminary BERA: barium (dissolved), 4,4'-DDT, anthracene, and pyrene. Box plots comparing the Waterside Investigation Area and Site-specific background surface water concentrations of these COPCs are presented in **Attachment B**. The conclusions for these four COPCs are that Site concentrations are consistent with background concentrations.

- Based on the population test and boxplot comparisons, Site concentrations of dissolved barium were found to be consistent with background.
- Site concentrations of 4,4'-DDT were found to be similar to background (e.g., the mean concentration of 4,4'-DDT in Study Area surface water was the same as its site-specific BTV).
- The boxplot comparisons for anthracene and pyrene illustrate that the IQRs of these COPCs in Waterside Investigation Area surface water are comparable to Site-specific background. The

mean Site concentration of pyrene is below its Site-specific BTV (a BTV was not calculated for anthracene).

# 5 Summary of Background Evaluation

Based on the quantitative statistics comparing Site and Site-specific background concentrations detected in soil, sediment, groundwater, and surface water samples, Site concentrations of the following COPCs were determined to be less than or consistent with background:

| Media | COPCs for which Site Concentrations are Less Than or Equal to Site-Specific Background |
|---|---|
| Soil | Arsenic, chromium, cobalt, nickel, lead (surface and subsurface), manganese (surface and subsurface), thallium, benzo(a)pyrene (surface), indeno(1,2,3-cd)pyrene (surface), BAP-TE (surface), and TCDD TEQ HH (subsurface) |
| Sediment | Aluminum, manganese, chlordane, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, total HMW PAHs (8270), and OCDD |
| Groundwater | Upper aquifer: Dissolved cadmium, dissolved cobalt, dissolved iron, dissolved manganese, dissolved nickel, total aluminum, total arsenic, total barium, total beryllium, total cadmium, total chromium, total cobalt, total iron, total lead, total manganese, total nickel, total thallium, total vanadium, total zinc, BAP-TE, bis-(2-ethylhexyl)phthalate, benzo(b)fluoranthene, DRO, and MTBE<br>Lower aquifer: Dissolved cadmium, dissolved cobalt, dissolved iron, dissolved manganese, dissolved nickel, total arsenic, total cadmium, total cobalt, total iron, total manganese, total thallium, DRO, and MTBE |
| Surface Water | Dissolved barium, 4,4'-DDT, anthracene, and pyrene |

The comparison of regional soil concentrations for inorganic COPCs with Site and Site-specific background soil concentrations supports the above findings: Site soil concentrations are comparable to Site-specific background and regional background concentrations.

Quantitative statistics were not performed for pore water, but boxplot comparisons of metals in Site and reference pore water samples illustrate that reference metal concentrations range higher than Site concentrations. Pyrene concentrations appear similar between Site and reference pore water samples, with the Site IQR ranging slightly higher than reference. These results appear to be driven by one high concentration measured in a Site sample. Therefore, the majority of Site and reference pore water concentrations appear consistent.

The boxplot comparisons of regional fish tissue samples, based on the samples that were used in the BHHRA and the BERA, illustrate that concentrations of fish tissue samples collected in the vicinity of the Site are comparable to regional fish tissue concentrations. For the BHHRA, the highest concentrations were detected in fish fillet samples collected in the Potomac River. For the BERA, the range of fish tissue concentrations detected in samples collected in the vicinity of the Waterside Investigation Area (but not within the boundaries of this area) are generally similar to ranges of concentrations detected in fish tissue samples collected downstream and upstream of the Site.

# 6 References

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# Tables

Table 2-1
Site-Specific Background Soil Samples

| Location | Sample Identification | Depth | Sample Date | X | Y |
|---|---|---|---|---|---|
| SOBACK01 | SOBACK0100N | 0 - 1 ft | 2/28/2017 | 1319864.18 | 453387.05 |
| SOBACK01 | SOBACK0103N | 3 - 4 ft | 2/28/2017 | 1319864.18 | 453387.05 |
| SOBACK02 | SOBACK0200N | 0 - 1 ft | 2/28/2017 | 1328627.26 | 447619.60 |
| SOBACK02 | SOBACK0203N | 3 - 4 ft | 2/28/2017 | 1328627.26 | 447619.60 |
| SOBACK03 | SOBACK0300N | 0 - 1 ft | 3/2/2017 | 1329214.24 | 444497.88 |
| SOBACK03 | SOBACK0303N | 3 - 4 ft | 3/2/2017 | 1329214.24 | 444497.88 |
| SOBACK04 | SOBACK0400N | 0 - 1 ft | 4/5/2017 | 1323248.4 | 445546.29 |
| SOBACK04 | SOBACK0403N | 3 - 4 ft | 4/5/2017 | 1323248.4 | 445546.29 |
| SOBACK05 | SOBACK0500N | 0 - 1 ft | 4/5/2017 | 1320831.45 | 447594.39 |
| SOBACK05 | SOBACK0503N | 3 - 4 ft | 4/5/2017 | 1320831.45 | 447594.39 |
| SOBACK06 | SOBACK0600N | 0 - 1 ft | 2/28/2017 | 1320783.913 | 451508.9617 |
| SOBACK06 | SOBACK0603N | 3 - 4 ft | 2/28/2017 | 1320783.913 | 451508.9617 |
| SOBACK07 | SOBACK0700N | 0 - 1 ft | 2/27/2017 | 1321557.439 | 453527.5656 |
| SOBACK07 | SOBACK0703N | 3 - 4 ft | 2/27/2017 | 1321557.439 | 453527.5656 |
| SOBACK08/ DPBACK12 | SOBACK0800N | 0 - 1 ft | 4/5/2017 | 1323513.39 | 446903.48 |
| SOBACK08/ DPBACK12 | SOBACK0803N | 3 - 4 ft | 4/5/2017 | 1323513.39 | 446903.48 |
| SOBACK09 | SOBACK0900N | 0 - 1 ft | 3/6/2017 | 1327403.24 | 447472.6476 |
| SOBACK09 | SOBACK0903N | 3 - 4 ft | 3/6/2017 | 1327403.24 | 447472.6476 |
| SOBACK10 | SOBACK1000N | 0 - 1 ft | 3/3/2017 | 1326882.96 | 440432.871 |
| SOBACK10 | SOBACK1003N | 3 - 4 ft | 3/3/2017 | 1326882.96 | 440432.871 |
| SOBACK11 | SOBACK1100N | 0 - 1 ft | 4/7/2017 | 1325016.99 | 446512.25 |
| SOBACK11 | SOBACK1103N | 3 - 4 ft | 4/7/2017 | 1325016.99 | 446512.25 |
| SOBACK12/DPBACK09 | SOBACK1200N | 0 - 1 ft | 4/4/2017 | 1327368.99 | 451106.18 |
| SOBACK12/DPBACK09 | SOBACK1203N | 3 - 4 ft | 4/4/2017 | 1327368.99 | 451106.18 |
| SOBACK13 | SOBACK1300N | 0 - 1 ft | 4/5/2017 | 1322878.35 | 444258.44 |
| SOBACK13 | SOBACK1303N | 3 - 4 ft | 4/5/2017 | 1322878.35 | 444258.44 |
| SOBACK14 | SOBACK1400N | 0 - 1 ft | 3/3/2017 | 1323622.173 | 453759.4707 |
| SOBACK14 | SOBACK1403N | 3 - 4 ft | 3/3/2017 | 1323622.173 | 453759.4707 |
| SOBACK15 | SOBACK1500N | 0 - 1 ft | 2/27/2017 | 1324917.008 | 454385.1345 |
| SOBACK15 | SOBACK1503N | 3 - 4 ft | 2/27/2017 | 1324917.008 | 454385.1345 |
| SOBACK16 | SOBACK1600N | 0 - 1 ft | 2/27/2017 | 1324848.901 | 455005.0768 |
| SOBACK16 | SOBACK1603N | 3 - 4 ft | 2/27/2017 | 1324848.901 | 455005.0768 |
| SOBACK17/ DPBACK05 | SOBACK1700N | 0 - 1 ft | 2/28/2017 | 1329476.81 | 454066.94 |
| SOBACK17/ DPBACK05 | SOBACK1703N | 3 - 4 ft | 2/28/2017 | 1329476.81 | 454066.94 |
| SOBACK18/ DPBACK13 | SOBACK1800N | 0 - 1 ft | 4/5/2017 | 1321086.38 | 446369.96 |
| SOBACK18/ DPBACK13 | SOBACK1803N | 3 - 4 ft | 4/5/2017 | 1321086.38 | 446369.96 |
| SU-BK-01 | SU-BK-0100N | 0 - 1 ft | 4/4/2017 | 1327237.88 | 454392.00 |
| SU-BK-01 | SU-BK-0103N | 3 - 4 ft | 4/4/2017 | 1327237.88 | 454392.00 |
| SU-BK-02 | SU-BK-0200N | 0 - 1 ft | 4/4/2017 | 1328149.06 | 454777.51 |
| SU-BK-02 | SU-BK-0203N | 3 - 4 ft | 4/4/2017 | 1328149.06 | 454777.51 |

Notes:
ft - feet.
Sources:
Pepco collected Site-specific background soil samples during the Phase II field investigation.

Table 2-2
Regional Background Soil Data

| Site Identification | State | Latitude | Longitude | Date Collected | Land Cover | Land Cover, secondary | Depth (cm) | Arsenic (mg/kg) | Chromium (mg/kg) | Cobalt (mg/kg) | Thallium (mg/kg) | Vanadium (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 444 | MD | 39.3912 | -76.829 | 7/6/2008 | Forested Upland | Deciduous Forest | 0-18 | 15.7 | 3060 | 184 | 0.4 | 114 |
| 2492 | MD | 39.5936 | -77.1964 | 7/6/2008 | Planted/Cultivated | Fallow | 0-20 | 6.8 | 68 | 17.2 | 0.6 | 99 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 0-16 | 4.8 | 38 | 12.3 | 1 | 47 |
| 5564 | MD | 39.4226 | -77.5685 | 7/11/2008 | Planted/Cultivated | Row Crops | 0-10 | 6.1 | 59 | 33.9 | 0.5 | 177 |
| 8892 | MD | 38.7125 | -76.5707 | 7/10/2008 | Planted/Cultivated | Urban/Recreational Grasses | 0-5 | 4 | 15 | 2.3 | 0.2 | 26 |
| 444 | MD | 39.3912 | -76.829 | 7/6/2008 | Forested Upland | Deciduous Forest | 70-78 | 29.3 | 4620 | 316 | 0.2 | 106 |
| 2492 | MD | 39.5936 | -77.1964 | 7/6/2008 | Planted/Cultivated | Fallow | 72-80 | 2.7 | 103 | 21 | 0.6 | 220 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 100-110 | 0.8 | 8 | 13.7 | 1.2 | 30 |
| 5564 | MD | 39.4226 | -77.5685 | 7/11/2008 | Planted/Cultivated | Row Crops | 100-116 | 5.3 | 78 | 23 | 0.5 | 227 |
| 8892 | MD | 38.7125 | -76.5707 | 7/10/2008 | Planted/Cultivated | Urban/Recreational Grasses | 100-120 | 1.7 | 14 | 3.7 | 0.3 | 21 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 100-110 | 0.8 | 63 | 13.5 | 0.2 | 162 |
| 8892 | MD | 38.7125 | -76.5707 | 7/10/2008 | Planted/Cultivated | Urban/Recreational Grasses | 100-120 | 1.7 | 37 | 8.5 | 0.3 | 102 |
| 5564 | MD | 39.4226 | -77.5685 | 7/11/2008 | Planted/Cultivated | Row Crops | 100-116 | 5.3 | 18 | 2.4 | 0.2 | 51 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 100-110 | 0.8 | 18 | 5.6 | 0.9 | 43 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 100-110 | 0.8 | 21 | 10.8 | 0.7 | 76 |
| 4540 | MD | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 100-110 | 0.8 | 5 | 1.7 | 0.1 | 5 |
| 8892 | VA | 38.7125 | -76.5707 | 7/10/2008 | Planted/Cultivated | Urban/Recreational Grasses | 0-5 | 4 | 36 | 21.9 | 0.4 | 96 |
| 8892 | VA | 38.7125 | -76.5707 | 7/10/2008 | Planted/Cultivated | Urban/Recreational Grasses | 0-5 | 4 | 26 | 35.8 | 0.3 | 59 |
| 4540 | VA | 39.1807 | -76.9614 | 7/6/2008 | Planted/Cultivated | Row Crops | 0-16 | 4.8 | 46 | 18.5 | 0.4 | 46 |
| 12476 | VA | 38.7947 | -77.5736 | 5/25/2010 | Forested Upland | Mixed Forest | 0-3 | 7.1 | 38 | 23 | 0.4 | 293 |

Notes:
cm - Centimeter.
MD - Maryland.
mg/kg - Milligrams per kilogram.
VA - Virginia.
Source: Smith et al. (2013)

Table 2-3

Site-specific Background Surficial Sediment Samples

| Location | Sample | Source | Sample Date | Depth Interval (ft) | X coordinate | Y coordinate |
|---|---|---|---|---|---|---|
| SEDBACK4 | SEDBACK400N | Pepco Phase I | 11/14/2013 | 0-0.5 | 1329783.99 | 457920.6 |
| SEDBACK5 | SEDBACK500N | Pepco Phase I | 11/14/2013 | 0-0.5 | 1326967.67 | 454617.45 |
| SEDBACK5 | SEDBACK500R (a) | Pepco Phase I | 11/14/2013 | 0-0.5 | 1326967.67 | 454617.45 |
| SEDBACK6 | SEDBACK600N | Pepco Phase I | 11/15/2013 | 0-0.5 | 1326311.59 | 454054.19 |
| SEDBACK17 | SEDBACK1700N | Pepco Phase II | 6/12/2017 | 0-0.33 | 1329694.41 | 459358.19 |
| SEDBACK18 | SEDBACK1800N | Pepco Phase II | 6/12/2017 | 0-0.33 | 1329623.25 | 456839.3 |
| SEDBACK19 | SEDBACK1900N | Pepco Phase II | 6/13/2017 | 0-0.33 | 1328365.16 | 455288.85 |
| SEDBACK19 | SEDBACK1900R (a) | Pepco Phase II | 6/13/2017 | 0-0.33 | 1328365.16 | 455288.85 |
| SEDBACK20 | SEDBACK2000N | Pepco Phase II | 6/13/2017 | 0-0.33 | 1325556.64 | 454320.61 |
| SEDBACK20 | SEDBACK2000R (a) | Pepco Phase II | 6/13/2017 | 0-0.33 | 1325556.64 | 454320.61 |
| R6-13 | RI-R6-13-SS | DOEE Phase I | 7/31/2014 | 0-0.5 | 1325680.27 | 454441.93 |
| R6-14 | RI-R6-14-SS | DOEE Phase I | 7/31/2014 | 0-0.5 | 1325561.57 | 454482.9899 |
| R6-15 | RI-R6-15-SS | DOEE Phase I | 7/31/2014 | 0-0.5 | 1327436.05 | 454739.1899 |
| R6-16 | RI-R6-16-SS | DOEE Phase I | 7/31/2014 | 0-0.5 | 1327947.38 | 454786.4801 |
| R6-17 | RI-R6-17-SS | DOEE Phase I | 7/31/2014 | 0-0.5 | 1328479.8 | 455285.41 |
| R7-01 | RI-R7-01-SS | DOEE Phase I | 8/1/2014 | 0-0.5 | 1328764.7 | 455633.9699 |
| R7-02 | RI-R7-02-SS | DOEE Phase I | 8/1/2014 | 0-0.5 | 1328552.35 | 455675.1099 |
| R7-03 | RI-R7-03-SS | DOEE Phase I | 8/1/2014 | 0-0.5 | 1329404.71 | 456710.4201 |
| R7-04 | RI-R7-04-SS | DOEE Phase I | 8/1/2014 | 0-0.5 | 1329819.06 | 457201.66 |
| R7-05 | RI-R7-05-SS | DOEE Phase I | 8/6/2014 | 0-0.5 | 1329658.33 | 457255.1599 |
| R7-06 | RI-R7-06-SS | DOEE Phase I | 8/6/2014 | 0-0.5 | 1329860.37 | 458232.44 |
| R7-07 | RI-R7-07-SS | DOEE Phase I | 8/6/2014 | 0-0.5 | 1329695.66 | 458694.86 |
| R7-08 | RI-R7-08-SS | DOEE Phase I | 8/6/2014 | 0-0.5 | 1329646.93 | 459522.3801 |
| R7-09 | RI-R7-09-SS | DOEE Phase I | 8/7/2014 | 0-0.5 | 1329759.94 | 459551.64 |
| R7-10 | RI-R7-10-SS | DOEE Phase I | 8/7/2014 | 0-0.5 | 1329596.58 | 460335.6098 |
| R7-11 | RI-R7-11-SS | DOEE Phase I | 8/7/2014 | 0-0.5 | 1329533.95 | 461040.5001 |
| R7-12 | RI-R7-12-SS | DOEE Phase I | 8/7/2014 | 0-0.5 | 1329801.3 | 461188.57 |
| R6-51 | P2-R6-51-SS | DOEE Phase II | 6/9/2016 | 0-0.5 | 1328488.39 | 455208.1499 |
| R7-27 | P2-R7-27-SS | DOEE Phase II | 6/9/2016 | 0-0.5 | 1329659.24 | 457231.2101 |
| R7-28 | P2-R7-28-SS | DOEE Phase II | 6/24/2016 | 0-0.5 | 1329661.24 | 457325.6899 |
| R7-32 | P2-R7-32-SS | DOEE Phase II | 6/9/2016 | 0-0.5 | 1329619.66 | 460404.4899 |
| R7-34 | P2-R7-34-SS | DOEE Phase II | 6/24/2016 | 0-0.5 | 1329517.35 | 460583.0899 |
| R7-35 | P2-R7-35-SC-0.00-0.50 | DOEE Phase II | 7/22/2016 | 0-0.5 | 1329501.93 | 460671.2498 |
| R7-38 | P2-R7-38-SS | DOEE Phase II | 6/24/2016 | 0-0.5 | 1329810.53 | 461246.5699 |

Notes:

ft - Feet.

(a) Field duplicate.

Sources:

Pepco collected Site-specific background sediment samples during the Phase I and Phase II field investigations.

Sediment samples were collected by Tetra Tech on behalf of DOEE to support Phase I and Phase II of the Anacostia River Sediment Project.

Table 2-4

Site-specific Background Groundwater Samples

| Location | Sample Identification | Depth | Sample Date | X | Y |
|---|---|---|---|---|---|
| DPBACK01 | DPWBACK0105-09N | 5 - 9 ft | 3/7/2017 | 1324538.28 | 442393.07 |
| DPBACK04 | DPWBACK0420-24N | 20 - 24 ft | 8/22/2017 | 1323248.40 | 445546.29 |
| DPBACK05 | DPWBACK0513-17N | 13 - 17 ft | 3/2/2017 | 1329476.81 | 454066.94 |
| DPBACK09 | DPWBACK0916-20N | 16 - 20 ft | 4/18/2017 | 1327368.99 | 451106.18 |
| DPBACK10 | DPWBACK1016-20N | 16 - 20 ft | 8/30/2017 | 1320862.14 | 445123.10 |
| DPBACK10 | DPWBACK1042-46N | 42 - 46 ft | 8/30/2017 | 1320862.14 | 445123.10 |
| DPBACK12 | DPWBACK1221-25N | 21 - 25 ft | 4/18/2017 | 1323513.39 | 446903.48 |
| DPBACK13 | DPWBACK1306-10N | 6 - 10 ft | 4/19/2017 | 1321086.38 | 446369.96 |
| DPBACK13 | DPWBACK1341-45N | 41 - 45 ft | 4/20/2017 | 1321086.38 | 446369.96 |
| DPBACK14 | DPWBACK1415-19N | 15 - 19 ft | 3/8/2017 | 1328627.63 | 446794.67 |
| DPBACK15 | DPWBACK1524-28N | 24 - 28 ft | 8/28/2017 | 1320831.45 | 447594.39 |
| DPBACK15 | DPWBACK1550-54N | 50 - 54 ft | 8/28/2017 | 1320831.45 | 447594.39 |
| DPBACK16 | DPWBACK1620-24N | 20 - 24 ft | 8/29/2017 | 1320555.10 | 444160.27 |
| DPBACK16 | DPWBACK1640-44N | 40 - 44 ft | 8/29/2017 | 1320555.10 | 444160.27 |

Notes:
ft - Feet.
Sources:
Pepco collected Site-specific background groundwater samples during the Phase II field investigation.

**Table 2-5**
**Site-specific Background Porewater Samples**

| Location | Sample | Source | Sample Date | X coordinate | Y coordinate |
|---|---|---|---|---|---|
| SEDBACK16 | PWBACK1600N | Pepco | 6/12/2017 | 1329539.61 | 461605.35 |
| SEDBACK17 | PWBACK1700N | Pepco | 6/12/2017 | 1329694.41 | 459358.19 |
| SEDBACK18 | PWBACK1800N | Pepco | 6/12/2017 | 1329623.25 | 456839.3 |
| SEDBACK19 | PWBACK1900N | Pepco | 6/13/2017 | 1328365.16 | 455288.85 |
| SEDBACK19 | PWBACK1900R (a) | Pepco | 6/13/2017 | 1328365.16 | 455288.85 |
| SEDBACK20 | PWBACK2000N | Pepco | 6/13/2017 | 1325556.64 | 454320.61 |

Notes:
(a) Field duplicate.
Sources:
Pepco collected Site-specific background pore water samples during the Phase II field investigation.

**Table 2-6**
**Fish Tissue Samples Used in the BHHRA**

| Sample Area | Sample ID | Species | Sample Date | Sample Type | Task Code |
|---|---|---|---|---|---|
| Lower Tidal Anacostia | LAAE01 | American eel | 9/26/2013 | N | USFWS/Pinkney |
| | LABC01 | Blue catfish | 9/26/2013 | N | USFWS/Pinkney |
| | LACA01 | Carp | 9/26/2013 | N | USFWS/Pinkney |
| | LACC01 | Channel catfish | 9/26/2013 | N | USFWS/Pinkney |
| | LALB01 | Largemouth bass | 9/26/2013 | N | USFWS/Pinkney |
| | LASF01 | Sunfish | 9/26/2013 | N | USFWS/Pinkney |
| Upper Tidal Anacostia | UABB01 | Brown bullhead | 9/26/2013 | N | USFWS/Pinkney |
| | UABC01 | Blue catfish | 9/26/2013 | N | USFWS/Pinkney |
| | UACA01 | Carp | 9/26/2013 | N | USFWS/Pinkney |
| | UACC01 | Channel catfish | 9/26/2013 | N | USFWS/Pinkney |
| | UALB01 | Largemouth bass | 9/26/2013 | N | USFWS/Pinkney |
| | UANS01 | Northern snakehead | 9/26/2013 | N | USFWS/Pinkney |
| | UASF01 | Sunfish | 9/23/2013 | N | USFWS/Pinkney |
| Lower Potomac | LPAE01 | American eel | 9/23/2013 | N | USFWS/Pinkney |
| | LPAE02 | American eel | 9/23/2013 | N | USFWS/Pinkney |
| | LPAS01 | American shad | 4/30/2013 | N | USFWS/Pinkney |
| | LPBB01 | Brown bullhead | 9/23/2013 | N | USFWS/Pinkney |
| | LPBC01 | Blue catfish | 9/30/2013 | N | USFWS/Pinkney |
| | LPCA01 | Carp | 9/23/2013 (M)<br>9/26/2016 (O) | N | USFWS/Pinkney |
| | LPCC01 | Channel catfish | 9/23/2013 | N | USFWS/Pinkney |
| | LPLB01 | Largemouth bass | 9/23/2013 | N | USFWS/Pinkney |
| | LPSF01 | Sunfish | 9/23/2013 (M)<br>9/26/2016 (O) | N | USFWS/Pinkney |
| Upper Potomac | UPAE01 | American eel | 9/24/2013 | N | USFWS/Pinkney |
| | UPBB01 | Brown bullhead | 9/24/2013 | N | USFWS/Pinkney |
| | UPCA01 | Carp | 9/24/2013 | N | USFWS/Pinkney |
| | UPCC01 | Channel catfish | 9/24/2013 | N | USFWS/Pinkney |
| | UPLB01 | Largemouth bass | 9/24/2013 | N | USFWS/Pinkney |
| | UPNS01 | Northern snakehead | 5/13/2013 | N | USFWS/Pinkney |
| | UPSB01 | Striped bass | 5/9/2013 | N | USFWS/Pinkney |
| | UPSF01 | Sunfish | 9/24/2013 | N | USFWS/Pinkney |
| | UPWP01 | White perch | 5/9/2013 | N | USFWS/Pinkney |
| Upstream Non-Tidal Anacostia - Indian Creek | P2-IC-008-GTA | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| | P2-IC-009-GT1A | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| | P2-IC-009-GT2A | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| | P2-IC-010-GT1A | Striped bass | 8/12/2016 | N | DOEE Phase 2 |
| | P2-IC-010-GT2A | Striped bass | 8/12/2016 | N | DOEE Phase 2 |
| | P2-IC-010-GT3A | Striped bass | 8/12/2016 | N | DOEE Phase 2 |

**Table 2-6**
**Fish Tissue Samples Used in the BHHRA**

| Sample Area | Sample ID | Species | Sample Date | Sample Type | Task Code |
|---|---|---|---|---|---|
| Upstream Non-Tidal Anacostia - Northeast Branch | P2-NEB-007-GTA | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| | P2-NEB-011-GTA | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| | P2-NEB-012-GTA | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |
| Upstream Non-Tidal Anacostia - Northwest Branch | P2-NWB-001-GT1A | Largemouth bass | 8/8/2016 | N | DOEE Phase 2 |
| | P2-NWB-001-GT2A | Largemouth bass | 8/8/2016 | N | DOEE Phase 2 |
| | P2-NWB-002-GT1A | Largemouth bass | 8/9/2016 | N | DOEE Phase 2 |
| | P2-NWB-200-GTA | Largemouth Bass | 8/9/2016 | FD (a) | DOEE Phase 2 |
| | P2-NWB-002-GT2A | Largemouth bass | 8/9/2016 | N | DOEE Phase 2 |
| | P2-NWB-002-GT3A | Largemouth bass | 8/9/2016 | N | DOEE Phase 2 |
| | P2-NWB-003-GTA | Northern snakehead | 8/16/2016 | N | DOEE Phase 2 |
| | P2-NWB-004-GT1A | Largemouth bass | 8/12/2016 | N | DOEE Phase 2 |
| | P2-NWB-004-GT2A | Largemouth bass | 8/12/2016 | N | DOEE Phase 2 |
| | P2-NWB-013-GT1A | Largemouth bass | 8/10/2016 | N | DOEE Phase 2 |
| | P2-NWB-013-GT2A | Largemouth bass | 8/10/2016 | N | DOEE Phase 2 |
| | P2-NWB-013-GT3A | Largemouth bass | 8/10/2016 | N | DOEE Phase 2 |
| | P2-NWB-014-GTA | Smallmouth bass | 8/4/2016 | N | DOEE Phase 2 |
| | P2-NWB-015-GTA | Smallmouth bass | 8/5/2016 | N | DOEE Phase 2 |
| | P2-NWB-016-GTA | Smallmouth bass | 8/4/2016 | N | DOEE Phase 2 |
| | P2-NWB-017-GTA | Smallmouth bass | 8/4/2016 | N | DOEE Phase 2 |
| | P2-NWB-018-GT1A | Smallmouth bass | 8/4/2016 | N | DOEE Phase 2 |
| | P2-NWB-018-GT2A | Smallmouth bass | 8/4/2016 | N | DOEE Phase 2 |
| Upstream Non-Tidal Anacostia - Paint Branch | P2-PB-005-GT1A | Largemouth bass | 8/15/2016 | N | DOEE Phase 2 |
| | P2-PB-005-GT2A | Largemouth bass | 8/15/2016 | N | DOEE Phase 2 |
| | P2-PB-006-GTA | Largemouth bass | 8/3/2016 | N | DOEE Phase 2 |

**Notes:**
FD = Field Duplicate
M = Metals
N = Normal sample
O = Organics
(a) - Duplicate of P2-NWB-002-GT1A.

Source: Pinkney (2017) and DOEE Phase 2 of the Anacostia River Sediment Project (TetraTech, 2018).

Table 2-7
Fish Tissue Samples Selected for BERA

| Area | Sample Identification | Species | Sample Date | X Coordinate | Y Coordinate |
|---|---|---|---|---|---|
| Site Vicinity | RI-KL-FT-16-GF | STS | 12/30/2014 | 1320983.4 | 443723.3 |
| Site Vicinity | RI-KL-FT-16-GM | PKS | 1/15/2015 | 1320983.4 | 443723.3 |
| Site Vicinity | RI-KL-FT-16-GT | LMB | 1/14/2015 | 1320983.4 | 443723.3 |
| Site Vicinity | RI-KL-FT-18-GF | ESM, PKS, STS, CCS | 12/30/2014 | 1322132.6 | 445637.5 |
| Site Vicinity | RI-KL-FT-18-GM | BG | 1/19/2015 | 1322132.6 | 445637.5 |
| Site Vicinity | RI-KL-FT-18-GT | LMB | 1/19/2015 | 1322132.6 | 445637.5 |
| Site Vicinity | RI-KL-FT-20-GF | BKF, STS, ESM, PKS | 1/20/2015 | 1321590.3 | 446817.5 |
| Site Vicinity | RI-KL-FT-20-GM | PKS, BG | 1/8/2015 | 1321590.3 | 446817.5 |
| Site Vicinity | RI-KL-FT-20-GT | LMB | 1/23/2015 | 1321590.3 | 446817.5 |
| Site Vicinity | RI-KL-FT-21-GF | GS, ESM, STS, PKS | 12/29/2014 | 1322217.3 | 446970.4 |
| Site Vicinity | RI-KL-FT-21-GM | PKS | 12/30/2014 | 1322217.3 | 446970.4 |
| Site Vicinity | RI-KL-FT-21-GT | LMB | 1/13/2015 | 1322217.3 | 446970.4 |
| Site Vicinity | RI-KL-FT-23-GF | STS, ESM | 1/15/2015 | 1322038.7 | 448853.3 |
| Site Vicinity | RI-KL-FT-23-GM | PKS | 1/7/2015 | 1322038.7 | 448853.3 |
| Site Vicinity | RI-KL-FT-24-GF | STS, ESM | 1/20/2015 | 1322451.2 | 449831.1 |
| Site Vicinity | RI-KL-FT-24-GM | PKS | 1/19/2015 | 1322451.2 | 449831.1 |
| Site Vicinity | RI-KL-FT-24-GT | LMB | 1/19/2015 | 1322451.2 | 449831.1 |
| Site Vicinity | RI-KL-FT-25-GF | ESM, GS, STS | 12/29/2014 | 1323249.1 | 450804.8 |
| Site Vicinity | RI-KL-FT-25-GM | PKS, BG | 1/12/2015 | 1323249.1 | 450804.8 |
| Site Vicinity | RI-KL-FT-25-GT | LMB | 1/23/2015 | 1323249.1 | 450804.8 |
| Site Vicinity | RI-KL-FT-26-GF | ESM | 1/5/2015 | 1323203.4 | 451713.1 |
| Site Vicinity | RI-KL-FT-27-GF | ESM | 1/23/2015 | 1324121.1 | 451881.1 |
| Site Vicinity | RI-KL-FT-27-GM | PKS | 1/25/2015 | 1324121.1 | 451881.1 |
| Site Vicinity | RI-KL-FT-27-GT | LMB | 1/13/2015 | 1324121.1 | 451881.1 |
| Site Vicinity | RI-R4-FT-15-GF | GS, ESM, TD, BKF, STS, WP, PKS, GSF | 12/30/2014 | 1320520.6 | 442831.2 |
| Site Vicinity | RI-R4-FT-15-GM | PKS | 12/30/2014 | 1320520.6 | 442831.2 |
| Site Vicinity | RI-R4-FT-15-GT | LMB | 1/25/2015 | 1320520.6 | 442831.2 |
| Site Vicinity | RI-R4-FT-17-GF | STS, ESM, WP, PKS | 12/30/2014 | 1322409.5 | 444121.5 |
| Site Vicinity | RI-R4-FT-17-GM | BG | 1/15/2015 | 1322409.5 | 444121.5 |
| Site Vicinity | RI-R4-FT-17-GT | BC | 1/25/2015 | 1322409.5 | 444121.5 |
| Site Vicinity | RI-R5-FT-19-GF | STS | 12/30/2014 | 1322699.6 | 445589.4 |
| Site Vicinity | RI-R5-FT-19-GM | PKS | 1/7/2015 | 1322699.6 | 445589.4 |
| Site Vicinity | RI-R5-FT-19-GT | LMB | 1/15/2015 | 1322699.6 | 445589.4 |
| Site Vicinity | RI-R5-FT-22-GF | ESM, STS | 1/19/2015 | 1322995.4 | 446761.4 |
| Site Vicinity | RI-R5-FT-22-GM | BG, PKS | 1/15/2015 | 1322995.4 | 446761.4 |
| Site Vicinity | RI-R5-FT-22-GT | LMB | 1/14/2015 | 1322995.4 | 446761.4 |
| Site Vicinity | RI-R6-FT-28-GF | STS, BKF, GS, ESM, PKS, BG, RSF | 12/29/2014 | 1325408.2 | 453913.0 |
| Site Vicinity | RI-R6-FT-28-GM | BG | 1/20/2015 | 1325408.2 | 453913.0 |
| Site Vicinity | RI-R6-FT-28-GT | LMB | 1/13/2015 | 1325408.2 | 453913.0 |
| Site Vicinity | RI-R6-FT-29-GF | STS, BKF, ESM | 1/20/2015 | 1326248.7 | 454536.5 |
| Site Vicinity | RI-R6-FT-29-GM | BG | 1/8/2015 | 1326248.7 | 454536.5 |
| Site Vicinity | RI-R6-FT-29-GT | LMB | 1/14/2015 | 1326248.7 | 454536.5 |
| Site Vicinity | RI-R6-FT-30-GF | ESM, STS | 12/29/2014 | 1326347.9 | 454123.2 |
| Site Vicinity | RI-R6-FT-30-GM | PKS | 1/7/2015 | 1326347.9 | 454123.2 |
| Site Vicinity | RI-R6-FT-30-GT | LMB | 1/23/2015 | 1326347.9 | 454123.2 |
| Site Vicinity | RI-R6-FT-31-GF | ESM | 12/29/2014 | 1328440.2 | 455288.3 |
| Site Vicinity | RI-R6-FT-31-GM | BG, RSF | 1/8/2015 | 1328440.2 | 455288.3 |
| Site Vicinity | RI-R6-FT-31-GT | LMB | 1/8/2015 | 1328440.2 | 455288.3 |
| Upstream | RI-R7-FT-32-GF | ESM | 12/29/2014 | 1328510.0 | 455662.2 |
| Upstream | RI-R7-FT-32-GM | BG | 1/15/2015 | 1328510.0 | 455662.2 |
| Upstream | RI-R7-FT-32-GT | SH | 1/20/2015 | 1328510.0 | 455662.2 |
| Upstream | RI-R7-FT-33-GF | ESM | 12/22/2014 | 1329621.9 | 457087.9 |
| Upstream | RI-R7-FT-33-GM | BG | 1/12/2015 | 1329621.9 | 457087.9 |
| Upstream | RI-R7-FT-33-GT | LMB | 1/7/2015 | 1329621.9 | 457087.9 |
| Upstream | RI-R7-FT-34-GF | GS, STS, ESM | 12/22/2014 | 1329863.6 | 458281.9 |
| Upstream | RI-R7-FT-34-GM | BG | 1/8/2015 | 1329863.6 | 458281.9 |
| Upstream | RI-R7-FT-34-GT | LMB | 1/13/2015 | 1329863.6 | 458281.9 |
| Upstream | RI-R7-FT-35-GF | GS, MMC, STS, BKF, PKS, BG | 12/22/2014 | 1329794.3 | 458988.4 |
| Upstream | RI-R7-FT-35-GM | BG | 1/7/2015 | 1329794.3 | 458988.4 |
| Upstream | RI-R7-FT-35-GT | LMB | 1/14/2015 | 1329794.3 | 458988.4 |
| Upstream | RI-R7-FT-36-GF | EMF, RSF, BG, PKS, STS | 12/22/2014 | 1329544.8 | 460143.9 |
| Upstream | RI-R7-FT-36-GM | BG | 1/12/2015 | 1329544.8 | 460143.9 |

Table 2-7
Fish Tissue Samples Selected for BERA

| Area | Sample Identification | Species | Sample Date | X Coordinate | Y Coordinate |
|---|---|---|---|---|---|
| Upstream | RI-R7-FT-36-GT | LMB | 1/23/2015 | 1329544.8 | 460143.9 |
| Upstream | RI-R7-FT-37-GF | PKS, BG, MMC, STS, ESM | 12/22/2014 | 1329816.9 | 461305.6 |
| Upstream | RI-R7-FT-37-GM | PKS, BG, RSF | 1/8/2015 | 1329816.9 | 461305.6 |
| Upstream | RI-R7-FT-37-GT | SMB | 1/7/2015 | 1329816.9 | 461305.6 |
| Upstream | RI-R7-FT-38-GF | ESM, BKF | 12/22/2014 | 1329784.1 | 461578.7 |
| Upstream | RI-R7-FT-38-GM | PKS, BG | 1/8/2015 | 1329784.1 | 461578.7 |
| Upstream | RI-R7-FT-38-GT | LMB | 1/13/2015 | 1329784.1 | 461578.7 |
| Upstream | RI-R7-FT-39-GF | BKF, MMC, BNM, PKS, QB | 1/8/2015 | 1329743.2 | 461716.9 |
| Upstream | RI-R7-FT-39-GM | PKS, BG | 1/7/2015 | 1329743.2 | 461716.9 |
| Upstream | RI-R7-FT-39-GT | LMB | 1/19/2015 | 1329743.2 | 461716.9 |
| Upstream | RI-R7-FT-40-GF | PKS, EMF, MMC, MMC, BKF | 12/22/2014 | 1329253.3 | 462521.7 |
| Upstream | RI-R7-FT-40-GM | PKS | 1/19/2015 | 1329253.3 | 462521.7 |
| Upstream | RI-R7-FT-40-GT | LMB | 1/23/2015 | 1329253.3 | 462521.7 |
| Upstream | RI-R7-FT-41-GF | BKF, MMC | 12/22/2014 | 1329280.3 | 462778.2 |
| Upstream | RI-R7-FT-41-GM | PKS | 1/8/2015 | 1329280.3 | 462778.2 |
| Upstream | RI-R7-FT-41-GT | LMB | 1/8/2015 | 1329280.3 | 462778.2 |
| Upstream | RI-R7-FT-42-GF | ESM, BKF, PKS, TD, MMC, STS | 12/22/2014 | 1328617.5 | 463220.3 |
| Upstream | RI-R7-FT-42-GM | PKS | 1/12/2015 | 1328617.5 | 463220.3 |
| Upstream | RI-R7-FT-42-GT | LMB | 1/14/2015 | 1328617.5 | 463220.3 |
| Upstream | RI-R7-FT-43-GF | STS, BKF, ESM, MMC | 12/22/2014 | 1328075.7 | 463842.8 |
| Upstream | RI-R7-FT-43-GM | RSF | 1/12/2015 | 1328075.7 | 463842.8 |
| Upstream | RI-R7-FT-43-GT | LMB | 1/6/2015 | 1328075.7 | 463842.8 |
| Upstream | RI-R7-FT-44-GF | BKF, MMC, TD, GSF, BG | 12/22/2014 | 1328155.4 | 464340.4 |
| Upstream | RI-R7-FT-44-GM | PKS | 1/8/2015 | 1328155.4 | 464340.4 |
| Upstream | RI-R7-FT-44-GT | LMB | 1/6/2015 | 1328155.4 | 464340.4 |
| Upstream | RI-R7-FT-45-GF | GSF, RSF, PKS, BG | 12/22/2014 | 1327932.8 | 465251.1 |
| Upstream | RI-R7-FT-45-GM | RSF | 1/15/2015 | 1327932.8 | 465251.1 |
| Upstream | RI-R7-FT-45-GT | LMB | 1/15/2015 | 1327932.8 | 465251.1 |
| Upstream | RI-R7-FT-46-GF | MMC | 12/22/2014 | 1328778.8 | 465398.4 |
| Upstream | RI-R7-FT-46-GM | RSF | 1/12/2015 | 1328778.8 | 465398.4 |
| Upstream | RI-R7-FT-46-GT | LMB | 12/30/2014 | 1328778.8 | 465398.4 |
| Downstream | RI-R1-FT-07-GF | STS, GSF, BG, BKF | 1/19/2015 | 1308961.0 | 434653.5 |
| Downstream | RI-R1-FT-07-GM | YP | 1/20/2015 | 1308961.0 | 434653.5 |
| Downstream | RI-R1-FT-07-GT | LMB | 1/26/2015 | 1308961.0 | 434653.5 |
| Downstream | RI-R1-FT-08-GF | BKF, TD, STS, ESM, ISS | 1/5/2015 | 1308965.1 | 435883.7 |
| Downstream | RI-R1-FT-08-GM | YP | 1/15/2015 | 1308965.1 | 435883.7 |
| Downstream | RI-R1-FT-08-GT | LMB | 1/15/2015 | 1308965.1 | 435883.7 |
| Downstream | RI-R1-FT-09-GF | STS | 1/5/2015 | 1310223.9 | 437751.3 |
| Downstream | RI-R1-FT-09-GM | YP | 1/5/2015 | 1310223.9 | 437751.3 |
| Downstream | RI-R1-FT-09-GT | LMB | 1/14/2015 | 1310223.9 | 437751.3 |
| Downstream | RI-R1-FT-10-GF | RSF, GSF, ESM, PKS, BKF, STS | 1/5/2015 | 1311092.2 | 437267.2 |
| Downstream | RI-R1-FT-10-GM | YP | 1/5/2015 | 1311092.2 | 437267.2 |
| Downstream | RI-R1-FT-10-GT | LMB | 1/23/2015 | 1311092.2 | 437267.2 |
| Downstream | RI-R3-FT-11-GF | GS, STS, LMB, PKS, WP | 1/5/2015 | 1317293.8 | 440607.7 |
| Downstream | RI-R3-FT-11-GM-A | YP | 1/5/2015 | 1317293.8 | 440607.7 |
| Downstream | RI-R3-FT-11-GM-B | BG | 1/8/2015 | 1317293.8 | 440607.7 |
| Downstream | RI-R3-FT-11-GT | LMB | 1/13/2015 | 1317293.8 | 440607.7 |
| Downstream | RI-R3-FT-12-GF | STS, PKS, BKF | 12/30/2014 | 1318810.8 | 440473.6 |
| Downstream | RI-R3-FT-12-GM | BG | 1/7/2015 | 1318810.8 | 440473.6 |
| Downstream | RI-R3-FT-12-GT | SB | 1/13/2015 | 1318810.8 | 440473.6 |
| Downstream | RI-R3-FT-13-GF | STS, GS | 1/5/2015 | 1319607.7 | 441397.8 |
| Downstream | RI-R3-FT-13-GM | PKS | 1/7/2015 | 1319607.7 | 441397.8 |
| Downstream | RI-R3-FT-13-GT | LMB | 1/13/2015 | 1319607.7 | 441397.8 |
| Downstream | RI-R3-FT-14-GF | STS, PKS, BG, BKF, RSF, WP, GSF | 12/30/2014 | 1320665.3 | 441868.1 |
| Downstream | RI-R3-FT-14-GM | BG | 1/7/2015 | 1320665.3 | 441868.1 |
| Downstream | RI-R3-FT-14-GT | LMB | 1/14/2015 | 1320665.3 | 441868.1 |

Notes:
The fish tissue samples were collected by Tetra Tech on behalf of DOEE for the ARSP (Tetra Tech, 2018). No fish tissue samples were collected within the Waterside Investigation Area. Therefore, fish tissue samples collected within Exposure Unit 3 (EU3), which is a sampling area defined by Tetra Tech extending from the CSX bridge to New York Avenue, and also Kingman Lake were selected to represent tissue samples in the "Site Vicinity". "Upstream" samples were collected upstream of New York Avenue. "Downstream" samples were collected downstream of the CSX bridge.
The fish tissue samples were composited according to trophic level: forage fish (identified as "-GF" in the sample name), mid-level trophic fish ("GM"),

Table 2-7
Fish Tissue Samples Selected for BERA

| Area | Sample Identification | Species | Sample Date | X Coordinate | Y Coordinate |
|---|---|---|---|---|---|

and top-level or predator fish ("GT").
Species:

| | | |
|---|---|---|
| BKF Banded killfish | ISS Inland silverside | SMB Smallmouth bass |
| BC Black crappie | LMB Largemouth bass | SH Snakehead |
| BG Bluegill | MMC Mummichog | STS Spottail shiner |
| BNM Blunt nose minnow | SB Striped bass | CCS Creek chubsucker |
| EMF Eastern mosquitofish | PKS Pumpkinseed | TD Tessellated Darter |
| ESM Eastern silvery minnow | QB Quillback | GS Golden shiner |
| RSF Redbreast sunfish | WP White perch | |
| GSF Green sunfish | YP Yellow perch | |

**Table 4-1**
**List of Constituents for Background Evaluation for Soil**

| List of Soil COPCs |
|---|
| Arsenic |
| Chromium |
| Cobalt |
| Lead |
| Manganese |
| Nickel |
| Thallium |
| Vanadium |
| BAP-TE |
| Benzo(a)anthracene |
| Benzo(a)pyrene |
| Benzo(b)fluoranthene |
| Dibenzo(a,h)anthracene |
| Indeno(1,2,3-cd)pyrene |
| Naphthalene |
| PCB, Total Aroclors |
| 2,3,7,8-TCDD |
| TCDD TEQ HH |
| Diesel Range Organics (C10-C20) |
| Oil Range Organics (C20-C36) |

Table 4-2
Rationale for List of COPCs for Background Evaluation for Soil

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| Inorganics | | | | | | | |
| SW6020A | Aluminum | mg/kg | Yes | 110000 | 37000 | No | -- |
| SW6020A | Antimony | mg/kg | Yes | 47 | 11 | No | -- |
| SW6020A | Arsenic | mg/kg | Yes | 3 | 190 | Yes | X |
| SW6020A | Barium | mg/kg | Yes | 22000 | 2400 | No | -- |
| SW6020A | Beryllium | mg/kg | Yes | 230 | 1.9 | No | -- |
| SW6020A | Cadmium | mg/kg | Yes | 98 | 7.1 | No | -- |
| SW6020A | Calcium | mg/kg | Yes | EN | -- | -- | -- |
| SW6020A | Chromium | mg/kg | Yes | 6.3 | 400 | Yes | X |
| SW6020A | Cobalt | mg/kg | Yes | 35 | 240 | Yes | X |
| SW6020A | Copper | mg/kg | Yes | 4700 | 2700 | No | -- |
| SW6020A | Iron | mg/kg | Yes | 82000 | 78000 | No | -- |
| SW6020A | Lead | mg/kg | Yes | 800 | 5400 | Yes | X |
| SW6020A | Magnesium | mg/kg | Yes | EN | -- | -- | -- |
| SW6020A | Manganese | mg/kg | Yes | 2600 | 6600 | Yes | X |
| SW6020A | Nickel | mg/kg | Yes | 2200 | 8000 | Yes | X |
| SW6020A | Potassium | mg/kg | Yes | EN | -- | -- | -- |
| SW6020A | Selenium | mg/kg | Yes | 580 | 9.3 | No | -- |
| SW6020A | Silver | mg/kg | Yes | 580 | 0.89 | No | -- |
| SW6020A | Sodium | mg/kg | Yes | EN | -- | -- | -- |
| SW6020A | Thallium | mg/kg | Yes | 1.2 | 1.6 | Yes | X |
| SW6020A | Vanadium | mg/kg | Yes | 580 | 42000 | Yes | X |
| SW6020A | Zinc | mg/kg | Yes | 35000 | 3000 | No | -- |
| SW7471B | Mercury | mg/kg | Yes | 35 | 2.2 | No | -- |
| XRF | Antimony | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Arsenic | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Barium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Cadmium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Calcium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Chromium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Cobalt | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Copper | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Iron | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Lead | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Manganese | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Mercury | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Nickel | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Potassium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Selenium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Silver | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Vanadium | mg/kg | Not measured | -- | -- | -- | -- |
| XRF | Zinc | mg/kg | Not measured | -- | -- | -- | -- |
| Polychlorinated Biphenyl Compounds | | | | | | | |
| SW8082A LL | Aroclor-1016 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1221 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1232 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1242 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1248 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1254 | ug/kg | Yes | (e) | -- | -- | -- |
| SW8082A LL | Aroclor-1260 | ug/kg | Yes | (e) | -- | -- | -- |
| SW8082A LL | Aroclor-1262 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1268 | ug/kg | No | -- | -- | -- | -- |
| SW8082A LL | PCB, Total Aroclors (AECOM Calc) | ug/kg | Yes | 970 | 130000 | Yes | X |
| E1668C | Decachlorobiphenyl (PCB-209) | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Dichlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Heptachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Hexachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Monochlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Nonachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Octachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB, Total Aroclors (Lab provided) | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB, Total Congeners (Provided by Lab) | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-1 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-10 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-100 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-101 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-102 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-103 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-104 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-105 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-106 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-107 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-108 | ng/g | Not measured | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| E1668C | PCB-109 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-11 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-110 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-111 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-112 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-113 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-114 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-115 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-116 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-117 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-118 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-119 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-12 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-120 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-121 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-122 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-123 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-124 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-125 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-126 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-127 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-128 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-129 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-13 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-130 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-131 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-132 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-133 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-134 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-135 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-136 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-137 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-138 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-139 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-14 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-140 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-141 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-142 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-143 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-144 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-145 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-146 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-147 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-148 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-149 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-15 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-150 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-151 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-152 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-153 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-154 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-155 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-156 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-157 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-158 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-159 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-16 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-160 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-161 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-162 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-163 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-164 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-165 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-166 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-167 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-168 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-169 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-17 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-170 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-171 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-172 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-173 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-174 | ng/g | Not measured | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| E1668C | PCB-175 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-176 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-177 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-178 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-179 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-18 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-180 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-181 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-182 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-183 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-184 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-185 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-186 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-187 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-188 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-189 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-19 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-190 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-191 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-192 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-193 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-194 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-195 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-196 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-197 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-198 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-199 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-2 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-20 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-200 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-201 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-202 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-203 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-204 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-205 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-206 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-207 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-208 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-21 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-22 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-23 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-24 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-25 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-26 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-27 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-28 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-29 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-3 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-30 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-31 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-32 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-33 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-34 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-35 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-36 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-37 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-38 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-39 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-4 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-40 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-41 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-42 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-43 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-44 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-45 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-46 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-47 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-48 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-49 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-5 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-50 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-51 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-52 | ng/g | Not measured | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| E1668C | PCB-53 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-54 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-55 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-56 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-57 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-58 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-59 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-6 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-60 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-61 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-62 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-63 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-64 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-65 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-66 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-67 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-68 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-69 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-7 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-70 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-71 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-72 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-73 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-74 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-75 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-76 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-77 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-78 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-79 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-8 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-80 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-81 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-82 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-83 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-84 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-85 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-86 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-87 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-88 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-89 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-9 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-90 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-91 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-92 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-93 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-94 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-95 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-96 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-97 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-98 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB-99 | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Pentachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Tetrachlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | Trichlorobiphenyl | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB TEQ HH | ng/g | Not measured | -- | -- | -- | -- |
| E1668C | PCB, TOTAL | ng/g | Not measured | -- | -- | -- | -- |
| Pesticides | | | | | | | |
| SW8081B LL | 4,4'-DDD | ug/kg | Yes | 9600 | 4.7 | No | -- |
| SW8081B LL | 4,4'-DDE | ug/kg | Yes | 9300 | 58 | No | -- |
| SW8081B LL | 4,4'-DDT | ug/kg | Yes | 8500 | 83 | No | -- |
| SW8081B LL | Aldrin | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | alpha-BHC | ug/kg | Yes | 360 | Not detected | -- | -- |
| SW8081B LL | beta-BHC | ug/kg | Yes | 1300 | 2.3 | No | -- |
| SW8081B LL | cis-Chlordane | ug/kg | Yes | 7700 | 12 | No | -- |
| SW8081B LL | delta-BHC | ug/kg | Yes | 360 | 7.5 | No | -- |
| SW8081B LL | Dieldrin | ug/kg | Yes | 140 | 9.4 | No | -- |
| SW8081B LL | Endosulfan I | ug/kg | Yes | 700000 | 1.4 | No | -- |
| SW8081B LL | Endosulfan II | ug/kg | Yes | 700000 | 15 | No | -- |
| SW8081B LL | Endosulfan Sulfate | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | Endrin | ug/kg | Yes | 25000 | 26 | No | -- |
| SW8081B LL | Endrin aldehyde | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | Endrin ketone | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | gamma-BHC (Lindane) | ug/kg | No | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| SW8081B LL | Heptachlor | ug/kg | Yes | 630 | 2.9 | No | -- |
| SW8081B LL | Heptachlor Epoxide | ug/kg | Yes | 330 | 22 | No | -- |
| SW8081B LL | Methoxychlor | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | Toxaphene | ug/kg | No | -- | -- | -- | -- |
| SW8081B LL | trans-Chlordane | ug/kg | Yes | 7700 | 16 | No | -- |
| Petroleum Compounds | | | | | | | |
| SW8015C DR( | Diesel Range Organics (C10-C20) | mg/kg | Yes | 960 | 7900 | Yes | X |
| SW8015C | Diesel Range Organics (C10-C28) | mg/kg | Not measured | -- | -- | -- | -- |
| SW8015C DR( | Diesel Range Organics (C10-C28) | mg/kg | Not measured | -- | -- | -- | -- |
| SW8015C | Gasoline Range Organics (C6-C10) | mg/kg | Not measured | -- | -- | -- | -- |
| SW8015C GR( | Gasoline Range Organics (C6-C10) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8015D GR | Gasoline Range Organics (C6-C10) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8015C DR( | Oil Range Organics (C20-C36) | mg/kg | Yes | 3300 | 17000 | Yes | X |
| Semi Volatile Organic Compounds | | | | | | | |
| SW8270D | Acenaphthene | ug/kg | Yes | 4.50E+06 | 91000 | No | -- |
| SW8270D | Acenaphthylene | ug/kg | Yes | 4.50E+06 | 1900 | No | -- |
| SW8270D | Anthracene | ug/kg | Yes | 2.30E+07 | 150000 | No | -- |
| SW8270D | Benzo(a)anthracene | ug/kg | Yes | 20600 | 200000 | Yes | -- |
| SW8270D | Benzo(a)pyrene | ug/kg | Yes | 2110 | 160000 | Yes | -- |
| SW8270D | Benzo(b)fluoranthene | ug/kg | Yes | 21100 | 190000 | Yes | -- |
| SW8270D | Benzo(g,h,i)perylene | ug/kg | Yes | 2.30E+06 | 120000 | -- | -- |
| SW8270D | Benzo(k)fluoranthene | ug/kg | Yes | 211000 | 71000 | -- | -- |
| SW8270D | Chrysene | ug/kg | Yes | 2.11E+06 | 180000 | No | -- |
| SW8270D | Dibenzo(a,h)anthracene | ug/kg | Yes | 2110 | 9800 | -- | -- |
| SW8270D | Fluoranthene | ug/kg | Yes | 3.00E+06 | 540000 | No | -- |
| SW8270D | Fluorene | ug/kg | Yes | 3.00E+06 | 75000 | -- | -- |
| SW8270D | Indeno(1,2,3-cd)pyrene | ug/kg | Yes | 21100 | 110000 | -- | -- |
| SW8270D | Naphthalene | ug/kg | Yes | 17000 | 30000 | -- | -- |
| SW8270D | Phenanthrene | ug/kg | Yes | 2.30E+07 | 500000 | No | -- |
| SW8270D | Pyrene | ug/kg | Yes | 2.30E+06 | 390000 | No | -- |
| SW8270D | BAP-TE | ug/kg | Yes | 2110 | 211000 | Yes | -- |
| SW8270D | Total High-molecular-weight PAHs | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D | Total Low-molecular-weight PAHs | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D | Total PAHs (sum 16) | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D LL | 1,1'-Biphenyl | ug/kg | Yes | 20000 | 32 | No | -- |
| SW8270D LL | 1,2,4,5-Tetrachlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,2'-oxybis(1-Chloropropane) | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,3,4,6-Tetrachlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,4,5-Trichlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,4,6-Trichlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,4-Dichlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,4-Dimethylphenol | ug/kg | Yes | 1.60E+06 | Not detected | -- | -- |
| SW8270D LL | 2,4-Dinitrophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,4-Dinitrotoluene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2,6-Dinitrotoluene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2-Chloronaphthalene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2-Chlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2-Methylnaphthalene | ug/kg | Yes | 300000 | 120 | No | -- |
| SW8270D LL | 2-Methylphenol | ug/kg | Yes | 4.10E+06 | 13 | No | -- |
| SW8270D LL | 2-Nitroaniline | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 2-Nitrophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 3,3'-Dichlorobenzidine | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 3-Nitroaniline | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4,6-Dinitro-2-methylphenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Bromophenyl-phenylether | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Chloro-3-methylphenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Chloroaniline | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Chlorophenyl-phenylether | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Methylphenol | ug/kg | Yes | 8.20E+06 | 26 | No | -- |
| SW8270D LL | 4-Nitroaniline | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | 4-Nitrophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Acenaphthene | ug/kg | Yes | 4.50E+06 | 91000 | No | -- |
| SW8270D LL | Acenaphthylene | ug/kg | Yes | 4.50E+06 | 1900 | No | -- |
| SW8270D LL | Acetophenone | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Anthracene | ug/kg | Yes | 2.30E+07 | 150000 | No | -- |
| SW8270D LL | Atrazine | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Benzaldehyde | ug/kg | Yes | 820000 | 170 | No | -- |
| SW8270D LL | Benzo(a)anthracene | ug/kg | Yes | 20600 | 200000 | Yes | X |
| SW8270D LL | Benzo(a)pyrene | ug/kg | Yes | 2110 | 160000 | Yes | X |
| SW8270D LL | Benzo(b)fluoranthene | ug/kg | Yes | 21100 | 190000 | Yes | X |
| SW8270D LL | Benzo(g,h,i)perylene | ug/kg | Yes | 2.30E+06 | 120000 | No | -- |
| SW8270D LL | Benzo(k)fluoranthene | ug/kg | Yes | 211000 | 71000 | No | -- |
| SW8270D LL | bis-(2-chloroethoxy)methane | ug/kg | No | -- | -- | -- | -- |

Table 4-2
Rationale for List of COPCs for Background Evaluation for Soil

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| SW8270D LL | bis-(2-Chloroethyl)ether | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | bis-(2-Ethylhexyl)phthalate | ug/kg | Yes | 160000 | 230 | No | -- |
| SW8270D LL | Butylbenzylphthalate | ug/kg | Yes | 1.20E+06 | 990 | No | -- |
| SW8270D LL | Caprolactam | ug/kg | Yes | 4.00E+07 | Not detected | -- | -- |
| SW8270D LL | Carbazole | ug/kg | Yes | 3.00E+06 | 260 | No | -- |
| SW8270D LL | Chrysene | ug/kg | Yes | 2.11E+06 | 180000 | No | -- |
| SW8270D LL | Dibenzo(a,h)anthracene | ug/kg | Yes | 2110 | 9800 | Yes | X |
| SW8270D LL | Dibenzofuran | ug/kg | Yes | 100000 | 120 | No | -- |
| SW8270D LL | Diethylphthalate | ug/kg | Yes | 6.60E+07 | 28 | No | -- |
| SW8270D LL | Dimethylphthalate | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Di-n-butylphthalate | ug/kg | Yes | 8.20E+06 | 320 | No | -- |
| SW8270D LL | Di-n-octylphthalate | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Fluoranthene | ug/kg | Yes | 3.00E+06 | 540000 | No | -- |
| SW8270D LL | Fluorene | ug/kg | Yes | 3.00E+06 | 75000 | No | -- |
| SW8270D LL | Hexachlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Hexachlorobutadiene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Hexachlorocyclo-pentadiene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Hexachloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Indeno(1,2,3-cd)pyrene | ug/kg | Yes | 21100 | 110000 | Yes | X |
| SW8270D LL | Isophorone | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Naphthalene | ug/kg | Yes | 17000 | 30000 | Yes | X |
| SW8270D LL | Nitrobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | N-Nitroso-di-n-propylamine | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | N-Nitrosodiphenylamine | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Pentachlorophenol | ug/kg | No | -- | -- | -- | -- |
| SW8270D LL | Phenanthrene | ug/kg | Yes | 2.30E+07 | 500000 | No | -- |
| SW8270D LL | Phenol | ug/kg | Yes | 2.50E+07 | 110 | No | -- |
| SW8270D LL | Pyrene | ug/kg | Yes | 2.30E+06 | 390000 | No | -- |
| SW8270D LL | BAP-TE | ug/kg | Yes | 2110 | 211000 | Yes | X |
| SW8270D LL | Total High-molecular-weight PAHs | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D LL | Total Low-molecular-weight PAHs | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D LL | Total PAHs (sum 16) | ug/kg | Yes | No SL | -- | -- | -- |
| SW8270D LL | Total PAHs (sum 34) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 13a,17b-20S-Ethyldiacholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 13b(H),17a(H)-20R-Diacholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 13b(H),17a(H)-20S-Diacholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 13b,17a-20S-Methyldiacholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a(H),17a(H)-20R-Cholestane/13b(H),17a(H)-20R-Ethyldiacholestane (S17) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a(H),17a(H)-20R-Ethylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a(H),17a(H)-20S-Cholestane/13b(H),17a(H)-20S-Ethyldiacholestane (S12) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a(H),17a(H)-20S-Ethylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a,17a-20R-Methylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14a,17a-20S-Methylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b(H),17b(H)-20R-Cholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b(H),17b(H)-20R-Ethylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b(H),17b(H)-20S-Cholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b(H),17b(H)-20S-Ethylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b,17b-20R-Methylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 14b,17b-20S-Methylcholestane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 17a(H),21b(H)-25-Norhopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 17a(H)-22,29,30-Trisnorhopane-TM | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 17a(H)-Diahopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 17a/b,21b/a 28,30-Bisnorhopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 18a(H)&18b(H)-Oleananes | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 18a(H)-30-Norneohopane-C29Ts | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 18a-22,29,30-Trisnorneohopane-TS | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 28-Nor-17.alpha.(H)-hopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30,31-Bishomohopane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30,31-Bishomohopane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30,31-Trishomohopane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30,31-Trishomohopane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30-Homohopane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30-Homohopane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | 30-Normoretane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C23 Tricyclic Terpane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C24 Tetracyclic Terpane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C24 Tricyclic Terpane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C25 Tricyclic Terpane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C26 Tricyclic Terpane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C26 Tricyclic Terpane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C26,20R- +C27,20S- triaromatic steroid | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C27,20R-triaromatic steroid | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C28 Tricyclic Terpane-22R | ug/kg | Not measured | -- | -- | -- | -- |

Table 4-2
Rationale for List of COPCs for Background Evaluation for Soil

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| SW8270DM S | C28 Tricyclic Terpane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C28,20R-triaromatic steroid | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C28,20S-triaromatic steroid | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C29 Tricyclic Terpane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C29 Tricyclic Terpane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C30 Tricyclic Terpane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | C30 Tricyclic Terpane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Hopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Moretane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Pentakishomohopane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Pentakishomohopane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | T22a-Gammacerane/C32-diahopane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Tetrakishomohopane-22R | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Tetrakishomohopane-22S | ug/kg | Not measured | -- | -- | -- | -- |
| SW8270DM S | Unknown Sterane (S18) | ug/kg | Not measured | -- | -- | -- | -- |
| ID-0016 | 1-Methylnaphthalene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | 2,3,5-Trimethylnaphthalene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | 2,6-Dimethylnaphthalene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | 2-Methylnaphthalene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Acenaphthene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Acenaphthylene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Anthracene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(a)anthracene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(a)pyrene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(b)fluoranthene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(e)pyrene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(g,h,i)perylene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Benzo(k)fluoranthene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C1-Benzanthracene/chrysenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C1-Dibenzothiophenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C1-Fluorenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C1-Phenanthrene/anthracenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C1-Pyrene/fluoranthenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C2-Benzanthracene/chrysenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C2-Dibenzothiophenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C2-Fluorenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C2-Naphthalenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C2-Phenanthrene/anthracenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C3-Benzanthracene/chrysenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C3-Dibenzothiophenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C3-Fluorenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C3-Naphthalenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C3-Phenanthrene/anthracenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C4-Benzanthracene/chrysenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C4-Dibenzothiophenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C4-Naphthalenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | C4-Phenanthrenes/anthracenes | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Chrysene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Dibenzo(a,h)anthracene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Dibenzothiophene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Fluoranthene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Fluorene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Indeno(1,2,3-cd)pyrene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Naphthalene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Perylene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Phenanthrene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Pyrene | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | BAP-TE | ug/kg | Not measured | -- | -- | -- | -- |
| ID-0016 | Total High-molecular-weight PAHs | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Total Low-molecular-weight PAHs | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Total PAHs (sum 16) | ng/g | Not measured | -- | -- | -- | -- |
| ID-0016 | Total PAHs (sum 34) | ng/g | Not measured | -- | -- | -- | -- |
| Volatile Organic Compounds | | | | | | | |
| SW8260C | 1,1,1-Trichloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,1,2,2-Tetrachloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,1,2-Trichloro-1,2,2-trifluoroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,1,2-Trichloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,1-Dichloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,1-Dichloroethene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2,3-Trichlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2,4-Trichlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2-Dibromo-3-chloropropane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2-Dibromoethane | ug/kg | No | -- | -- | -- | -- |

Table 4-2
Rationale for List of COPCs for Background Evaluation for Soil

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| SW8260C | 1,2-Dichlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2-Dichloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,2-Dichloropropane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,3-Dichlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,4-Dichlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 1,4-Dioxane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 2-Butanone | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 2-Hexanone | ug/kg | No | -- | -- | -- | -- |
| SW8260C | 4-Methyl-2-pentanone | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Acetone | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Benzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Bromochloromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Bromodichloromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Bromoform | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Bromomethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Carbon Disulfide | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Carbon Tetrachloride | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Chlorobenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Chloroethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Chloroform | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Chloromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | cis-1,2-Dichloroethylene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | cis-1,3-Dichloropropene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Cyclohexane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Dibromochloromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Dichlorodifluoromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Ethylbenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Isopropylbenzene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | m, p-Xylene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Methyl Acetate | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Methyl tert-Butyl Ether (MTBE) | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Methylcyclohexane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Methylene Chloride | ug/kg | Yes | 320000 | 1.1 | No | -- |
| SW8260C | o-Xylene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Styrene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Tetrachloroethylene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Toluene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | trans-1,2-Dichloroethene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | trans-1,3-Dichloropropene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Trichloroethene | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Trichlorofluoromethane | ug/kg | No | -- | -- | -- | -- |
| SW8260C | Vinyl Chloride | ug/kg | No | -- | -- | -- | -- |
| SW8260B | 1,1,1-Trichloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,1,2,2-Tetrachloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,1,2-Trichloro-1,2,2-trifluoroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,1,2-Trichloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,1-Dichloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,1-Dichloroethene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2,3-Trichlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2,4-Trichlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2-Dibromo-3-chloropropane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2-Dibromoethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2-Dichlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2-Dichloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,2-Dichloropropane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,3-Dichlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,4-Dichlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 1,4-Dioxane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 2-Butanone | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 2-Hexanone | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | 4-Methyl-2-pentanone | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Acetone | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Benzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Bromochloromethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Bromodichloromethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Bromoform | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Bromomethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Carbon Disulfide | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Carbon Tetrachloride | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Chlorobenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Chloroethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Chloroform | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Chloromethane | ug/kg | Not measured | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| SW8260B | cis-1,2-Dichloroethylene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | cis-1,3-Dichloropropene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Cyclohexane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Dibromochloromethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Dichlorodifluoromethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Ethylbenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Isopropylbenzene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | m, p-Xylene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Methyl Acetate | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Methyl tert-Butyl Ether (MTBE) | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Methylcyclohexane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Methylene Chloride | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | o-Xylene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Styrene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Tetrachloroethylene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Toluene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | trans-1,2-Dichloroethene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | trans-1,3-Dichloropropene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Trichloroethene | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Trichlorofluoromethane | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Vinyl Chloride | ug/kg | Not measured | -- | -- | -- | -- |
| SW8260B | Xylenes (total) | ug/kg | Not measured | -- | -- | -- | -- |
| Dioxin/Furan Compounds | | | | | | | |
| SW8290A | 1,2,3,4,6,7,8-HpCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,4,6,7,8-HpCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,4,7,8,9-HpCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,4,7,8-HxCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,4,7,8-HxCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,6,7,8-HxCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,6,7,8-HxCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,7,8,9-HxCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,7,8,9-HxCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,7,8-PeCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 1,2,3,7,8-PeCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 2,3,4,6,7,8-HxCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 2,3,4,7,8-PeCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | 2,3,7,8-TCDD | pg/g | Yes | 22 | 25.5 | Yes | X |
| SW8290A | 2,3,7,8-TCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | OCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | OCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total HpCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total HpCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Table | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total HxCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total PeCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total PeCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total TCDD | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | Total TCDF | pg/g | Yes | (f) | -- | -- | -- |
| SW8290A | TCDD TEQ HH | pg/g | Yes | 22 | 484 | Yes | X |
| SW8290A | Total TEQ | pg/g | Not measured | -- | -- | -- | -- |
| Saturated Hydrocarbons | | | | | | | |
| M8015D | 2,6,10,14-TETRAMETHYL PENTADECANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | 2,6,10,14-TETRAMETHYLHEXADECANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | 2,6,10-TRIMETHYLDODECANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | 2,6,10-TRIMETHYLTRIDECANE (1470) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Decane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Docosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Dodecane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | DOTRIACONTANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Henicosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Hentriacontane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Heptacosane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Heptadecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | HEPTATRIACONTANE (C37) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Hexacosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Hexadecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | HEXATRIACONTANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Icosane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | NONACOSANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Nonadecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Nonane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | NONATRIACONTANE (C39) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Norpristane (1650) | mg/kg | Not measured | -- | -- | -- | -- |

Table 4-2
Rationale for List of COPCs for Background Evaluation for Soil

| Analytical Method | Constituent | Units | Detected in Background? (a) | Industrial RSL (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > RSL? | Selected for Background Evaluation and BTV Calculation (d) |
|---|---|---|---|---|---|---|---|
| M8015D | N-TRIACONTANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Octacosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Octadecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | OCTATRIACONTANE (C38) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Pentacosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Pentadecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | PENTATRIACONTANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | TETRACONTANE (C40) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Tetracosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Tetradecane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | TETRATRIACONTANE | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | TOTAL PETROLEUM HYDROCARBONS | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | TOTAL SATURATED HYDROCARBONS | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Tricosane, n- | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Tridecane | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | TRITRIACONTANE (C33) | mg/kg | Not measured | -- | -- | -- | -- |
| M8015D | Undecane | mg/kg | Not measured | -- | -- | -- | -- |

Notes:
BTV - Background Threshold Value.
EN - Essential nutrient. These constituents will not be included in the refined background evaluation for soil.
No SL - No screening level.
RSL - Regional Screening Level.
(a) Constituents detected at least once in background soil samples are indicated with "Yes". "Not measured" indicates those constituents and/or analytical methods for which background soil samples were not analyzed.
(b) USEPA Regional Screening Levels. June 2017. Industrial soil value. [ELCR = 1E-6, HQ=0.1]. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls.
Presented only for constituents detected in background.
(c) The maximum detected concentration in Site soil samples. Presented only for consituents detected in background.
(d) An "X" indicates the constituents selected for the refined background evaluation for soil.
(e) Evaluated based on total rather than individual aroclors/congeners.
(f) Evaluated based on the TCDD TEQ, which is calculated based on the 2005 World Health Organization toxicity equivalency factors (TEFs).
(g) The value for hexavalent chromium was used for chromium.

Table 4-3
Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-Specific Background Soil

| | | | Distribution of Background Dataset | | Identification of Outlier in Site-Specific Background Dataset | | | Summary Statistics - Following Outlier Removal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COPC | Depth Interval [a] | FOD | Raw Dataset [e] | Following log transformation [f] | Outlier Test [g] | Outlier Value (mg/kg) | Sample Identification of Outlier Value | FOD | Maximum Detected Concentration (mg/kg) | BTV Statistic (mg/kg) [h] | |
| **Inorganics** | | | | | | | | | | | |
| Arsenic | Surface and Subsurface | 40 : 40 | Lognormal | Normal | Rosner | -- | -- | 40 : 40 | 30 | 17 | Lognormal: 95% UTL with 95% Coverage |
| Chromium | Surface and Subsurface | 40 : 40 | Lognormal | Normal | Rosner | 110 | SOBACK18 (3 - 4 ft) | 39 : 39 | 57 | 43 | Lognormal: 95% UTL with 95% Coverage |
| Cobalt | Surface and Subsurface | 40 : 40 | Gamma | Normal | Rosner | -- | -- | 40 : 40 | 16 | 20 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Lead | Surface [b] | 20 : 20 | Lognormal | Normal | Dixon | -- | -- | 20 : 20 | 320 | 540 | Lognormal: 95% UTL with 95% Coverage |
| | Subsurface [b] | 20 : 20 | No distribution | Gamma | Dixon | 5100 | SOBACK18 (3 - 4 ft) | 19 : 19 | 170 | 170 | Nonparametric: 95% UTL with 95% Coverage |
| Manganese | Surface [b] | 20 : 20 | Gamma | Normal | Dixon | -- | -- | 20 : 20 | 1000 | 1100 | 95% WH Approx. Gamma UTL with 95% Coverage |
| | Subsurface [b] | 20 : 20 | Gamma | Normal | Dixon | -- | -- | 20 : 20 | 1000 | 740 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Nickel | Surface and Subsurface | 40 : 40 | Lognormal | Normal | Rosner | -- | -- | 40 : 40 | 88 | 54 | Lognormal: 95% UTL with 95% Coverage |
| Thallium | Surface and Subsurface | 32 : 40 | Lognormal | Normal | Rosner | 0.016 [i], 0.64 | SOBACK02 (3 - 4 ft), SOBACK18 (3 - 4 ft) | 31 : 38 | 0.21 | 0.18 | KM - Normal: 95% UTL with 95% Coverage |
| Vanadium | Surface and Subsurface | 40 : 40 | Gamma | No distribution | Rosner | 80, 57, 56, 50 | SOBACK15 (3 - 4 ft), SOBACK14 (3 - 4 ft), SOBACK02 (3 - 4 ft), SOBACK16 (3 - 4 ft) | 36 : 36 | 36 | 38 | Normal: 95% UTL with 95% Coverage |
| **Polychlorinated Biphenyl Compounds** | | | | | | | | | | | |
| Total PCBs, Aroclors | Surface and Subsurface [c] | 6 : 40 | No distribution | No distribution | Rosner | 0.39 | SOBACK18 (0 - 1 ft) | 5 : 39 | 0.034 | 0.0151 | KM - Normal: 95% UTL with 95% Coverage |
| **Petroleum Compounds** | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | Surface and Subsurface [d] | 14 : 40 | No distribution | No distribution | Rosner | 230, 150, 40 | SOBACK04 (3 - 4 ft), SOBACK05 (3 - 4 ft), SOBACK18 (3 - 4 ft) | 11 : 37 | 20 | 20 | KM - Normal: 95% UTL with 95% Coverage |

Table 4-3
Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-Specific Background Soil

| COPC | Depth Interval [a] | FOD | Distribution of Background Dataset: Raw Dataset [e] | Distribution of Background Dataset: Following log transformation [f] | Identification of Outlier in Site-Specific Background Dataset: Outlier Test [g] | Identification of Outlier in Site-Specific Background Dataset: Outlier Value (mg/kg) | Identification of Outlier in Site-Specific Background Dataset: Sample Identification of Outlier Value | Summary Statistics - Following Outlier Removal: FOD | Summary Statistics - Following Outlier Removal: Maximum Detected Concentration (mg/kg) | BTV Statistic (mg/kg) [h] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil Range Organics (C20-C36) | Surface and Subsurface | 27 : 40 | No distribution | Approximate Lognormal | Rosner | -- | -- | 27 : 40 | 860 | 372 | 95% KM UTL (Lognormal)95% Coverage |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | |
| Benzo(a)anthracene | Surface [b] | 18 : 20 | Approximate Lognormal | Approximate Normal | Dixon | -- | -- | 18 : 20 | 0.67 | 0.89 | 95% KM UTL (Lognormal)95% Coverage |
| | Subsurface [b] | 9 : 20 | No distribution | No distribution | Dixon | 11 | SOBACK04 (3 - 4 ft) | 8 : 19 | 0.096 | 0.077 | KM - WH Approx. Gamma 95% UTL with 95% Coverage |
| Benzo(a)pyrene | Surface [b] | 17 : 20 | Approximate Lognormal | Approximate Normal | Dixon | -- | -- | 17 : 20 | 1.5 | 1.19 | 95% KM UTL (Lognormal)95% Coverage |
| | Subsurface [b] | 6 : 20 | No distribution | No distribution | Dixon | 8.7 | SOBACK04 (3 - 4 ft) | 5 : 19 | 0.095 | 0.072 | KM - Normal: 95% UTL with 95% Coverage |
| Benzo(b)fluoranthene | Surface [b] | 17 : 20 | Lognormal | Normal | Dixon | -- | -- | 17 : 20 | 1.3 | 1.5 | 95% KM UTL (Lognormal)95% Coverage |
| | Subsurface [b] | 6 : 20 | No distribution | No distribution | Dixon | 11 | SOBACK04 (3 - 4 ft) | 5 : 19 | 0.12 | 0.10 | KM - Normal: 95% UTL with 95% Coverage |
| Dibenzo(a,h)anthracene | Surface and Subsurface | 17 : 40 | No distribution | No distribution | Rosner | 1.8 | SOBACK04 (3 - 4 ft) | 16 : 39 | 0.48 | 0.079 | 95% KM UTL (Lognormal)95% Coverage |
| Indeno(1,2,3-cd)pyrene | Surface [b] | 17 : 20 | No distribution | No distribution | Dixon | -- | -- | 17 : 20 | 1.6 | 1.6 | Nonparametric: 95% UTL with 95% Coverage |
| | Subsurface [b] | 6 : 20 | No distribution | No distribution | Dixon | 5.1 | SOBACK04 (3 - 4 ft) | 5 : 19 | 0.065 | 0.052 | KM - Normal: 95% UTL with 95% Coverage |
| Naphthalene | Surface and Subsurface | 15 : 40 | No distribution | No distribution | Rosner | 2.8 | SOBACK04 (3-4 ft) | 14 : 39 | 0.13 | 0.03 | 95% KM UTL (Lognormal)95% Coverage |
| BAP-TE | Surface [b] | 18 : 20 | Lognormal | Normal | Dixon | -- | -- | 18 : 20 | 2.34 | 3.39 | 95% KM UTL (Lognormal)95% Coverage |
| | Subsurface [b] | 9 : 20 | No distribution | No distribution | Dixon | 13.3 | SOBACK04 (3 - 4 ft) | 8 : 19 | 0.147 | 0.12 | KM - WH Approx. Gamma 95% UTL with 95% Coverage |

Table 4-3

Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-Specific Background Soil

| | | | **Distribution of Background Dataset** | | **Identification of Outlier in Site-Specific Background Dataset** | | | **Summary Statistics - Following Outlier Removal** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPC** | **Depth Interval [a]** | **FOD** | **Raw Dataset [e]** | **Following log transformation [f]** | Outlier Test [g] | Outlier Value (mg/kg) | Sample Identification of Outlier Value | FOD | Maximum Detected Concentration (mg/kg) | **BTV Statistic (mg/kg) [h]** | |
| **Dioxin/Furan Compounds** | | | | | | | | | | | |
| 2,3,7,8-TCDD | Surface and Subsurface | 6 : 40 | Gamma | Normal | Rosner | -- | -- | 6 : 40 | 2.29E-06 | 1.00E-6 | KM - Normal: 95% UTL with 95% Coverage |
| TCDD TEQ HH | Surface [b] | 20 : 20 | Gamma | Normal | Dixon | -- | -- | 20 : 20 | 2.10E-05 | 2.06E-05 | 95% WH Approx. Gamma UTL with 95% Coverage |
| | Subsurface [b] | 20 : 20 | Lognormal | Normal | Dixon | -- | -- | 20 : 20 | 2.71E-05 | 4.25E-05 | Lognormal: 95% UTL with 95% Coverage |

Notes:

BTV - Background Threshold Value.

COPC - Chemical of Potential Concern.

FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.

KM - Kaplan Meier.

NC - Not calculated.

SD - Standard Deviation.

USEPA - United States Environmental Protection Agency.

[a] This evaluation is based on a dataset including both surficial (0-1 feet below ground surface) and subsurface (>1 feet below ground surface) soil samples. An outlier test was conducted to determine if the presence of outliers in this combined dataset (see table note [f]). Following the removal of outlier values, an analysis of variance (ANOVA) comparing detected concentrations of COPCs in background surface and subsurface soil found that surface and subsurface concentrations were not statistically different except where noted.

[b] The ANOVA test found that surface and subsurface concentrations are significantly different, and therefore, the BTV was calculated for each depth interval.

[c] PCBs were not detected in subsurface soil.

[d] Only one concentration was detected in subsurface samples at concentration within the range of surface concentrations. Therefore, surface and subsurface datasets were considered comparable and combined for the calculation of the BTV.

[e] The distribution of Site-Specific Background datasets was determined using the Goodness-of-Fit tests (significance level 0.05) based on the Shapiro-Wilk test in ProUCL (version 5.1; USEPA, 2016). If the dataset includes non-detects, the non-detects were included at the full value of the detection limit.

[f] If the dataset is not normally distributed, the data were transformed using a log transformation and the GOF test was repeated on the log-transformed data. If the log-transformed data are normally distributed, then the outlier test was performed on the log-transformed data.

[g] The default outlier test in ProUCL (version 5.1; USEPA, 2016) was conducted (Rosner's test for over 25 samples, Dixon's test for under 25 samples). If the dataset includes non-detects, the non-detects were included at the full value of the detection imit. Identified outlier values were removed from the dataset prior to the calculation of the BTV statistics. For the five carcinogenic PAH compounds, several results between 0.1 and 1.8 mg/kg were identified by ProUCL as potential outliers. Numerous studies have documented carcinogenic PAH concentrations in urban background soil at concentrations of 2 mg/kg and higher (MADEP, 2002; AMEC, 2012; Illinois EPA, 2005; Teaf, 2008; EPRI, 2008; and Bradley, 1994). Therefore, these results were not removed from the data set used for the BTV calculations.

[h] BTVs were calculated in ProUCL (version 5.1; USEPA, 2016). The 95UTL was selected based on the distribution of the raw dataset. If the dataset includes non-detects, the BTV was selected from the Kaplan-Meier statistics.

[i] This is a low tail outlier.

Table 4-4
Comparison of Chemical Concentrations In Site and Background Soil

| SOIL COPC | | Frequency of Detection [a] | | Median (Standard deviation) of Detected Concentrations (mg/kg) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site | Site-Specific Background | Site | Site-Specific Background | Site | Site-Specific Background | Test | p-value | Reject Null Hypothesis? | Is Site > or = Background? |
| **Inorganics** | | | | | | | | | | | |
| Arsenic | Surface and Subsurface | 119:119 | 40 : 40 | 3.8 (21) | 3.55 (4.7) | Not Normal | Not Normal | WMW | 1.86E-05 | Yes | No |
| Chromium | Surface and Subsurface | 130:130 | 39 : 39 | 14 (50) | 13 (10) | Not Normal | Not Normal | WMW | 8.02E-06 | Yes | No |
| Cobalt | Surface and Subsurface | 119:119 | 40 : 40 | 5 (28) | 5 (4) | Not Normal | Not Normal | WMW | 9.20E-06 | Yes | No |
| Lead | Surface | 64:64 | 20 : 20 | 46 (292) | 31 (88) | Not Normal | Not Normal | WMW | 2.22E-06 | Yes | No |
| | Subsurface | 55:55 | 19 : 19 | 15 (726) | 8 (40) | Not Normal | Not Normal | WMW | 1.74E-04 | Yes | No |
| Manganese | Surface | 64:64 | 20 : 20 | 165 (828) | 160 (248) | Not Normal | Not Normal | WMW | 2.35E-07 | Yes | No |
| | Subsurface | 55:55 | 20 : 20 | 120 (147) | 72 (221) | Not Normal | Not Normal | WMW | 1.16E-07 | Yes | No |
| Nickel | Surface and Subsurface | 119:119 | 40 : 40 | 14 (968) | 8 (17) | Not Normal | Not Normal | WMW | 3.54E-04 | Yes | No |
| Thallium | Surface and Subsurface | 88:119 | 31 : 38 | 0.15 (0.18) | 0.1 (0.044) | Not Normal | Normal | Gehan | 4.44E-03 | Yes | No |
| Vanadium | Surface and Subsurface | 125:125 | 36 : 36 | 31 (5026) | 22 (7.4) | Not Normal | Not Normal | WMW | 0.78 | No | Yes |
| **Polychlorinated Biphenyl Compounds** | | | | | | | | | | | |
| Total PCBs, Aroclors | Surface and Subsurface | 463 : 579 | 5 : 39 | 23 (410) | 0.014(0.012) | Not Normal | Normal | NC | -- | -- | -- |
| **Petroleum Compounds** | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | Surface and Subsurface | 71 : 181 | 11 : 37 | 99 (2039) | 12 (4.7) | Not Normal | Normal | Gehan | 1.0 | No | Yes |
| Oil Range Organics (C20-C36) | Surface and Subsurface | 123 : 181 | 27 : 40 | 240 (2943) | 51 (169) | Not Normal | Not Normal | Gehan | 0.17 | No | Yes |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | |
| Benzo(a)anthracene | Surface | 97 : 114 | 18 : 20 | 0.27 (1.6) | 0.023 (0.17) | Not Normal | Not Normal | Gehan | 0.47 | No | Yes |
| | Subsurface | 349 : 405 | 8 : 19 | 0.78 (51) | 0.012 (0.035) | Not Normal | Not Normal | Gehan | 1.00 | No | Yes |
| Benzo(a)pyrene | Surface | 95 : 114 | 17 : 20 | 0.31 (1.3) | 0.03 (0.36) | Not Normal | Not Normal | Gehan | 0.04 | Yes | No |
| | Subsurface | 337 : 405 | 5 : 19 | 0.83 (44) | 0.019 (0.038) | Not Normal | Normal | NC | -- | -- | -- |
| Benzo(b)fluoranthene | Surface | 97 : 114 | 17 : 20 | 0.38 (1.5) | 0.03 (0.31) | Not Normal | Not Normal | Gehan | 0.30 | No | Yes |
| | Subsurface | 341 : 405 | 5 : 19 | 1.0 (39) | 0.044 (0.051) | Not Normal | Normal | NC | -- | -- | -- |
| Dibenzo(a,h)anthracene | Surface and Subsurface | 379 : 519 | 16 : 39 | 0.16 (6.5) | 0.016 (0.12) | Not Normal | Not Normal | Gehan | 0.98 | No | Yes |
| Indeno(1,2,3-cd)pyrene | Surface | 96 : 114 | 17 : 20 | 0.22 (0.87) | 0.02 (0.38) | Not Normal | Not Normal | Gehan | 4.1E-03 | Yes | No |
| | Subsurface | 336 : 405 | 5 : 19 | 0.64 (27) | 0.014 (0.026) | Not Normal | Normal | NC | -- | -- | -- |
| Naphthalene | Surface and Subsurface | 341 : 519 | 14 : 39 | 0.07 (9.1) | 0.005 (0.034) | Not Normal | Not Normal | Gehan | 1.0 | No | Yes |
| BAP-TE | Surface | 97 : 114 | 18 : 20 | 0.45 (1.9) | 0.04 (0.55) | Not Normal | Not Normal | Gehan | 2.1E-02 | Yes | No |
| | Subsurface | 352 : 405 | 8 : 19 | 1.1 (62) | 0.016 (0.056) | Not Normal | Not Normal | Gehan | 1.0 | No | Yes |

Table 4-4
Comparison of Chemical Concentrations In Site and Background Soil

| SOIL COPC | | Frequency of Detection [a] | | Median (Standard deviation) of Detected Concentrations (mg/kg) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Site | Site-Specific Background | Site | Site-Specific Background | Site | Site-Specific Background | Test | p-value | Reject Null Hypothesis? | Is Site > or = Background? |
| **DIOXIN/FURAN COMPOUNDS** | | | | | | | | | | | |
| 2,3,7,8-TCDD | Surface and Subsurface | 35 : 81 | 6 : 40 | 9.1E-07 (2.9E-06) | 5.2E-07 (8.4E-07) | Not Normal | Normal | Gehan | 0.52 | No | Yes |
| TCDD TEQ HH | Surface | 64 : 64 | 20 : 20 | 6.7E-06 (6.6E-05) | 5E-06 (4.8E-06) | Not Normal | Not Normal | WMW | 0.14 | No | Yes |
| | Subsurface | 17 : 17 | 20 : 20 | 1.3E-06 (7.2E-06) | 8.8E-06 (7.4E-06) | Not Normal | Not Normal | WMW | 2.07E-05 | Yes | No |

Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.
NC - Insufficient data and/or detected concentrations.

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Site-Specific Background datasets were determined using the Shapiro-Wilks test (significance level 0.05 and ROS estimates for non detects) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.0 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan).
The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected.
The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.

Table 4-5

List of Constituents Selected for Refined Background Sediment Evaluation

| Analytical Method | Constituent |
|---|---|
| **Inorganics** | |
| SW6020A | Aluminum |
| SW6020A | Antimony |
| SW6020A | Arsenic |
| SW6020A | Barium |
| SW6020A | Beryllium |
| SW6020A | Cobalt |
| SW6020A | Cyanide |
| SW6020A | Manganese |
| SW6020A | Nickel |
| SW6020A | Thallium |
| SW6020A | Vanadium |
| **Pesticides** | |
| SW8081B LL | 4,4'-DDT |
| SW8081B LL | Chlordane (technical) |
| **Polychlorinated Biphenyls (PCBs)** | |
| SW8082A | Total PCBs Aroclors |
| E1668A/C | Total PCB Congeners |
| **Semi Volatile Organic Compounds** | |
| SW8270D | 4-Methylphenol |
| SW8270D | Acetophenone |
| SW8270D | bis-(2-Ethylhexyl)phthalate |
| SW8270D | Di-n-octylphthalate |
| SW8270D | Total High-molecular-weight PAHs |
| SW8270D | Benzo(a)anthracene |
| SW8270D | Benzo(a)pyrene |
| SW8270D | Benzo(b)fluoranthene |
| SW8270D | Benzo(k)fluoranthene |
| SW8270D | Chrysene |
| SW8270D | Dibenzo(a,h)anthracene |
| SW8270D | Indeno(1,2,3-cd)pyrene |
| ID-0016 | 2,3,5-Trimethylnaphthalene |
| ID-0016 | 2,6-Dimethylnaphthalene |
| ID-0016 | Total High-molecular-weight PAHs |
| **Petroleum Hydrocarbons** | |
| SW8015C DRO | Diesel Range Organics (C10-C20) |
| SW8015C DRO | TPH-C10-28 |
| **Dioxin and Furans** | |
| SW1613B | 1,2,3,7,8-PeCDD |
| SW1613B | 1,2,3,6,7,8-HxCDD |
| SW1613B | 1,2,3,4,7,8-HxCDD |
| SW1613B | 1,2,3,7,8,9-HxCDD |
| SW1613B | 1,2,3,4,6,7,8-HpCDD |
| SW1613B | 2,3,7,8-TCDD |
| SW1613B | OCDD |
| SW1613B | 1,2,3,7,8-PeCDF |
| SW1613B | 2,3,4,7,8-PeCDF |
| SW1613B | 1,2,3,6,7,8-HxCDF |
| SW1613B | 1,2,3,4,7,8-HxCDF |
| SW1613B | 2,3,4,6,7,8-HxCDF |
| SW1613B | 1,2,3,7,8,9-HxCDF |
| SW1613B | 1,2,3,4,6,7,8-HpCDF |
| SW1613B | 1,2,3,4,7,8,9-HpCDF |
| SW1613B | 2,3,7,8-TCDF |
| SW1613B | OCDF |
| SW1613B | TCDD TEQ HH |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | |
| SW6020A | Aluminum | mg/kg | Yes | NV | 7700 | 18000 | Yes | X |
| SW6020A | Antimony | mg/kg | Yes | 2 | 3.1 | 43 | Yes | X |
| SW6020A | Arsenic | mg/kg | Yes | 5.9 | 0.68 | 17 | Yes | X |
| SW6020A | Barium | mg/kg | Yes | 0.7 | 1500 | 180 | Yes | X |
| SW6020A | Beryllium | mg/kg | Yes | NV | 16 | 2.2 | No | X |
| SW6020A | Cadmium | mg/kg | Yes | 0.583 | 7.1 | 5.2 | Yes | (f) |
| SW6020A | Calcium | mg/kg | Yes | EN | EN | -- | -- | -- |
| SW6020A | Chromium | mg/kg | Yes | 26 | 12000 | 140 | Yes | (f) |
| SW6020A | Cobalt | mg/kg | Yes | 50 | 2.3 | 32 | Yes | X |
| SW6020A | Copper | mg/kg | Yes | 31.6 | 310 | 240 | Yes | (f) |
| SW9014 | Cyanide | mg/kg | Yes | 0.1 | NV | 4.9 | Yes | X |
| SW6020A | Iron | mg/kg | Yes | 20000 | 5500 | 34000 | Yes | (f) |
| SW6020A | Lead | mg/kg | Yes | 31 | 400 | 320 | Yes | (f) |
| SW6020A | Magnesium | mg/kg | Yes | EN | EN | -- | -- | -- |
| SW6020A | Manganese | mg/kg | Yes | 460 | 180 | 590 | Yes | X |
| SW7471B | Mercury | mg/kg | Yes | 0.174 | 2.3 | 0.69 | Yes | (f) |
| SW6020A | Nickel | mg/kg | Yes | 16 | 150 | 160 | Yes | X |
| SW6020A | Potassium | mg/kg | Yes | EN | EN | -- | -- | -- |
| SW6020A | Selenium | mg/kg | Yes | NV | 39 | 2.75 | No | -- |
| SW6020A | Silver | mg/kg | Yes | 0.5 | 39 | 3.5 | Yes | (f) |
| SW6020A | Sodium | mg/kg | Yes | EN | EN | -- | -- | -- |
| SW6020A | Thallium | mg/kg | Yes | NV | 0.078 | 0.63 | Yes | X |
| SW6020A | Vanadium | mg/kg | Yes | NV | 39 | 440 | Yes | X |
| SW6020A | Zinc | mg/kg | Yes | 98 | 2300 | 630 | Yes | (f) |
| **Pesticides** | | | | | | | | |
| E160.3M | Allethrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Baythroid | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Biphenthrin (Talstar) | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Cypermethrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Danitol | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Deltamethrin/Tralomethrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Dichloran | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Fenvalerate | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Lambda Cyhalothrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Penoxalin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Permethrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Prallethrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Sumithrin | mg/kg | No | -- | -- | -- | -- | -- |
| E160.3M | Tefluthrin | mg/kg | No | -- | -- | -- | -- | -- |
| SW8081B LL | 4,4'-DDD | mg/kg | Yes | 0.00354 | 0.19 | 0.068 | Yes | (f) |
| SW8081B LL | 4,4'-DDE | mg/kg | Yes | 0.00316 | 2 | 0.056 | Yes | (f) |
| SW8081B LL | 4,4'-DDT | mg/kg | Yes | 0.00119 | 1.9 | 1.5 | Yes | X |
| SW8081B LL | Aldrin | mg/kg | Yes | 0.002 | 0.039 | 0.003 | Yes | (f) |
| SW8081B LL | alpha-BHC | mg/kg | Yes | 0.006 | 0.086 | 0.00024 | No | -- |
| SW8081B LL | beta-BHC | mg/kg | Yes | 0.005 | 0.3 | 0.0039 | No | -- |
| SW8081B LL | Chlordane (All) | mg/kg | Yes | 0.00003 | 1.7 | 0.13 | Yes | (f) |
| SW8081B LL | cis-Chlordane | mg/kg | Yes | 0.00003 | 1.7 | 0.018 | Yes | (f) |
| SW8081B LL | delta-BHC | mg/kg | Yes | 0.01 | 0.086 | 0.0055 | No | -- |
| SW8081B LL | Dieldrin | mg/kg | Yes | 0.0019 | 0.034 | 0.014 | Yes | (f) |
| SW8081B LL | Endosulfan I | mg/kg | No | -- | -- | -- | -- | -- |
| SW8081B LL | Endosulfan II | mg/kg | Yes | 0.014 | 47 | 0.0068 | No | -- |
| SW8081B LL | Endosulfan Sulfate | mg/kg | Yes | 0.0054 | 47 | 0.011 | Yes | (f) |
| SW8081B LL | Endrin | mg/kg | Yes | 0.00222 | 1.9 | 0.022 | Yes | (f) |
| SW8081B LL | Endrin aldehyde | mg/kg | Yes | 0.00222 | 1.9 | 0.0021 | No | -- |
| SW8081B LL | Endrin ketone | mg/kg | Yes | 0.00222 | 1.9 | 0.008 | Yes | (f) |
| SW8081B LL | gamma-BHC (Lindane) | mg/kg | Yes | 0.00237 | 0.57 | 0.0016 | No | -- |
| SW8081B LL | gamma-Chlordane | mg/kg | Yes | 0.00003 | 1.7 | 0.13 | Yes | X |
| SW8081B LL | Heptachlor | mg/kg | Yes | 0.01 | 0.13 | 0.0071 | No | -- |
| SW8081B LL | Heptachlor Epoxide | mg/kg | Yes | 0.0006 | 0.07 | 0.0065 | Yes | (f) |
| SW8081B LL | Methoxychlor | mg/kg | Yes | 0.0187 | 32 | 0.027 | Yes | (f) |
| SW8081B LL | Toxaphene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8081B LL | trans-Chlordane | mg/kg | Yes | 0.00003 | 1.7 | 0.031 | Yes | (f) |
| **Polychlorinated Biphenyls (PCBs)** | | | | | | | | |
| E1668A | Decachlorobiphenyl (PCB-209) | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-1 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-10 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-103 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-104 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-105 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-106 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-107 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-11 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-111 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-112 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-114 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-118 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-120 | mg/kg | Yes | NV | NV | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| E1668A | PCB-121 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-122 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-123 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-126 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-127 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-129/138/160/163 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-130 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-131 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-132 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-133 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-135/151 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-136 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-137 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-14 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-141 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-142 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-144 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-145 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-146 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-148 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-15 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-150 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-152 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-154 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-155 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-158 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-159 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-16 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-161 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-162 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-164 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-165 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-167 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-169 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-17 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-170 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-172 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-174 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-175 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-176 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-177 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-178 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-179 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-181 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-182 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-184 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-186 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-187 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-188 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-189 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-19 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-190 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-191 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-192 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-194 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-195 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-196 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-197 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-198/201 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-199 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-2 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-200 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-202 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-203 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-204 | mg/kg | No | -- | -- | -- | -- | -- |
| E1668A | PCB-205 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-206 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-207 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-208 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-22 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-23 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-24 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-25 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-27 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-3 | mg/kg | Yes | NV | NV | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| E1668A | PCB-31 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-32 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-34 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-35 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-36 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-37 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-38 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-39 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-4 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-42 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-43/73 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-46 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-48 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-5 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-52 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-54 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-55 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-56 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-57 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-58 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-6 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-60 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-63 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-64 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-66 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-67 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-68 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-7 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-72 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-77 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-78 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-79 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-8 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-80 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-81 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-82 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-84 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-85/116/117 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-89 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-9 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-90/101/113 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-92 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-93/100 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-94 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-95 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A | PCB-96 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Dichlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Heptachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Hexachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Monochlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Nonachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Octachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Pentachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Tetrachlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | Trichlorobiphenyl | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-100 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-101 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-102 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-108 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-109 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-110 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-113 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-115 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-116 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-117 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-119 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-12 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-124 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-125 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-128 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-129 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-13 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-134 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-135 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-138 | mg/kg | Yes | NV | NV | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| E1668C | PCB-139 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-140 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-143 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-147 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-149 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-151 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-153 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-156 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-157 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-160 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-163 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-166 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-168 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-171 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-173 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-18 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-180 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-183 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-185 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-193 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-198 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-20 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-201 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-21 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-26 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-28 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-29 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-30 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-33 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-40 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-41 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-43 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-44 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-45 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-47 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-49 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-50 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-51 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-53 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-59 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-61 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-62 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-65 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-69 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-70 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-71 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-73 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-74 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-75 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-76 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-83 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-85 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-86 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-87 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-88 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-90 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-91 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-93 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-97 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-98 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668C | PCB-99 | mg/kg | Yes | NV | NV | -- | -- | -- |
| E1668A/C | Total PCB Congeners | mg/kg | Yes | 0.026 | 0.12 | 11.8 | Yes | **X** |
| SW8082A | Aroclor-1016 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8082A | Aroclor-1221 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8082A | Aroclor-1232 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8082A | Aroclor-1242 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8082A | Aroclor-1248 | mg/kg | Yes | 0.026 | NV | 0.89 | Yes | (f) |
| SW8082A | Aroclor-1254 | mg/kg | Yes | 0.06 | NV | 0.25 | Yes | (f) |
| SW8082A | Aroclor-1260 | mg/kg | Yes | 0.026 | NV | 1 | Yes | (f) |
| SW8082A | PCB, Total Aroclors | mg/kg | Yes | 0.026 | 0.12 | 1.9 | Yes | **X** |
| SW8082A LL | Aroclor-1262 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8082A LL | Aroclor-1268 | mg/kg | No | -- | -- | -- | -- | -- |
| **Petroleum Hydrocarbons** | | | | | | | | |
| M8015D | 2,6,10,14-Tetramethylhexadecane | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | 2,6,10,14-Tetramethylpentadecane | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | 2,6,10-Trimethyldodecane | mg/kg | No | -- | -- | -- | -- | -- |

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|---|---|---|---|---|---|---|---|---|
| M8015D | 2,6,10-Trimethyltridecane | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Decane, n- | mg/kg | No | -- | -- | -- | -- | -- |
| M8015D | Docosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Dodecane, n- | mg/kg | No | -- | -- | -- | -- | -- |
| M8015D | Dotriacontance, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Henicosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Hentriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Heptacosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Heptadecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Heptatriacontance, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Hexacosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Hexadecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Hexatriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Icosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Nonacosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Nonadecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Nonane, n- | mg/kg | No | -- | -- | -- | -- | -- |
| M8015D | Nonantriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Norpristane | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Octacosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Octadecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Octatriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Pentacosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Pentadecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Pentatriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tetracontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tetracosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tetradecane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tetratriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Total Petroleum Hydrocarbons (C9-C44) | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Total Saturated Hydrocarbons | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Triacontance, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tricosane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Tridecane, n- | mg/kg | No | -- | -- | -- | -- | -- |
| M8015D | Tritriacontane, n- | mg/kg | Yes | NV | NV | -- | -- | -- |
| M8015D | Undecane, n- | mg/kg | No | -- | -- | -- | -- | -- |
| SW8015C | TPH-C10-28 | mg/kg | Yes | NV | NV | -- | -- | X |
| SW8015C DRO | Diesel Range Organics (C10-C20) | mg/kg | Yes | NV | 96 | 270 | Yes | X |
| SW8015C DRO | Oil Range Organics (C20-C36) | mg/kg | Yes | NV | 23000 | 1600 | No | -- |
| **Semi Volatile Organic Compounds** | | | | | | | | |
| 1614 | BDE153 | mg/kg | No | -- | -- | -- | -- | -- |
| 1614 | BDE47 | mg/kg | No | -- | -- | -- | -- | -- |
| 1614 | BDE99 | mg/kg | No | -- | -- | -- | -- | -- |
| 1614 | PBDE_Total_1B | mg/kg | No | -- | -- | -- | -- | -- |
| 1614 | PBDE-100 | mg/kg | No | -- | -- | -- | -- | -- |
| 1614 | PBDE-154 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Methylnaphthalene | mg/kg | Yes | 0.0202 | 24 | 0.082 | Yes | (f) |
| SW8270D | Acenaphthene | mg/kg | Yes | 0.00671 | 360 | 0.43 | Yes | (f) |
| SW8270D | Acenaphthylene | mg/kg | Yes | 0.00587 | 360 | 0.17 | Yes | (f) |
| SW8270D | Anthracene | mg/kg | Yes | 0.01 | 1800 | 0.86 | Yes | (f) |
| SW8270D | Benzo(a)anthracene | mg/kg | Yes | 0.01572 | 1.1 | 2.3 | Yes | X |
| SW8270D | Benzo(a)pyrene | mg/kg | Yes | 0.0319 | 0.11 | 2 | Yes | X |
| SW8270D | Benzo(b)fluoranthene | mg/kg | Yes | 10.4 | 1.1 | 2.6 | Yes | X |
| SW8270D | Benzo(g,h,i)perylene | mg/kg | Yes | 0.17 | 180 | 1.7 | Yes | (f) |
| SW8270D | Benzo(k)fluoranthene | mg/kg | Yes | 0.0272 | 11 | 0.96 | Yes | X |
| SW8270D | Chrysene | mg/kg | Yes | 0.02683 | 110 | 2.4 | Yes | X |
| SW8270D | Dibenzo(a,h)anthracene | mg/kg | Yes | 0.00622 | 0.11 | 0.47 | Yes | X |
| SW8270D | Fluoranthene | mg/kg | Yes | 0.03146 | 240 | 6 | Yes | (f) |
| SW8270D | Fluorene | mg/kg | Yes | 0.01 | 240 | 0.41 | Yes | (f) |
| SW8270D | Indeno(1,2,3-cd)pyrene | mg/kg | Yes | 0.01732 | 1.1 | 1.4 | Yes | X |
| SW8270D | Naphthalene | mg/kg | Yes | 0.01465 | 3.8 | 0.13 | Yes | (f) |
| SW8270D | Phenanthrene | mg/kg | Yes | 0.01873 | 1800 | 4.4 | Yes | (f) |
| SW8270D | Pyrene | mg/kg | Yes | 0.04427 | 180 | 4 | Yes | (f) |
| SW8270D | Total High-molecular-weight PAHs | mg/kg | Yes | 0.193 | NV | 24 | Yes | X |
| SW8270D | Total Low-molecular-weight PAHs | mg/kg | Yes | 0.07642 | NV | 6.3 | Yes | (f) |
| SW8270D | Total PAHs (sum 16) | mg/kg | Yes | 0.2641 | NV | 30 | Yes | (f) |
| SW8270D | 1,1'-Biphenyl | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 1,2,4,5-Tetrachlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 1,2,4-Trichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,2'-oxybis(1-Chloropropane) | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,3,4,6-Tetrachlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4,5-Trichlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4,6-Trichlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4-Dichlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4-Dimethylphenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4-Dinitrophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2,4-Dinitrotoluene | mg/kg | No | -- | -- | -- | -- | -- |

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|---|---|---|---|---|---|---|---|---|
| SW8270D | 2,6-Dinitrotoluene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Chloronaphthalene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Chlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Methylphenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Nitroaniline | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 2-Nitrophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 3,3'-Dichlorobenzidine | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 3-Nitroaniline | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4,6-Dinitro-2-methylphenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Bromophenyl-phenylether | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Chloro-3-methylphenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Chloroaniline | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Chlorophenyl-phenylether | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Methylphenol | mg/kg | Yes | 0.0051 | 630 | 0.11 | Yes | X |
| SW8270D | 4-Nitroaniline | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | 4-Nitrophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Acetophenone | mg/kg | Yes | NV | 780 | 0.044 | No | -- |
| SW8270D | Atrazine | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Benzaldehyde | mg/kg | Yes | NV | 170 | 0.32 | No | -- |
| SW8270D | Benzidine | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Benzoic acid | mg/kg | Yes | NV | NV | 1.4 | No | -- |
| SW8270D | bis-(2-chloroethoxy)methane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | bis-(2-Chloroethyl)ether | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | bis-(2-Ethylhexyl)phthalate | mg/kg | Yes | 0.1 | 39 | 10 | Yes | X |
| SW8270D | Butylbenzylphthalate | mg/kg | Yes | 0.1 | 290 | 2.5 | Yes | (f) |
| SW8270D | Caprolactam | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Carbazole | mg/kg | Yes | NV | 240 | 0.25 | No | -- |
| SW8270D | Dibenzofuran | mg/kg | Yes | 5.1 | 7.3 | 0.11 | No | -- |
| SW8270D | Diethylphthalate | mg/kg | Yes | 0.53 | 5100 | 0.12 | No | -- |
| SW8270D | Dimethylphthalate | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Di-n-butylphthalate | mg/kg | Yes | 0.44 | 630 | 0.2 | No | -- |
| SW8270D | Di-n-octylphthalate | mg/kg | Yes | 0.1 | 63 | 0.4 | Yes | X |
| SW8270D | Diphenylhydrazine-1,2 | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Hexachlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Hexachlorobutadiene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Hexachlorocyclo-pentadiene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Hexachloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Isophorone | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Nitrobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Nitrosodimethylamine-n | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | N-Nitroso-di-n-propylamine | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | N-Nitrosodiphenylamine | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Pentachlorophenol | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D | Phenol | mg/kg | Yes | 0.048 | 1900 | 0.041 | No | -- |
| ID-0016 | 1-Methylnaphthalene | mg/kg | Yes | NV | 18 | 0.239 | No | -- |
| ID-0016 | 2,3,5-Trimethylnaphthalene | mg/kg | Yes | NV | NA | 0.39 | No | X |
| ID-0016 | 2,6-Dimethylnaphthalene | mg/kg | Yes | NV | NA | 0.3 | No | X |
| ID-0016 | 2-Methylnaphthalene | mg/kg | Yes | 0.0202 | 24 | 0.4 | Yes | (f) |
| ID-0016 | Acenaphthene | mg/kg | Yes | 0.00671 | 360 | 0.122 | Yes | (f) |
| ID-0016 | Acenaphthylene | mg/kg | Yes | 0.00587 | 360 | 0.13 | Yes | (f) |
| ID-0016 | Anthracene | mg/kg | Yes | 0.01 | 1800 | 0.33 | Yes | (f) |
| ID-0016 | Benzo(a)anthracene | mg/kg | Yes | 0.01572 | 1.1 | 1.6 | Yes | (f) |
| ID-0016 | Benzo(a)pyrene | mg/kg | Yes | 0.0319 | 0.11 | 2.2 | Yes | (f) |
| ID-0016 | Benzo(b)fluoranthene | mg/kg | Yes | 10.4 | 1.1 | 3.2 | Yes | (f) |
| ID-0016 | Benzo(e)pyrene | mg/kg | Yes | NV | NV | 1.9 | No | -- |
| ID-0016 | Benzo(g,h,i)perylene | mg/kg | Yes | 0.17 | 180 | 1.7 | Yes | (f) |
| ID-0016 | Benzo(k)fluoranthene | mg/kg | Yes | 0.0272 | 11 | 1.5 | Yes | (f) |
| ID-0016 | C1-Benzanthracene/chrysenes | mg/kg | Yes | NV | NV | 2.3 | No | -- |
| ID-0016 | C1-Dibenzothiophenes | mg/kg | Yes | NV | NV | 0.58 | No | -- |
| ID-0016 | C1-Fluorenes | mg/kg | Yes | NV | NV | 0.45 | No | -- |
| ID-0016 | C1-Phenanthrene/anthracenes | mg/kg | Yes | NV | NV | 1.8 | No | -- |
| ID-0016 | C1-Pyrene/fluoranthenes | mg/kg | Yes | NV | NV | 4.7 | No | -- |
| ID-0016 | C2-Benzanthracene/chrysenes | mg/kg | Yes | NV | NV | 1.5 | No | -- |
| ID-0016 | C2-Dibenzothiophenes | mg/kg | Yes | NV | NV | 1.1 | No | -- |
| ID-0016 | C2-Fluorenes | mg/kg | Yes | NV | NV | 1.5 | No | -- |
| ID-0016 | C2-Naphthalenes | mg/kg | Yes | NV | NV | 0.95 | No | -- |
| ID-0016 | C2-Phenanthrene/anthracenes | mg/kg | Yes | NV | NV | 6.5 | No | -- |
| ID-0016 | C3-Benzanthracene/chrysenes | mg/kg | Yes | NV | NV | 0.791 | No | -- |
| ID-0016 | C3-Dibenzothiophenes | mg/kg | Yes | NV | NV | 1.3 | No | -- |
| ID-0016 | C3-Fluorenes | mg/kg | Yes | NV | NV | 1.3 | No | -- |
| ID-0016 | C3-Naphthalenes | mg/kg | Yes | NV | NV | 2.4 | No | -- |
| ID-0016 | C3-Phenanthrene/anthracenes | mg/kg | Yes | NV | NV | 5.7 | No | -- |
| ID-0016 | C4-Benzanthracene/chrysenes | mg/kg | Yes | NV | NV | 0.519 | No | -- |
| ID-0016 | C4-Dibenzothiophenes | mg/kg | Yes | NV | NV | 0.88 | No | -- |
| ID-0016 | C4-Naphthalenes | mg/kg | Yes | NV | NV | 2.2 | No | -- |
| ID-0016 | C4-Phenanthrenes/anthracenes | mg/kg | Yes | NV | NV | 2.8 | No | -- |
| ID-0016 | Chrysene | mg/kg | Yes | 0.02683 | 110 | 2.8 | Yes | (f) |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| ID-0016 | Dibenzo(a,h)anthracene | mg/kg | Yes | 0.00622 | 0.11 | 0.23 | Yes | (f) |
| ID-0016 | Dibenzothiophene | mg/kg | Yes | NV | 78 | 0.18 | No | -- |
| ID-0016 | Fluoranthene | mg/kg | Yes | 0.03146 | 240 | 3.7 | Yes | (f) |
| ID-0016 | Fluorene | mg/kg | Yes | 0.01 | 240 | 0.18 | Yes | (f) |
| ID-0016 | Indeno(1,2,3-cd)pyrene | mg/kg | Yes | 0.01732 | 1.1 | 1.5 | Yes | (f) |
| ID-0016 | Naphthalene | mg/kg | Yes | 0.01465 | 3.8 | 0.204 | Yes | (f) |
| ID-0016 | Perylene | mg/kg | Yes | NV | NA | 0.6 | No | -- |
| ID-0016 | Phenanthrene | mg/kg | Yes | 0.01873 | 1800 | 1.87 | Yes | (f) |
| ID-0016 | Pyrene | mg/kg | Yes | 0.04427 | 180 | 3.2 | Yes | (f) |
| ID-0016 | Total High-molecular-weight PAHs | mg/kg | Yes | 0.193 | NV | 22 | Yes | X |
| ID-0016 | Total Low-molecular-weight PAHs | mg/kg | Yes | 0.07642 | NV | 2.74 | Yes | (f) |
| ID-0016 | Total PAHs (sum 16) | mg/kg | Yes | 0.2641 | NV | 23 | Yes | (f) |
| SW8270DM SIM | 13a,17b-20S-Ethyldiacholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 13b(H),17a(H)-20R-Diacholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 13b(H),17a(H)-20S-Diacholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 13b,17a-20S-Methyldiacholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a(H),17a(H)-20R-Cholestane/13b(H),17a(H)-20R- | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a(H),17a(H)-20R-Ethylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a(H),17a(H)-20S-Cholestane/13b(H),17a(H)-20S- | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a(H),17a(H)-20S-Ethylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a,17a-20R-Methylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14a,17a-20S-Methylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b(H),17b(H)-20R-Cholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b(H),17b(H)-20R-Ethylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b(H),17b(H)-20S-Cholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b(H),17b(H)-20S-Ethylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b,17b-20R-Methylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 14b,17b-20S-Methylcholestane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 17a(H),21b(H)-25-Norhopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 17a(H)-22,29,30-Trisnorhopane-TM | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 17a(H)-Diahopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 17a/b,21b/a 28,30-Bisnorhopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 18a(H)&18b(H)-Oleananes | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 18a(H)-30-Norneohopane-C29Ts | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 18a-22,29,30-Trisnorneohopane-TS | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 28-Nor-17.alpha.(H)-hopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30,31-Bishomohopane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30,31-Bishomohopane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30,31-Trishomohopane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30,31-Trishomohopane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30-Homohopane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30-Homohopane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | 30-Normoretane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C23 Tricyclic Terpane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C24 Tetracyclic Terpane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C24 Tricyclic Terpane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C25 Tricyclic Terpane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C26 Tricyclic Terpane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C26 Tricyclic Terpane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C26,20R- +C27,20S- triaromatic steroid | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C27,20R-triaromatic steroid | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C28 Tricyclic Terpane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C28 Tricyclic Terpane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C28,20R-triaromatic steroid | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C28,20S-triaromatic steroid | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C29 Tricyclic Terpane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C29 Tricyclic Terpane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C30 Tricyclic Terpane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | C30 Tricyclic Terpane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Hopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Moretane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Pentakishomohopane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Pentakishomohopane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | T22a-Gammacerane/C32-diahopane | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Tetrakishomohopane-22R | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Tetrakishomohopane-22S | mg/kg | Yes | NV | NV | -- | -- | -- |
| SW8270DM SIM | Unknown Sterane (S18) | mg/kg | Yes | NV | NV | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| SW8260C | 1,1,1-Trichloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,1,2,2-Tetrachloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 1,1,2-Trichloro-1,2,2-trifluoroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,1,2-Trichloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,1-Dichloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,1-Dichloroethene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 1,2,3-Trichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8270D LL | 1,2,4-Trichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 1,2-Dibromo-3-chloropropane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 1,2-Dibromoethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,2-Dichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,2-Dichloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,2-Dichloropropane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,3-Dichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | 1,4-Dichlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 1,4-Dioxane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 2-Butanone | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 2-Hexanone | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | 4-Methyl-2-pentanone | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Acetone | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Acrolein | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Acrylonitrile | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Benzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Bromochloromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Bromodichloromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Bromoform | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Bromomethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Butyl alcohol, tert- | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Carbon Disulfide | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Carbon Tetrachloride | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Chlorobenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Chloroethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Chloroform | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Chloromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | cis-1,2-Dichloroethylene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | cis-1,3-Dichloropropene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Cyclohexane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Dibromochloromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Dichlorodifluoromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Dichloropropene, 1,3- | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Diisopropyl ether | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Ethylbenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Ethyl-Tert-Butyl-Ether | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Isopropylbenzene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | m, p-Xylene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Methyl Acetate | mg/kg | Yes | NV | 7800 | ND | -- | -- |
| SW8260B | Methyl tert-Butyl Ether (MTBE) | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Methylcyclohexane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Methylene Chloride | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | o-Xylene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Styrene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Tetrachloroethylene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Toluene | mg/kg | Yes | 0.01 | 490 | ND | -- | -- |
| SW8260C | trans-1,2-Dichloroethene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | trans-1,3-Dichloropropene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Trichloroethene | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Trichlorofluoromethane | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Vinyl Chloride | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260C | Vinyl ether, 2-chloroethyl | mg/kg | No | -- | -- | -- | -- | -- |
| SW8260B | Xylenes (total) | mg/kg | No | -- | -- | -- | -- | -- |
| **Dioxin/Furans** | | | | | | | | |
| SW1613B | 1,2,3,4,6,7,8-Heptachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,4,7,8,9-Heptachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,4,7,8-Hexachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,6,7,8-Hexachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,7,8,9-Hexachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,7,8-PeCDF | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 2,3,4,6,7,8-Hexachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 2,3,4,7,8-Pentachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | 2,3,7,8-Tetrachlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW8270D LL | 2,3,7,8-Tetrachlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | Octachlorochlorodibenzofuran | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |

Table 4-6
Rationale for List of Constituents for Background Evaluation for Sediment

| Analytical Method | Constituent | Units | Detected in Background? (a) | Ecological Screening Value (b) | Sediment Residential RSL (c) | Maximum Detected Site Concentration (d) | Is Maximum Detected Site Concentration > ESV and/or RSL? | Selected for Background Evaluation and BTV Calculation (e) |
|---|---|---|---|---|---|---|---|---|
| SW1613B | Octachlorochlorodibenzo-p-dioxin | mg/kg | Yes | NV | NV | -- | -- | **X** (g) |
| SW1613B | TCDD TEQ HH | mg/kg | Yes | NV | 0.0000048 | 0.000707 | Yes | **X** |

Notes:
BTV - Background Threshold Value.
EN - Essential nutrient. These constituents will not be included in the refined background evaluation for sediment.
ESV - Ecological Screening Value.
mg/kg - Milligrams per kilogram.
NOAA - National Oceanic and Atmospheric Administration.
NV - No screening value available.
OMOE - Ontario Ministry of Environment and Energy
RSL - Regional Screening Level.
SQuiRT - Screening Quick Reference Tables.
TCDD TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalent.
USEPA - United States Environmental Protection Agency.
(a) Constituents detected at least once in background soil samples are indicated with "Yes".
Screening levels presented only for constituents detected in background.
(b) USEPA Regional Screening Level Table. (Target Risk =1E-06; Target Hazard Quotient=0.1). November 2017.
Residential value used for soil.
(c) Low effect ESVs selected based on a hierarchy of freshwater values from NOAA SQuiRT tables (Buchman 2008), USEPA Region 3 freshwater sediment and values from OMOE (Persaud 1993).
(d) The maximum detected concentration in Site sediment samples. Presented only for consituents detected in background.
(e) An "X" indicates the constituents selected for the refined background evaluation for sediment.
(f) The COPCs identified for the BERA are based on the results of the COPC refinement step of the BERA (i.e., comparisons of the maximum and average exposure point concentrations to ecological screening levels).
(g) Individual dioxin and furan compounds were included as COPCs in the BERA but are not toxic to benthic organisms and therefore, no sediment screening value is applied.

Table 4-7

Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-specific Background Sediment

| COPC | FOD | Detected Concentrations (mg/kg) Min | Mean | Max | Distribution of Background Dataset: Raw data [a] | Following log transformation [b] | Identification of Outlier in Site-Specific Background Dataset: Outlier Test [c] | Outlier Value (mg/kg) | Sample Identification of Outlier Value | Summary Statistics Following Outlier Removal: FOD | Maximum Detected Value (mg/kg) | BTV Statistic (mg/kg) [d] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | | | | | | | |
| Aluminum | 30 : 30 | 1600 | 7293 | 20000 | Normal | -- | Rosner's | 20000 | R7-04 | 29 : 29 | 15000 | 15034 | Normal: 95% UTL with 95% Coverage |
| Antimony | 29 : 30 | 0.13 | 0.39 | 1.1 | Gamma Lognormal | Normal | Rosner's | -- | -- | 29 : 30 | 1.1 | 0.92 | Gamma: 95% KM-WH UTL with 95% Coverage |
| Arsenic | 30 : 30 | 1.0 | 2.7 | 4.7 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 4.7 | 4.9 | Normal: 95% UTL with 95% Coverage |
| Barium | 30 : 30 | 17 | 57 | 140 | Normal | -- | Rosner's | 140 | R7-04 | 29 : 29 | 100 | 107 | Normal: 95% UTL with 95% Coverage |
| Beryllium | 30 : 30 | 0.29 | 0.85 | 1.7 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 1.7 | 1.6 | Normal: 95% UTL with 95% Coverage |
| Cobalt | 30 : 30 | 4.4 | 12 | 22 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 22 | 21 | Normal: 95% UTL with 95% Coverage |
| Cyanide | 19 : 27 | 0.082 | 0.387 | 0.99 | Gamma Lognormal | Normal | Rosner's | -- | -- | 19 : 27 | 0.99 | 0.87 | Normal: 95% KM UTL with 95% Coverage |
| Manganese | 30 : 30 | 94 | 233 | 440 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 440 | 436 | Normal: 95% UTL with 95% Coverage |
| Nickel | 30 : 30 | 7.7 | 21 | 40 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 40 | 40 | Normal: 95% UTL with 95% Coverage |
| Thallium | 28 : 30 | 0.035 | 0.156 | 0.29 | Normal | -- | Rosner's | -- | -- | 28 : 30 | 0.29 | 0.31 | Normal: 95% KM UTL with 95% Coverage |
| Vanadium | 30 : 30 | 11 | 24 | 44 | Normal | -- | Rosner's | -- | -- | 30 : 30 | 44 | 43 | Normal: 95% UTL with 95% Coverage |
| **Pesticides** | | | | | | | | | | | | | |
| 4,4'-DDT | 26 : 30 | 0.00007 | 0.0014 | 0.0056 | Gamma | No Distribution | Rosner's | 0.0056; 0.005 | SEDBACK6; SEDBACK4 | 24 : 28 | 0.0032 | 0.0028 | Normal: 95% KM UTL with 95% Coverage |
| Chlordane (technical) | 18 : 18 | 0.012 | 0.052 | 0.12 | Normal | -- | Dixon's | -- | -- | 18 : 18 | 0.12 | 0.12 | Normal: 95% UTL with 95% Coverage |
| **Polychlorinated Biphenyl Compounds** | | | | | | | | | | | | | |
| Total PCBs (Aroclors) | 30 : 30 | 0.006 | 0.055 | 0.19 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 0.19 | 0.18 | Gamma: 95% WH UTL with 95% Coverage |
| Total PCBs (Congeners) | 29 : 29 | 0.0081 | 0.118 | 0.38 | Gamma Lognormal | Normal | Rosner's | -- | -- | 29 : 29 | 0.38 | 0.42 | Gamma: 95% WH UTL with 95% Coverage |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | | | |
| 4-Methylphenol | 2 : 7 | 0.034 | 0.0385 | 0.043 | Normal | -- | NC | -- | -- | 2 : 7 | 0.043 | NC | -- |
| Acetophenone | 1 : 7 | 0.044 | 0.044 | 0.044 | -- | -- | NC | -- | -- | 1 : 6 | 0.044 | NC | -- |
| bis-(2-Ethylhexyl)phthalate | 29 : 30 | 0.23 | 0.86 | 2.8 | Gamma Lognormal | Normal | Rosner's | -- | -- | 29 : 30 | 2.8 | 2.3 | Gamma: 95% KM-WH UTL with 95% Coverage |
| Di-n-octylphthalate | 3 : 30 | 0.042 | 0.143 | 0.3 | No Distribution | -- | NC | -- | -- | 3 : 27 | 0.3 | NC | -- |
| Total High-molecular-weight PAHs | 30 : 30 | 1.4 | 6.58 | 28 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 28 | 19 | Gamma: 95% WH UTL with 95% Coverage |
| Benzo(a)anthracene | 30 : 30 | 0.1 | 0.515 | 2.7 | Gamma | Normal | Rosner's | -- | -- | 30 : 30 | 2.7 | 1.6 | Gamma: 95% WH UTL with 95% Coverage |
| Benzo(a)pyrene | 30 : 30 | 0.12 | 0.576 | 2.6 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 2.6 | 1.7 | Gamma: 95% WH UTL with 95% Coverage |
| Benzo(b)fluoranthene | 30 : 30 | 0.19 | 0.829 | 2.8 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 2.8 | 2.3 | Gamma: 95% WH UTL with 95% Coverage |
| Benzo(k)fluoranthene | 30 : 30 | 0.072 | 0.317 | 1.4 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 1.4 | 0.93 | Gamma: 95% WH UTL with 95% Coverage |

Table 4-7

Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-specific Background Sediment

| COPC | FOD | Detected Concentrations (mg/kg) Min | Mean | Max | Distribution of Background Dataset Raw data [a] | Following log transformation [b] | Identification of Outlier in Site-Specific Background Dataset Outlier Test [c] | Outlier Value (mg/kg) | Sample Identification of Outlier Value | Summary Statistics Following Outlier Removal FOD | Maximum Detected Value (mg/kg) | BTV Statistic (mg/kg) [d] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chrysene | 30 : 30 | 0.18 | 0.784 | 3.3 | Gamma | No Distribution | Rosner's | 3.3 | SEDBACK4 | 29 : 29 | 1.2 | 1.8 | Gamma: 95% WH UTL with 95% Coverage |
| Dibenzo(a,h)anthracene | 26 : 30 | 0.026 | 0.137 | 0.4 | Gamma | No Distribution | Rosner's | 0.4 | SEDBACK4 | 25 : 29 | 0.25 | 0.11 | Normal: 95% KM UTL with 95% Coverage |
| Indeno(1,2,3-cd)pyrene | 30 : 30 | 0.12 | 0.527 | 1.5 | Gamma Lognormal | Normal | Rosner's | -- | -- | 30 : 30 | 1.5 | 1.4 | Gamma: 95% WH UTL with 95% Coverage |
| **Semi-Volatile Organic Compounds (Method ID-0016)** | | | | | | | | | | | | | |
| 2,3,5-Trimethylnaphthalene | 6 : 6 | 0.0034 | 0.009 | 0.0164 | Normal | -- | Dixon's | -- | -- | 6 : 6 | 0.0164 | 0.028 | Normal: 95% UTL with 95% Coverage |
| 2,6-Dimethylnaphthalene | 6 : 6 | 0.0056 | 0.015 | 0.037 | Normal | -- | Dixon's | 0.0369 | SEDBACK6 | 5 : 5 | 0.019 | 0.035 | Normal: 95% UTL with 95% Coverage |
| Total High-molecular-weight PAHs | 27 : 27 | 2.1 | 12.0 | 6.926 | Gamma Lognormal | Gamma | Rosner's | -- | -- | 27 : 27 | 12.0 | 17 | Gamma: 95% WH UTL with 95% Coverage |
| **Petroleum Compounds** | | | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | 4 : 4 | 33 | 38 | 44 | Normal | -- | Dixon's | -- | -- | 4 : 4 | 44 | 64 | Normal: 95% UTL with 95% Coverage |
| TPH-C10-28 | 23 : 23 | 53 | 294 | 1100 | Gamma Lognormal | Normal | Dixon's | -- | -- | 23 : 23 | 1100 | 906 | Gamma: 95% WH UTL with 95% Coverage |
| **Dioxin/Furan Compounds** | | | | | | | | | | | | | |
| 2,3,7,8-TCDD | 11 : 21 | 4.1E-08 | 3.0E-07 | 7.2E-07 | Gamma Lognormal | Normal | Dixon's | -- | -- | 11 : 21 | 7.2E-07 | 6.8E-07 | Normal: 95% KM UTL with 95% Coverage |
| 1,2,3,7,8-PeCDD | 10 : 21 | 2.2E-07 | 1.1E-06 | 2.2E-06 | Gamma Lognormal | Normal | Dixon's | -- | -- | 10 : 21 | 2.2E-06 | 2.2E-06 | Normal: 95% KM UTL with 95% Coverage |
| 1,2,3,6,7,8-HxCDD | 16 : 21 | 9.9E-07 | 4.4E-06 | 1.2E-05 | Gamma Lognormal | Normal | Dixon's | -- | -- | 16 : 21 | 1.2E-05 | 1.4E-05 | Gamma: 95% KM-WH UTL with 95% Coverage |
| 1,2,3,4,7,8-HxCDD | 16 : 21 | 3.8E-07 | 1.9E-06 | 4.7E-06 | Gamma Lognormal | Normal | Dixon's | -- | -- | 16 : 21 | 4.7E-06 | 4.8E-06 | Normal: 95% KM UTL with 95% Coverage |
| 1,2,3,7,8,9-HxCDD | 17 : 21 | 8.5E-07 | 4.6E-06 | 1.1E-05 | Lognormal | Normal | Dixon's | -- | -- | 17 : 21 | 1.1E-05 | 1.5E-05 | Gamma: 95% KM-WH UTL with 95% Coverage |
| 1,2,3,4,6,7,8-HpCDD | 21 : 21 | 1.7E-05 | 1.0E-04 | 2.6E-04 | Gamma Lognormal | Normal | Dixon's | -- | -- | 21 : 21 | 2.6E-04 | 3.8E-04 | Gamma: 95% WH UTL with 95% Coverage |
| OCDD | 21 : 21 | 5.2E-04 | 3.4E-03 | 8.0E-03 | Gamma Lognormal | Normal | Dixon's | -- | -- | 21 : 21 | 8.0E-03 | 1.3E-02 | Gamma: 95% WH UTL with 95% Coverage |
| 2,3,7,8-TCDF | 21 : 21 | 1.6E-07 | 8.8E-07 | 3.3E-06 | Gamma Lognormal | Normal | Dixon's | -- | -- | 21 : 21 | 3.3E-06 | 3.1E-06 | Gamma: 95% WH UTL with 95% Coverage |
| 1,2,3,7,8-PeCDF | 10 : 21 | 2.4E-07 | 6.5E-07 | 1.7E-06 | Gamma Lognormal | Normal | Dixon's | -- | -- | 10 : 21 | 1.7E-06 | 1.8E-06 | Gamma: 95% KM-WH UTL with 95% Coverage |
| 2,3,4,7,8-PeCDF | 16 : 21 | 4.3E-07 | 1.3E-06 | 2.6E-06 | Normal | -- | Dixon's | -- | -- | 16 : 21 | 2.6E-06 | 2.6E-06 | Normal: 95% KM UTL with 95% Coverage |
| 1,2,3,6,7,8-HxCDF | 14 : 21 | 5.1E-07 | 1.5E-06 | 3.6E-06 | Gamma Lognormal | Normal | Dixon's | -- | -- | 14 : 21 | 3.6E-06 | 3.3E-06 | Normal: 95% KM UTL with 95% Coverage |
| 1,2,3,7,8,9-HxCDF | 4 : 21 | 7.9E-08 | 4.1E-07 | 1.3E-06 | No Distribution | No Distribution | Dixon's | 1.3E-06 | R7-06 | 3 : 20 | 1.5E-07 | NC | -- |
| 1,2,3,4,7,8-HxCDF | 14 : 21 | 4.0E-07 | 2.4E-06 | 7.0E-06 | Lognormal | Normal | Dixon's | -- | -- | 14 : 21 | 7.0E-06 | 7.2E-06 | Gamma: 95% KM-WH UTL with 95% Coverage |
| 2,3,4,6,7,8-HxCDF | 14 : 21 | 3.9E-07 | 1.4E-06 | 2.8E-06 | Normal | -- | Dixon's | -- | -- | 14 : 21 | 2.8E-06 | 3.8E-06 | Gamma: 95% KM-WH UTL with 95% Coverage |
| 1,2,3,4,6,7,8-HpCDF | 19 : 21 | 3.3E-06 | 1.5E-05 | 3.5E-05 | Lognormal | Normal | Dixon's | -- | -- | 19 : 21 | 3.5E-05 | 4.7E-05 | Gamma: 95% KM-WH UTL with 95% Coverage |

Table 4-7

Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Site-specific Background Sediment

| | | Detected Concentrations (mg/kg) | | | Distribution of Background Dataset | | Identification of Outlier in Site-Specific Background Dataset | | | Summary Statistics Following Outlier Removal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COPC** | **FOD** | Min | Mean | Max | Raw data [a] | Following log transformation [b] | Outlier Test [c] | Outlier Value (mg/kg) | Sample Identification of Outlier Value | FOD | Maximum Detected Value (mg/kg) | **BTV Statistic (mg/kg) [d]** | |
| 1,2,3,4,7,8,9-HpCDF | 7 : 21 | 4.1E-07 | 1.5E-06 | 3.8E-06 | Gamma Lognormal | Normal | Dixon's | 0.000000066 | R7-12 | 7 : 20 | 3.8E-06 | 3.0E-06 | Normal: 95% KM UTL with 95% Coverage |
| OCDF | 15 : 21 | 5.6E-06 | 4.0E-05 | 8.5E-05 | Gamma Lognormal | Normal | Dixon's | -- | -- | 15 : 21 | 8.5E-05 | 9.2E-05 | Normal: 95% KM UTL with 95% Coverage |
| TCDD TEQ HH | 21 : 21 | 8.1E-07 | 4.5E-06 | 1.3E-05 | Gamma Lognormal | Normal | Dixon's | -- | -- | 21 : 21 | 1.3E-05 | 1.7E-05 | Gamma: 95% WH UTL with 95% Coverage |

Notes:
BTV - Background Threshold Value.
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
KM - Kaplan Meier.
NC - Not calculated.
USEPA - United States Environmental Protection Agency.
UTL - Upper Threshold Value.
[a] The distribution of Site-Specific Background datasets was determined using the Goodness-of-Fit tests (significance level 0.05) based on the Shapiro-Wilk test for normal or lognormal distributions and the Kolmogorov-Smirnov or Anderson-Darling tests for gamma distributions in ProUCL (version 5.1; USEPA, 2016). If the dataset includes non-detects, the non-detects were included at the full value of the detection limit.
[b] If the dataset is not normally distributed, the data were transformed using a log transformation and the GOF test was repeated on the log-transformed data. If the log-transformed data are normally distributed, then the outlier test was performed on the log-transformed data.
[c] The default outlier test in ProUCL (version 5.1; USEPA, 2016) was conducted (Rosner's test for over 25 samples, Dixon's test for under 25 samples). If the dataset includes non-detects, the non-detects were included at the full value of the detection limit. Identified outlier values were removed from the dataset prior to the calculation of the BTV statistics.
[d] BTVs were calculated in ProUCL (version 5.1; USEPA, 2016). The 95UTL was selected based on the distribution of the detected concentrations in the raw (not log-transformed) dataset. If the dataset includes non-detects, the BTV was selected from the Kaplan-Meier (KM) statistics.  For gamma UTLs, the Wilson Hilferty (WH) statistic was selected.

Table 4-8
Comparison of Chemical Concentrations in Site and Background Sediment

| COPC | Frequency of Detection [a] | | Mean/Median (Standard deviation) of Detected Concentrations (mg/kg) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Site | Site-specific Background | Site | Site-specific Background | Site | Site-specific Background | Test | p-value | Reject Null Hypothesis? | Is Site > or = Background? |
| **Inorganics** | | | | | | | | | | |
| Aluminum | 84 : 84 | 29 : 29 | 8000 (3410) | 6855 (3664) | Normal | Normal | t-test | 0.003 | Yes | No |
| Antimony | 83 : 84 | 29 : 30 | 0.55 (4.67) | 0.35 (0.2) | Not Normal | Not Normal | Gehan | 0.55 | No | Yes |
| Arsenic | 84 : 84 | 30 : 30 | 3.95 (2.96) | 2.5 (0.98) | Not Normal | Normal | WMW | 0.85 | No | Yes |
| Barium | 84 : 84 | 29 : 29 | 84 (28.9) | 54 (24) | Normal | Normal | t-test | 0.86 | No | Yes |
| Beryllium | 84 : 84 | 30 : 30 | 1 (0.4) | 0.84 (0.36) | Not Normal | Normal | WMW | 0.069 | No | Yes |
| Cobalt | 84 : 84 | 30 : 30 | 15 (5.2) | 12 (4.36) | Normal | Normal | t-test | 0.21 | No | Yes |
| Cyanide | 15 : 20 | 19 : 27 | 0.48 (1.2) | 0.37 (0.26) | Not Normal | Normal | Gehan | 0.074 | No | Yes |
| Manganese | 84 : 84 | 30 : 30 | 245 (126) | 230 (92) | Not Normal | Normal | WMW | 0.0054 | Yes | No |
| Nickel | 84 : 84 | 30 : 30 | 32 (27) | 21 (8.6) | Not Normal | Normal | WMW | 0.84 | No | Yes |
| Thallium | 84 : 84 | 28 : 30 | 0.19 (0.085) | 0.16 (0.07) | Normal | Normal | Gehan | 0.054 | No | Yes |
| Vanadium | 84 : 84 | 30 : 30 | 37 (69) | 23 (8.6) | Not Normal | Normal | WMW | 0.99 | No | Yes |
| **Pesticides** | | | | | | | | | | |
| 4,4'-DDT | 33 : 49 | 24 : 28 | 0.0025 (0.26) | 0.0012 (0.00077) | Not Normal | Normal | Gehan | 0.26 | No | Yes |
| Chlordane (technical) | 14 : 15 | 18 : 18 | 0.05 (0.026) | 0.055 (0.028) | Normal | Normal | WMW | 0.0083 | Yes | No |
| **Polychlorinated Biphenyl Compounds** | | | | | | | | | | |
| Total PCB Aroclors | 83 : 84 | 30 : 30 | 0.17 (0.37) | 0.046 (0.04) | Not Normal | Not Normal | Gehan | 1.0 | No | Yes |
| Total PCB Congeners | 32 : 32 | 29 : 29 | 0.24 (2.1) | 0.099 (0.096) | Not Normal | Not Normal | WMW | 0.98 | No | Yes |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| 4-Methylphenol | 6 : 14 | 2 : 7 | 0.068 (0.032) | 0.04 (0.0064) | Normal | -- | -- | NC | NC | NC |
| Acetophenone | 6 : 14 | 1 : 6 | 0.03 (0.01) | 0.044 (NC) | Normal | -- | -- | NC | NC | NC |
| bis-(2-Ethylhexyl)phthalate | 34 : 34 | 29 : 30 | 1.2 (1.65) | 0.86 (0.54) | Not Normal | Not Normal | Gehan | 0.17 | No | Yes |
| Di-n-octylphthalate | 7 : 34 | 3 : 27 | 0.24 (0.131) | 0.087 (0.14) | Not Normal | Not Normal | -- | NC | NC | NC |
| Total High-molecular-weight PAHs | 68 : 69 | 30 : 30 | 6 (3.6) | 6.3 (4.9) | Not Normal | Not Normal | Gehan | 1.0E-08 | Yes | No |
| Benzo(a)anthracene | 68 : 69 | 30 : 30 | 0.48 (0.32) | 0.45 (0.47) | Not Normal | Not Normal | Gehan | 6.2E-10 | Yes | No |
| Benzo(a)pyrene | 68 : 69 | 30 : 30 | 0.56 (0.31) | 0.53 (0.45) | Not Normal | Not Normal | Gehan | 6.7E-09 | Yes | No |
| Benzo(b)fluoranthene | 68 : 69 | 30 : 30 | 0.85 (0.43) | 0.83 (0.52) | Not Normal | Not Normal | Gehan | 1.0E-05 | Yes | No |
| Benzo(k)fluoranthene | 67 : 69 | 30 : 30 | 0.31 (0.16) | 0.23 (0.25) | Normal | Not Normal | Gehan | 1.2E-08 | Yes | No |
| Chrysene | 68 : 69 | 29 : 29 | 0.78 (0.37) | 0.71 (0.33) | Not Normal | Not Normal | Gehan | 0.0017 | Yes | No |
| Dibenzo(a,h)anthracene | 65 : 69 | 25 : 29 | 0.14 (0.073) | 0.13 (0.06) | Not Normal | Normal | Gehan | 0.0071 | Yes | No |
| Indeno(1,2,3-cd)pyrene | 68 : 69 | 30 : 30 | 0.46 (0.28) | 0.49 (0.3) | Not Normal | Not Normal | Gehan | 8.4E-07 | Yes | No |
| **Semi-Volatile Organic Compounds (Method ID-0016)** | | | | | | | | | | |
| 2,3,5-Trimethylnaphthalene | 22 : 22 | 6 : 6 | 0.032 (0.084) | 0.008 (0.005) | Not Normal | Normal | -- | NC | NC | NC |
| 2,6-Dimethylnaphthalene | 22 : 22 | 5 : 5 | 0.054 (0.084) | 0.0078 (0.0057) | Not Normal | Normal | -- | NC | NC | NC |
| Total High-molecular-weight PAHs | 68 : 69 | 27 : 27 | 9.9 (4.42) | 7 (3.3) | Normal | Not Normal | Gehan | 0.48 | No | Yes |
| **Petroleum** | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | 18 : 18 | 4 : 4 | 74 (64) | 38 (4.97) | Not Normal | Normal | -- | NC | NC | NC |
| TPH-C10-28 | 20 : 20 | 23 : 23 | 360 (297) | 210 (225.9) | Not Normal | Not Normal | WMW | 0.13 | No | Yes |

Table 4-8
Comparison of Chemical Concentrations in Site and Background Sediment

| COPC | Frequency of Detection [a] | | Mean/Median (Standard deviation) of Detected Concentrations (mg/kg) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Site | Site-specific Background | Site | Site-specific Background | Site | Site-specific Background | Test | p-value | Reject Null Hypothesis? | Is Site > or = Background? |
| **Dioxin/Furans** | | | | | | | | | | |
| 1,2,3,7,8-PeCDD | 39 : 41 | 10 : 21 | 2.4E-06 (4.9E-05) | 8.9E-07 (7.7E-07) | Not Normal | Normal | Gehan | 1.0 | No | Yes |
| 1,2,3,6,7,8-HxCDD | 41 : 41 | 16 : 21 | 5.9E-06 (9.7E-05) | 3.4E-06 (3.3E-06) | Not Normal | Not Normal | Gehan | 0.61 | No | Yes |
| 1,2,3,4,7,8-HxCDD | 39 : 41 | 16 : 21 | 2.6E-06 (5.3E-05) | 1.6E-06 (1.4E-06) | Not Normal | Normal | Gehan | 0.73 | No | Yes |
| 1,2,3,7,8,9-HxCDD | 40 : 41 | 17 : 21 | 6.1E-06 (1.3E-04) | 3.4E-06 (3.5E-06) | Not Normal | Not Normal | Gehan | 0.65 | No | Yes |
| 1,2,3,4,6,7,8-HpCDD | 41 : 41 | 21 : 21 | 1.3E-04 (7.1E-04) | 7.1E-05 (7.7E-05) | Not Normal | Not Normal | WMW | 0.054 | No | Yes |
| 2,3,7,8-TCDD | 34 : 41 | 11 : 21 | 7.9E-07 (7.4E-06) | 2.7E-07 (2.4E-07) | Not Normal | Normal | Gehan | 0.99 | No | Yes |
| OCDD | 41 : 41 | 21 : 21 | 2.8E-03 (3.2E-03) | 2.6E-03 (2.5E-03) | Not Normal | Not Normal | WMW | 0.00020 | Yes | No |
| 1,2,3,7,8-PeCDF | 38 : 41 | 10 : 21 | 1.3E-06 (2.3E-05) | 4.6E-07 (5.0E-07) | Not Normal | Not Normal | Gehan | 0.99 | No | Yes |
| 2,3,4,7,8-PeCDF | 38 : 41 | 16 : 21 | 2.9E-06 (4.1E-05) | 1.2E-06 (6.5E-07) | Not Normal | Normal | Gehan | 1.0 | No | Yes |
| 1,2,3,6,7,8-HxCDF | 36 : 41 | 14 : 21 | 4.4E-06 (5.0E-05) | 1.2E-06 (9.5E-07) | Not Normal | Normal | Gehan | 0.99 | No | Yes |
| 1,2,3,4,7,8-HxCDF | 39 : 41 | 14 : 21 | 3.6E-06 (8.6E-05) | 1.4E-06 (2.0E-06) | Not Normal | Not Normal | Gehan | 0.80 | No | Yes |
| 2,3,4,6,7,8-HxCDF | 39 : 41 | 14 : 21 | 3.1E-06 (5.1E-05) | 1.0E-06 (8.9E-07) | Not Normal | Not Normal | Gehan | 0.99 | No | Yes |
| 1,2,3,7,8,9-HxCDF | 27 : 41 | 3 : 20 | 3.9E-07 (5.2E-06) | 1.1E-07 (3.8E-08) | Not Normal | -- | -- | NC | NC | NC |
| 1,2,3,4,6,7,8-HpCDF | 41 : 41 | 19 : 21 | 2.3E-05 (1.9E-04) | 1.0E-05 (1.0E-05) | Not Normal | Not Normal | Gehan | 0.80 | No | Yes |
| 1,2,3,4,7,8,9-HpCDF | 37 : 41 | 7 : 20 | 1.8E-06 (2.8E-05) | 8.3E-07 (1.3E-06) | Not Normal | Normal | Gehan | 0.90 | No | Yes |
| 2,3,7,8-TCDF | 40 : 41 | 21 : 21 | 2.0E-06 (1.1E-05) | 5.8E-07 (7.6E-07) | Not Normal | Not Normal | WMW | 0.85 | No | Yes |
| OCDF | 39 : 41 | 15 : 21 | 4.6E-05 (1.7E-04) | 3.0E-05 (2.6E-05) | Not Normal | Normal | Gehan | 0.26 | No | Yes |
| TCDD TEQ HH | 41 : 41 | 21 : 21 | 9.1E-06 (1.2E-04) | 3.0E-06 (3.8E-06) | Not Normal | Not Normal | WMW | 0.88 | No | Yes |

Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.
NC - Not Calculated (Insufficient data and/or detected concentrations).

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Background datasets were determined using the Shapiro-Wilks test (significance level 0.05) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.1 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan).
The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected.
The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.

**Table 4-9**
**List of Constituents for Background Evaluation for Groundwater**

| Constituents | Upper Zone | Lower Zone |
|---|---|---|
| **Dissolved Metals** | | |
| Cadmium | X | X |
| Cobalt | X | X |
| Iron | X | X |
| Manganese | X | X |
| Nickel | X | X |
| Zinc | -- | X |
| **Total Metals** | | |
| Aluminum | X | X |
| Arsenic | X | X |
| Barium | X | X |
| Beryllium | X | X |
| Cadmium | X | X |
| Chromium | X | X |
| Cobalt | X | X |
| Copper | -- | X |
| Iron | X | X |
| Lead | X | X |
| Manganese | X | X |
| Mercury | X | -- |
| Nickel | X | X |
| Thallium | X | X |
| Vanadium | X | X |
| Zinc | X | X |
| **Petroleum Compounds** | | |
| Diesel Range Organics (C10-C20) | X | X |
| **Semi-Volatile Organic Compounds** | | |
| BaP-TE | X | -- |
| bis-(2-Ethylhexyl)phthalate | X | -- |
| Benzo(b)fluoranthene | X | -- |
| **Volatile Organic Compounds** | | |
| Methyl tert-Butyl Ether (MTBE) | X | X |

Note:
Constituents were identified separately based on samples representing the upper and lower aquifer zones.

Table 4-10
Rationale for List of Constituents for Background Evaluation for Groundwater

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| Dissolved Metals | | | | | | | | | | | |
| SW6020A | Aluminum | ug/l | Yes | Yes | 2000 | 970 | 200 | No | No | -- | -- |
| SW6020A | Antimony | ug/l | Yes | Yes | 6 | 1.4 | 0.54 | No | No | -- | -- |
| SW6020A | Arsenic | ug/l | Yes | Yes | 10 | 3 | 2.3 | No | No | -- | -- |
| SW6020A | Barium | ug/l | Yes | Yes | 1000 | 580 | 540 | No | No | -- | -- |
| SW6020A | Beryllium | ug/l | Yes | Yes | 4 | 1.3 | 1.3 | No | No | -- | -- |
| SW6020A | Cadmium | ug/l | Yes | Yes | 5 | 7.9 | 6.5 | Yes | Yes | X | X |
| SW6020A | Calcium | ug/l | Yes | Yes | EN | 240000 | 120000 | No | No | -- | -- |
| SW6020A | Chromium | ug/l | Yes | Yes | 100 | 5.6 | 4.4 | No | No | -- | -- |
| SW6020A | Cobalt | ug/l | Yes | Yes | 0.6 | 71 | 80 | Yes | Yes | X | X |
| SW6020A | Copper | ug/l | Yes | Yes | 1300 | 9.5 | 28 | No | No | -- | -- |
| SW6020A | Iron | ug/l | Yes | Yes | 1400 | 150000 | 38000 | Yes | Yes | X | X |
| SW6020A | Lead | ug/l | Yes | Yes | 15 | 0.087 | 0.12 | No | No | -- | -- |
| SW6020A | Magnesium | ug/l | Yes | Yes | EN | 33000 | 30000 | No | No | -- | -- |
| SW6020A | Manganese | ug/l | Yes | Yes | 43 | 5000 | 3400 | Yes | Yes | X | X |
| SW7470A | Mercury | ug/l | No | Yes | 2 | 0.042 | 0.045 | No | No | -- | -- |
| SW6020A | Nickel | ug/l | Yes | Yes | 39 | 85 | 81 | Yes | Yes | X | X |
| SW6020A | Potassium | ug/l | Yes | Yes | EN | 23000 | 10000 | No | No | -- | -- |
| SW6020A | Selenium | ug/l | Yes | Yes | 50 | 2.8 | 0.94 | No | No | -- | -- |
| SW6020A | Silver | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW6020A | Sodium | ug/l | Yes | Yes | EN | 700000 | 330000 | No | No | -- | -- |
| SW6020A | Thallium | ug/l | Yes | No | 2 | 0.22 | -- | No | -- | -- | -- |
| SW6020A | Vanadium | ug/l | Yes | Yes | 8.6 | 6.6 | 8.3 | No | No | -- | -- |
| SW6020A | Zinc | ug/l | Yes | Yes | 600 | 490 | 790 | No | Yes | -- | X |
| Total Metals | | | | | | | | | | | |
| SW6020A | Aluminum | ug/l | Yes | Yes | 2000 | 170000 | 170000 | Yes | Yes | X | X |
| SW6020A | Antimony | ug/l | Yes | Yes | 6 | 1.9 | 3.2 | No | No | -- | -- |
| SW6020A | Arsenic | ug/l | Yes | Yes | 10 | 74 | 160 | Yes | Yes | X | X |
| SW6020A | Barium | ug/l | Yes | Yes | 1000 | 1800 | 1200 | Yes | Yes | X | X |
| SW6020A | Beryllium | ug/l | Yes | Yes | 4 | 40 | 59 | Yes | Yes | X | X |
| SW6020A | Cadmium | ug/l | Yes | Yes | 5 | 6.5 | 7.6 | Yes | Yes | X | X |
| SW6020A | Calcium | ug/l | Yes | Yes | EN | 240000 | 120000 | No | No | -- | -- |
| SW6020A | Chromium | ug/l | Yes | Yes | 100 | 650 | 2000 | Yes | Yes | X | X |
| SW6020A | Cobalt | ug/l | Yes | Yes | 0.6 | 560 | 2200 | Yes | Yes | X | X |
| SW6020A | Copper | ug/l | Yes | Yes | 1300 | 960 | 1500 | No | Yes | -- | X |
| SW6020A | Iron | ug/l | Yes | Yes | 1400 | 1200000 | 690000 | Yes | Yes | X | X |
| SW6020A | Lead | ug/l | Yes | Yes | 15 | 220 | 900 | Yes | Yes | X | X |
| SW6020A | Magnesium | ug/l | Yes | Yes | EN | 33000 | 39000 | No | No | -- | -- |
| SW6020A | Manganese | ug/l | Yes | Yes | 43 | 5700 | 4800 | Yes | Yes | X | X |
| SW7470A | Mercury | ug/l | Yes | Yes | 2 | 3 | 0.62 | Yes | No | X | -- |
| SW6020A | Nickel | ug/l | Yes | Yes | 39 | 260 | 1800 | Yes | Yes | X | X |
| SW6020A | Potassium | ug/l | Yes | Yes | EN | 27000 | 15000 | No | No | -- | -- |
| SW6020A | Selenium | ug/l | Yes | Yes | 50 | 7.1 | 12 | No | No | -- | -- |
| SW6020A | Silver | ug/l | Yes | No | 50 | 0.85 | -- | No | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) Upper | Detected in Background? (a) Lower | Selected Screening Level (b) | Maximum Detected Site Concentration (c) Upper | Maximum Detected Site Concentration (c) Lower | Is Maximum Detected Site Concentration > Screening Level? Upper | Is Maximum Detected Site Concentration > Screening Level? Lower | Selected for Background Evaluation and BTV Calculation (d) Upper | Selected for Background Evaluation and BTV Calculation (d) Lower |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW6020A | Sodium | ug/l | Yes | Yes | EN | 670000 | 330000 | No | No | -- | -- |
| SW6020A | Thallium | ug/l | Yes | Yes | 2 | 2.6 | 2.6 | Yes | Yes | X | X |
| SW6020A | Vanadium | ug/l | Yes | Yes | 8.6 | 850 | 2900 | Yes | Yes | X | X |
| SW6020A | Zinc | ug/l | Yes | Yes | 600 | 870 | 3100 | Yes | Yes | X | X |
| SW9012B | Cyanide | ug/l | Yes | No | 200 | -- | -- | -- | -- | -- | -- |
| Polychlorinated Biphenyl Compounds and Pesticides | | | | | | | | | | | |
| SW8081B LL | 4,4'-DDD | ug/l | Yes | Yes | 0.0063 | 0.0011 | -- | No | -- | -- | -- |
| SW8081B LL | 4,4'-DDE | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | 4,4'-DDT | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Aroclor-1242 | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Aroclor-1248 | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Aroclor-1254 | ug/l | Yes | No | 0.5 | 0.013 | -- | No | -- | -- | -- |
| SW8081B LL | Aroclor-1260 | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | beta-BHC | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | cis-Chlordane | ug/l | Yes | No | 2 | 0.00096 | -- | No | -- | -- | -- |
| E1668C | Decachlorobiphenyl (PCB-209) | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | delta-BHC | ug/l | Yes | No | 0.0072 | 0.00097 | -- | No | -- | -- | -- |
| SW8081B LL | Dichlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Dieldrin | ug/l | Yes | No | 0.0018 | 0.0012 | -- | No | -- | -- | -- |
| SW8081B LL | Endosulfan I | ug/l | Yes | No | 10 | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Endosulfan Sulfate | ug/l | Yes | No | 10 | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Endrin | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Endrin ketone | ug/l | Yes | No | 0.23 | -- | -- | -- | -- | -- | -- |
| SW8081B LL | gamma-BHC (Lindane) | ug/l | No | Yes | 0.2 | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Heptachlor Epoxide | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Heptachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Hexachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Monochlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Nonachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | Octachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB TEQ Bird | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB TEQ HH | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB, TOTAL | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8082A LL | PCB, Total Aroclors (AECOM Calc) | ug/l | Yes | No | 0.5 | 0.15 | -- | No | -- | -- | -- |
| SW8082A LL | PCB, Total Aroclors (Lab provided) | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-1 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-10 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-100 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-101 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-102 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-103 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-105 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-107 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-108 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

Table 4-10
Rationale for List of Constituents for Background Evaluation for Groundwater

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| E1668C | PCB-109 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-11 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-110 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-112 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-113 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-114 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-115 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-116 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-117 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-118 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-119 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-12 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-120 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-122 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-123 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-124 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-125 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-126 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-127 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-128 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-129 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-13 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-130 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-131 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-132 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-133 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-134 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-135 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-136 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-137 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-138 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-139 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-14 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-140 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-141 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-143 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-144 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-146 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-147 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-149 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-15 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-151 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-153 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-154 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| E1668C | PCB-156 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-157 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-158 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-159 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-16 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-160 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-162 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-163 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-164 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-166 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-167 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-168 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-169 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-17 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-170 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-171 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-172 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-173 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-174 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-175 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-176 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-177 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-178 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-179 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-18 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-180 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-181 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-183 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-185 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-187 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-189 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-19 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-190 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-191 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-193 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-194 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-195 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-196 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-197 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-198 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-199 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-2 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-20 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-200 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| E1668C | PCB-201 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-202 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-203 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-205 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-206 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-207 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-208 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-21 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-22 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-24 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-25 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-26 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-27 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-28 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-29 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-3 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-30 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-31 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-32 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-33 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-35 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-37 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-38 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-4 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-40 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-41 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-42 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-43 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-44 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-45 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-46 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-47 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-48 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-49 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-5 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-50 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-51 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-52 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-53 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-55 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-56 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-59 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-6 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-60 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| E1668C | PCB-61 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-62 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-63 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-64 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-65 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-66 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-67 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-68 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-69 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-7 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-70 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-71 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-72 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-73 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-74 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-75 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-76 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-77 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-78 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-79 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-8 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-81 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-82 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-83 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-84 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-85 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-86 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-87 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-88 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-89 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-9 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-90 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-91 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-92 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-93 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-94 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-95 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-96 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-97 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-98 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | PCB-99 | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | Pentachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| E1668C | Tetrachlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8081B LL | trans-Chlordane | ug/l | Yes | Yes | 2 | 0.0021 | 0.0018 | No | No | -- | -- |

Table 4-10
Rationale for List of Constituents for Background Evaluation for Groundwater

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| E1668C | Trichlorobiphenyl | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| Petroleum Compounds | | | | | | | | | | | |
| SW8015C DRO | Diesel Range Organics (C10-C20) | ug/l | Yes | Yes | 100 | 540 | 380 | Yes | Yes | X | X |
| SW8015C GRO | Gasoline Range Organics (C6-C10) | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Hentriacontane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Heptacosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Hexacosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Hexatriacontane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Nonacosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Octacosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Oil Range Organics (C20-C36) | ug/l | Yes | Yes | 6000 | 1900 | 580 | No | No | -- | -- |
| M8015D | Pentadecane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Tetracosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8015C DRO | Total Petroleum Hydrocarbons (C9-C44) | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Total Saturated Hydrocarbons | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Triacontance, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| M8015D | Tricosane, n- | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| Semi-Volatile Organic Compounds | | | | | | | | | | | |
| ID-0016 | 1-Methylnaphthalene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | 2,3,5-Trimethylnaphthalene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | 2,6-Dimethylnaphthalene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | 2-Methylnaphthalene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Acenaphthene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Acenaphthylene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Anthracene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(a)anthracene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(a)pyrene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(b)fluoranthene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(e)pyrene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(g,h,i)perylene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Benzo(k)fluoranthene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C1-Benzanthracene/chrysenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C1-Dibenzothiophenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C1-Fluorenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C1-Phenanthrene/anthracenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C1-Pyrene/fluoranthenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C2-Benzanthracene/chrysenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C2-Dibenzothiophenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C2-Fluorenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C2-Naphthalenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C2-Phenanthrene/anthracenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C3-Benzanthracene/chrysenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C3-Dibenzothiophenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C3-Fluorenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

Table 4-10
Rationale for List of Constituents for Background Evaluation for Groundwater

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| ID-0016 | C3-Naphthalenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C3-Phenanthrene/anthracenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C4-Dibenzothiophenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C4-Naphthalenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | C4-Phenanthrenes/anthracenes | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Chrysene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Dibenzo(a,h)anthracene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Dibenzothiophene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Fluoranthene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Fluorene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Indeno(1,2,3-cd)pyrene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Naphthalene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Perylene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Phenanthrene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| ID-0016 | Pyrene | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | 1,1'-Biphenyl | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | 2-Methylnaphthalene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | 4-Methylphenol | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Acenaphthene | ug/l | Yes | No | 53 | 1.3 | -- | No | -- | -- | -- |
| SW8270D LL | Acenaphthylene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Anthracene | ug/l | Yes | Yes | 180 | 0.5 | 0.17 | No | No | -- | -- |
| SW8270D LL | BaP-TE | ug/l | Yes | No | 0.2 | 7.76 | -- | Yes | -- | X | -- |
| SW8270D LL | Benzaldehyde | ug/l | Yes | Yes | 19 | 0.9 | 0.93 | No | No | -- | -- |
| SW8270D LL | Benzo(a)anthracene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Benzo(a)pyrene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Benzo(b)fluoranthene | ug/l | Yes | No | 0.25 | 3.1 | -- | Yes | -- | X | -- |
| SW8270D LL | Benzo(g,h,i)perylene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Benzo(k)fluoranthene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | bis-(2-Ethylhexyl)phthalate | ug/l | Yes | Yes | 6 | 7.6 | 1.5 | Yes | No | X | -- |
| SW8270D LL | Butylbenzylphthalate | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Caprolactam | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Carbazole | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Chrysene | ug/l | Yes | No | 25 | 3.8 | -- | No | -- | -- | -- |
| SW8270D LL | Dibenzo(a,h)anthracene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Dibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Diethylphthalate | ug/l | Yes | Yes | 1500 | 0.4 | 0.44 | No | No | -- | -- |
| SW8270D LL | Dimethylphthalate | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Di-n-butylphthalate | ug/l | Yes | Yes | 90 | 1.5 | 1.3 | No | No | -- | -- |
| SW8270D LL | Di-n-octylphthalate | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Fluoranthene | ug/l | Yes | Yes | 80 | 1.6 | 0.63 | No | No | -- | -- |
| SW8270D LL | Fluorene | ug/l | Yes | No | 29 | 0.64 | -- | No | -- | -- | -- |
| SW8270D LL | Indeno(1,2,3-cd)pyrene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Naphthalene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Pentachlorophenol | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |

| Analytical Method | Constituent | Units | Detected in Background? (a) | | Selected Screening Level (b) | Maximum Detected Site Concentration (c) | | Is Maximum Detected Site Concentration > Screening Level? | | Selected for Background Evaluation and BTV Calculation (d) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| SW8270D LL | Phenanthrene | ug/l | Yes | Yes | 180 | 1.5 | 0.69 | No | No | -- | -- |
| SW8270D LL | Phenol | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8270D LL | Pyrene | ug/l | Yes | Yes | 12 | 1.2 | 0.54 | No | No | -- | -- |
| SW8270D LL | Total High-molecular-weight PAHs | ug/l | Yes | Yes | NA | 30 | 1.4 | No | No | -- | -- |
| SW8270D LL | Total Low-molecular-weight PAHs | ug/l | Yes | Yes | NA | 16 | 2.7 | No | No | -- | -- |
| SW8270D LL | Total PAHs (sum 16) | ug/l | Yes | Yes | NA | 30 | 2.8 | No | No | -- | -- |
| SW3510C | 13a,17b-20S-Ethyldiacholestane | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW3510C | 30,31-Bishomohopane-22S | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW3510C | C29 Tricyclic Terpane-22S | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW3510C | Moretane | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW3510C | Tetrakishomohopane-22R | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| Volatile Organic Compounds | | | | | | | | | | | |
| SW8260B | 1,1-Dichloroethene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | 2-Butanone | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | 2-Hexanone | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | 4-Methyl-2-pentanone | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Acetone | ug/l | Yes | Yes | 1400 | 73 | 16 | No | No | -- | -- |
| SW8260B | Benzene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Bromodichloromethane | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Butyl alcohol, tert- | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Carbon Disulfide | ug/l | Yes | Yes | 81 | 1.5 | 6.3 | No | No | -- | -- |
| SW8260B | Chlorobenzene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Chloroform | ug/l | Yes | No | 80 | 15 | -- | No | -- | -- | -- |
| SW8260B | Chloromethane | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | cis-1,2-Dichloroethylene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Dibromochloromethane | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Diisopropyl ether | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | m, p-Xylene | ug/l | Yes | No | 10000 | 0.56 | -- | No | -- | -- | -- |
| SW8260B | Methyl tert-Butyl Ether (MTBE) | ug/l | Yes | Yes | 14 | 48 | 1100 | Yes | Yes | X | X |
| SW8260B | Methylene Chloride | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | o-Xylene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Tertiary-Amyl Methyl Ether | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Tetrachloroethylene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Toluene | ug/l | Yes | No | 1000 | 2.1 | -- | No | -- | -- | -- |
| SW8260B | trans-1,2-Dichloroethene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Trichloroethene | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Vinyl Chloride | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8260B | Xylenes (total) | ug/l | Yes | No | 10000 | 0.8 | -- | No | -- | -- | -- |
| Dioxin/Furan Compounds | | | | | | | | | | | |
| SW8290A | 1,2,3,4,6,7,8-Heptachlorodibenzofuran | ug/l | Yes | Yes | NA | 0.0000163 | 4.14E-06 | No | No | -- | -- |
| SW8290A | 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | ug/l | Yes | Yes | NA | 0.000555 | 0.000205 | No | No | -- | -- |
| SW8290A | 1,2,3,4,7,8,9-Heptachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | 1,2,3,4,7,8-Hexachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | 1,2,3,6,7,8-Hexachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upper | Lower | | Upper | Lower | Upper | Lower | Upper | Lower |
| SW8290A | 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | ug/l | Yes | No | NA | 0.0000159 | -- | No | -- | -- | -- |
| SW8290A | 1,2,3,7,8,9-Hexachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | ug/l | Yes | No | NA | 0.000028 | -- | No | -- | -- | -- |
| SW8290A | 2,3,4,6,7,8-Hexachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | 2,3,4,7,8-Pentachlorodibenzofuran | ug/l | No | Yes | NA | -- | -- | -- | -- | -- | -- |
| SW8290A | 2,3,7,8-Tetrachlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | Octachlorochlorodibenzofuran | ug/l | No | No | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | Octachlorochlorodibenzo-p-dioxin | ug/l | Yes | Yes | NA | 0.0112 | 0.00429 | No | No | -- | -- |
| SW8290A | TCDD TEQ Bird | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | TCDD TEQ Fish | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |
| SW8290A | TCDD TEQ HH | ug/l | Yes | Yes | 0.00003 | 0.0000141 | 3.34E-06 | No | No | -- | -- |
| SW8290A | Total HpCDD | ug/l | Yes | Yes | NA | 0.00129 | 0.000507 | No | No | -- | -- |
| SW8290A | Total HpCDF | ug/l | Yes | Yes | NA | 0.0000237 | 4.14E-06 | No | No | -- | -- |
| SW8290A | Total HxCDD | ug/l | Yes | Yes | NA | 0.000512 | 0.000227 | No | No | -- | -- |
| SW8290A | Total HxCDF | ug/l | No | Yes | NA | -- | 5.08E-06 | -- | No | -- | -- |
| SW8290A | Total PeCDD | ug/l | Yes | Yes | NA | 0.000155 | 0.0000562 | No | No | -- | -- |
| SW8290A | Total PeCDF | ug/l | Yes | Yes | NA | 0.0000615 | 3.52E-06 | No | No | -- | -- |
| SW8290A | Total TCDD | ug/l | Yes | Yes | NA | 0.000555 | 0.000298 | No | No | -- | -- |
| SW8290A | Total TCDF | ug/l | No | Yes | NA | -- | 0.0000116 | -- | No | -- | -- |
| SW8290A | Total TEQ | ug/l | Not measured | Not measured | -- | -- | -- | -- | -- | -- | -- |

Notes:

ug/l = Microgram per liter.

BAP-TE - Benzo(a)pyrene toxic equivalent.

BTV - Background Threshold Value.

EN - Essential nutrient. These constituents will not be included in the refined background evaluation for groundwater.

NA - No screening level.

RSL - Regional Screening Level.

PAH = Polycyclic aromatic hydrocarbon.

PCB - Polychlorinated Biphenyl.

TCDD - Tetrachlorodibenzo-p-dioxin.

TEQ - Toxicity equivalence.

(a) Constituents detected at least once in background groundwater samples are indicated with "Yes". "Not measured" indicates those constituents and/or analytical methods for which background groundwater samples were not analyzed.

(b) Groundwater screening levels selected from DOEE Water Quality Standards (1994); National Primary Drinking Water Regulations, Maximum Contaminant Level (USEPA, 2017), or the USEPA Regional Screening Level Table, value for tapwater (USEPA, 2017). Selected screening level is the lower of the DOEE and the MCL, where available. Where neither is available, the tapwater RSL is selected. Presented only for constituents detected in background.

(c) The maximum detected concentration in Site groundwater samples. Presetned only for constituents detected in background.

(d) An "X" indicates the constituents selected for the refined background evaluation for groundwater.

**Table 4-11**

**Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Background Groundwater – Upper Aquifer Zone**

| COPC | | FOD | Distribution of Background Dataset: Raw Dataset [a] | Distribution of Background Dataset: Following Log Transformation [b] | Outlier Identification in Background Dataset: Outlier Test [c] | Outlier Identification in Background Dataset: Value (ug/L) | Outlier Identification in Background Dataset: Sample Identification | Summary Statistics - Following Outlier Removal: FOD | Summary Statistics - Following Outlier Removal: Maximum Detected Value (ug/L) | BTV Statistic (ug/L) [d] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total Metals** | | | | | | | | | | | |
| Aluminum | | 10 : 10 | Gamma | Normal | Dixon | -- | -- | 10 : 10 | 29000 | 55,000 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Barium | | 10 : 10 | Normal | -- | Dixon | -- | -- | 10 : 10 | 600 | 800 | Normal 95% UTL with 95% Coverage |
| Beryllium | | 6 : 10 | Lognormal | Normal | Dixon | -- | -- | 6 : 10 | 8.9 | 16 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Chromium | | 10 : 10 | Gamma | Normal | Dixon | -- | -- | 10 : 10 | 110 | 250 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Lead | | 9 : 10 | Lognormal | Normal | Dixon | 1 [f] | DPBACK05 | 8 : 9 | 46 | 70 | Lognormal 95% UTL with 95% Coverage |
| Mercury | (e) | 2 : 10 | No distribution | -- | NC | -- | -- | 2 : 10 | 1.0 | NC | |
| Nickel | | 10 : 10 | Gamma | Normal | Dixon | -- | -- | 10 : 10 | 92 | 190 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Vanadium | | 10 : 10 | Gamma | Normal | Dixon | -- | -- | 10 : 10 | 250 | 320 | Normal 95% UTL with 95% Coverage |
| Zinc | | 9 : 10 | Lognormal | Normal | Dixon | -- | -- | 9 : 10 | 320 | 550 | 95% WH Approx. Gamma UTL with 95% Coverage |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | | |
| BaP-TE | (e) | 1 : 10 | No distribution | -- | NC | -- | -- | 1 : 10 | 0.0078 | NC | |
| bis-(2-Ethylhexyl)phthalate | (e) | 3 : 10 | No distribution | -- | NC | -- | -- | 3 : 10 | 24 | NC | |
| Benzo(b)fluoranthene | (e) | 1 : 10 | No distribution | -- | NC | -- | -- | 1 : 10 | 0.077 | NC | |

Notes:
ug/L = Microgram per liter.
BTV - Background Threshold Value.
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
KM - Kaplan Meier.
NC - Not calculated.
USEPA - United States Environmental Protection Agency.
95UTL - 95% upper tolerance limit; Calculated such that 95% of observations from the background dataset are less than or equal to the statistic, which is the 95% upper confidence limit of the 95th percentile of the dataset, with 95% confidence.
WH - Wilson-Hilferty Approximation; Calculation of the 95UTL for gamma distributions is based on the W-H approximation. (which is the 95% upper confidence limit of the 95th percentile of the dataset) with 95% confidence.

**Table 4-11**

**Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Background Groundwater – Upper Aquifer Zone**

| | | Distribution of Background Dataset | | Outlier Identification in Background Dataset | | | Summary Statistics - Following Outlier Removal | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPC** | **FOD** | Raw Dataset [a] | Following Log Transformation [b] | Outlier Test [c] | Value (ug/L) | Sample Identification | FOD | Maximum Detected Value (ug/L) | **BTV Statistic (ug/L) [d]** |

[a] The distribution of Background datasets was determined using the Goodness-of-Fit (GOF) tests (significance level 0.05) based on the Shapiro-Wilk test in ProUCL (version 5.1; USEPA, 2016). If the dataset includes non-detects, the non-detects were included at the full value of the reporting limit.
[b] If the dataset is not normally distributed, the data were transformed using a log transformation and the GOF test was repeated on the log-transformed data. If the log-transformed data are normally distributed, then the outlier test was performed on the log-transformed data.
[c] The default outlier test in ProUCL (version 5.1; USEPA, 2016) was conducted (Dixon's test for datasets with less than 25 samples). If the dataset includes non-detects, the non-detects were included at the full value of the reporting limit. Identified outlier values from the datasets were removed prior to the calculation of the BTV statistics. The outlier test was not performed on datasets with 4 detected concentrations or less.
[d] BTVs were calculated in ProUCL (version 5.1; USEPA, 2016). The 95UTL was selected based on the distribution of the raw dataset. If the dataset includes non-detects, the BTV was selected from the Kaplan-Meier statistics.
[e] BTV Statistics were not calculated for COPCs with four or less detected concentrations.
[f] Low-tail outlier.

Table 4-12

Results of the Distribution and Summary Statistics for COPCs in Background Groundwater - Lower Aquifer Zone

| COPC | Distribution of Background Dataset [a] | Summary Statistics (ug/L) | | | | | |
|---|---|---|---|---|---|---|---|
| | | FOD | Minimum | Mean | Standard Deviation | Median | Maximum |
| **Dissolved Metals** | | | | | | | |
| Zinc | Gamma | 4 : 4 | 6.6 | 42 | 65.3 | 11.5 | 140 |
| **Total Metals** | | | | | | | |
| Aluminum | Normal | 4 : 4 | 3100 | 14725 | 15292 | 9400 | 37000 |
| Barium | Normal | 4 : 4 | 320 | 658 | 280 | 655 | 1000 |
| Beryllium | Gamma | 4 : 4 | 3.4 | 6.1 | 4.62 | 4 | 13 |
| Chromium | Normal | 4 : 4 | 28 | 97 | 58 | 106 | 150 |
| Copper | Normal | 4 : 4 | 31 | 118 | 67 | 125 | 190 |
| Lead | Gamma | 4 : 4 | 50 | 393 | 605 | 111 | 1300 |
| Nickel | Normal | 4 : 4 | 42 | 54 | 18.5 | 46.5 | 81 |
| Vanadium | Normal | 4 : 4 | 45 | 121 | 68 | 119 | 200 |
| Zinc | Normal | 4 : 4 | 110 | 378 | 299 | 335 | 730 |

Notes:
ug/L = Microgram per liter.
BTV - Background Threshold Value.
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
USEPA - United States Environmental Protection Agency.
[a] The distribution of Site-Specific Background datasets was determined using the Goodness-of-Fit (GOF) tests (significance level 0.05) based on the Shapiro-Wilk test in ProUCL (version 5.1; USEPA, 2016). If the dataset includes non-detects, the non-detects were included at the full value of the reporting limit.

Table 4-13
Results of the Distribution, Outlier Test, and Background Threshold Values for COPCs in Background Groundwater – Combined Upper and Lower Aquifer Zone

| COPC | | Distribution of Background Dataset | | FOD | Outlier Identification in Background Dataset | | | Summary Statistics - Following Outlier Removal | | BTV Statistics (ug/L) [d] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Raw Dataset [a] | Following Log Transformation [b] | | Outlier Test [c] | Outlier Value (ug/L) | Sample Identification | FOD | Maximum Detected Value (ug/L) | | |
| **Dissolved Metals** | | | | | | | | | | | |
| Cadmium | (e) | No distribution | No distribution | 4 : 14 | NC | -- | -- | 4 : 14 | 2.00 | NC | |
| Cobalt | | Approximate Lognormal | Gamma | 14 : 14 | Dixon | -- | -- | 14 : 14 | 65 | 176 | Lognormal 95% UTL with 95% Coverage |
| Iron | | Lognormal | Normal | 13 : 14 | Dixon | -- | -- | 13 : 14 | 24000 | 85000 | 95% KM UTL (Lognormal) 95% Coverage |
| Manganese | | Lognormal | Normal | 14 : 14 | Dixon | -- | -- | 14 : 14 | 15000 | 18000 | Lognormal 95% UTL with 95% Coverage |
| Nickel | | Gamma | Normal | 14 : 14 | Dixon | -- | -- | 14 : 14 | 46 | 47 | 95% WH Approx. Gamma UTL with 95% Coverage |
| **Total Metals** | | | | | | | | | | | |
| Arsenic | | Normal | -- | 14 : 14 | Dixon | -- | -- | 14 : 14 | 29 | 31 | Normal 95% UTL with 95% Coverage |
| Cadmium | | Lognormal | Normal | 9 : 14 | Dixon | 0.081 (f) | DPBACK15 | 8 : 14 | 5.1 | 5.6 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Cobalt | | Gamma | Normal | 14 : 14 | Dixon | -- | -- | 14 : 14 | 130 | 200 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Iron | | Normal | -- | 14 : 14 | Dixon | -- | -- | 14 : 14 | 180000 | 200000 | Normal 95% UTL with 95% Coverage |
| Manganese | | Gamma | Normal | 14 : 14 | Dixon | -- | -- | 14 : 14 | 15000 | 14000 | 95% WH Approx. Gamma UTL with 95% Coverage |
| Thallium | | No distribution | No distribution | 5 : 14 | Dixon | -- | -- | 5 : 14 | 0.15 | NC [g] | |
| **Petroleum Compounds** | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | (e) | No distribution | No distribution | 4 : 14 | NC | -- | -- | 4 : 14 | 470 | NC | |
| **Volatile Organic Compounds** | | | | | | | | | | | |
| Methyl tert-Butyl Ether (MTBE) | (e) | No distribution | No distribution | 4 : 14 | NC | -- | -- | 4 : 14 | 0.34 | NC | |

Notes:
ug/L = Microgram per liter.
BTV - Background Threshold Value.
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
KM - Kaplan Meier.
NC - Not calculated.
USEPA - United States Environmental Protection Agency.
95UTL - 95% upper tolerance limit; Calculated such that 95% of observations from the background dataset are less than or equal to the statistic,

| | **Distribution of Background Dataset** | | | **Outlier Identification in Background Dataset** | | | **Summary Statistics - Following Outlier Removal** | | |
|---|---|---|---|---|---|---|---|---|---|
| **COPC** | Raw Dataset [a] | Following Log Transformation [b] | **FOD** | Outlier Test [c] | Outlier Value (ug/L) | Sample Identification | FOD | Maximum Detected Value (ug/L) | **BTV Statistics (ug/L) [d]** |

which is the 95% upper confidence limit of the 95th percentile of the dataset, with 95% confidence.
WH - Wilson-Hilferty Approximation; Calculation of the 95UTL for gamma distributions is based on the W-H approximation.
[a] The distribution of Site-Specific Background datasets was determined using the Goodness-of-Fit (GOF) tests (significance level 0.05) based on the Shapiro-Wilk test in ProUCL (version 5.1; USEPA, 2016). If the dataset includes non-detects, the non-detects were included at the full value of the reporting limit.
[b] If the dataset is not normally distributed, the data were transformed using a log transformation and the GOF test was repeated on the log-transformed data. If the log-transformed data are normally distributed, then the outlier test and BTV statistics were performed on the log-transformed data.
[c] The default outlier test in ProUCL (version 5.1; USEPA, 2016) was conducted (Dixon's test for datasets with less than 25 samples). If the dataset includes non-detects, the non-detects were included at the full value of the reporting limit. Identified outlier values from the datasets were removed prior to the calculation of the BTV statistics. The outlier test was not performed on datasets with 4 detected concentrations or less.
[d] BTVs were calculated in ProUCL (version 5.1; USEPA, 2016). The 95UTL was selected based on the distribution of the raw dataset. If the dataset includes non-detects, the BTV was selected from the Kaplan-Meier statistics.
[e] BTV Statistics were not calculated for COPCs with four or less detected concentrations.
[f] Low-tail outlier.
[g] The value of the detection limit (1 ug/L) was used to represent the non detects and was the resulting BTV recommended by ProUCL. Therefore, the BTV is the maximum detected value.

Table 4-14
Comparison of Chemical Concentrations In Site and
Background Upper Aquifer Zone Groundwater

| UPPER ZONE COPC | Frequency of Detection [a] | | Median (Standard deviation) of Detected Concentrations (ug/l) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Upper Zone Site | Upper Zone Background | Upper Zone Site | Upper Zone Background | Upper Zone Site | Upper Zone Background | Test | p-value | Reject Null Hypothesis? | Is Site > Background? |
| **GROUNDWATER** | | | | | | | | | | |
| ALUMINUM, TOTAL | 56 : 56 | 10 : 10 | 1050 (35000) | 2200 (8800) | Not Normal | Not Normal | WMW | 1.4E-03 | Yes | No |
| BARIUM, TOTAL | 55 : 56 | 10 : 10 | 100 (340) | 200 (190) | Not Normal | Normal | WMW | 3.2E-04 | Yes | No |
| BERYLLIUM, TOTAL | 48 : 56 | 6 : 10 | 0.29 (8.1) | 1.6 (3.7) | Not Normal | Not Normal | Gehan | 7.5E-03 | Yes | No |
| CHROMIUM, TOTAL | 44 : 56 | 10 : 10 | 8.7 (160) | 15 (36) | Not Normal | Not Normal | Gehan | 6.9E-04 | Yes | No |
| LEAD, TOTAL | 43 : 56 | 9 : 9 | 5.7 (60) | 12 (12) | Not Normal | Not Normal | Gehan | 1.0E-03 | Yes | No |
| MERCURY, TOTAL | 20 : 56 | 2 : 10 | 0.081 (0.72) | 0.54 (0.66) | Not Normal | -- | NC | -- | -- | -- |
| NICKEL, TOTAL | 54 : 56 | 10 : 10 | 8.5 (51) | 11 (31) | Not Normal | Not Normal | WMW | 5.1E-04 | Yes | No |
| VANADIUM, TOTAL | 51 : 56 | 10 : 10 | 9.8 (180) | 20 (87) | Not Normal | Normal | WMW | 1.1E-04 | Yes | No |
| ZINC, TOTAL | 41 : 56 | 9 : 10 | 40 (220) | 23 (110) | Not Normal | Not Normal | Gehan | 1.3E-03 | Yes | No |
| BaP-TE | 9 : 58 | 1 : 10 | 0.29 (2.7) | 0.0078 (0) | Not Normal | -- | NC | -- | -- | -- |
| BIS-(2-ETHYLHEXYL)PHTHALATE | 1 : 21 | 3 : 10 | 7.6 (0) | 4.2 (12) | -- | -- | NC | -- | -- | -- |
| BENZO(B)FLUORANTHENE | 7 : 58 | 1 : 10 | 0.48 (1.1) | 0.077 (0) | Not Normal | -- | NC | -- | -- | -- |

Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.
NC - Insufficient data and/or detected concentrations.

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Site-Specific Background datasets were determined using the Shapiro-Wilks test (significance level 0.05 and ROS estimates for non detects) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.0 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan).
The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected.
The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.

Table 4-15
Comparison of Chemical Concentrations In Site Upper Aquifer Zone and
Background Combined Upper and Lower Aquifer Zone Groundwater

| | Frequency of Detection [a] | | Median (Standard deviation) of Detected Concentrations (ug/l) | | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **UPPER ZONE COPC** | Upper Zone Site | Combined Upper and Lower Zone Background | Upper Zone Site | Combined Upper and Lower Zone Background | Upper Zone Site | Combined Upper and Lower Zone Background | Test | p-value | Reject Null Hypothesis? | Is Site > Background? |
| **GROUNDWATER** | | | | | | | | | | |
| CADMIUM, DISSOLVED | 17 : 56 | 4 : 14 | 0.61 (2.3) | 0.21 (0.92) | Not Normal | NC | NC | -- | -- | -- |
| COBALT, DISSOLVED | 51 : 56 | 14 : 14 | 6.8 (19) | 3.9 (20) | Not Normal | Not Normal | Gehan | 3.94E-05 | Yes | No |
| IRON, DISSOLVED | 32 : 56 | 13 : 14 | 450 (26000) | 530 (7200) | Not Normal | Not Normal | Gehan | 1.57E-07 | Yes | No |
| MANGANESE, DISSOLVED | 56 : 56 | 14 : 14 | 825 (1300) | 805 (3800) | Not Normal | Not Normal | WMW | 3.25E-08 | Yes | No |
| NICKEL, DISSOLVED | 50 : 56 | 14 : 14 | 4.1 (15) | 5.1 (12) | Not Normal | Not Normal | WMW | 3.83E-06 | Yes | No |
| ARSENIC, TOTAL | 50 : 56 | 14 : 14 | 6.4 (18) | 7.2 (8.5) | Not Normal | Normal | WMW | 7.95E-04 | Yes | No |
| CADMIUM, TOTAL | 29 : 56 | 7 : 13 | 0.82 (2) | 0.74 (1.7) | Not Normal | Normal | Gehan | 3.25E-03 | Yes | No |
| COBALT, TOTAL | 56 : 56 | 14 : 14 | 14 (79) | 21 (37) | Not Normal | Not Normal | WMW | 1.90E-04 | Yes | No |
| IRON, TOTAL | 56 : 56 | 14 : 14 | 25000 (180000) | 46000 (52000) | Not Normal | Normal | WMW | 7.58E-05 | Yes | No |
| MANGANESE, TOTAL | 56 : 56 | 14 : 14 | 1200 (1300) | 1050 (3800) | Not Normal | Not Normal | WMW | 3.53E-08 | Yes | No |
| THALLIUM, TOTAL | 29 : 56 | 5 : 14 | 0.15 (0.7) | 0.13 (0.029) | Not Normal | NC | NC | -- | -- | -- |
| DIESEL RANGE ORGANICS (C10-C20) | 6 : 41 | 4 : 14 | 450 (84) | 250 (120) | Normal | NC | NC | -- | -- | -- |
| METHYL TERT-BUTYL ETHER (MTBE) | 51 : 91 | 4 : 14 | 0.78 (9.5) | 0.30 (0.066) | Not Normal | NC | NC | -- | -- | -- |

Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.
NC - Insufficient data and/or detected concentrations.

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Site-Specific Background datasets were determined using the Shapiro-Wilks test (significance level 0.05 and ROS estimates for non detects) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.0 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan). The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected. The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.
[d] The 95% upper tolerance limit with 95% coverage calculated assuming a nonparametric distribution was used for background threshold values (BTVs).

Table 4-16
Comparison of Chemical Concentrations In Site Lower Aquifer Zone and
Background Combined Upper and Lower Aquifer Zone Groundwater

| | **Frequency of Detection [a]** | | **Median (Standard deviation) of Detected Concentrations (ug/l)** | | **Distribution [b]** | | **Two-Sample Hypothesis Test [c]** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **LOWER ZONE COPC** | Lower Zone Site | Combined Upper and Lower Zone Background | Lower Zone Site | Combined Upper and Lower Zone Background | Lower Zone Site | Combined Upper and Lower Zone Background | Test | p-value | Reject Null Hypothesis? | Is Site > Background? |
| **GROUNDWATER** | | | | | | | | | | |
| CADMIUM, DISSOLVED | 11 : 31 | 4 : 14 | 0.36 (1.9) | 0.21 (0.92) | Not Normal | NC | NC | -- | -- | -- |
| COBALT, DISSOLVED | 29 : 31 | 14 : 14 | 5.3 (24) | 3.9 (20) | Not Normal | Not Normal | Gehan | -- | Yes | No |
| IRON, DISSOLVED | 24 : 31 | 13 : 14 | 4100 (10000) | 530 (7200) | Not Normal | Not Normal | Gehan | 8.86E-04 | Yes | No |
| MANGANESE, DISSOLVED | 31 : 31 | 14 : 14 | 880 (770) | 805 (3800) | Not Normal | Not Normal | WMW | 4.83E-08 | Yes | No |
| NICKEL, DISSOLVED | 30 : 31 | 14 : 14 | 11 (22) | 5.1 (12) | Not Normal | Not Normal | WMW | 1.12E-01 | No | No |
| ARSENIC, TOTAL | 28 : 31 | 14 : 14 | 8.45 (32) | 7.2 (8.5) | Not Normal | Normal | WMW | 3.03E-02 | Yes | No |
| CADMIUM, TOTAL | 16 : 31 | 7 : 13 | 1.9 (1.9) | 0.74 (1.7) | Not Normal | Normal | Gehan | 1.87E-02 | Yes | No |
| COBALT, TOTAL | 31 : 31 | 14 : 14 | 8 (390) | 21 (37) | Not Normal | Not Normal | WMW | 5.55E-02 | No | No |
| IRON, TOTAL | 31 : 31 | 14 : 14 | 60000 (140000) | 46000 (52000) | Not Normal | Normal | WMW | 2.79E-02 | Yes | No |
| MANGANESE, TOTAL | 31 : 31 | 14 : 14 | 1100 (1100) | 1050 (3800) | Not Normal | Not Normal | WMW | 1.14E-07 | Yes | No |
| THALLIUM, TOTAL | 13 : 31 | 5 : 14 | 0.50 (0.69) | 0.13 (0.029) | Not Normal | NC | NC | -- | -- | -- |
| DIESEL RANGE ORGANICS (C10-C20) | 2 : 16 | 4 : 14 | 320 (85) | 250 (120) | NC | NC | NC | -- | -- | -- |
| METHYL TERT-BUTYL ETHER (MTBE) | 42 : 63 | 4 : 14 | 2 (230) | 0.30 (0.066) | Not Normal | NC | NC | -- | -- | -- |

Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.
NC - Insufficient data and/or detected concentrations.

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Site-Specific Background datasets were determined using the Shapiro-Wilks test (significance level 0.05 and ROS estimates for non detects) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.0 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan). The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected. The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.
[d] The 95% upper tolerance limit with 95% coverage calculated assuming a nonparametric distribution was used for background threshold values (BTVs).

Table 4-17
Rationale for List of Constituents for Background Evaluation for Porewater
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| Chemical | Detected in Background? (a) | Ecological Screening Value (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > ESV? | Selected for Background Evaluation? (d) |
|---|---|---|---|---|---|
| **Inorganic - Dissolved Phase** | | | | | |
| Aluminum | Yes | 87 | ND | No | -- |
| Antimony | Yes | 30 | ND | No | -- |
| Arsenic | Yes | 150 | 3.3 | No | -- |
| Barium | Yes | 4 | 180 | Yes | **X** |
| Beryllium | No | -- | -- | -- | -- |
| Cadmium | No | -- | -- | -- | -- |
| Calcium | Yes | EN | -- | No | -- |
| Chromium | Yes | 11 | 0.99 | No | -- |
| Cobalt | Yes | 23 | 19 | No | -- |
| Copper | No | -- | -- | -- | -- |
| Iron | Yes | 1000 | 67000 | Yes | **X** |
| Lead | Yes | 7.8 (e) | ND | No | -- |
| Magnesium | Yes | EN | -- | No | -- |
| Manganese | Yes | 120 | 11000 | Yes | **X** |
| Nickel | Yes | 128 (e) | 3.8 | No | -- |
| Potassium | Yes | EN | -- | No | -- |
| Silver | No | -- | -- | -- | -- |
| Sodium | Yes | EN | -- | No | -- |
| Vanadium | Yes | 20 | 0.92 | No | -- |
| Zinc | Yes | 291 (e) | 6.4 | No | -- |
| **Inorganic - Total Recoverable Phase** | | | | | |
| Calcium | Yes | EN | -- | No | -- |
| Iron | Yes | 300 | 110000 | Yes | **X** |
| Mercury | No | -- | -- | -- | -- |
| Potassium | Yes | EN | -- | No | -- |
| Selenium | No | -- | -- | -- | -- |
| Sodium | Yes | EN | -- | No | -- |
| Thallium | No | -- | -- | -- | -- |
| **Polychlorinated Biphenyls (PCBs)** | | | | | |
| Decachlorobiphenyl (PCB-209) | Yes | NV (f) | 0.0000001 | No | -- |
| PCB, TOTAL Congeners | Yes | 0.014 | 0.01 | No | -- |
| PCB-1 | Yes | NV (f) | 0.00065 | No | -- |
| PCB-10 | Yes | NV (f) | 0.000069 | No | -- |
| PCB-100 | Yes | NV (f) | 0.0000084 | No | -- |
| PCB-101 | Yes | NV (f) | 0.00022 | No | -- |
| PCB-102 | Yes | NV (f) | 0.0000086 | No | -- |
| PCB-103 | Yes | NV (f) | 0.0000062 | No | -- |
| PCB-105 | Yes | NV (f) | 0.000023 | No | -- |
| PCB-106 | No | -- | -- | -- | -- |
| PCB-107 | Yes | NV (f) | 0.0000076 | No | -- |
| PCB-108 | Yes | NV (f) | 0.0000033 | No | -- |
| PCB-109 | Yes | NV (f) | 0.000089 | No | -- |
| PCB-11 | Yes | NV (f) | 0.000044 | No | -- |
| PCB-110 | Yes | NV (f) | 0.00016 | No | -- |
| PCB-111 | No | -- | -- | -- | -- |
| PCB-112 | Yes | NV (f) | 0.0000011 | No | -- |
| PCB-113 | Yes | NV (f) | 0.00022 | No | -- |
| PCB-114 | Yes | NV (f) | 0.0000019 | No | -- |
| PCB-115 | Yes | NV (f) | 0.00016 | No | -- |
| PCB-116 | Yes | NV (f) | 0.000029 | No | -- |
| PCB-117 | Yes | NV (f) | 0.000029 | No | -- |
| PCB-118 | Yes | NV (f) | 0.000076 | No | -- |
| PCB-119 | Yes | NV (f) | 0.000089 | No | -- |
| PCB-12 | Yes | NV (f) | ND | No | -- |
| PCB-120 | No | -- | -- | -- | -- |
| PCB-122 | Yes | NV (f) | 0.00000081 | No | -- |
| PCB-123 | Yes | NV (f) | 0.0000017 | No | -- |
| PCB-124 | Yes | NV (f) | 0.0000033 | No | -- |
| PCB-125 | Yes | NV (f) | 0.000089 | No | -- |
| PCB-126 | Yes | NV (f) | 0.00000075 | No | -- |
| PCB-127 | No | -- | -- | -- | -- |
| PCB-128 | Yes | NV (f) | 0.000011 | No | -- |
| PCB-129 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-13 | Yes | NV (f) | ND | No | -- |
| PCB-130 | Yes | NV (f) | 0.0000061 | No | -- |
| PCB-131 | Yes | NV (f) | ND | No | -- |
| PCB-132 | Yes | NV (f) | 0.000036 | No | -- |
| PCB-133 | Yes | NV (f) | 0.0000022 | No | -- |
| PCB-134 | Yes | NV (f) | 0.0000075 | No | -- |
| PCB-135 | Yes | NV (f) | 0.000078 | No | -- |
| PCB-136 | Yes | NV (f) | 0.000014 | No | -- |
| PCB-137 | Yes | NV (f) | 0.0000033 | No | -- |
| PCB-138 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-139 | Yes | NV (f) | 0.000002 | No | -- |
| PCB-140 | Yes | NV (f) | 0.000002 | No | -- |
| PCB-141 | Yes | NV (f) | 0.00003 | No | -- |
| PCB-143 | Yes | NV (f) | 0.0000075 | No | -- |
| PCB-144 | Yes | NV (f) | 0.0000091 | No | -- |

Table 4-17
Rationale for List of Constituents for Background Evaluation for Porewater
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| Chemical | Detected in Background? (a) | Ecological Screening Value (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > ESV? | Selected for Background Evaluation? (d) |
|---|---|---|---|---|---|
| PCB-145 | No | -- | -- | -- | -- |
| PCB-146 | Yes | NV (f) | 0.000024 | No | -- |
| PCB-147 | Yes | NV (f) | 0.00016 | No | -- |
| PCB-148 | No | -- | -- | -- | -- |
| PCB-149 | Yes | NV (f) | 0.00016 | No | -- |
| PCB-15 | Yes | NV (f) | 0.000065 | No | -- |
| PCB-150 | Yes | NV (f) | 0.00000045 | No | -- |
| PCB-151 | Yes | NV (f) | 0.000078 | No | -- |
| PCB-152 | Yes | NV (f) | 0.000000044 | No | -- |
| PCB-153 | Yes | NV (f) | 0.00014 | No | -- |
| PCB-154 | Yes | NV (f) | 0.0000041 | No | -- |
| PCB-156 | Yes | NV (f) | 0.000007 | No | -- |
| PCB-157 | Yes | NV (f) | 0.000007 | No | -- |
| PCB-158 | Yes | NV (f) | 0.000011 | No | -- |
| PCB-159 | Yes | NV (f) | 0.0000013 | No | -- |
| PCB-16 | Yes | NV (f) | 0.00025 | No | -- |
| PCB-160 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-161 | No | -- | -- | -- | -- |
| PCB-162 | No | -- | -- | -- | -- |
| PCB-163 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-164 | Yes | NV (f) | 0.000007 | No | -- |
| PCB-165 | No | -- | -- | -- | -- |
| PCB-166 | Yes | NV (f) | 0.000011 | No | -- |
| PCB-167 | Yes | NV (f) | 0.0000029 | No | -- |
| PCB-168 | Yes | NV (f) | 0.00014 | No | -- |
| PCB-169 | No | -- | -- | -- | -- |
| PCB-17 | Yes | NV (f) | 0.00052 | No | -- |
| PCB-170 | Yes | NV (f) | 0.000015 | No | -- |
| PCB-171 | Yes | NV (f) | 0.0000068 | No | -- |
| PCB-172 | Yes | NV (f) | 0.000004 | No | -- |
| PCB-173 | Yes | NV (f) | 0.0000068 | No | -- |
| PCB-174 | Yes | NV (f) | 0.000025 | No | -- |
| PCB-175 | Yes | NV (f) | 0.0000013 | No | -- |
| PCB-176 | Yes | NV (f) | 0.0000028 | No | -- |
| PCB-177 | Yes | NV (f) | 0.000014 | No | -- |
| PCB-178 | Yes | NV (f) | 0.0000063 | No | -- |
| PCB-179 | Yes | NV (f) | 0.0000098 | No | -- |
| PCB-18 | Yes | NV (f) | 0.00076 | No | -- |
| PCB-180 | Yes | NV (f) | 0.000047 | No | -- |
| PCB-181 | No | -- | -- | -- | -- |
| PCB-182 | No | -- | -- | -- | -- |
| PCB-183 | Yes | NV (f) | 0.000022 | No | -- |
| PCB-185 | Yes | NV (f) | 0.000022 | No | -- |
| PCB-186 | No | -- | -- | -- | -- |
| PCB-187 | Yes | NV (f) | 0.000039 | No | -- |
| PCB-188 | No | -- | -- | -- | -- |
| PCB-189 | Yes | NV (f) | 0.00000041 | No | -- |
| PCB-19 | Yes | NV (f) | 0.00019 | No | -- |
| PCB-190 | Yes | NV (f) | 0.0000035 | No | -- |
| PCB-191 | Yes | NV (f) | 0.00000094 | No | -- |
| PCB-193 | Yes | NV (f) | 0.000047 | No | -- |
| PCB-194 | Yes | NV (f) | 0.0000034 | No | -- |
| PCB-195 | Yes | NV (f) | 0.0000016 | No | -- |
| PCB-196 | Yes | NV (f) | 0.0000023 | No | -- |
| PCB-197 | Yes | NV (f) | 0.00000018 | No | -- |
| PCB-198 | Yes | NV (f) | 0.0000046 | No | -- |
| PCB-199 | Yes | NV (f) | 0.0000046 | No | -- |
| PCB-2 | Yes | NV (f) | 0.00018 | No | -- |
| PCB-20 | Yes | NV (f) | 0.00062 | No | -- |
| PCB-200 | Yes | NV (f) | 0.00000043 | No | -- |
| PCB-201 | Yes | NV (f) | 0.00000063 | No | -- |
| PCB-202 | Yes | NV (f) | 0.0000008 | No | -- |
| PCB-203 | Yes | NV (f) | 0.000003 | No | -- |
| PCB-205 | Yes | NV (f) | 0.00000016 | No | -- |
| PCB-206 | Yes | NV (f) | 0.0000006 | No | -- |
| PCB-207 | Yes | NV (f) | 0.000000065 | No | -- |
| PCB-208 | Yes | NV (f) | 0.00000013 | No | -- |
| PCB-21 | Yes | NV (f) | 0.00018 | No | -- |
| PCB-22 | Yes | NV (f) | 0.00015 | No | -- |
| PCB-23 | No | -- | -- | -- | -- |
| PCB-24 | Yes | NV (f) | 0.000019 | No | -- |
| PCB-25 | Yes | NV (f) | 0.000062 | No | -- |
| PCB-26 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-27 | Yes | NV (f) | 0.000083 | No | -- |
| PCB-28 | Yes | NV (f) | 0.00062 | No | -- |
| PCB-29 | Yes | NV (f) | 0.00012 | No | -- |
| PCB-3 | Yes | NV (f) | 0.00013 | No | -- |
| PCB-30 | Yes | NV (f) | 0.00076 | No | -- |
| PCB-31 | Yes | NV (f) | 0.00043 | No | -- |

Table 4-17
Rationale for List of Constituents for Background Evaluation for Porewater
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| Chemical | Detected in Background? (a) | Ecological Screening Value (b) | | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > ESV? | Selected for Background Evaluation? (d) |
|---|---|---|---|---|---|---|
| PCB-32 | Yes | NV | (f) | 0.00037 | No | -- |
| PCB-33 | Yes | NV | (f) | 0.00018 | No | -- |
| PCB-34 | No | -- | | -- | -- | -- |
| PCB-35 | Yes | NV | (f) | 0.0000026 | No | -- |
| PCB-37 | Yes | NV | (f) | 0.000052 | No | -- |
| PCB-38 | No | -- | | -- | -- | -- |
| PCB-39 | Yes | NV | (f) | 0.0000018 | No | -- |
| PCB-4 | Yes | NV | (f) | 0.00076 | No | -- |
| PCB-40 | Yes | NV | (f) | 0.00021 | No | -- |
| PCB-41 | Yes | NV | (f) | 0.00021 | No | -- |
| PCB-42 | Yes | NV | (f) | 0.0001 | No | -- |
| PCB-43 | Yes | NV | (f) | 0.000015 | No | -- |
| PCB-44 | Yes | NV | (f) | 0.00045 | No | -- |
| PCB-45 | Yes | NV | (f) | 0.00018 | No | -- |
| PCB-46 | Yes | NV | (f) | 0.000034 | No | -- |
| PCB-47 | Yes | NV | (f) | 0.00045 | No | -- |
| PCB-48 | Yes | NV | (f) | 0.000087 | No | -- |
| PCB-49 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-5 | Yes | NV | (f) | ND | No | -- |
| PCB-50 | Yes | NV | (f) | 0.00011 | No | -- |
| PCB-51 | Yes | NV | (f) | 0.00018 | No | -- |
| PCB-52 | Yes | NV | (f) | 0.00045 | No | -- |
| PCB-53 | Yes | NV | (f) | 0.00011 | No | -- |
| PCB-54 | Yes | NV | (f) | 0.0000037 | No | -- |
| PCB-55 | Yes | NV | (f) | 0.0000033 | No | -- |
| PCB-56 | Yes | NV | (f) | 0.000059 | No | -- |
| PCB-57 | Yes | NV | (f) | 0.0000027 | No | -- |
| PCB-58 | Yes | NV | (f) | 0.000004 | No | -- |
| PCB-59 | Yes | NV | (f) | 0.00004 | No | -- |
| PCB-6 | Yes | NV | (f) | 0.00012 | No | -- |
| PCB-60 | Yes | NV | (f) | 0.00003 | No | -- |
| PCB-61 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-62 | Yes | NV | (f) | 0.00004 | No | -- |
| PCB-63 | Yes | NV | (f) | 0.000011 | No | -- |
| PCB-64 | Yes | NV | (f) | 0.00015 | No | -- |
| PCB-65 | Yes | NV | (f) | 0.00045 | No | -- |
| PCB-66 | Yes | NV | (f) | 0.00016 | No | -- |
| PCB-67 | Yes | NV | (f) | 0.0000076 | No | -- |
| PCB-68 | Yes | NV | (f) | 0.0000037 | No | -- |
| PCB-69 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-7 | Yes | NV | (f) | ND | No | -- |
| PCB-70 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-71 | Yes | NV | (f) | 0.00021 | No | -- |
| PCB-72 | Yes | NV | (f) | 0.0000038 | No | -- |
| PCB-73 | Yes | NV | (f) | 0.000015 | No | -- |
| PCB-74 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-75 | Yes | NV | (f) | 0.00004 | No | -- |
| PCB-76 | Yes | NV | (f) | 0.00028 | No | -- |
| PCB-77 | Yes | NV | (f) | 0.0000084 | No | -- |
| PCB-79 | No | -- | | -- | -- | -- |
| PCB-8 | Yes | NV | (f) | 0.00025 | No | -- |
| PCB-80 | Yes | NV | (f) | 0.0000008 | No | -- |
| PCB-81 | No | -- | | -- | -- | -- |
| PCB-82 | Yes | NV | (f) | 0.000015 | No | -- |
| PCB-83 | Yes | NV | (f) | 0.00011 | No | -- |
| PCB-84 | Yes | NV | (f) | 0.00004 | No | -- |
| PCB-85 | Yes | NV | (f) | 0.000029 | No | -- |
| PCB-86 | Yes | NV | (f) | 0.000089 | No | -- |
| PCB-87 | Yes | NV | (f) | 0.000089 | No | -- |
| PCB-88 | Yes | NV | (f) | 0.000045 | No | -- |
| PCB-89 | Yes | NV | (f) | 0.0000017 | No | -- |
| PCB-9 | Yes | NV | (f) | ND | No | -- |
| PCB-90 | Yes | NV | (f) | 0.00022 | No | -- |
| PCB-91 | Yes | NV | (f) | 0.000045 | No | -- |
| PCB-92 | Yes | NV | (f) | 0.000041 | No | -- |
| PCB-93 | Yes | NV | (f) | 0.0000084 | No | -- |
| PCB-94 | Yes | NV | (f) | 0.0000039 | No | -- |
| PCB-95 | Yes | NV | (f) | 0.0002 | No | -- |
| PCB-96 | Yes | NV | (f) | 0.000002 | No | -- |
| PCB-97 | Yes | NV | (f) | 0.000089 | No | -- |
| PCB-98 | Yes | NV | (f) | 0.0000086 | No | -- |
| PCB-99 | Yes | NV | (f) | 0.00011 | No | -- |
| **Semi Volatile Organic Compounds** | | | | | | |
| 1-Methylnaphthalene | No | -- | | -- | -- | -- |
| 2-Methylnaphthalene | No | -- | | -- | -- | -- |
| Acenaphthene | No | -- | | -- | -- | -- |
| Acenaphthylene | No | -- | | -- | -- | -- |
| Anthracene | No | -- | | -- | -- | -- |
| Benzo(a)anthracene | No | -- | | -- | -- | -- |

Table 4-17
Rationale for List of Constituents for Background Evaluation for Porewater
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| Chemical | Detected in Background? (a) | Ecological Screening Value (b) | Maximum Detected Site Concentration (c) | Is Maximum Detected Site Concentration > ESV? | Selected for Background Evaluation? (d) |
|---|---|---|---|---|---|
| Benzo(a)pyrene | No | -- | -- | -- | -- |
| Benzo(b,k)fluoranthene | No | -- | -- | -- | -- |
| Benzo(e)pyrene | No | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | No | -- | -- | -- | -- |
| C1-Chrysenes | No | -- | -- | -- | -- |
| C1-Fluorenes | No | -- | -- | -- | -- |
| C1-Phenanthrene/anthracenes | Yes | NV | 0.19 | No | -- |
| C1-Pyrene/fluoranthenes | No | -- | -- | -- | -- |
| C2-Chrysenes | No | -- | -- | -- | -- |
| C2-Fluorenes | No | -- | -- | -- | -- |
| C2-Naphthalenes | No | -- | -- | -- | -- |
| C2-Phenanthrene/anthracenes | No | -- | -- | -- | -- |
| C3-Chrysenes | No | -- | -- | -- | -- |
| C3-Fluorenes | No | -- | -- | -- | -- |
| C3-Naphthalenes | Yes | NV | 4.06 | No | -- |
| C3-Phenanthrene/anthracenes | No | -- | -- | -- | -- |
| C4-Chrysenes | No | -- | -- | -- | -- |
| C4-Naphthalenes | No | -- | -- | -- | -- |
| C4-Phenanthrenes/anthracenes | No | -- | -- | -- | -- |
| Chrysene | No | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | No | -- | -- | -- | -- |
| Fluoranthene | Yes | 400 | 0.09 | No | -- |
| Fluorene | No | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | No | -- | -- | -- | -- |
| Naphthalene | Yes | 600 | 0.22 | No | -- |
| Perylene | No | -- | -- | -- | -- |
| Phenanthrene | No | -- | -- | -- | -- |
| Pyrene | Yes | 0.025 | 0.12 | Yes | X |

Notes:

BTV - Background Threshold Value.

DOEE WQS - Title 21 of the District of Columbia Municipal Regulations, Chapter 11, Water Quality Standards, Department of Health.

EN - Essential nutrient. These constituents will not be included in the refined background evaluation for porewater.

ESV - Ecological Screening Value.

ND - Not detected.

NV - No screening value available.

(a) Constituents detected at least once in background porewater samples are indicated with "Yes".
Screening levels presented only for constituents detected in background.

(b) Chronic ESVs selected based on a hierarchy of fresh surface water quality standards and benchmarks from DOEE WQS (DOEE, 2010), USEPA Region 3 freshwater surface water screening values (USEPA 2006b), and other literature values (Suter and Tsao 1996, Buchman 2008).

(c) The maximum detected concentration in Site porewater samples. Presented only for consituents detected in background.

(d) An "X" indicates the constituents selected for the refined background evaluation for porewater.

(e) Value presented has been adjusted by a mean hardness of 290 mg/L as $CaCO_3$ for the Waterside Investigation Area.

(f) Evaluated as Total PCBs (Congeners).

pepco
An Exelon Company

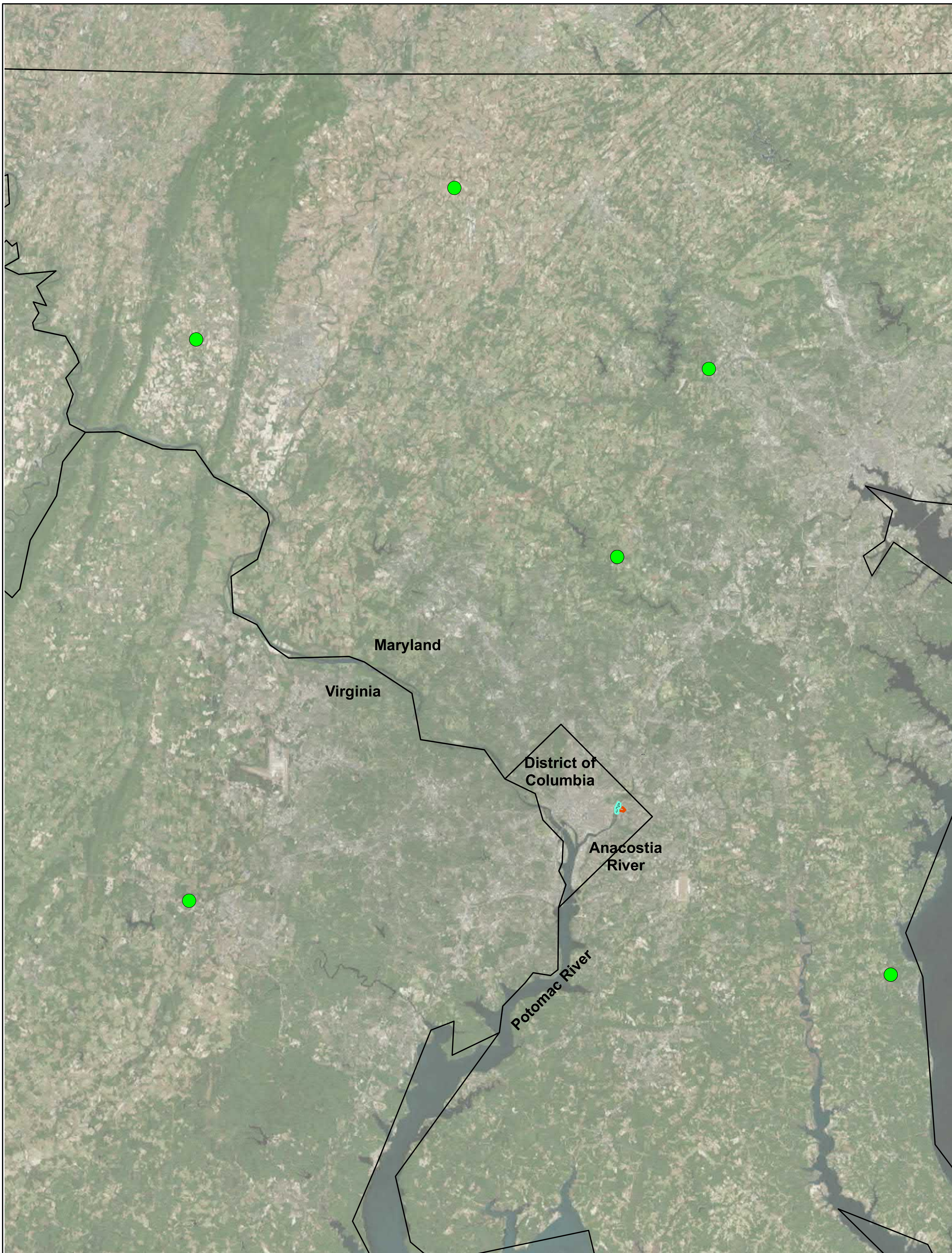
# Figures


AECOM

BENNING ROAD FACILITY RI/FS PROJECT
3400 BENNING RD., NE
WASHINGTON, DC 20019

BACKGROUND SAMPLE LOCATIONS

Date: 9/12/2017 | Drawn By: JM | FIGURE 2-1




LEGEND

Background Surface and Subsurface Soil Sample Locations

Waterside Investigation Area

Benning Road Facility Property Boundary

Note: In general, ,multiple samples were collected at each location.

AECOM

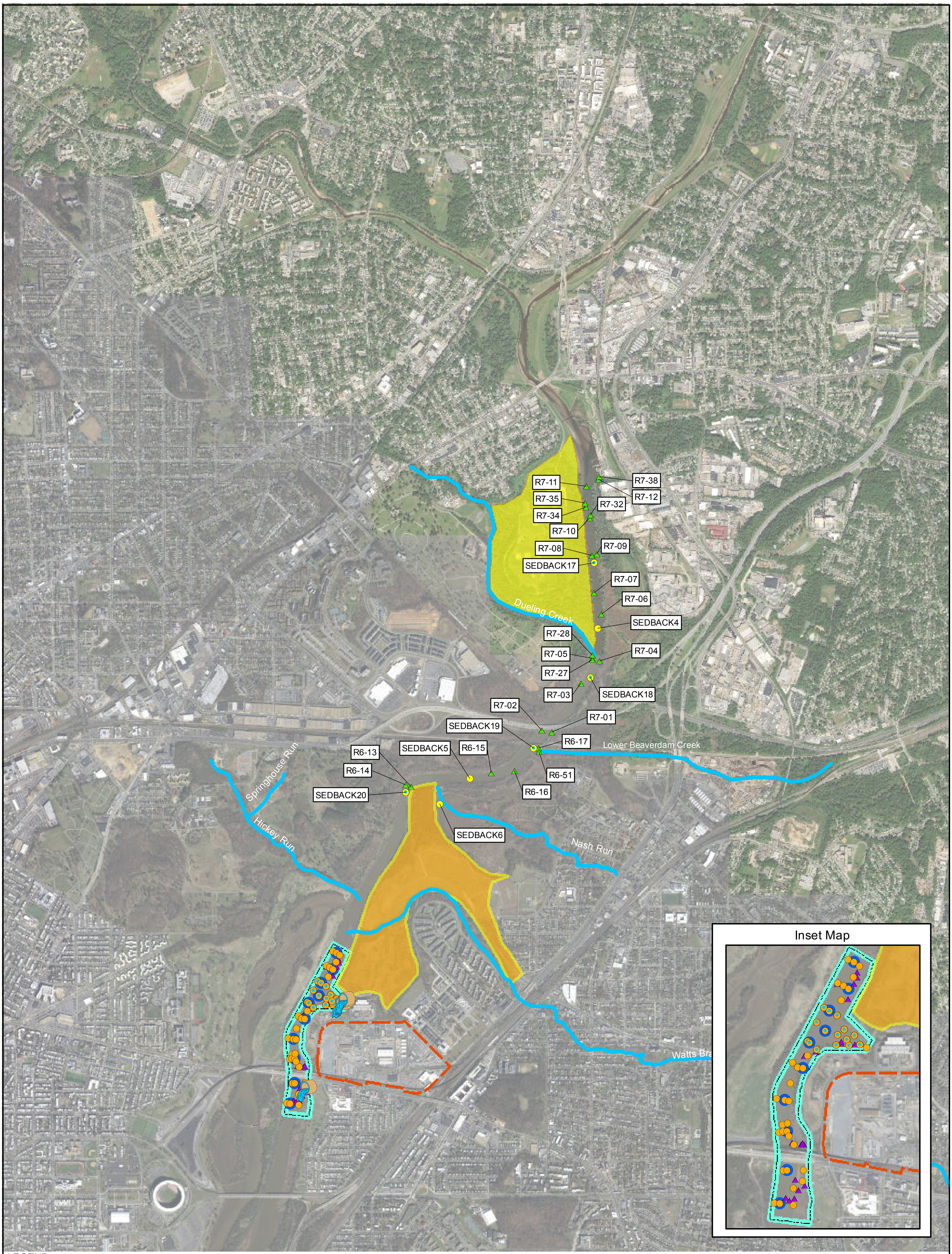
0 10 Miles

N W E S

BENNING ROAD FACILITY RI/FS PROJECT
3400 BENNING RD., NE
WASHINGTON, DC 20019

REGIONAL CONDITIONS SURFACE AND SUBSURFACE INORGANIC SOIL SAMPLE LOCATIONS

Date: 10/16/2018 | Drawn By: KNS | Checked By: SED | FIGURE 2-2




LEGEND

- Pepco Sediment and Pore Water Background Location (2017)*
- Pepco Background Location - Co-located Sediment/Surface Water (2013)
- DOEE Background Location - Sediment
- Pepco Sediment and Pore Water Location (2017)*
- Pepco Sediment Sample Location (2013)
- DOEE Sediment Sample Location
- Pepco Co-Located Sediment / Surface Water Location (2013)
- Benning Road Facility Property Boundary
- Outfalls
- Selected Tributaries
- Colmar Manner Landfill
- Kenilworth Landfill
- Waterside Investigation Area

*Co-located with sediment bioassays and benthic macroinvertebrate community survey samples.

AECOM

0 1,500 Feet

N E S W

BENNING ROAD FACILITY RI/FS PROJECT
3400 BENNING RD., NE
WASHINGTON, DC 20019

BACKGROUND AND SITE SEDIMENT, SURFACE WATER, AND PORE WATER SAMPLE LOCATIONS

| Date: 5/22/2019 | Drawn By: KNS | Checked By: SED | | FIGURE 2-3 |
|---|---|---|---|---|

Path: P:\Jobs\Water\QA_Group\Pepco\GIS\MXD\2019Revisions\ Fig2_3_PepcoDOEE_SurfSdBkg_03252019

J:\Indl_Service\Project Files\Pepco Benning Road RI_FS\GIS\MXD\2018\MXD\anacostia_081618_Fish_SampleLocations.mxd


**Summary of Upper Anacostia Sampling Area**

| Collection Date | Species | Number of Composite Samples Per Species | Number of Individuals Per Composite Sample |
|---|---|---|---|
| 2013 | Brown Bullhead | 1 | 7 |
| | Blue catfish | 1 | 4 |
| | Carp | 1 | 3 |
| | Channel Catfish | 1 | 4 |
| | Largemouth Bass | 1 | 3 |
| | Northern Snakehead | 1 | 3 |
| | Sunfish | 1 | 8 |

**Summary of Lower Anacostia Sampling Area**

| Collection Date | Species | Number of Composite Samples Per Species | Number of Individuals Per Composite Sample |
|---|---|---|---|
| 2013 | American Eel | 1 | 4 |
| | Blue catfish | 1 | 4 |
| | Carp | 1 | 4 |
| | Channel Catfish | 1 | 4 |
| | Largemouth Bass | 1 | 4 |
| | Sunfish | 1 | 9 |

N E S W

**Fillet Fish Tissue Samples in the Anacostia River**
**Pepco – Benning Road Facility**
**Washington, DC**

0 0.425 0.85 1.7 Miles

**Legend**

- Property Boundaries
- Waterside Investigation Area
- Benning Road Facility
- Upper Anacostia River Sampling Area (US Fish and Wildlife Service)
- Lower Anacostia River Sampling Area (US Fish and Wildlife Service)

AECOM

Figure 2-4

P:\Projects\Jobs\Indl_Service\Project Files\Pepco Benning Road RI_FS\GIS\MXD\2018\MXD\Potomac_081418_Fish_SampleLocations.mxd


**Summary of Upper Potomac Sampling Area**

| Collection Date | Fish Species | Number of Composite Samples per Species | Number of Individuals per Composite Sample |
|---|---|---|---|
| 2013 | American eel | 1 | 4 |
| | Brown bullhead | 1 | 2 |
| | Carp | 1 | 5 |
| | Channel catfish | 1 | 6 |
| | Largemouth bass | 1 | 6 |
| | Northern snakehead | 1 | 3 |
| | Striped bass | 1 | 3 |
| | Sunfish | 1 | 10 |
| | White perch | 1 | 10 |

**Summary of Lower Potomac Sampling Area**

| Collection Date | Fish Species | Number of Composite Samples per Species | Number of Individuals per Composite Sample |
|---|---|---|---|
| 2013 | American eel | 2 | 4 in one composite, and one large individual |
| | American shad | 1 | 4 |
| | Brown bullhead | 1 | 6 |
| | Blue catfish | 1 | 6 |
| | Carp | 1 | 4 |
| | Channel catfish | 1 | 6 |
| | Largemouth bass | 1 | 6 |
| | Sunfish | 1 | 8 |

N E S W

**Fillet Fish Tissue Samples in the Potomac River**
**Pepco – Benning Road Facility**
**Washington, DC**

0 0.75 1.5 3 Miles

**Legend**

- Upper Potomac River Fish Fillet Sampling Area
- Lower Potomac River Fish Fillet Sampling Area
- Upper Anacostia River Sampling Area
- Lower Anacostia River Sampling Area

AECOM

Figure 2-5

J:\Indl_Service\Project Files\Pepco Benning Road RI_FS\GIS\MXD\2018\MXD\NonTidal_081418_Fish_AnacostiaSample.mxd


| Collection Date | Fish Species | Number of Samples per Species* |
|---|---|---|
| 2016 | Indian Creek (IC) | |
| | Largemouth bass | 3 |
| | Striped bass | 3 |

| Collection Date | Fish Species | Number of Samples per Species* |
|---|---|---|
| 2016 | Paint Branch (PC) | |
| | Largemouth bass | 3 |

| Collection Date | Fish Species | Number of Samples per Species* |
|---|---|---|
| 2016 | Northeast Branch (NEBAR) | |
| | Largemouth bass | 3 |

| Collection Date | Fish Species | Number of Samples per Species* |
|---|---|---|
| 2016 | Northwest Branch (NWBAR) | |
| | Largemouth bass | 10 |
| | Smallmouth bass | 6 |
| | Northern snakehead | 1 |

* Where sufficient mass was available, the fish were treated as single samples. Where not enough mass was present, multiple fish from the same species were composited.

N W E S

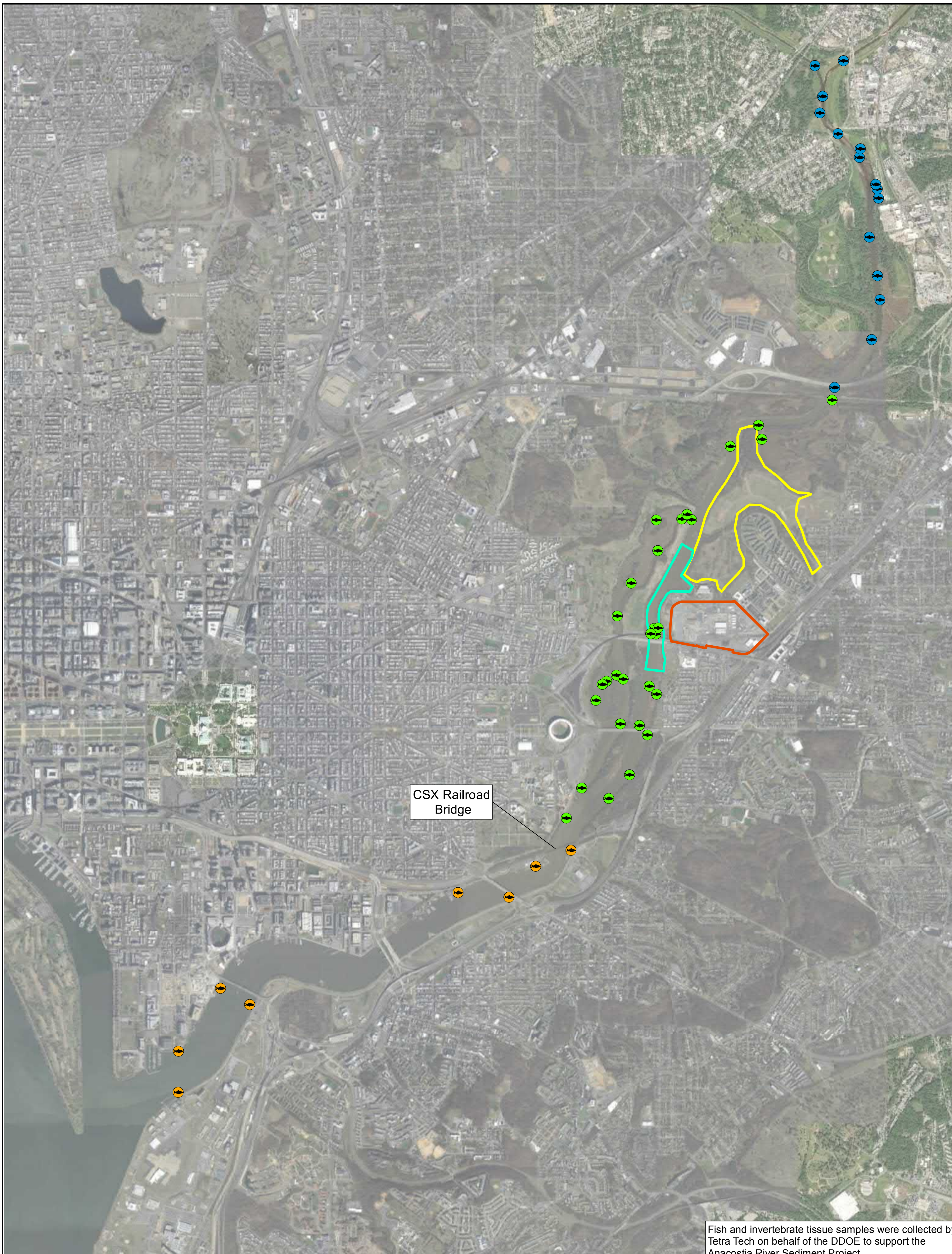
**Fillet Fish Tissue Samples in Non-Tidal Rivers**
**Background Locations**
**Pepco – Benning Road Facility**
**Washington, DC**

0 0.5 1 2 Miles

**Legend**
- Property Boundaries
- Waterside Investigation Area
- Benning Road Facility
- Upper Anacostia River Sampling Area (US Fish and Wildlife Service)
- Background Fish Tissue Sampling Reach

AECOM

Figure 2-6




LEGEND

- Fish Tissue Sample Locations Selected to Represent Downstream Conditions
- Fish Tissue Sample Locations Selected to Represent Upstream Conditions
- Fish Tissue Sampling Locations Selected to Represent Site Conditions
- Waterside Investigation Area
- Kenilworth Landfill
- Benning Road Facility Property Boundary

AECOM

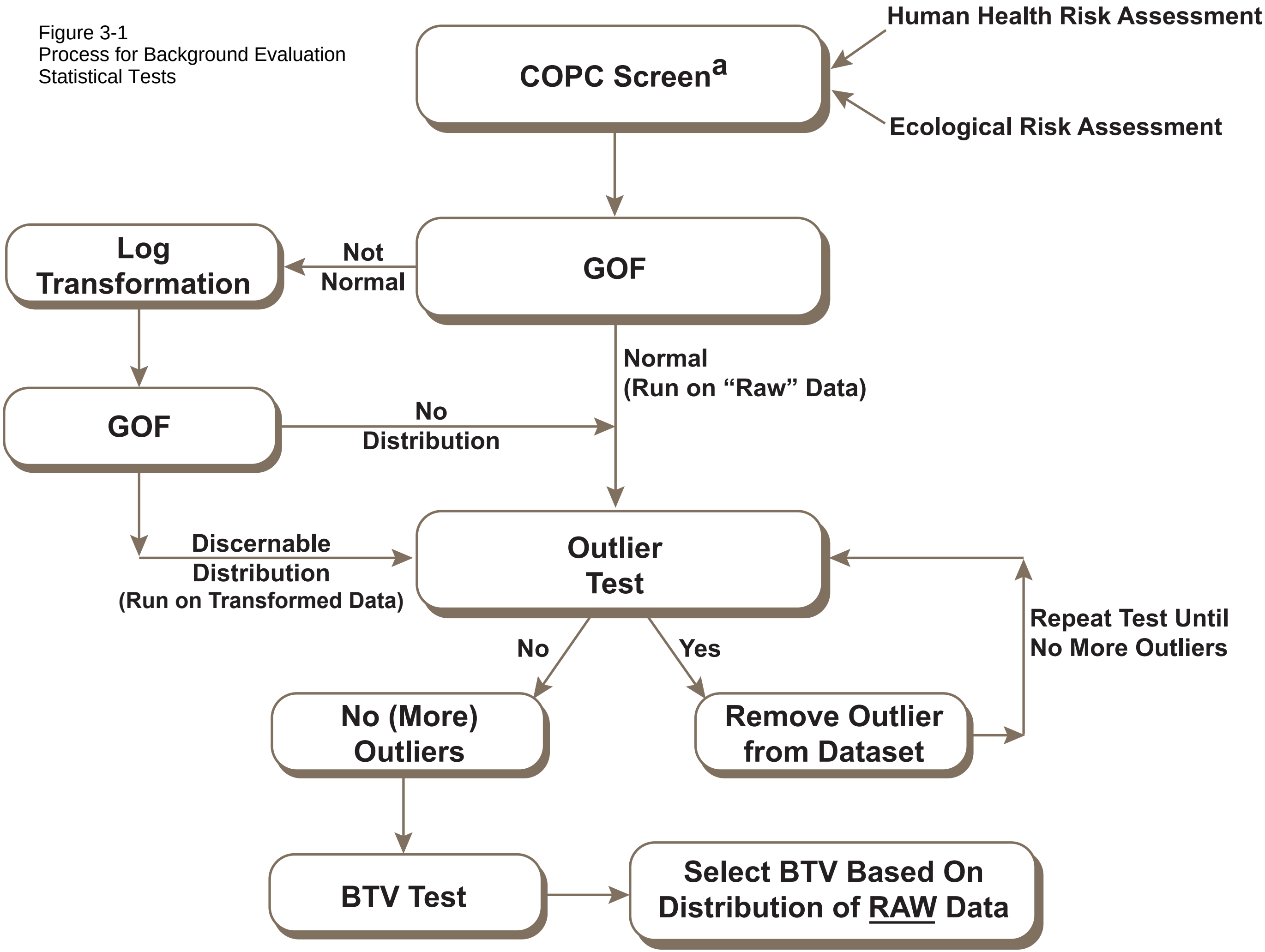
0 2,500 Feet

N S E W

| | |
|---|---|
| BENNING ROAD FACILITY RI/FS PROJECT<br>3400 BENNING RD., NE<br>WASHINGTON, DC 20019 | WHOLE BODY FISH TISSUE SAMPLES |

| | | | | |
|---|---|---|---|---|
| Date: 10/17/2018 | Drawn By: KNS | Checked By: SED | | FIGURE 2-7 |

Figure 3-1
Process for Background Evaluation
Statistical Tests




**Notes**
BTV – Background Threshold Value.
GOF – Goodness-of-fit Test.
(a) The list of COPCs were identified based on comparisons of the maximum detected concentrations in Site media to the project screening levels for the Human Health and Ecological Risk Assessments.

M18005

# Attachment A

# Analytical Chemistry Data for Background Datasets

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | Location ID | SOBACK01 | SOBACK01 | SOBACK02 | SOBACK02 | SOBACK03 | SOBACK03 | SOBACK04/ DPBACK04 | SOBACK04/ DPBACK04 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | SOBACK0100N | SOBACK0103N | SOBACK0200N | SOBACK0203N | SOBACK0300N | SOBACK0303N | SOBACK0400N | SOBACK0403N |
| | | Sample Date | 2/28/2017 | 2/28/2017 | 2/28/2017 | 2/28/2017 | 3/2/2017 | 3/2/2017 | 4/5/2017 | 4/5/2017 |
| | | Sample Type | N | N | N | N | N | N | N | N |
| | | Depth Interval | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | | |
| **Inorganics** | | | | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 3.1 | 2 | 3.2 | 9.8 | 4.3 | 2.9 | 9.9 J- | 5 J- |
| Chromium | 7440-47-3 | mg/kg | 7.4 | 11 | 9.3 | 16 | 18 | 5.5 | 15 | 13 |
| Cobalt | 7440-48-4 | mg/kg | 13 | 5.1 | 3.3 | 0.47 | 5.6 | 0.75 | 3 | 2.9 |
| Lead | 7439-92-1 | mg/kg | 32 | 8 | 21 | 7.9 | 20 | 3.5 | 250 | 50 |
| Manganese | 7439-96-5 | mg/kg | 490 | 73 | 110 | 2 | 130 | 9.3 | 77 | 84 |
| Nickel | 7440-02-0 | mg/kg | 5.7 | 7 | 6.5 | 1.3 | 43 | 0.99 | 6.4 | 5.2 |
| Thallium | 7440-28-0 | mg/kg | 0.078 J | 0.037 J | 0.07 J | 0.016 J | 0.091 J | 0.07 J | 0.19 | 0.13 |
| Vanadium | 7440-62-2 | mg/kg | 19 | 21 | 15 | 56 | 16 | 11 | 32 | 19 |
| **Pesticides / PCBs** | | | | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.034 | 0.0046 U | 0.0047 U | 0.0047 U | 0.0046 U | 0.0048 U | 0.0055 U | 0.0046 U |
| **Petroleum Compounds** | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 20 U | 19 U | 19 U | 19 U | 7.5 J | 19 U | 12 J | 230 J+ |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 58 | 7.6 J | 19 U | 19 U | 110 | 8.1 J | 50 | 860 J+ |
| **Semi Volatile Organic Compounds** | | | | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0323 | 0.000537 | 0.0343 | 0.0077 U | 0.619 | 0.0077 U | 0.0381 | 13.3 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.022 | 0.0053 J | 0.023 | 0.0077 U | 0.42 | 0.0077 U | 0.032 | 11 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.02 | 0.0074 U | 0.021 | 0.0077 U | 0.4 | 0.0077 U | 0.025 | 8.7 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.03 | 0.0074 U | 0.026 | 0.0077 U | 0.44 | 0.0077 U | 0.031 | 11 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0051 J | 0.0074 U | 0.0066 J | 0.0077 U | 0.1 | 0.0077 U | 0.0049 | 1.8 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.018 | 0.0074 U | 0.016 | 0.0077 U | 0.3 | 0.0077 U | 0.017 | 5.1 |
| Naphthalene | 91-20-3 | mg/kg | 0.0028 J | 0.0074 U | 0.0074 U | 0.0077 U | 0.016 J | 0.0077 U | 0.002 J | 2.8 |
| **Dioxin/Furans** | | | | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 8.28E-08 J | 3.2E-07 U | 1.13E-07 U | 5.76E-07 U | 3.31E-07 U | 7.74E-08 U | 1.7E-07 U | 2.67E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 2.10E-06 | 1.95E-06 | 4.28E-06 | 2.21E-06 | 3.61E-06 | 3.42E-06 | 6.28E-06 | 1.04E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Location ID** | SOBACK05/ DPBACK15 | SOBACK05/ DPBACK15 | SOBACK06 | SOBACK06 | SOBACK07 | SOBACK07 | SOBACK08/ DPBACK12 |
|---|---|---|---|---|---|---|---|---|---|
| | | **Sample ID** | SOBACK0500N | SOBACK0503N | SOBACK0600N | SOBACK0603N | SOBACK0700N | SOBACK0703N | SOBACK0800N |
| | | **Sample Date** | 4/5/2017 | 4/5/2017 | 2/28/2017 | 2/28/2017 | 2/27/2017 | 2/27/2017 | 4/5/2017 |
| | | **Sample Type** | N | N | N | N | N | N | N |
| | | **Depth Interval** | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | |
| **Inorganics** | | | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 7.9 J- | 10 J- | 5.6 | 5.9 | 3.9 | 1.5 | 4.1 J- |
| Chromium | 7440-47-3 | mg/kg | 23 | 12 | 14 | 18 | 13 | 6.7 | 14 |
| Cobalt | 7440-48-4 | mg/kg | 7.9 | 4.2 | 16 | 9.4 | 5.1 J | 2.8 J | 2.1 |
| Lead | 7439-92-1 | mg/kg | 210 | 78 | 75 | 9.9 | 7.1 | 5.9 | 15 |
| Manganese | 7439-96-5 | mg/kg | 290 | 81 | 250 | 71 | 36 | 18 | 27 |
| Nickel | 7440-02-0 | mg/kg | 13 | 13 | 13 | 15 | 5.8 | 3.6 | 10 |
| Thallium | 7440-28-0 | mg/kg | 0.16 | 0.16 J | 0.09 J | 0.1 | 0.082 J | 0.04 J | 0.059 J |
| Vanadium | 7440-62-2 | mg/kg | 35 | 18 | 24 | 36 | 25 J- | 17 J- | 24 |
| **Pesticides / PCBs** | | | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.0061 U | 0.0049 U | 0.0059 | 0.0047 U | 0.0048 U | 0.0045 U | 0.00097 U |
| **Petroleum Compounds** | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 15 J | 150 | 20 U | 20 U | 20 U | 18 U | 19 U |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 110 | 320 | 15 J | 20 U | 11 J | 18 U | 16 J |
| **Semi Volatile Organic Compounds** | | | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0323 | 0.0285 | 0.108 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.023 | 0.036 | 0.077 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.021 | 0.019 | 0.064 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.027 | 0.044 | 0.097 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0046 J | 0.004 U | 0.021 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.016 | 0.014 | 0.049 | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| Naphthalene | 91-20-3 | mg/kg | 0.0019 J | 0.026 | 0.0077 U | 0.0076 U | 0.0076 U | 0.0073 U | 0.0039 U |
| **Dioxin/Furans** | | | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1.47E-07 U | 4.95E-07 U | 2.34E-07 J | 1.16E-07 U | 2.22E-07 U | 3.92E-07 U | 2.66E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 6.20E-06 | 1.59E-06 | 5.49E-06 | 2.39E-05 | 6.95E-06 | 1.21E-06 | 2.57E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Location ID** | SOBACK08/ DPBACK12 | SOBACK09 | SOBACK09 | SOBACK10/DPBACK01 | SOBACK10/DPBACK01 | SOBACK11 | SOBACK11 |
|---|---|---|---|---|---|---|---|---|---|
| | | **Sample ID** | SOBACK0803N | SOBACK0900N | SOBACK0903N | SOBACK1000N | SOBACK1003N | SOBACK1100N | SOBACK1103N |
| | | **Sample Date** | 4/5/2017 | 3/6/2017 | 3/6/2017 | 3/3/2017 | 3/3/2017 | 4/7/2017 | 4/7/2017 |
| | | **Sample Type** | N | N | N | N | N | N | N |
| | | **Depth Interval** | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | |
| **Inorganics** | | | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 0.78 J- | 2.7 J- | 1.5 J- | 4.4 | 1.6 | 5 | 2.8 |
| Chromium | 7440-47-3 | mg/kg | 9.4 | 12 J | 7.4 J | 45 | 6.7 | 17 | 14 |
| Cobalt | 7440-48-4 | mg/kg | 3.3 | 2.7 J | 1 J | 9.8 | 4.7 | 4 | 2.8 |
| Lead | 7439-92-1 | mg/kg | 7.2 | 7.9 J | 6.2 J | 46 | 3.5 | 54 | 9.8 |
| Manganese | 7439-96-5 | mg/kg | 24 | 58 | 20 | 240 | 49 | 140 J | 14 J |
| Nickel | 7440-02-0 | mg/kg | 4.7 | 5.6 J | 2.1 J | 88 | 3 | 7.4 | 5.2 |
| Thallium | 7440-28-0 | mg/kg | 0.11 | 0.11 J | 0.047 J | 0.11 U | 0.12 U | 0.13 | 0.21 |
| Vanadium | 7440-62-2 | mg/kg | 21 | 19 J- | 16 J- | 24 | 15 | 26 | 23 |
| **Pesticides / PCBs** | | | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.00091 U | 0.0097 | 0.0047 U | 0.0051 U | 0.0048 U | 0.00095 U | 0.0012 U |
| **Petroleum Compounds** | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 19 U | 21 U | 19 U | 8.7 J | 20 U | 20 U | 24 U |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 19 U | 21 U | 19 U | 76 | 20 U | 19 J | 24 U |
| **Semi Volatile Organic Compounds** | | | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0037 U | 0.0277 | 0.000313 | 0.223 | 0.0079 U | 0.00756 | 0.0048 U |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.0037 U | 0.021 | 0.0031 J | 0.12 | 0.0079 U | 0.0072 | 0.0048 U |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.0037 U | 0.021 | 0.0078 U | 0.14 | 0.0079 U | 0.0056 | 0.0048 U |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.0037 U | 0.029 | 0.0078 U | 0.19 | 0.0079 U | 0.0073 | 0.0048 U |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0037 U | 0.0081 U | 0.0078 U | 0.038 J | 0.0079 U | 0.0039 U | 0.0048 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.0037 U | 0.016 | 0.0078 U | 0.13 | 0.0079 U | 0.0046 | 0.0048 U |
| Naphthalene | 91-20-3 | mg/kg | 0.0037 U | 0.0081 U | 0.0078 U | 0.041 U | 0.0079 U | 0.0011 J | 0.0048 U |
| **Dioxin/Furans** | | | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1.77E-07 U | 8.01E-07 JN | 2.66E-07 U | 9.31E-07 U | 4.63E-07 U | 1.23E-07 U | 3.29E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 8.48E-07 | 1.61E-05 | 3.43E-06 | 6.61E-06 | 6.95E-07 | 4.56E-06 | 1.15E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Location ID** | SOBACK12/DPBACK09 | SOBACK12/DPBACK09 | SOBACK13 | SOBACK13 | SOBACK14 | SOBACK14 | SOBACK14 | SOBACK15 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Sample ID** | SOBACK1200N | SOBACK1203N | SOBACK1300N | SOBACK1303N | SOBACK1400N | SOBACK1400R | SOBACK1403N | SOBACK1500N |
| | | **Sample Date** | 4/4/2017 | 4/4/2017 | 4/5/2017 | 4/5/2017 | 3/3/2017 | 3/3/2017 | 3/3/2017 | 2/27/2017 |
| | | **Sample Type** | N | N | N | N | N | FD | N | N |
| | | **Depth Interval** | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | | |
| **Inorganics** | | | | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 5.3 | 5.8 | 3.1 J- | 2.8 J- | 2.5 | 2.5 | 4.5 | 2.9 |
| Chromium | 7440-47-3 | mg/kg | 13 | 13 | 16 | 16 | 13 | 12 | 28 | 10 |
| Cobalt | 7440-48-4 | mg/kg | 8.6 | 12 | 5.5 | 4.9 | 5.7 | 4.2 | 6.9 | 15 J |
| Lead | 7439-92-1 | mg/kg | 61 | 12 | 83 | 170 | 18 | 20 | 14 | 32 |
| Manganese | 7439-96-5 | mg/kg | 420 | 260 | 180 | 160 | 97 | 76 | 50 | 1000 |
| Nickel | 7440-02-0 | mg/kg | 8.8 | 14 | 9.5 | 9.1 | 5.7 | 4.7 | 8.7 | 7.7 |
| Thallium | 7440-28-0 | mg/kg | 0.11 U | 0.11 U | 0.11 J | 0.06 J | 0.11 U | 0.11 U | 0.13 | 0.096 J |
| Vanadium | 7440-62-2 | mg/kg | 22 | 23 | 27 | 17 | 30 | 24 | 57 | 26 J- |
| **Pesticides / PCBs** | | | | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.0066 | 0.00096 U | 0.0055 U | 0.0051 U | 0.017 | 0.015 | 0.005 U | 0.005 U |
| **Petroleum Compounds** | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 11 J | 19 U | 14 J | 20 J | 19 U | 19 U | 20 U | 20 U |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 59 | 11 J | 89 | 160 | 14 J | 11 J | 20 U | 28 |
| **Semi Volatile Organic Compounds** | | | | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0394 | 0.000161 | 0.0868 | 0.147 | 0.0256 | 0.0188 | 0.0082 U | 0.018 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.021 | 0.0016 J | 0.07 | 0.096 | 0.019 | 0.015 | 0.0082 U | 0.015 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.025 | 0.0076 U | 0.057 | 0.095 | 0.016 | 0.014 | 0.0082 U | 0.013 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.035 | 0.0076 U | 0.069 | 0.12 | 0.021 | 0.019 | 0.0082 U | 0.021 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0068 J | 0.0076 U | 0.012 | 0.023 | 0.0043 J | 0.0077 U | 0.0082 U | 0.0079 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.019 | 0.0076 U | 0.035 | 0.065 | 0.012 | 0.013 | 0.0082 U | 0.013 |
| Naphthalene | 91-20-3 | mg/kg | 0.0019 J | 0.0076 U | 0.004 J | 0.019 | 0.0075 U | 0.0077 U | 0.0082 U | 0.0079 U |
| **Dioxin/Furans** | | | | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1E-06 JN | 4.98E-07 U | 5.81E-07 U | 3.23E-07 U | 2.23E-07 U | 3.38E-07 U | 5.79E-07 U | 3.12E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 2.10E-05 | 3.99E-07 | 6.91E-06 | 5.50E-06 | 2.89E-06 | 3.82E-06 | 1.21E-06 | 2.42E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Location ID** | SOBACK15 | SOBACK16 | SOBACK16 | SOBACK16 | SOBACK17/ DPBACK05 | SOBACK17/ DPBACK05 | SOBACK18/ DPBACK13 |
|---|---|---|---|---|---|---|---|---|---|
| | | **Sample ID** | SOBACK1503N | SOBACK1600N | SOBACK1600R | SOBACK1603N | SOBACK1700N | SOBACK1703N | SOBACK1800N |
| | | **Sample Date** | 2/27/2017 | 2/27/2017 | 2/27/2017 | 2/27/2017 | 2/28/2017 | 2/28/2017 | 4/5/2017 |
| | | **Sample Type** | N | N | FD | N | N | N | N |
| | | **Depth Interval** | 3 - 4 ft | 0 - 1 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | |
| **Inorganics** | | | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 2 | 1.3 | 1.7 | 2.2 | 3.1 | 5.8 | 4.6 J- |
| Chromium | 7440-47-3 | mg/kg | 30 | 7.9 | 11 | 19 | 11 | 14 | 57 |
| Cobalt | 7440-48-4 | mg/kg | 9.5 J | 3.2 J | 4 J | 5.6 J | 7.3 | 12 | 10 |
| Lead | 7439-92-1 | mg/kg | 9.5 | 5.8 | 7.1 | 6.8 | 22 | 6.5 | 320 |
| Manganese | 7439-96-5 | mg/kg | 130 | 60 | 72 | 130 | 670 | 330 | 370 |
| Nickel | 7440-02-0 | mg/kg | 15 | 3.2 | 4.3 | 9 | 7.6 | 11 | 27 |
| Thallium | 7440-28-0 | mg/kg | 0.085 J | 0.058 J | 0.074 J | 0.046 J | 0.062 J | 0.058 J | 0.15 |
| Vanadium | 7440-62-2 | mg/kg | 80 J- | 18 J- | 26 J- | 50 J- | 16 | 19 | 36 |
| **Pesticides / PCBs** | | | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.005 U | 0.0048 U | 0.0047 U | 0.0047 U | 0.0045 U | 0.0043 U | 0.39 |
| **Petroleum Compounds** | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 20 U | 19 U | 19 U | 19 U | 17 J | 17 U | 20 |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 20 U | 11 J | 10 J | 19 U | 100 | 17 U | 180 |
| **Semi Volatile Organic Compounds** | | | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0079 U | 0.000343 | 0.0135 | 0.0076 U | 2.34 | 0.0143 | 0.282 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.0079 U | 0.0034 J | 0.0087 | 0.0076 U | 0.67 | 0.008 | 0.2 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.0079 U | 0.0077 U | 0.0085 | 0.0076 U | 1.5 | 0.011 | 0.18 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.0079 U | 0.0077 U | 0.014 | 0.0076 U | 1.3 | 0.012 | 0.25 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0079 U | 0.0077 U | 0.002 J | 0.0076 U | 0.48 | 0.0069 U | 0.043 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.0079 U | 0.0077 U | 0.0064 J | 0.0076 U | 1.6 | 0.012 | 0.13 |
| Naphthalene | 91-20-3 | mg/kg | 0.0079 U | 0.0077 U | 0.0075 U | 0.0076 U | 0.13 J | 0.0069 U | 0.005 |
| **Dioxin/Furans** | | | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 2.41E-07 U | 2.82E-07 U | 1.41E-07 JN | 1.68E-07 U | 1.3E-07 U | 8.97E-08 U | 3.2E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 1.35E-06 | 2.90E-06 | 3.73E-06 | 2.46E-06 | 3.50E-06 | 1.86E-07 | 1.05E-05 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

**Table 1**
**Analytical Data - Soil**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | Location ID | SOBACK18/ DPBACK13 | SU-BK-01 | SU-BK-01 | SU-BK-02 | SU-BK-02 |
|---|---|---|---|---|---|---|---|
| | | Sample ID | SOBACK1803N | SU-BK-0100N | SU-BK-0103N | SU-BK-0200N | SU-BK-0203N |
| | | Sample Date | 4/5/2017 | 4/4/2017 | 4/4/2017 | 4/4/2017 | 4/4/2017 |
| | | Sample Type | N | N | N | N | N |
| | | Depth Interval | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft | 0 - 1 ft | 3 - 4 ft |
| **Chemical** | **CAS** | **Units** | | | | | |
| **Inorganics** | | | | | | | |
| Arsenic | 7440-38-2 | mg/kg | 30 J- | 0.93 | 0.59 | 5.6 | 5 |
| Chromium | 7440-47-3 | mg/kg | 110 | 3.7 | 4.6 | 21 | 21 |
| Cobalt | 7440-48-4 | mg/kg | 16 | 0.65 | 1.5 | 9 | 8.9 |
| Lead | 7439-92-1 | mg/kg | 5100 | 8 | 1.7 | 29 | 19 |
| Manganese | 7439-96-5 | mg/kg | 1000 | 17 | 23 | 210 | 160 |
| Nickel | 7440-02-0 | mg/kg | 61 | 1.7 | 2.2 | 9.7 | 10 |
| Thallium | 7440-28-0 | mg/kg | 0.64 U | 0.1 U | 0.093 U | 0.14 | 0.13 |
| Vanadium | 7440-62-2 | mg/kg | 26 | 6.8 | 3.4 | 29 | 28 |
| **Pesticides / PCBs** | | | | | | | |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.0055 U | 0.00086 U | 0.00084 U | 0.001 U | 0.001 U |
| **Petroleum Compounds** | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 40 | 6.7 J | 17 U | 10 J | 21 U |
| Oil Range Organics (C20-C36) | C20C36 | mg/kg | 200 | 51 | 7.4 J | 62 | 32 |
| **Semi Volatile Organic Compounds** | | | | | | | |
| BaP-TE | BAP | mg/kg | 0.0184 | 0.00131 | 0.0069 U | 0.131 | 0.11 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.015 | 0.013 | 0.0069 U | 0.085 | 0.064 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.014 | 0.007 U | 0.0069 U | 0.084 | 0.068 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.018 | 0.007 U | 0.0069 U | 0.12 | 0.11 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.0045 U | 0.007 U | 0.0069 U | 0.019 | 0.019 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.01 | 0.007 U | 0.0069 U | 0.066 | 0.053 |
| Naphthalene | 91-20-3 | mg/kg | 0.0053 | 0.007 U | 0.0069 U | 0.0079 J | 0.0071 J |
| **Dioxin/Furans** | | | | | | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 2.29E-06 | 4.19E-07 U | 7.82E-07 U | 2.71E-07 U | 3.79E-07 U |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 2.71E-05 | 8.82E-07 | 1.30E-07 | 6.74E-06 | 5.24E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Fett.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
U - Not detected.

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | Location ID | R6-13 | R6-14 | R6-15 | R6-16 | R6-17 | R6-51 | R7-01 | R7-02 | R7-03 | R7-04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | RI-R6-13-SS | RI-R6-14-SS | RI-R6-15-SS | RI-R6-16-SS | RI-R6-17-SS | P2-R6-51-SS | RI-R7-01-SS | RI-R7-02-SS | RI-R7-03-SS | RI-R7-04-SS |
| | | Sample Date | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 6/9/2016 | 8/1/2014 | 8/1/2014 | 8/1/2014 | 8/1/2014 |
| | | Sample Type | N | N | N | N | N | N | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Inorganics | | | | | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 2700 | 3100 | 8200 | 3500 | 10000 | 1600 J | 13000 | 11000 | 12000 | 20000 |
| Antimony | 7440-36-0 | mg/kg | 0.23 | 0.21 | 0.34 | 0.36 | 0.51 | 0.39 J | 0.3 | 0.44 | 0.44 | 0.18 J |
| Arsenic | 7440-38-2 | mg/kg | 1.7 | 1.9 | 2.2 | 2.1 | 2.8 | 2.4 J | 4.7 | 2.7 | 2.4 | 2.7 |
| Barium | 7440-39-3 | mg/kg | 19 | 51 | 49 | 27 | 79 | 21 | 80 | 75 | 78 | 140 |
| Cadmium | 7440-43-9 | mg/kg | 0.27 | 0.26 | 0.44 | 0.37 | 0.49 | 0.28 | 0.88 | 0.44 | 1 | 0.29 |
| Chromium | 7440-47-3 | mg/kg | 12 | 15 | 26 | 15 | 32 | 12 J | 57 | 31 | 33 | 27 |
| Cobalt | 7440-48-4 | mg/kg | 4.4 | 5.8 | 11 | 6.6 | 15 | 5.8 | 12 | 14 | 14 | 15 |
| Copper | 7440-50-8 | mg/kg | 10 | 12 | 24 | 17 | 33 | 15 J | 26 | 31 | 31 | 21 |
| Iron | 7439-89-6 | mg/kg | 10000 | 11000 | 16000 | 11000 | 20000 | 12000 | 24000 | 20000 | 21000 | 20000 |
| Lead | 7439-92-1 | mg/kg | 21 | 22 | 32 | 24 | 40 | 23 | 89 | 41 | 40 | 28 |
| Manganese | 7439-96-5 | mg/kg | 120 | 120 | 170 | 100 | 230 | 94 J | 290 | 250 | 240 | 280 |
| Mercury | 7439-97-6 | mg/kg | 0.027 | 0.033 | 0.094 | 0.043 | 0.11 | 0.025 | 0.14 | 0.098 | 0.093 | 0.063 |
| Nickel | 7440-02-0 | mg/kg | 7.7 | 8.7 | 19 | 10 | 25 | 10 | 19 | 25 | 27 | 20 |
| Silver | 7440-22-4 | mg/kg | 0.05 J | 0.065 J | 0.098 | 0.076 J | 0.17 | 0.051 J | 0.36 | 0.12 | 0.12 | 0.069 J |
| Thallium | 7440-28-0 | mg/kg | 0.044 J | 0.064 J | 0.16 | 0.059 J | 0.2 | 0.037 U | 0.22 | 0.21 | 0.23 | 0.29 |
| Vanadium | 7440-62-2 | mg/kg | 15 | 17 | 25 | 18 | 31 | 15 | 44 | 31 | 32 | 39 |
| Zinc | 7440-66-6 | mg/kg | 66 | 68 | 120 | 88 | 150 | 79 | 140 | 140 | 140 | 74 |
| Pesticides / PCBs | | | | | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 0.0016 | 0.0014 J | 0.0044 | 0.0013 J | 0.0052 J | 0.00034 J | 0.0089 J | 0.005 | 0.0051 | 0.00058 J |
| 4,4'-DDE | 72-55-9 | mg/kg | 0.0014 | 0.0012 J | 0.0043 | 0.00098 J | 0.0047 J | 0.00026 J | 0.03 | 0.0046 | 0.0045 | 0.00067 |
| 4,4'-DDT | 50-29-3 | mg/kg | 0.00015 J | 0.00095 J | 0.00094 J | 0.00052 J | 0.0015 J | 0.0022 J+ | 0.002 J | 0.0013 J | 0.0011 J | 0.00013 J |
| Aldrin | 309-00-2 | mg/kg | 0.00017 J | 0.00031 J | 0.00068 J | 0.00028 J | 0.0011 J | 5.4E-05 U | 0.00054 J | 0.00074 J | 0.00086 | 0.0001 J |
| Aroclor-1248 | 12672-29-6 | mg/kg | 0.038 | 0.026 | 0.036 | 0.077 | 0.05 | 0.06 | 0.076 | 0.03 | 0.00047 U | 0.00046 U |
| Aroclor-1254 | 11097-69-1 | mg/kg | 0.00044 U | 0.00046 U | 0.00058 U | 0.00049 U | 0.00061 U | 0.041 | 0.00051 U | 0.00061 U | 0.00071 U | 0.00068 U |
| Aroclor-1260 | 11096-82-5 | mg/kg | 0.024 | 0.016 | 0.025 | 0.024 | 0.022 | 0.022 | 0.11 | 0.018 | 0.026 | 0.017 |
| CHLORDANE (ALL) | CHLORDANE_ALL | mg/kg | 0.022 | 0.034 | 0.063 | 0.052 | 0.079 J | 0.023 J+ | 0.063 | 0.069 | 0.059 | 0.012 |
| Chlordane (Technical) | 12789-03-6 | mg/kg | 0.022 | 0.034 | 0.063 | 0.052 | 0.079 J | | 0.063 | 0.069 | 0.059 | 0.012 |
| cis-Chlordane | 5103-71-9 | mg/kg | | | | | | | | | | |
| Dieldrin | 60-57-1 | mg/kg | 0.00043 J | 0.0012 J | 0.00077 J | 0.0012 J | 0.0015 J | 0.00059 J | 0.0022 J | 0.0014 J | 0.0017 J | 0.00048 J |
| Endosulfan Sulfate | 1031-07-8 | mg/kg | 0.00025 J | 0.0009 | 0.00056 J | 0.00068 J | 0.00051 J | 0.00015 J | 0.002 J | 0.00082 J | 0.00034 J | 0.0001 J |
| Endrin | 72-20-8 | mg/kg | 0.0013 | 0.0031 | 0.0013 J | 0.004 | 0.0025 J | 0.0015 J+ | 0.0038 J | 0.002 | 0.00081 J | 0.00015 J |
| Endrin ketone | 53494-70-5 | mg/kg | | | | | | | | | | |
| Heptachlor Epoxide | 1024-57-3 | mg/kg | 0.00043 J | 0.0013 J | 0.0005 J | 0.0016 J | 0.0012 J | 0.00067 J | 0.001 J | 0.00062 J | 0.00063 J | 0.00016 J |
| Methoxychlor | 72-43-5 | mg/kg | | | | | | | | | | |
| PCB, Total Congeners | PCB | mg/kg | 0.1987467 | 0.071077 | 0.0985547 | 0.235035 | 0.1428058 | 0.1572537 | 0.3684919 | 0.0987131 | 0.0661707 | 0.0495149 |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.062 | 0.042 | 0.061 | 0.1 | 0.072 | 0.12 | 0.19 | 0.048 | 0.026 | 0.017 |
| trans-Chlordane | 5103-74-2 | mg/kg | | | | | | | | | | |
| **Petroleum Hydrocarbons** | | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | | | | | | | | | | |

| | | Location ID | R6-13 | R6-14 | R6-15 | R6-16 | R6-17 | R6-51 | R7-01 | R7-02 | R7-03 | R7-04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | RI-R6-13-SS | RI-R6-14-SS | RI-R6-15-SS | RI-R6-16-SS | RI-R6-17-SS | P2-R6-51-SS | RI-R7-01-SS | RI-R7-02-SS | RI-R7-03-SS | RI-R7-04-SS |
| | | Sample Date | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 6/9/2016 | 8/1/2014 | 8/1/2014 | 8/1/2014 | 8/1/2014 |
| | | Sample Type | N | N | N | N | N | N | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Semi Volatile Organic Compounds | | | | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | | | | | | | | | | |
| 4-Methylphenol | 106-44-5 | mg/kg | | | | | | | | | | |
| Acenaphthene | 83-32-9 | mg/kg | 0.012 J | 0.06 | 0.022 J | 0.025 J | 0.021 J | 0.018 J | 0.021 J | 0.042 J | 0.027 J | 0.0083 J |
| Acenaphthylene | 208-96-8 | mg/kg | 0.042 J | 0.061 | 0.051 J | 0.056 | 0.059 J | 0.019 J | 0.066 | 0.065 J | 0.047 J | 0.015 J |
| Anthracene | 120-12-7 | mg/kg | 0.05 | 0.2 | 0.091 | 0.098 | 0.11 | 0.04 | 0.072 | 0.15 | 0.092 | 0.028 J |
| BaP-TE | BAP | mg/kg | 0.425 | 1.14 | 0.995 | 0.807 | 1.14 | 0.254 | 0.311 | 1.37 | 1.03 | 0.336 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.2 | 0.76 | 0.47 | 0.44 | 0.56 | 0.16 | 0.16 | 0.72 | 0.54 | 0.17 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.27 | 0.75 | 0.61 | 0.51 | 0.69 | 0.19 | 0.19 | 0.85 | 0.64 | 0.21 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.35 | 0.89 | 0.87 | 0.8 | 1.2 | 0.3 | 0.26 | 1.3 | 1.1 | 0.34 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.36 | 0.76 | 0.84 | 0.65 | 0.94 | 0.21 | 0.25 | 1.1 | 0.76 | 0.25 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.12 | 0.4 | 0.38 | 0.2 | 0.32 | 0.12 | 0.095 | 0.5 | 0.33 | 0.11 |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | mg/kg | 0.29 J | 0.46 J | 0.86 | 0.94 | 1.2 | 0.4 | 0.28 | 0.9 | 0.87 | 0.23 J |
| Butylbenzylphthalate | 85-68-7 | mg/kg | 0.034 U | 0.038 J | 0.045 U | 0.064 J | 0.064 J | 0.097 J | 0.019 U | 0.047 U | 0.054 U | 0.026 U |
| Chrysene | 218-01-9 | mg/kg | 0.29 | 0.91 | 0.77 | 0.64 | 0.97 | 0.24 | 0.25 | 1.1 | 0.87 | 0.29 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.071 | 0.16 | 0.18 | 0.12 | 0.2 | 0.0027 U | 0.06 | 0.22 | 0.16 | 0.055 |
| Di-n-octylphthalate | 117-84-0 | mg/kg | 0.026 U | 0.027 U | 0.035 U | 0.087 J | 0.036 U | 0.013 U | 0.015 U | 0.042 J | 0.042 U | 0.02 U |
| Fluoranthene | 206-44-0 | mg/kg | 0.46 | 2 | 1.3 | 1.2 | 1.6 | 0.42 | 0.41 | 2.1 | 1.4 | 0.47 |
| Fluorene | 86-73-7 | mg/kg | 0.014 J | 0.074 | 0.035 J | 0.038 J | 0.04 J | 0.019 J | 0.027 J | 0.066 J | 0.04 J | 0.014 J |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.28 | 0.6 | 0.66 | 0.5 | 0.74 | 0.17 | 0.18 | 0.88 | 0.62 | 0.19 |
| Naphthalene | 91-20-3 | mg/kg | 0.0043 U | 0.0044 U | 0.0057 U | 0.0048 U | 0.0059 U | 0.006 J | 0.019 J | 0.0059 U | 0.043 J | 0.0033 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.14 | 0.84 | 0.32 | 0.39 | 0.47 | 0.18 | 0.16 | 0.7 | 0.46 | 0.15 |
| Pyrene | 129-00-0 | mg/kg | 0.31 | 1.3 | 0.78 | 0.73 | 0.92 | 0.31 | 0.29 | 1.2 | 0.97 | 0.33 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 2.7 | 8.5 | 6.9 | 5.8 | 8.1 | 2.1 | 2.1 | 10 | 7.4 | 2.4 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.26 | 1.2 | 0.52 | 0.61 | 0.7 | 0.28 | 0.37 | 1 | 0.71 | 0.22 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 3 | 9.8 | 7.4 | 6.4 | 8.8 | 2.4 | 2.5 | 11 | 8.1 | 2.6 |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 0.017 U | 0.021 J | 0.028 J | 0.017 U | 0.029 U | 0.011 U | 0.04 J | 0.029 U | 0.031 U | 0.018 U |
| Acenaphthene | 83-32-9 | mg/kg | 0.0082 | 0.022 | 0.051 | 0.023 | 0.029 | 0.0071 | 0.017 | 0.03 | 0.027 | 0.014 |
| Acenaphthylene | 208-96-8 | mg/kg | 0.013 | 0.011 | 0.024 | 0.018 | 0.022 | 0.0071 | 0.035 | 0.023 | 0.017 | 0.0076 |
| Anthracene | 120-12-7 | mg/kg | 0.031 | 0.099 | 0.16 | 0.064 | 0.091 | 0.021 | 0.057 | 0.11 | 0.081 | 0.044 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.19 | 0.54 | 0.68 | 0.39 | 0.63 | 0.24 | 0.2 | 0.67 | 0.63 | 0.29 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.26 | 0.62 | 1 | 0.56 | 1 | 0.24 | 0.3 | 1.1 | 1 | 0.42 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.34 | 0.89 | 1.5 | 0.76 | 1.5 | 0.4 | 0.42 | 1.6 | 1.5 | 0.63 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.19 | 0.48 | 0.8 | 0.47 | 0.83 | 0.24 | 0.24 | 0.88 | 0.84 | 0.35 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.17 | 0.36 | 0.73 | 0.45 | 0.68 | 0.16 | 0.17 | 0.68 | 0.68 | 0.31 |
| Chrysene | 218-01-9 | mg/kg | 0.32 | 0.83 | 1.3 | 0.74 | 1.3 | 0.35 | 0.38 | 1.4 | 1.3 | 0.56 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.04 | 0.083 | 0.1 | 0.076 | 0.1 | 0.044 | 0.05 | 0.11 | 0.11 | 0.063 |
| Fluoranthene | 206-44-0 | mg/kg | 0.42 | 1.1 | 1.9 | 1 | 1.8 | 0.45 | 0.44 | 1.9 | 1.7 | 0.81 |
| Fluorene | 86-73-7 | mg/kg | 0.012 | 0.034 | 0.066 | 0.034 | 0.038 | 0.012 | 0.035 | 0.044 | 0.036 | 0.018 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.16 | 0.41 | 0.7 | 0.4 | 0.73 | 0.18 | 0.19 | 0.76 | 0.74 | 0.3 |
| Naphthalene | 91-20-3 | mg/kg | 0.032 U | 0.031 U | 0.051 U | 0.03 U | 0.054 U | 0.02 J | 0.046 J | 0.053 U | 0.056 U | 0.033 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.16 | 0.5 | 0.77 | 0.42 | 0.65 | 0.18 | 0.26 | 0.71 | 0.63 | 0.3 |
| Pyrene | 129-00-0 | mg/kg | 0.39 | 0.96 | 1.6 | 0.9 | 1.5 | 0.4 | 0.51 | 1.5 | 1.4 | 0.67 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 2.5 | 6.3 | 10 | 5.7 | 10 | 2.7 | 2.9 | 11 | 9.9 | 4.4 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.22 | 0.67 | 1.1 | 0.56 | 0.83 | 0.25 | 0.45 | 0.92 | 0.79 | 0.38 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 2.7 | 6.9 | 11 | 6.3 | 11 | 3 | 3.4 | 12 | 11 | 4.8 |

| | | Location ID | R6-13 | R6-14 | R6-15 | R6-16 | R6-17 | R6-51 | R7-01 | R7-02 | R7-03 | R7-04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | RI-R6-13-SS | RI-R6-14-SS | RI-R6-15-SS | RI-R6-16-SS | RI-R6-17-SS | P2-R6-51-SS | RI-R7-01-SS | RI-R7-02-SS | RI-R7-03-SS | RI-R7-04-SS |
| | | Sample Date | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 7/31/2014 | 6/9/2016 | 8/1/2014 | 8/1/2014 | 8/1/2014 | 8/1/2014 |
| | | Sample Type | N | N | N | N | N | N | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| **Dioxin/Furans** | | | | | | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | 67562-39-4 | mg/kg | 6.9E-06 J | | | | 1.6E-05 J | 6.7E-06 U | | 2.4E-05 J | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | 35822-46-9 | mg/kg | 4.70E-05 | | | | 0.00011 | 4.90E-05 | | 0.00015 | | |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | 55673-89-7 | mg/kg | 1.1E-06 U | | | | 1.3E-06 U | 7.6E-07 U | | 2.3E-06 U | | |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | 70648-26-9 | mg/kg | 1.4E-06 U | | | | 3.4E-06 J | 1.4E-06 U | | 4.4E-06 J | | |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | 39227-28-6 | mg/kg | 1.4E-07 U | | | | 2E-06 J | 5.6E-07 U | | 2.5E-06 J | | |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | 57117-44-9 | mg/kg | 5.8E-07 U | | | | 1.6E-06 U | 7.4E-07 U | | 1.7E-06 U | | |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | 57653-85-7 | mg/kg | 1.8E-06 U | | | | 4.3E-06 J | 1.6E-06 U | | 5.7E-06 J | | |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | 19408-74-3 | mg/kg | 1.4E-06 U | | | | 5.3E-06 J | 1.9E-06 U | | 6.3E-06 J | | |
| 1,2,3,7,8-PeCDF | 57117-41-6 | mg/kg | 2.5E-07 J | | | | 1.4E-07 U | 2.9E-07 U | | 4E-07 J | | |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | 40321-76-4 | mg/kg | 4.9E-07 U | | | | 1.2E-06 U | 4.2E-07 U | | 1.6E-06 U | | |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | 60851-34-5 | mg/kg | 1.1E-06 U | | | | 2.1E-06 J | 6.8E-07 U | | 1.5E-06 U | | |
| 2,3,4,7,8-Pentachlorodibenzofuran | 57117-31-4 | mg/kg | 1.2E-06 J | | | | 1.3E-06 J | 1.1E-06 U | | 1.8E-06 J | | |
| 2,3,7,8-Tetrachlorodibenzofuran | 51207-31-9 | mg/kg | 9.7E-07 J | | | | 9.6E-07 J | 7.30E-07 | | 1E-06 J | | |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1.4E-07 U | | | | 1.9E-07 U | 9.7E-08 J | | 2.7E-07 J | | |
| Octachlorochlorodibenzofuran | 39001-02-0 | mg/kg | 1.8E-05 U | | | | 4.20E-05 | 1.6E-05 U | | 5.60E-05 | | |
| Octachlorochlorodibenzo-p-dioxin | 3268-87-9 | mg/kg | 0.0014 | | | | 0.0042 | 0.0017 | | 0.0056 | | |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 1.42E-06 | | | | 4.73E-06 | 1.17E-06 | | 6.25E-06 | | |

Notes:
CAS - Chemical Abstracts Service.
ft - Feet.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
PAH - Polycyclic aromatic hydrocarbons.
U - Not detected.

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | Location ID | R7-05 | R7-06 | R7-07 | R7-08 | R7-09 | R7-09 | R7-10 | R7-11 | R7-12 | R7-27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | RI-R7-05-SS | RI-R7-06-SS | RI-R7-07-SS | RI-R7-08-SS | RI-R7-09-SS | RI-R7-120-SS | RI-R7-10-SS | RI-R7-11-SS | RI-R7-12-SS | P2-R7-27-SS |
| | | Sample Date | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 6/9/2016 |
| | | Sample Type | N | N | N | N | N | FD | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Inorganics | | | | | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 7800 | 8700 | 12000 | 2900 | 15000 | | 6400 | 7900 | 1900 | 7400 J |
| Antimony | 7440-36-0 | mg/kg | 0.33 | 0.2 J | 0.28 | 0.13 J | 0.54 J | | 0.35 J | 0.42 J | 0.2 J | 0.51 J |
| Arsenic | 7440-38-2 | mg/kg | 3.3 | 2.5 | 3.7 | 1 | 4.7 J | | 1.9 J | 2.4 J | 2.4 J | 3 J |
| Barium | 7440-39-3 | mg/kg | 57 | 66 | 79 | 20 | 92 | | 46 | 58 | 17 | 58 |
| Cadmium | 7440-43-9 | mg/kg | 0.49 | 0.19 | 0.72 | 0.11 | 0.98 J | | 0.24 J | 0.34 J | 0.17 J | 0.35 |
| Chromium | 7440-47-3 | mg/kg | 28 | 19 | 39 | 14 | 64 J | | 25 J | 28 J | 15 J | 32 J |
| Cobalt | 7440-48-4 | mg/kg | 12 | 11 | 15 | 5.5 | 16.5 | | 11 | 13 | 9.9 | 14 |
| Copper | 7440-50-8 | mg/kg | 31 | 16 | 33 | 11 | 43 | | 24 | 29 | 17 | 34 J |
| Iron | 7439-89-6 | mg/kg | 18000 | 13000 | 21000 | 11000 | 35000 | | 17000 | 16000 | 22000 | 20000 |
| Lead | 7439-92-1 | mg/kg | 50 | 21 | 100 | 11 | 170 J | | 27 J | 38 J | 15 J | 39 |
| Manganese | 7439-96-5 | mg/kg | 190 | 320 | 360 | 120 | 440 | | 240 | 250 | 390 | 230 J |
| Mercury | 7439-97-6 | mg/kg | 0.095 | 0.07 | 0.14 | 0.026 | 0.2 J | | 0.096 J | 0.078 J | 0.022 J | 0.049 |
| Nickel | 7440-02-0 | mg/kg | 24 | 15 | 30 | 9.8 | 34 | | 21 | 26 | 13 | 27 |
| Silver | 7440-22-4 | mg/kg | 0.15 | 0.078 J | 0.18 | 0.029 J | 0.33 | | 0.081 J | 0.094 J | 0.037 J | 0.16 J |
| Thallium | 7440-28-0 | mg/kg | 0.18 | 0.16 | 0.22 | 0.066 J | 0.25 | | 0.14 | 0.17 | 0.035 J | 0.18 |
| Vanadium | 7440-62-2 | mg/kg | 26 | 21 | 32 | 13 | 32 J | | 18 J | 18 J | 16 J | 29 |
| Zinc | 7440-66-6 | mg/kg | 130 | 57 | 170 | 41 | 570 J | | 95 J | 120 J | 75 J | 130 |
| Pesticides / PCBs | | | | | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 0.01 | 0.0014 | 0.01 | 0.00091 | 0.0034 J | | 0.0024 | 0.004 | 0.00057 J | 0.0053 |
| 4,4'-DDE | 72-55-9 | mg/kg | 0.0074 | 0.0012 | 0.0099 | 0.00066 | 0.0083 | | 0.0021 | 0.0028 | 0.00062 J | 0.0047 |
| 4,4'-DDT | 50-29-3 | mg/kg | 0.0022 J | 0.00012 J | 0.0012 J | 0.00023 J | 0.0011 J | | 0.00089 J | 0.00091 J | 0.00066 J | 0.0014 J |
| Aldrin | 309-00-2 | mg/kg | 0.00021 J | 0.00016 J | 0.0005 J | 0.0001 J | 0.000285 J | | 0.00037 J | 0.00025 J | 0.00016 J | 0.00011 J |
| Aroclor-1248 | 12672-29-6 | mg/kg | 0.01 J | 0.0062 J | 0.032 J | 0.0034 J | 0.021 | | 0.0045 | 0.015 | 0.0081 J | 0.0019 U |
| Aroclor-1254 | 11097-69-1 | mg/kg | 0.00054 U | 0.00067 U | 0.00058 U | 0.00044 U | 0.00064 U | | 0.00056 U | 0.00058 U | 0.00039 UJ | 0.026 |
| Aroclor-1260 | 11096-82-5 | mg/kg | 0.021 J | 0.006 J | 0.035 J | 0.0026 J | 0.0345 | | 0.0021 J | 0.01 | 0.0063 J | 0.018 |
| CHLORDANE (ALL) | CHLORDANE_AL | mg/kg | 0.045 | 0.02 | 0.12 | 0.015 | 0.093 | | 0.057 | 0.046 | 0.024 J | 0.04 |
| Chlordane (Technical) | 12789-03-6 | mg/kg | 0.045 | 0.02 | 0.12 | 0.015 | 0.093 | | 0.057 | 0.046 | 0.024 J | |
| cis-Chlordane | 5103-71-9 | mg/kg | | | | | | | | | | |
| Dieldrin | 60-57-1 | mg/kg | 0.0012 J | 0.00063 J | 0.0014 J | 0.00054 J | 0.0011 J | | 0.0018 J | 0.0011 J | 0.0006 J | 0.001 J |
| Endosulfan Sulfate | 1031-07-8 | mg/kg | 0.0014 | 0.00016 J | 0.0012 | 8.1E-05 J | 0.0011 | | 0.00036 J | 0.00033 J | 0.00016 J | 0.00047 |
| Endrin | 72-20-8 | mg/kg | 0.003 J | 9.1E-05 U | 0.0022 J | 0.00012 J | 0.00185 J | | 0.00049 J | 0.00095 | 0.00024 J | 0.0011 J |
| Endrin ketone | 53494-70-5 | mg/kg | | | | | | | | | | |
| Heptachlor Epoxide | 1024-57-3 | mg/kg | 0.00048 J | 0.0003 J | 0.00093 J | 0.00022 J | 0.00071 J | | 0.00074 J | 0.00036 J | 0.0003 J | 0.00051 J |
| Methoxychlor | 72-43-5 | mg/kg | | | | | | | | | | |
| PCB, Total Congeners | PCB | mg/kg | 0.1253246 | 0.0161269 | 0.159757 | 0.0079856 | 0.1434743 | | 0.03709745 | 0.0560092 | 0.0273913 | 0.07440958 |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.031 | 0.012 | 0.067 | 0.006 | 0.0555 | | 0.0066 | 0.025 | 0.014 | 0.044 |
| trans-Chlordane | 5103-74-2 | mg/kg | | | | | | | | | | |
| **Petroleum Hydrocarbons** | | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | | | | | | | | | | |

| | | Location ID | R7-05 | R7-06 | R7-07 | R7-08 | R7-09 | R7-09 | R7-10 | R7-11 | R7-12 | R7-27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | RI-R7-05-SS | RI-R7-06-SS | RI-R7-07-SS | RI-R7-08-SS | RI-R7-09-SS | RI-R7-120-SS | RI-R7-10-SS | RI-R7-11-SS | RI-R7-12-SS | P2-R7-27-SS |
| | | Sample Date | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 6/9/2016 |
| | | Sample Type | N | N | N | N | N | FD | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Semi Volatile Organic Compounds | | | | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | | | | | | | | | | |
| 4-Methylphenol | 106-44-5 | mg/kg | | | | | | | | | | |
| Acenaphthene | 83-32-9 | mg/kg | 0.033 J | 0.006 J | 0.032 J | 0.0048 U | 0.0445 J | | 0.028 J | 0.025 J | 0.03 J | 0.012 U |
| Acenaphthylene | 208-96-8 | mg/kg | 0.06 J | 0.015 J | 0.083 | 0.0057 U | 0.0835 | | 0.056 J | 0.065 J | 0.037 J | 0.049 J |
| Anthracene | 120-12-7 | mg/kg | 0.12 | 0.022 J | 0.12 | 0.023 J | 0.13 | | 0.12 | 0.12 | 0.082 J | 0.12 J |
| BaP-TE | BAP | mg/kg | 1.29 | 0.242 | 0.799 | 0.254 | 1.19 | | 0.92 | 1.27 | 0.572 | 1.01 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.74 | 0.11 | 0.45 | 0.13 | 0.66 | | 0.51 | 0.64 | 0.34 J | 0.57 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.82 J | 0.13 J | 0.51 | 0.15 | 0.735 | | 0.56 | 0.76 | 0.35 J | 0.75 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 1.2 J | 0.24 J | 0.72 | 0.23 | 1.2 J | | 0.85 | 1.1 | 0.53 J | 1.2 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.88 J | 0.18 J | 0.65 | 0.17 | 0.955 | | 0.77 | 1 | 0.43 J | 0.87 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.38 J | 0.072 J | 0.34 | 0.08 | 0.35 | | 0.31 | 0.49 | 0.22 J | 0.5 |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | mg/kg | 1.1 J | 0.33 J | 1.2 | 0.48 J | 1.8 | | 0.88 | 1.2 | 0.58 J | 0.82 J |
| Butylbenzylphthalate | 85-68-7 | mg/kg | 0.11 J | 0.032 J | 0.045 U | 0.16 J | 0.05 U | | 0.043 U | 0.045 U | 0.03 UJ | 0.087 U |
| Chrysene | 218-01-9 | mg/kg | 1.1 | 0.21 | 0.71 | 0.21 | 1.15 | | 0.81 | 1.1 | 0.52 J | 0.96 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.2 J | 0.06 J | 0.12 | 0.051 | 0.19 | | 0.16 | 0.25 | 0.094 J | 0.014 U |
| Di-n-octylphthalate | 117-84-0 | mg/kg | 0.032 UJ | 0.02 UJ | 0.034 U | 0.026 U | 0.038 U | | 0.033 U | 0.034 U | 0.023 UJ | 0.067 U |
| Fluoranthene | 206-44-0 | mg/kg | 1.8 | 0.27 | 1.2 | 0.29 | 1.65 J | | 1.1 | 1.5 | 0.91 J | 1.6 |
| Fluorene | 86-73-7 | mg/kg | 0.049 J | 0.005 U | 0.055 J | 0.0065 U | 0.081 | | 0.05 J | 0.053 J | 0.043 J | 0.017 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.76 J | 0.16 J | 0.48 | 0.16 | 0.77 | | 0.6 | 0.8 | 0.38 J | 0.78 |
| Naphthalene | 91-20-3 | mg/kg | 0.017 J | 0.0032 U | 0.0056 U | 0.0043 U | 0.0063 U | | 0.0054 U | 0.0056 U | 0.0038 UJ | 0.011 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.57 | 0.095 | 0.42 | 0.11 | 0.66 | | 0.63 | 0.55 | 0.37 J | 0.54 |
| Pyrene | 129-00-0 | mg/kg | 1.2 | 0.2 | 0.77 | 0.25 | 1.25 | | 0.95 | 1.2 | 0.61 J | 1.2 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 9.1 | 1.6 | 6 | 1.7 | 8.91 | | 6.6 | 8.8 | 4.4 | 8.4 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.85 | 0.14 | 0.71 | 0.13 | 0.999 | | 0.88 | 0.81 | 0.56 | 0.71 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 9.9 | 1.8 | 6.7 | 1.9 | 9.91 | | 7.5 | 9.7 | 4.9 | 9.1 |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 0.028 J | 0.018 U | 0.029 U | 0.017 U | 0.069 U | | 0.029 U | 0.058 U | 0.057 UJ | 0.058 U |
| Acenaphthene | 83-32-9 | mg/kg | 0.047 | 0.0078 | 0.023 | 0.011 | 0.028 | | 0.013 | 0.024 | 0.017 J | 0.031 |
| Acenaphthylene | 208-96-8 | mg/kg | 0.016 | 0.0032 J | 0.011 | 0.003 J | 0.013 J | | 0.0056 J | 0.0071 J | 0.012 J | 0.015 J |
| Anthracene | 120-12-7 | mg/kg | 0.13 | 0.017 | 0.078 | 0.029 | 0.07 | | 0.044 | 0.068 | 0.043 J | 0.087 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.86 | 0.12 | 0.44 | 0.19 | 0.48 | | 0.31 | 0.49 | 0.28 J | 1 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 1.2 | 0.18 | 0.67 | 0.25 | 0.69 | | 0.47 | 0.77 | 0.44 J | 1.2 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 1.8 | 0.35 | 0.97 | 0.41 | 1.1 | | 0.81 | 1.2 | 0.69 J | 2 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.98 | 0.19 | 0.59 | 0.22 | 0.6 | | 0.44 | 0.65 | 0.41 J | 1.1 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.83 | 0.13 | 0.55 | 0.16 | 0.42 | | 0.36 | 0.53 | 0.27 J | 0.78 |
| Chrysene | 218-01-9 | mg/kg | 1.5 | 0.25 | 0.91 | 0.31 | 0.96 | | 0.65 | 1 | 0.49 J | 1.5 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.12 J | 0.035 | 0.087 | 0.041 | 0.093 | | 0.07 | 0.092 | 0.066 J | 0.18 |
| Fluoranthene | 206-44-0 | mg/kg | 2.2 | 0.37 | 1.2 | 0.53 | 1.3 | | 0.96 | 1.5 | 0.8 J | 2.1 |
| Fluorene | 86-73-7 | mg/kg | 0.064 | 0.0096 | 0.046 | 0.013 | 0.0445 | | 0.021 | 0.036 | 0.023 J | 0.049 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.87 | 0.15 | 0.48 | 0.18 | 0.46 | | 0.37 | 0.54 | 0.34 J | 0.86 |
| Naphthalene | 91-20-3 | mg/kg | 0.051 U | 0.032 U | 0.053 U | 0.031 U | 0.13 U | | 0.052 U | 0.11 U | 0.1 UJ | 0.11 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.86 | 0.12 | 0.51 | 0.22 | 0.56 | | 0.35 | 0.57 | 0.3 J | 0.82 |
| Pyrene | 129-00-0 | mg/kg | 1.8 | 0.32 | 1.1 | 0.46 | 1.2 | | 0.79 | 1.2 | 0.65 J | 1.7 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 12 | 2.1 | 7 | 2.8 | 7.3 | | 5.2 | 8 | 4.4 | 12 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 1.1 | 0.16 | 0.67 | 0.28 | 0.716 | | 0.43 | 0.71 | 0.4 | 1 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 13 | 2.3 | 7.7 | 3 | 8.02 | | 5.7 | 8.7 | 4.8 | 13 |

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Location ID | R7-05 | R7-06 | R7-07 | R7-08 | R7-09 | R7-09 | R7-10 | R7-11 | R7-12 | R7-27 |
| | | Sample ID | RI-R7-05-SS | RI-R7-06-SS | RI-R7-07-SS | RI-R7-08-SS | RI-R7-09-SS | RI-R7-120-SS | RI-R7-10-SS | RI-R7-11-SS | RI-R7-12-SS | P2-R7-27-SS |
| | | Sample Date | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 8/7/2014 | 6/9/2016 |
| | | Sample Type | N | N | N | N | N | FD | N | N | N | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| **Dioxin/Furans** | | | | | | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | 67562-39-4 | mg/kg | 2.3E-05 J | 7.4E-06 J | | | 3.40E-05 | | 1E-05 J | | 4.3E-06 J | 2.3E-05 J |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | 35822-46-9 | mg/kg | 0.00026 | 0.00017 | | | 0.000225 | | 6.50E-05 | | 1.7E-05 J | 0.00013 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | 55673-89-7 | mg/kg | 2E-06 U | 1.2E-06 U | | | 3.8E-06 J | | 8.6E-07 U | | 6.6E-08 UJ | 1.5E-06 U |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | 70648-26-9 | mg/kg | 4.3E-06 J | 9.5E-07 U | | | 7E-06 J | | 1.1E-06 J | | 1.1E-06 U | 2.6E-06 U |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | 39227-28-6 | mg/kg | 3.8E-06 J | 2.1E-06 J | | | 4.7E-06 J | | 1.2E-06 J | | 4.8E-07 U | 2E-06 U |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | 57117-44-9 | mg/kg | 2.7E-06 J | 1E-06 U | | | 3.6E-06 J | | 1.5E-06 J | | 9.3E-07 J | 2.1E-06 U |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | 57653-85-7 | mg/kg | 1.20E-05 | 5.2E-06 J | | | 9.2E-06 J | | 2.5E-06 J | | 9.2E-07 U | 4.8E-06 U |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | 19408-74-3 | mg/kg | 9.4E-06 J | 6.3E-06 J | | | 9.8E-06 J | | 2.6E-06 J | | 1.1E-06 J | 5.5E-06 U |
| 1,2,3,7,8-PeCDF | 57117-41-6 | mg/kg | 9E-07 J | 1.6E-07 U | | | 1.7E-06 J | | 4.4E-07 U | | 5.3E-07 J | 5.7E-07 U |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | 40321-76-4 | mg/kg | 1.8E-06 J | 1.2E-06 U | | | 2.1E-06 J | | 1.1E-06 U | | 3.2E-07 U | 1.3E-06 U |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | 60851-34-5 | mg/kg | 2.3E-06 J | 1.2E-06 U | | | 2.75E-06 J | | 8.4E-07 J | | 2.7E-07 U | 1.6E-06 U |
| 2,3,4,7,8-Pentachlorodibenzofuran | 57117-31-4 | mg/kg | 1.5E-06 J | 7.9E-07 J | | | 2.55E-06 J | | 8.8E-07 U | | 6E-07 J | 1.3E-06 U |
| 2,3,7,8-Tetrachlorodibenzofuran | 51207-31-9 | mg/kg | 3.30E-06 | 4.5E-07 J | | | 2.45E-06 J | | 2.7E-07 J | | 4.7E-07 J | 1.10E-06 |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1.6E-07 U | 2E-07 U | | | 7.2E-07 J | | 4.9E-07 J | | 7.1E-08 UJ | 4.1E-07 J |
| Octachlorochlorodibenzofuran | 39001-02-0 | mg/kg | 5.40E-05 | 1.7E-05 U | | | 8E-05 J | | 2.70E-05 | | 8.9E-06 U | 5.8E-05 U |
| Octachlorochlorodibenzo-p-dioxin | 3268-87-9 | mg/kg | 0.0047 | 0.0041 | | | 0.00775 | | 0.0024 | | 0.00052 J | 0.0053 J |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 1.03E-05 | 4.78E-06 | | | 1.26E-05 | | 2.97E-06 | | 8.15E-07 | 3.64E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Feet.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
PAH - Polycyclic aromatic hydrocarbons.
U - Not detected.

| | | Location ID | R7-28 | R7-32 | R7-34 | R7-35 | R7-38 | SEDBACK17 | SEDBACK18 | SEDBACK19 | SEDBACK19 | SEDBACK20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | P2-R7-28-SS | P2-R7-32-SS | P2-R7-34-SS | R7-35-SC-0.00-0 | P2-R7-38-SS | SEDBACK1700N | SEDBACK1800N | SEDBACK1900N | SEDBACK1900R | SEDBACK2000N |
| | | Sample Date | 6/24/2016 | 6/9/2016 | 6/24/2016 | 7/22/2016 | 6/24/2016 | 6/12/2017 | 6/12/2017 | 6/13/2017 | 6/13/2017 | 6/13/2017 |
| | | Sample Type | N | N | N | N | N | N | N | N | FD | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Inorganics | | | | | | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 6400 | 2900 | 4400 | 5500 | | 9300 | 5800 | 5000 | 3300 | 6300 |
| Antimony | 7440-36-0 | mg/kg | 0.68 | 0.16 U | 0.28 | 0.25 J | | 1.1 J | 0.5 J | 0.55 | 0.4 | 0.55 |
| Arsenic | 7440-38-2 | mg/kg | 3.9 | 1.1 J | 1.6 | 1.8 | | 3.9 | 2.5 | 4.2 | 2.9 | 3.3 |
| Barium | 7440-39-3 | mg/kg | 61 | 25 | 37 | 46 | | 92 | 54 | 49 | 33 | 61 |
| Cadmium | 7440-43-9 | mg/kg | 0.45 | 0.1 | 0.16 | 0.35 J | | 0.48 | 0.27 | 0.53 | 0.28 | 0.4 |
| Chromium | 7440-47-3 | mg/kg | 30 | 15 J | 19 | 25 J | | 41 J | 25 J | 25 | 16 | 28 |
| Cobalt | 7440-48-4 | mg/kg | 14 | 5.9 | 9.6 | 11 | | 21 | 15 | 14 | 8.4 | 13 |
| Copper | 7440-50-8 | mg/kg | 35 | 13 | 17 | 22 | | 49 | 27 | 31 | 22 | 34 |
| Iron | 7439-89-6 | mg/kg | 21000 | 8200 | 12000 | 16000 J | | 22000 | 16000 | 22000 | 15000 | 18000 |
| Lead | 7439-92-1 | mg/kg | 46 | 10 | 16 | 35 | | 39 | 22 | 27 | 19 | 29 |
| Manganese | 7439-96-5 | mg/kg | 250 | 110 J | 180 | 190 J | | 380 | 210 | 230 | 140 | 250 |
| Mercury | 7439-97-6 | mg/kg | 0.092 | 0.046 | 0.052 | 0.05 | | 0.13 J+ | 0.054 J+ | 0.067 | 0.041 | 0.092 |
| Nickel | 7440-02-0 | mg/kg | 27 | 10 | 17 | 21 | | 38 | 27 | 24 | 15 | 23 |
| Silver | 7440-22-4 | mg/kg | 0.17 | 0.028 J | 0.054 J | 0.093 | | 0.18 | 0.075 J | 0.088 J | 0.056 J | 0.11 |
| Thallium | 7440-28-0 | mg/kg | 0.16 | 0.078 U | 0.12 | 0.13 | | 0.24 | 0.16 | 0.11 | 0.066 J | 0.13 |
| Vanadium | 7440-62-2 | mg/kg | 29 | 11 | 17 | 22 | | 34 | 22 | 28 | 19 | 26 |
| Zinc | 7440-66-6 | mg/kg | 140 | 43 J | 69 | 110 | | 200 J | 120 J | 160 | 110 | 140 |
| Pesticides / PCBs | | | | | | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 0.013 | 0.0014 J | 0.00095 J | 0.0024 J | | 0.0023 J | 0.0011 J | 0.0005 J | 0.0004 J | 0.0012 J |
| 4,4'-DDE | 72-55-9 | mg/kg | 0.011 | 0.0016 | 0.0014 | 0.004 | | 0.0042 | 0.0019 | 0.00087 J | 0.0006 J | 0.0025 |
| 4,4'-DDT | 50-29-3 | mg/kg | 0.0024 J | 0.0012 J | 0.00061 U | 7E-05 U | | 0.0013 J | 0.00085 U | 0.00079 U | 0.00056 U | 0.0014 J |
| Aldrin | 309-00-2 | mg/kg | 0.00063 | 7.1E-05 U | 3.6E-05 U | 7.2E-05 U | | 0.0012 U | 0.00085 U | 0.00079 U | 0.00056 U | 0.00087 U |
| Aroclor-1248 | 12672-29-6 | mg/kg | 0.035 | 0.016 | 0.015 | 0.0065 | | 0.006 U | 0.0042 U | 0.036 J | 0.013 J | 0.0043 UJ |
| Aroclor-1254 | 11097-69-1 | mg/kg | 0.035 | 0.003 U | 0.0064 J | 0.013 | | 0.023 J+ | 0.012 J+ | 0.026 J | 0.013 J | 0.025 J+ |
| Aroclor-1260 | 11096-82-5 | mg/kg | 0.034 | 0.0076 J | 0.0075 | 0.0038 | | 0.022 J+ | 0.0099 J+ | 0.015 J+ | 0.0058 J+ | 0.018 J+ |
| CHLORDANE (ALL) | CHLORDANE_ALL | mg/kg | 0.064 J | 0.028 | 0.021 | 0.06 | | | | | | |
| Chlordane (Technical) | 12789-03-6 | mg/kg | | | | 0.06 | | | | | | |
| cis-Chlordane | 5103-71-9 | mg/kg | | | | | | 0.0095 J | 0.0034 J | 0.0026 J | 0.0033 | 0.0043 J |
| Dieldrin | 60-57-1 | mg/kg | 0.0011 U | 0.0013 J | 0.00078 U | 0.00046 J | | 0.0034 J | 0.0013 J | 0.0012 J+ | 0.001 J+ | 0.0016 J |
| Endosulfan Sulfate | 1031-07-8 | mg/kg | 6.9E-05 U | 4.1E-05 U | 4.4E-05 U | 8.7E-05 U | | R | 0.00085 U | 0.00079 U | 0.00056 U | 0.00087 U |
| Endrin | 72-20-8 | mg/kg | 0.0011 J | 0.00012 J | 0.00052 | 0.0002 U | | 0.0012 U | 0.00085 U | 0.00079 U | 0.00054 J | 0.00087 U |
| Endrin ketone | 53494-70-5 | mg/kg | | | | | | 0.0012 U | 0.00085 U | 0.00079 U | 0.00056 U | 0.00087 U |
| Heptachlor Epoxide | 1024-57-3 | mg/kg | 0.00025 J | 0.001 | 0.00044 J | 0.00019 J | | 0.00094 J | 0.00041 J | 0.00041 J | 0.00043 J | 0.00051 J |
| Methoxychlor | 72-43-5 | mg/kg | | | | | | 0.0012 U | 0.00085 U | 0.00079 U | 0.00056 U | 0.00087 U |
| PCB, Total Congeners | PCB | mg/kg | 0.1832049 | 0.0326204 | 0.02118302 | | 0.0744337 | 0.38 | 0.037 | 0.14 | 0.079 | 0.06 |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.1 | 0.024 | 0.029 | 0.023 | | 0.045 | 0.022 | 0.077 | 0.032 | 0.043 |
| trans-Chlordane | 5103-74-2 | mg/kg | | | | | | 0.013 J- | 0.0046 | 0.0038 | 0.0031 | 0.0057 J |
| **Petroleum Hydrocarbons** | | | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | | | | | | 40 J | 35 | 44 | 25 | 33 J |

| | | Location ID | R7-28 | R7-32 | R7-34 | R7-35 | R7-38 | SEDBACK17 | SEDBACK18 | SEDBACK19 | SEDBACK19 | SEDBACK20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | P2-R7-28-SS | P2-R7-32-SS | P2-R7-34-SS | R7-35-SC-0.00-0 | P2-R7-38-SS | SEDBACK1700N | SEDBACK1800N | SEDBACK1900N | SEDBACK1900R | SEDBACK2000N |
| | | Sample Date | 6/24/2016 | 6/9/2016 | 6/24/2016 | 7/22/2016 | 6/24/2016 | 6/12/2017 | 6/12/2017 | 6/13/2017 | 6/13/2017 | 6/13/2017 |
| | | Sample Type | N | N | N | N | N | N | N | N | FD | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| Semi Volatile Organic Compounds | | | | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | | | | | | 0.24 U | 0.17 U | 0.063 U | 0.046 U | 0.1 U |
| 4-Methylphenol | 106-44-5 | mg/kg | | | | | | 1.2 U | 0.84 U | 0.31 U | 0.22 U | 0.51 U |
| Acenaphthene | 83-32-9 | mg/kg | 0.021 U | 0.018 U | 0.013 J | 0.068 J | | 0.24 U | 0.17 U | 0.063 U | 0.046 U | 0.1 U |
| Acenaphthylene | 208-96-8 | mg/kg | 0.044 J | 0.25 | 0.023 J | 0.05 J | | 0.24 U | 0.17 U | 0.063 U | 0.046 U | 0.1 U |
| Anthracene | 120-12-7 | mg/kg | 0.068 J | 0.29 | 0.1 J | 0.14 J+ | | 0.24 U | 0.072 J | 0.063 U | 0.046 U | 0.1 U |
| BaP-TE | BAP | mg/kg | 0.645 | 1.24 | 0.822 | 1.08 | | 0.863 | 0.698 | 0.162 | 0.15 | 0.399 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.3 | 0.94 | 0.45 | 0.66 | | 0.45 | 0.42 | 0.1 | 0.07 | 0.2 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.39 | 0.95 | 0.5 | 0.68 | | 0.55 | 0.46 | 0.12 | 0.093 | 0.26 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.54 J | 1.1 | 0.66 J | 1.1 | | 0.96 J- | 0.65 | 0.19 | 0.15 | 0.4 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.56 | 1 | 0.59 | 0.74 | | 0.63 | 0.44 | 0.15 | 0.11 | 0.29 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.19 J | 0.52 | 0.25 | 0.38 | | 0.28 | 0.23 | 0.083 | 0.052 | 0.18 |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | mg/kg | 0.57 J | 0.45 J | 0.34 J | 1.4 | | 1.2 J | 1.7 U | 0.35 J | 0.22 J | 1.2 |
| Butylbenzylphthalate | 85-68-7 | mg/kg | 0.15 U | 0.13 U | 0.13 J | 0.075 U | | R | 0.84 U | 0.31 U | 0.22 U | 0.51 U |
| Chrysene | 218-01-9 | mg/kg | 0.56 | 1.2 | 0.71 | 0.92 | | 0.85 | 0.61 | 0.18 | 0.13 | 0.4 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.13 J | 0.021 U | 0.16 | 0.16 | | 0.12 J | 0.093 J | 0.063 U | 0.026 J | 0.054 J |
| Di-n-octylphthalate | 117-84-0 | mg/kg | 0.12 UJ | 0.1 UJ | 0.074 UJ | 0.058 U | | 1.2 U | 0.84 U | 0.31 U | 0.22 U | 0.51 U |
| Fluoranthene | 206-44-0 | mg/kg | 0.81 | 2.7 | 1.1 | 1.7 J+ | | 1.3 | 1.1 | 0.28 | 0.21 | 0.58 |
| Fluorene | 86-73-7 | mg/kg | 0.029 U | 0.12 J | 0.018 U | 0.083 J | | 0.24 U | 0.17 U | 0.063 U | 0.046 U | 0.1 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.39 | 0.82 | 0.48 | 0.63 | | 0.48 | 0.35 | 0.12 | 0.088 | 0.23 |
| Naphthalene | 91-20-3 | mg/kg | 0.019 U | 0.031 J | 0.012 U | 0.0094 U | | 0.24 U | 0.17 U | 0.063 U | 0.046 U | 0.1 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.26 | 1.4 | 0.4 | 0.8 J+ | | 0.42 | 0.43 | 0.089 | 0.064 | 0.17 |
| Pyrene | 129-00-0 | mg/kg | 0.46 J | 1.7 | 0.68 J | 1.4 | | 0.95 | 0.79 | 0.21 | 0.15 | 0.46 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 4.3 | 11 | 5.6 | 8.4 | | 6.6 | 5.1 | 1.4 | 1.1 | 3.1 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.37 | 2.1 | 0.54 | 1.1 | | 0.42 | 0.5 | 0.089 | 0.064 | 0.17 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 4.7 | 13 | 6.1 | 9.5 | | 7 | 5.6 | 1.5 | 1.1 | 3.2 |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | | 0.033 J | 0.029 U | | | 0.14 U | 0.051 U | 0.05 U | 0.006 J | 0.052 U |
| Acenaphthene | 83-32-9 | mg/kg | | 0.12 | 0.041 | | | 0.028 | 0.011 | 0.019 J | 0.0033 J | 0.011 |
| Acenaphthylene | 208-96-8 | mg/kg | | 0.012 | 0.012 | | | 0.013 J | 0.008 | 0.0058 | 0.0022 | 0.0074 |
| Anthracene | 120-12-7 | mg/kg | | 0.26 | 0.22 | | | 0.09 J- | 0.029 | 0.05 J | 0.009 J | 0.028 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | | 0.96 | 0.96 | | | 1 | 0.32 | 0.29 J | 0.092 J | 0.27 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | | 0.89 | 0.86 | | | 1 | 0.38 | 0.31 J | 0.11 J | 0.32 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | | 1.1 | 1.1 | | | 1.8 | 0.68 | 0.57 J | 0.18 J | 0.56 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | | 0.7 | 0.68 | | | 1 | 0.45 | 0.34 J | 0.12 J | 0.33 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | | 0.64 | 0.59 | | | 0.83 | 0.3 | 0.27 J | 0.087 J | 0.25 |
| Chrysene | 218-01-9 | mg/kg | | 1.1 | 1.3 | | | 1.5 | 0.58 | 0.47 J | 0.17 J | 0.52 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | | 0.14 | 0.13 | | | 0.17 | 0.07 | 0.059 J | 0.025 J | 0.061 |
| Fluoranthene | 206-44-0 | mg/kg | | 1.8 | 1.8 | | | 2 | 0.79 | 0.68 J | 0.21 J | 0.63 |
| Fluorene | 86-73-7 | mg/kg | | 0.14 | 0.062 | | | 0.047 | 0.02 | 0.021 J | 0.0053 J | 0.015 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | | 0.55 | 0.55 | | | 0.79 | 0.31 | 0.26 J | 0.093 J | 0.26 |
| Naphthalene | 91-20-3 | mg/kg | | 0.091 J | 0.053 U | | | 0.29 U | 0.1 U | 0.099 U | 0.04 U | 0.1 U |
| Phenanthrene | 85-01-8 | mg/kg | | 1.2 | 0.89 | | | 0.76 | 0.3 | 0.31 J | 0.077 J | 0.23 |
| Pyrene | 129-00-0 | mg/kg | | 1.5 | 1.4 | | | 1.7 | 0.67 | 0.54 J | 0.19 J | 0.53 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | | 9.4 | 9.4 | | | 12 | 4.6 | 3.8 | 1.3 | 3.7 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | | 1.8 | 1.2 | | | 0.94 | 0.37 | 0.41 | 0.097 | 0.29 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | | 11 | 11 | | | 13 | 4.9 | 4.2 | 1.4 | 4 |

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | Location ID | R7-28 | R7-32 | R7-34 | R7-35 | R7-38 | SEDBACK17 | SEDBACK18 | SEDBACK19 | SEDBACK19 | SEDBACK20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample ID | P2-R7-28-SS | P2-R7-32-SS | P2-R7-34-SS | R7-35-SC-0.00-0 | P2-R7-38-SS | SEDBACK1700N | SEDBACK1800N | SEDBACK1900N | SEDBACK1900R | SEDBACK2000N |
| | | Sample Date | 6/24/2016 | 6/9/2016 | 6/24/2016 | 7/22/2016 | 6/24/2016 | 6/12/2017 | 6/12/2017 | 6/13/2017 | 6/13/2017 | 6/13/2017 |
| | | Sample Type | N | N | N | N | N | N | N | N | FD | N |
| | | Depth Interval | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft | 0 - 0.33 ft |
| Chemical | CAS | Units | | | | | | | | | | |
| **Dioxin/Furans** | | | | | | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | 67562-39-4 | mg/kg | 3.5E-05 J | 4.7E-06 U | 1.1E-05 J | | 2.6E-05 J | 2.34E-05 | 1.04E-05 | 5.75E-06 | 4.52E-06 | 7.90E-06 |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | 35822-46-9 | mg/kg | 0.00024 | 3.30E-05 | 7.10E-05 | | 0.00019 | 0.000148 J | 7.79E-05 | 4.38E-05 | 3.78E-05 | 6.10E-05 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | 55673-89-7 | mg/kg | 2.6E-06 J | 4.5E-07 U | 8.3E-07 J | | 2.1E-06 J | 5.16E-07 U | 2.64E-07 U | 3.04E-07 U | 4.19E-07 U | 3.59E-07 U |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | 70648-26-9 | mg/kg | 4.5E-06 J | 6.7E-07 U | 1.2E-06 U | | 2.8E-06 J | 1.62E-06 J | 7.45E-07 J | 5.73E-07 J | 9.75E-07 J | 6.77E-07 J |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | 39227-28-6 | mg/kg | 3.9E-06 J | 5.1E-07 U | 1.1E-06 J | | 3.3E-06 J | 2.32E-06 J | 1.05E-06 J | 6.24E-07 J | 4.44E-07 J | 9.07E-07 J |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | 57117-44-9 | mg/kg | 2.8E-06 J | 5.2E-07 U | 8.2E-07 J | | 2.1E-06 J | 1.65E-06 J | 7.46E-07 J | 1.15E-07 U | 5.06E-07 J | 5.93E-07 J |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | 57653-85-7 | mg/kg | 8.40E-06 | 1.1E-06 U | 2.4E-06 J | | 6.40E-06 | 4.81E-06 | 2.33E-06 | 1.12E-06 J | 1.38E-06 J | 1.76E-06 J |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | 19408-74-3 | mg/kg | 1.1E-05 J | 1.6E-06 U | 3.4E-06 J | | 8.8E-06 J | 4.94E-06 | 2.05E-06 | 1.26E-06 J | 1.2E-06 J | 1.96E-06 |
| 1,2,3,7,8-PeCDF | 57117-41-6 | mg/kg | 1.2E-06 J | 1.5E-07 U | 2.4E-07 J | | 7.5E-07 J | 3.31E-07 U | 1.88E-07 U | 1.58E-07 U | 1.62E-07 U | 2.32E-07 U |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | 40321-76-4 | mg/kg | 2.2E-06 J | 3.1E-07 U | 7.7E-07 U | | 1.6E-06 J | 1.17E-06 J | 6.09E-07 J | 3.4E-07 J | 4.59E-07 J | 2.61E-07 U |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | 60851-34-5 | mg/kg | 2.8E-06 J | 3.4E-07 U | 7.4E-07 J | | 1.4E-06 J | 2.25E-06 J | 9.46E-07 J | 6.02E-07 J | 7.33E-07 J | 7.1E-07 J |
| 2,3,4,7,8-Pentachlorodibenzofuran | 57117-31-4 | mg/kg | 2.4E-06 J | 2.8E-07 U | 5.7E-07 U | | 1.2E-06 J | 1.82E-06 J | 9.91E-07 J | 9.11E-07 J | 1.33E-06 J | 9.76E-07 J |
| 2,3,7,8-Tetrachlorodibenzofuran | 51207-31-9 | mg/kg | 1.60E-06 | 2.1E-07 J | 4.7E-07 J | | 1E-06 J | 9.64E-07 | 4.37E-07 | 1.49E-07 U | 4.11E-07 | 1.74E-07 U |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 6.2E-07 J | 4.1E-08 J | 1.4E-07 J | | 3.9E-07 J | 3.38E-07 U | 1.64E-07 U | 1.61E-07 U | 1.51E-07 U | 2.26E-07 U |
| Octachlorochlorodibenzofuran | 39001-02-0 | mg/kg | 8.50E-05 | 1.4E-05 U | 2.70E-05 | | 7.10E-05 | 5.64E-05 J | 2.98E-05 | 1.45E-05 | 1.10E-05 | 2.05E-05 |
| Octachlorochlorodibenzo-p-dioxin | 3268-87-9 | mg/kg | 0.008 J | 0.0014 | 0.0028 | | 0.0076 J | 0.00558 | 0.00249 | 0.00144 | 0.00116 | 0.00202 |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 1.23E-05 | 8.12E-07 | 2.72E-06 | | 9.43E-06 | 6.98E-06 | 3.38E-06 | 1.96E-06 | 2.20E-06 | 2.25E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Feet.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
PAH - Polycyclic aromatic hydrocarbons.
U - Not detected.

| | | Location ID | SEDBACK20 | SEDBACK4 | SEDBACK5 | SEDBACK5 | SEDBACK6 |
|---|---|---|---|---|---|---|---|
| | | Sample ID | SEDBACK2000R | SEDBACK400N | SEDBACK500N | SEDBACK500R | SEDBACK600N |
| | | Sample Date | 6/13/2017 | 11/14/2013 | 11/14/2013 | 11/14/2013 | 11/15/2013 |
| | | Sample Type | FD | N | N | FD | N |
| | | Depth Interval | 0 - 0.33 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | |
| Inorganics | | | | | | | |
| Aluminum | 7429-90-5 | mg/kg | 4300 | 3800 | 3300 | 3000 | 11000 |
| Antimony | 7440-36-0 | mg/kg | 0.37 | 0.19 J- | 0.19 J- | 0.17 J- | 0.67 J- |
| Arsenic | 7440-38-2 | mg/kg | 2.4 | 1.6 J- | 2.1 J- | 2.2 J- | 3.6 J- |
| Barium | 7440-39-3 | mg/kg | 41 | 37 | 37 | 32 | 100 |
| Cadmium | 7440-43-9 | mg/kg | 0.27 | 0.33 | 0.44 | 0.42 | 1.1 |
| Chromium | 7440-47-3 | mg/kg | 19 | 17 | 15 | 14 | 47 J |
| Cobalt | 7440-48-4 | mg/kg | 8.8 | 7.8 | 7.8 | 7.2 | 22 |
| Copper | 7440-50-8 | mg/kg | 23 | 18 | 22 | 20 | 66 J |
| Iron | 7439-89-6 | mg/kg | 13000 | 10000 | 13000 | 11000 | 31000 J |
| Lead | 7439-92-1 | mg/kg | 20 | 24 | 21 | 21 | 75 |
| Manganese | 7439-96-5 | mg/kg | 170 | 180 | 200 | 180 | 370 |
| Mercury | 7439-97-6 | mg/kg | 0.043 | 0.059 J+ | 0.056 J+ | 0.064 J+ | 0.18 J+ |
| Nickel | 7440-02-0 | mg/kg | 16 | 14 | 14 | 12 | 40 J |
| Silver | 7440-22-4 | mg/kg | 0.094 | 0.071 J | 0.1 | 0.083 J | 0.42 |
| Thallium | 7440-28-0 | mg/kg | 0.09 | 0.095 J- | 0.077 J- | 0.069 J- | 0.28 |
| Vanadium | 7440-62-2 | mg/kg | 18 | 14 | 16 | 16 | 36 J |
| Zinc | 7440-66-6 | mg/kg | 100 | 82 | 100 | 99 | 280 J |
| Pesticides / PCBs | | | | | | | |
| 4,4'-DDD | 72-54-8 | mg/kg | 0.00054 J | 0.0041 | 0.0015 | 0.0013 J | 0.0044 J |
| 4,4'-DDE | 72-55-9 | mg/kg | 0.0013 | 0.0028 | 0.0013 | 0.0011 J | 0.0094 |
| 4,4'-DDT | 50-29-3 | mg/kg | 0.00063 U | 0.005 | 0.002 J | 0.0032 | 0.0056 J |
| Aldrin | 309-00-2 | mg/kg | 0.00063 U | 0.00061 J | 0.00035 J | 0.0011 J | 0.0018 |
| Aroclor-1248 | 12672-29-6 | mg/kg | 0.022 J | 0.028 J | 0.05 J | 0.052 J | 0.1 J |
| Aroclor-1254 | 11097-69-1 | mg/kg | 0.017 J+ | 0.0085 U | 0.0071 U | 0.0071 U | 0.011 U |
| Aroclor-1260 | 11096-82-5 | mg/kg | 0.013 J+ | 0.018 J | 0.028 J | 0.019 J | 0.043 J |
| CHLORDANE (ALL) | CHLORDANE_ALL | mg/kg | | | | | |
| Chlordane (Technical) | 12789-03-6 | mg/kg | | | | | |
| cis-Chlordane | 5103-71-9 | mg/kg | 0.0023 J | 0.0083 | 0.0037 | 0.0054 | 0.012 J |
| Dieldrin | 60-57-1 | mg/kg | 0.00081 J | 0.0014 J | 0.0013 | 0.0019 | 0.0022 J |
| Endosulfan Sulfate | 1031-07-8 | mg/kg | 0.00063 U | 0.00085 U | 0.00027 J | 0.00044 J | 0.0014 J |
| Endrin | 72-20-8 | mg/kg | 0.00029 J | 0.001 J | 0.001 | 0.0015 | 0.0035 J |
| Endrin ketone | 53494-70-5 | mg/kg | 0.00063 U | 0.00098 J | 0.00071 J | 0.0013 J | 0.0059 J |
| Heptachlor Epoxide | 1024-57-3 | mg/kg | 0.00024 J | 0.00049 J | 0.00055 J | 0.00094 J | 0.0011 J |
| Methoxychlor | 72-43-5 | mg/kg | 0.00063 U | 0.0092 | 0.0035 J | 0.005 J | 0.018 |
| PCB, Total Congeners | PCB | mg/kg | 0.024 | | 0.127 | | 0.219 |
| PCB, Total Aroclors (AECOM Calc) | TOT-PCB-ARO-C | mg/kg | 0.052 | 0.046 | 0.078 | 0.071 | 0.14 |
| trans-Chlordane | 5103-74-2 | mg/kg | 0.0031 J | 0.0083 | 0.0037 | 0.0055 | 0.018 |
| **Petroleum Hydrocarbons** | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | mg/kg | 17 J | | | | |

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | Location ID | SEDBACK20 | SEDBACK4 | SEDBACK5 | SEDBACK5 | SEDBACK6 |
|---|---|---|---|---|---|---|---|
| | | Sample ID | SEDBACK2000R | SEDBACK400N | SEDBACK500N | SEDBACK500R | SEDBACK600N |
| | | Sample Date | 6/13/2017 | 11/14/2013 | 11/14/2013 | 11/14/2013 | 11/15/2013 |
| | | Sample Type | FD | N | N | FD | N |
| | | Depth Interval | 0 - 0.33 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | |
| Semi Volatile Organic Compounds | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 0.076 U | 0.18 | 0.057 U | 0.0075 J | 0.012 J |
| 4-Methylphenol | 106-44-5 | mg/kg | 0.37 U | 0.034 J | 0.28 U | 0.043 J | 0.42 U |
| Acenaphthene | 83-32-9 | mg/kg | 0.076 U | 0.32 | 0.017 J | 0.016 J | 0.018 J |
| Acenaphthylene | 208-96-8 | mg/kg | 0.076 U | 0.027 J | 0.02 J | 0.015 J | 0.064 J |
| Anthracene | 120-12-7 | mg/kg | 0.076 U | 0.93 | 0.053 J | 0.037 J | 0.1 |
| BaP-TE | BAP | mg/kg | 0.303 | 3.72 | 0.562 | 0.507 | 0.993 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.17 | 2.7 | 0.32 | 0.27 | 0.57 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.19 | 2.6 | 0.37 | 0.32 | 0.73 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.33 | 2.8 | 0.6 | 0.55 | 1.2 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.23 | 1.8 | 0.33 | 0.31 | 0.88 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.1 | 1.4 | 0.23 | 0.21 | 0.44 |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | mg/kg | 0.37 J | 0.8 | 1 | 1.2 | 2.8 J |
| Butylbenzylphthalate | 85-68-7 | mg/kg | 0.37 U | 0.34 U | 0.42 | 0.28 U | 0.42 UJ |
| Chrysene | 218-01-9 | mg/kg | 0.29 | 3.3 | 0.58 | 0.52 | 1.1 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.044 J | 0.4 | 0.067 | 0.075 | 0.085 U |
| Di-n-octylphthalate | 117-84-0 | mg/kg | 0.3 J | 0.34 U | 0.28 U | 0.28 U | 0.42 UJ |
| Fluoranthene | 206-44-0 | mg/kg | 0.43 | 6.2 | 0.82 | 0.71 | 1.1 |
| Fluorene | 86-73-7 | mg/kg | 0.076 U | 0.28 | 0.024 J | 0.024 J | 0.085 U |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.18 | 1.5 | 0.3 | 0.27 | 0.8 |
| Naphthalene | 91-20-3 | mg/kg | 0.076 U | 0.076 | 0.057 U | 0.057 U | 0.085 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.14 | 5.6 | 0.29 | 0.25 | 0.41 |
| Pyrene | 129-00-0 | mg/kg | 0.34 | 5.2 | 0.66 | 0.59 | 1.2 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 2.3 | 28 | 4.3 | 3.8 | 8 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.14 | 7.2 | 0.4 | 0.34 | 0.59 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 2.4 | 35 | 4.7 | 4.2 | 8.6 |
| 2-Methylnaphthalene | 91-57-6 | mg/kg | 0.03 U | 0.0995 U | | | 0.0347 J |
| Acenaphthene | 83-32-9 | mg/kg | 0.0064 | 0.0456 | | | 0.0277 |
| Acenaphthylene | 208-96-8 | mg/kg | 0.0047 | 0.0111 | | | 0.0246 |
| Anthracene | 120-12-7 | mg/kg | 0.019 | 0.132 | | | 0.0862 |
| Benzo(a)anthracene | 56-55-3 | mg/kg | 0.23 | 0.505 | | | 0.604 |
| Benzo(a)pyrene | 50-32-8 | mg/kg | 0.24 | 0.817 | | | 1.04 |
| Benzo(b)fluoranthene | 205-99-2 | mg/kg | 0.43 | 1.03 | | | 1.71 |
| Benzo(g,h,i)perylene | 191-24-2 | mg/kg | 0.24 | 0.631 | | | 0.953 |
| Benzo(k)fluoranthene | 207-08-9 | mg/kg | 0.15 | 0.545 | | | 0.648 |
| Chrysene | 218-01-9 | mg/kg | 0.35 | 1.05 | | | 1.45 |
| Dibenzo(a,h)anthracene | 53-70-3 | mg/kg | 0.041 | 0.099 J | | | 0.122 J |
| Fluoranthene | 206-44-0 | mg/kg | 0.46 | 1.52 | | | 1.57 |
| Fluorene | 86-73-7 | mg/kg | 0.011 | 0.071 | | | 0.0428 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | mg/kg | 0.18 | 0.483 | | | 0.727 |
| Naphthalene | 91-20-3 | mg/kg | 0.06 U | 0.199 U | | | 0.2 U |
| Phenanthrene | 85-01-8 | mg/kg | 0.16 | 0.768 | | | 0.551 |
| Pyrene | 129-00-0 | mg/kg | 0.4 | 1.03 | | | 1.35 |
| Total High-molecular-weight PAHs | TOT-PAH-HMW | mg/kg | 2.7 | 7.71 | | | 10.2 |
| Total Low-molecular-weight PAHs | TOT-PAH-LMW | mg/kg | 0.2 | 1.03 | | | 0.732 |
| Total PAHs (sum 16) | TOT-PAH | mg/kg | 2.9 | 8.74 | | | 10.9 |

Attachment 1 Table 2
Analytical Data - Surface Sediment
Benning Road Facility RI/FS Project
3400 Benning Rd, N.E., Washington DC 20019

| | | Location ID | SEDBACK20 | SEDBACK4 | SEDBACK5 | SEDBACK5 | SEDBACK6 |
|---|---|---|---|---|---|---|---|
| | | Sample ID | SEDBACK2000R | SEDBACK400N | SEDBACK500N | SEDBACK500R | SEDBACK600N |
| | | Sample Date | 6/13/2017 | 11/14/2013 | 11/14/2013 | 11/14/2013 | 11/15/2013 |
| | | Sample Type | FD | N | N | FD | N |
| | | Depth Interval | 0 - 0.33 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft | 0 - 0.5 ft |
| Chemical | CAS | Units | | | | | |
| **Dioxin/Furans** | | | | | | | |
| 1,2,3,4,6,7,8-Heptachlorodibenzofuran | 67562-39-4 | mg/kg | 9.98E-06 | 6.56E-06 J | 1.86E-06 J | 4.90E-06 | 3.31E-06 J |
| 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin | 35822-46-9 | mg/kg | 6.84E-05 | 2.60E-05 | 1.3E-05 J | 3.11E-05 J | 1.93E-05 |
| 1,2,3,4,7,8,9-Heptachlorodibenzofuran | 55673-89-7 | mg/kg | 3.45E-07 U | 4.1E-07 J | 3.7E-07 J | 5.72E-07 J | 5.13E-07 J |
| 1,2,3,4,7,8-Hexachlorodibenzofuran | 70648-26-9 | mg/kg | 7.38E-07 J | 8.71E-07 J | 3.33E-07 J | 6.65E-07 J | 4.03E-07 J |
| 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin | 39227-28-6 | mg/kg | 7.78E-07 J | 4.91E-07 J | 2.85E-07 J | 3.75E-07 J | 4.23E-07 J |
| 1,2,3,6,7,8-Hexachlorodibenzofuran | 57117-44-9 | mg/kg | 6.31E-07 J | 1.41E-06 J | 8.63E-07 J | 9E-07 J | 9.09E-07 J |
| 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin | 57653-85-7 | mg/kg | 1.89E-06 | 1.24E-06 J | 6.66E-07 J | 1.3E-06 J | 9.89E-07 J |
| 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | 19408-74-3 | mg/kg | 1.81E-06 J | 1.43E-06 J | 6.62E-07 J | 1.19E-06 J | 8.54E-07 J |
| 1,2,3,7,8-PeCDF | 57117-41-6 | mg/kg | 2.57E-07 U | 4.34E-08 U | 1.37E-07 J | 2.42E-07 J | 2.48E-07 J |
| 1,2,3,7,8-Pentachlorodibenzo-p-dioxin | 40321-76-4 | mg/kg | 2.1E-07 U | 4.25E-07 J | 2.19E-07 J | 2.08E-07 J | 3.46E-07 J |
| 2,3,4,6,7,8-Hexachlorodibenzofuran | 60851-34-5 | mg/kg | 1.07E-06 J | 4.59E-07 J | 2.75E-07 J | 3.97E-07 J | 3.92E-07 J |
| 2,3,4,7,8-Pentachlorodibenzofuran | 57117-31-4 | mg/kg | 1.21E-06 J | 4.25E-07 J | 2.79E-07 J | 4.83E-07 J | 4.3E-07 J |
| 2,3,7,8-Tetrachlorodibenzofuran | 51207-31-9 | mg/kg | 5.43E-07 | 5.75E-07 J | 1.78E-07 J | 5.06E-07 J | 1.57E-07 J |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin | 1746-01-6 | mg/kg | 1.82E-07 U | 2.23E-08 U | 1.24E-08 U | 5.66E-08 J | 9.37E-08 J |
| Octachlorochlorodibenzofuran | 39001-02-0 | mg/kg | 2.64E-05 | 1.02E-05 | 4.67E-06 J | 9.34E-06 J | 5.56E-06 J |
| Octachlorochlorodibenzo-p-dioxin | 3268-87-9 | mg/kg | 0.00255 | 0.000692 | 0.000359 J | 0.000999 J | 0.000537 |
| TCDD TEQ HH | DFTEQ-HH | mg/kg | 2.67E-06 | 1.76E-06 | 9.00E-07 | 1.63E-06 | 1.39E-06 |

Notes:
CAS - Chemical Abstracts Service.
ft - Feet.
FD - Field duplicate.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
mg/kg - Milligram per kilogram.
N (Sample type) - Normal sample.
PCBs - Polychlorinated biphenyls.
PAH - Polycyclic aromatic hydrocarbons.
U - Not detected.

**Table 3**
**Analtyical Data -Ground Water**
**Benning Road Facility RI / FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Group** | UPPER-BKG | UPPER-BKG | UPPER-BKG | UPPER-BKG | UPPER-BKG | UPPER-BKG | UPPER-BKG | UPPER-BKG |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Location ID** | DPBACK10 | DPBACK14 | DPBACK16 | SOBACK04/ DPBACK04 | SOBACK05/ DPBACK15 | SOBACK08/ DPBACK12 | SOBACK10/DPBACK01 | SOBACK12/DPBACK09 |
| | | **Sample ID** | DPWBACK1016-20N | DPWBACK1415-19N | DPWBACK1620-24N | DPWBACK0420-24N | DPWBACK1524-28N | DPWBACK1221-25N | DPWBACK0105-09N | DPWBACK0916-20N |
| | | **Sample Date** | 8/30/2017 | 3/8/2017 | 8/29/2017 | 8/22/2017 | 8/28/2017 | 4/18/2017 | 3/7/2017 | 4/18/2017 |
| | | **Sample Type** | N | N | N | N | N | N | N | N |
| | | **Depth Interval** | 16 - 20 ft | 15 - 19 ft | 20 - 24 ft | 20 - 24 ft | 24 - 28 ft | 21 - 25 ft | 5 - 9 ft | 16 - 20 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | | |
| **Dissolved Metals** | | | | | | | | | | |
| Cadmium | 7440-43-9 | ug/l | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.2 J | 2 |
| Cobalt | 7440-48-4 | ug/l | 65 | 8.8 | 2.8 | 1.3 | 2.1 | 1.7 | 38 | 40 |
| Iron | 7439-89-6 | ug/l | 2400 | 24000 | 560 | 14000 | 1100 | 50 U | 59 J | 480 |
| Manganese | 7439-96-5 | ug/l | 15000 | 2300 | 280 | 890 | 210 | 2400 | 640 J | 900 |
| Nickel | 7440-02-0 | ug/l | 7.8 | 8.1 | 1.8 | 7.2 | 4.3 | 1.3 | 11 | 46 |
| Zinc | 7440-66-6 | ug/l | 2.7 J | 29 | 5 U | 21 | 6.9 | 5 U | 19 | 95 |
| **Total Metals** | | | | | | | | | | |
| Aluminum | 7429-90-5 | ug/l | 280 | 6000 | 1500 | 2900 | 770 | 6700 | 29000 | 8100 |
| Arsenic | 7440-38-2 | ug/l | 3.7 | 19 | 2.3 | 2.2 | 0.64 J | 14 | 29 J | 19 |
| Barium | 7440-39-3 | ug/l | 350 | 170 | 150 | 230 | 80 | 510 | 260 | 93 |
| Beryllium | 7440-41-7 | ug/l | 1 U | 1 U | 0.42 J | 1.6 | 0.39 J | 1.6 | 7.3 | 8.9 |
| Cadmium | 7440-43-9 | ug/l | 1 U | 1 U | 1 U | 1 U | 0.081 J | 0.19 J | 0.74 J | 2.5 |
| Chromium | 7440-47-3 | ug/l | 2.2 | 24 | 6.8 | 24 | 2.5 | 28 | 72 J | 110 |
| Cobalt | 7440-48-4 | ug/l | 3.9 | 25 | 85 | 1.6 | 2.3 | 14 | 130 | 60 |
| Iron | 7439-89-6 | ug/l | 44000 | 110000 | 45000 | 55000 | 3200 | 98000 | 180000 | 140000 |
| Lead | 7439-92-1 | ug/l | 10 | 12 | 8.3 | 13 | 13 | 9.2 | 46 J | 20 |
| Manganese | 7439-96-5 | ug/l | 360 | 2600 | 15000 | 910 | 240 | 3100 | 1800 J | 1000 |
| Mercury | 7439-97-6 | ug/l | 1 | 0.2 U | 0.071 J | 0.2 U | 0.2 U | 0.2 U | 0.2 U | 0.2 U |
| Nickel | 7440-02-0 | ug/l | 2.5 | 30 | 12 | 9.9 | 4.7 | 17 | 67 | 92 |
| Thallium | 7440-28-0 | ug/l | 0.15 J | 0.13 J | 1 U | 0.072 J | 1 U | 1 U | 1 U | 1 U |
| Vanadium | 7440-62-2 | ug/l | 2 | 120 | 7.4 | 78 | 7.1 | 32 | 170 | 250 |
| Zinc | 7440-66-6 | ug/l | 12 | 60 | 10 | 23 | 16 | 61 | 190 | 320 |
| **Petroleum Compounds** | | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | ug/l | 190 J | 480 U | 470 J | 480 U | 490 U | 480 U | 480 U | 480 U |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| BaP-TE | BAP | ug/l | 0.19 U | 0.18 U | 0.19 U | 0.18 U | 0.0078 | 0.18 U | 0.18 U | 0.18 U |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | ug/l | 2 U | 1.9 U | 2.2 | 4.2 | 2.1 U | 24 | 1.9 U | 1.9 U |
| **Volatile Organic Compounds** | | | | | | | | | | |
| Methyl tert-Butyl Ether (MTBE) | 1634-04-4 | ug/l | 1 U | 1 U | 1 U | 0.21 J | 1 U | 0.34 J | 1 U | 0.34 J |

Notes:
CAS - Chemical Abstracts Service.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
U - Not detected.
ug/l = Microgram per liter.

**Table 3**
**Analtyical Data -Ground Water**
**Benning Road Facility RI/FS Project**
**3400 Benning Rd, N.E., Washington DC 20019**

| | | **Group** | UPPER-BKG | UPPER-BKG | UPPER-BKG | LOWER-BKG | LOWER-BKG | LOWER-BKG | LOWER-BKG |
|---|---|---|---|---|---|---|---|---|---|
| | | **Location ID** | SOBACK17/ DPBACK05 | SOBACK17/ DPBACK05 | SOBACK18/ DPBACK13 | DPBACK10 | DPBACK16 | SOBACK05/ DPBACK15 | SOBACK18/ DPBACK13 |
| | | **Sample ID** | DPWBACK0513-17N | DPWBACK0513-17R | DPWBACK1306-10N | DPWBACK1042-46N | DPWBACK1640-44N | DPWBACK1550-54N | DPWBACK1341-45N |
| | | **Sample Date** | 3/2/2017 | 3/2/2017 | 4/19/2017 | 8/30/2017 | 8/29/2017 | 8/28/2017 | 4/20/2017 |
| | | **Sample Type** | N | FD | N | N | N | N | N |
| | | **Depth Interval** | 13 - 17 ft | 13 - 17 ft | 6 - 10 ft | 42 - 46 ft | 40 - 44 ft | 50 - 54 ft | 41 - 45 ft |
| **Chemical** | **CAS** | **Units** | | | | | | | |
| **Dissolved Metals** | | | | | | | | | |
| Cadmium | 7440-43-9 | ug/l | 1 U | 1 U | 1 U | 1 U | 1 U | 0.21 J | 0.098 J |
| Cobalt | 7440-48-4 | ug/l | 5.2 | 4.5 | 2.1 | 1.2 | 5.3 | 5.7 | 1.2 |
| Iron | 7439-89-6 | ug/l | 50 U | 76 | 530 | 250 | 230 | 5400 | 220 |
| Manganese | 7439-96-5 | ug/l | 130 | 110 | 1100 | 720 | 600 | 1000 | 500 |
| Nickel | 7440-02-0 | ug/l | 3.9 | 3.9 | 1.5 | 2.8 | 5.8 | 21 | 3.5 |
| Zinc | 7440-66-6 | ug/l | 3 J | 3.4 J | 2.7 J | 6.6 | 7.3 | 140 | 15 |
| **Total Metals** | | | | | | | | | |
| Aluminum | 7429-90-5 | ug/l | 210 J | 41 J | 70 | 12000 | 3100 | 6800 | 37000 |
| Arsenic | 7440-38-2 | ug/l | 0.77 J | 0.28 J | 4 | 12 | 8.4 | 5.9 | 8.9 |
| Barium | 7440-39-3 | ug/l | 16 | 14 | 600 | 1000 | 610 | 700 | 320 |
| Beryllium | 7440-41-7 | ug/l | 1 U | 1 U | 1 U | 13 | 3.4 | 4.4 | 3.6 |
| Cadmium | 7440-43-9 | ug/l | 1 U | 1 U | 1 U | 5.1 | 0.55 J | 1.8 | 0.55 J |
| Chromium | 7440-47-3 | ug/l | 0.53 J | 2 U | 2 | 71 | 28 | 140 | 150 |
| Cobalt | 7440-48-4 | ug/l | 5.3 | 4.4 | 1.8 | 30 | 31 | 27 | 17 |
| Iron | 7439-89-6 | ug/l | 880 J | 140 J | 15000 | 78000 | 27000 | 43000 | 47000 |
| Lead | 7439-92-1 | ug/l | 1 U | 1 U | 7.6 | 140 | 82 | 1300 | 50 |
| Manganese | 7439-96-5 | ug/l | 130 | 110 | 1100 | 2700 | 880 | 1700 | 750 |
| Mercury | 7439-97-6 | ug/l | 0.2 U | 0.2 U | 0.2 U | 1.2 | 0.31 | 9.1 | 0.2 U |
| Nickel | 7440-02-0 | ug/l | 4.2 | 3.3 | 1.8 | 42 | 42 | 81 | 51 |
| Thallium | 7440-28-0 | ug/l | 1 U | 1 U | 1 U | 0.12 J | 1 U | 0.13 J | 1 U |
| Vanadium | 7440-62-2 | ug/l | 2.1 | 1.2 | 2.8 | 200 | 45 | 88 | 150 |
| Zinc | 7440-66-6 | ug/l | 5 U | 5 U | 5 | 520 | 110 | 730 | 150 |
| **Petroleum Compounds** | | | | | | | | | |
| Diesel Range Organics (C10-C20) | C10C20 | ug/l | 480 U | 480 U | 240 J | 260 J | 510 U | 520 U | 480 U |
| **Semi-Volatile Organic Compounds** | | | | | | | | | |
| BaP-TE | BAP | ug/l | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.19 U | 0.18 U |
| bis-(2-Ethylhexyl)phthalate | 117-81-7 | ug/l | 1.9 U | 1.9 U | 1.9 U | 2 U | 3 | 2 U | 1.9 U |
| **Volatile Organic Compounds** | | | | | | | | | |
| Methyl tert-Butyl Ether (MTBE) | 1634-04-4 | ug/l | 1 U | 1 U | 1 U | 1 U | 1 U | 1 U | 0.25 J |

Notes:
CAS - Chemical Abstracts Service.
J - The chemical was positively identified; however, the associated numerical value is an estimated concentration.
U - Not detected.
ug/l = Microgram per liter.

# Attachment B

# Preliminary Background Evaluation – Surface Water

**Background Evaluation for Surface Water**

For this preliminary background evaluation, ten surface water samples were collected as part of the RI to represent site-specific background conditions. The site-specific background surface water samples were analyzed for the same suite of inorganic and organic constituents that were analyzed in Study Area surface water samples. The background surface water samples are shown in **Figure 2-3**. The available background data for surface water are presented in **Table 1** of this attachment.

The following four constituents were identified as COPCs in surface water based on the results of the preliminary BERA: barium (dissolved), 4,4'-DDT, anthracene, and pyrene. Box plots for these COPCs in Study Area and Site-specific background surface water are presented below. The results of the population test for the single surface water COPC with sufficient data (dissolved barium) is presented in **Table 2** of this attachment. There were insufficient data and/or detected concentrations to perform the statistical test for the remaining COPCs in surface water.

**Inorganic COPCs**

The IQR and median for barium (dissolved) in Study Area surface water samples are below the IQR and median for barium in Site-specific background surface water. Based on the population test (see **Table 2** of this attachment), Study Area and background concentrations of dissolved barium are similar. The same finding is observed based on a comparison of the mean concentration of dissolved barium in Study Area surface water with its Site-specific BTV (see **Table 2** of this attachment). The findings of this preliminary evaluation suggest that dissolved barium in surface water in the Study Area is consistent with Site-specific background in the Anacostia River.

**Organic COPCs**

4,4'-DDT was detected in all five Study Area surface water samples and four of six background samples. The detections of 4,4'-DDT fall into the same general range of 0.0011 to 0.0016 micrograms per liter µg/L with a reporting limit of 0.0013 µg/L. While the range of 4,4'-DDT in Study Area surface water is greater than the background range, this difference is slight. Further, the mean concentration of 4,4'-DDT in Study Area surface water is the same as its site-specific BTV.

Anthracene was detected in only one of the ten Study Area surface water samples (and was qualified as estimated because it was present below the reporting limit), and was not detected in any of the background samples. Pyrene was detected in four of the ten Study Area surface samples and four of the ten site-specific background samples, with all results qualified as estimated (J qualified), due to detections below the reporting limit. For the purposes of this background evaluation, non-detect results were included at the reporting limit. The IQRs for anthracene and pyrene in Study Area surface water are comparable to Site-specific background. The mean concentration of pyrene in Study Area surface water is below its Site-specific BTV (a BTV was not calculated for anthracene).

These preliminary findings suggest that these organic COPCs in surface water in the Study Area are consistent with Site-specific background conditions in the Anacostia River.

Table 1
Analytical Results for COPCs in Site-Specific Background Surface Water

| Sample Location | Barium, dissolved | 4,4'-DDT | Anthracene | Pyrene |
|---|---|---|---|---|
| SUWBACK1 | 43 | <0.0013 | <0.21 | <0.21 |
| SUWBACK2 | 58 | <0.0013 | <0.2 | <0.2 |
| SUWBACK3 | 39 | -- | <0.19 | 0.022 |
| SUWBACK4 | 33 | 0.0012 | <0.19 | 0.023 |
| SUWBACK5 | 31 | 0.00081 | <0.19 | <0.19 |
| SUWBACK6 | 31 | -- | <0.19 | 0.019 |
| SUWBACK11 | 38 | -- | <0.2 | <0.2 |
| SUWBACK12 | 38 | 0.0011 | <0.21 | <0.21 |
| SUWBACK13 | 40 | -- | <0.19 | 0.02 |
| SUWBACK15 | 40 | 0.0012 | <0.22 | <0.22 |
| | | | | |
| **Minimum** | 31 | 0.00081 | 0.19 | 0.019 |
| **Maximum** | 58 | 0.0013 | 0.22 | 0.22 |
| **Mean** | 39 | 0.0012 | 0.20 | 0.131 |
| **Median** | 39 | 0.0012 | 0.20 | 0.195 |
| **25th Percentile** | 34 | 0.0011 | 0.19 | 0.022 |
| **75th Percentile** | 40 | 0.0013 | 0.21 | 0.208 |

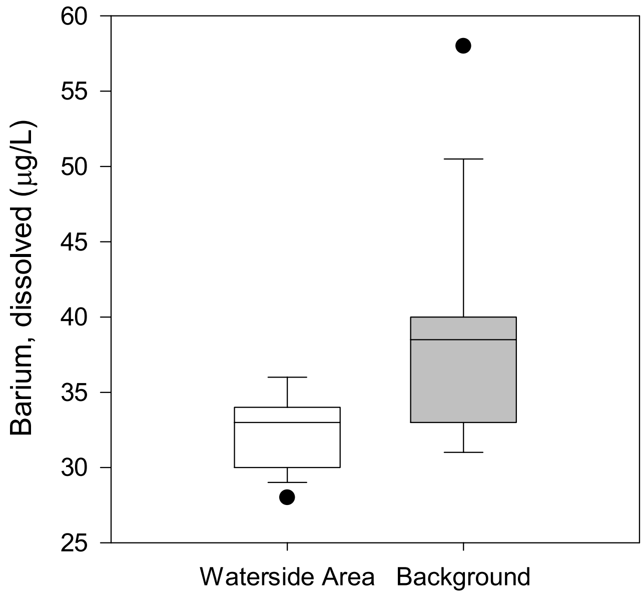
Notes:
All units are micrograms per liter ( μg/L).
< = Not detected (reporting limited presented).
-- = Not analyzed.

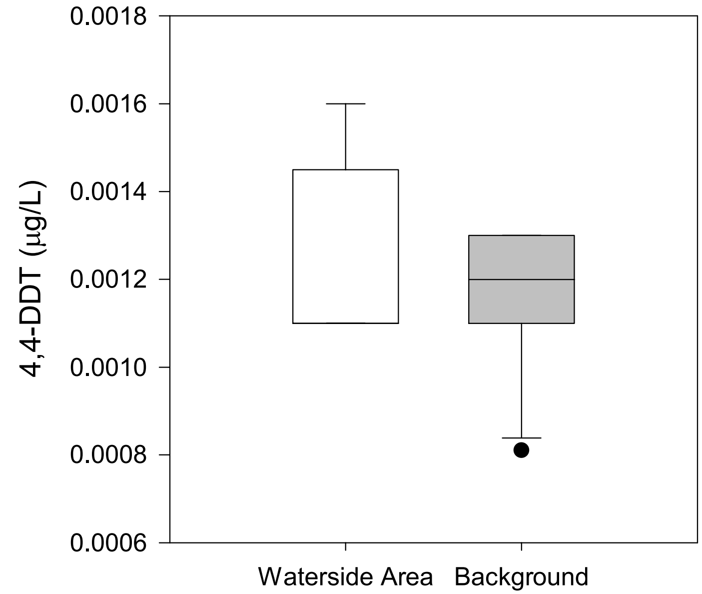
Comparison of Chemical Concentrations In Site
And Site-Specific Background Surface Water

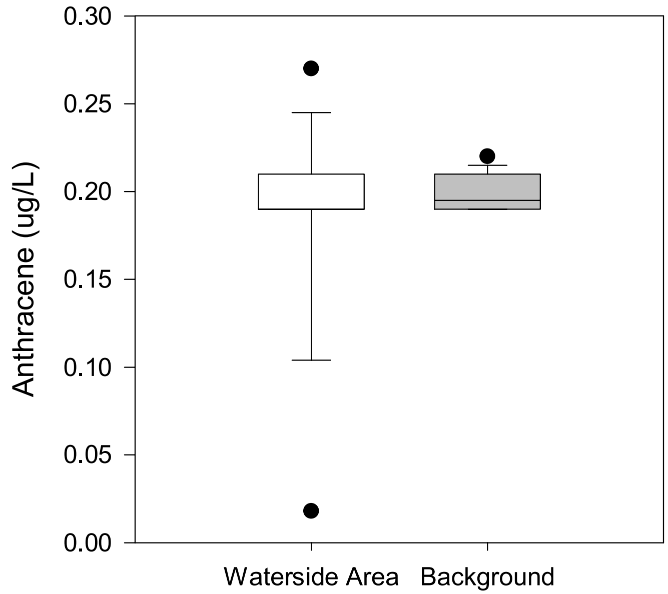
| COPC | Frequency of Detection [a] | | Mean (Standard deviation) of Detected Concentrations (mg/kg) | | Site Specific Background BTV [d] | Distribution [b] | | Two-Sample Hypothesis Test [c] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site | Site-Specific Background | Site | Site-Specific Background | | Site | Site-Specific Background | Test | p-value | Reject Null Hypothesis? | Is Site > Background? |
| BARIUM, DISSOLVED | 10 : 10 | 10 : 10 | 32.5 (2.7) | 39.1 (7.8) | 58 | Normal | Normal | t-test | 0.000 | **Yes** | **No** |
| 4,4-DDT | 5 : 5 | 4 : 6 | 0.0013 (0.00023) | 0.0011 (0.00018) | 0.0013 | Normal | Normal | NC | -- | -- | -- |
| ANTHRACENE | 1 : 10 | 0 : 10 | 0.018 | ND | ND | NC | NC | NC | -- | -- | -- |
| PYRENE | 4 : 10 | 4 : 10 | 0.03 (0.0077) | 0.021 (0.0018) | 0.22 | Normal | Normal | NC | -- | -- | -- |

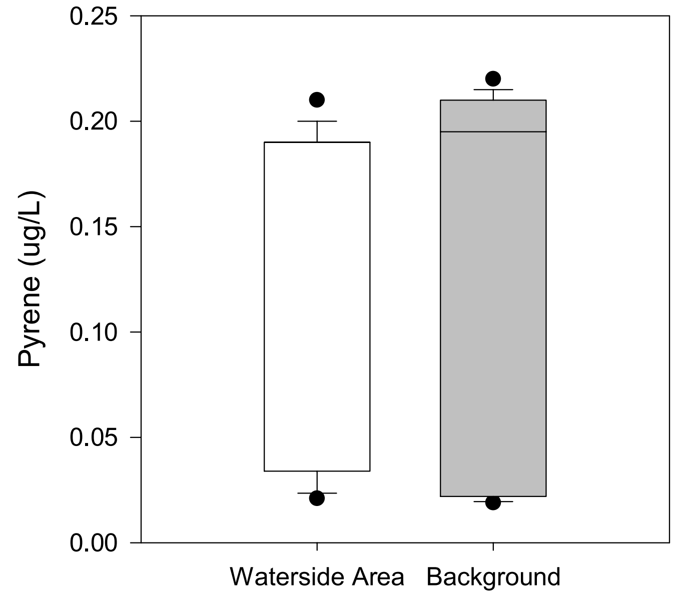
Notes:
COPC - Chemical of Potential Concern.
FOD - Frequency of Detection.
S - Substantial Difference.
WMW - Wilcoxon-Mann-Whitney test.

[a] The frequency of detection is the number of detected samples: the total number of samples.
[b] The distribution of the Site and Site-Specific Background datasets were determined using the Shapiro-Wilks test (significance level 0.05) in ProUCL 5.0. A minimum of four detected samples was required for determining the distribution in ProUCL.
[c] A two-sample hypothesis test was conducted in ProUCL 5.0 if a minimum of eight samples with six detected concentrations are available. A t-test was used when both Site and Background datasets are normally distributed and all samples were detected. If either datasets were not normally distributed or included non-detected samples, then the WMW test or the Gehan test was used depending on if detection limits were equal for all non-detected samples (WMW) or if they were not equal (Gehan). The null hypothesis is "Mean/Median of Site Concentrations >= Background Concentrations + S". The alternative hypothesis is "Mean/Median of Site Concentrations < Background Concentrations + S". If the p-value of the two-sample hypothesis test is < alpha (0.05), then the null hypothesis is rejected.
The value of S is the standard deviation of the Background data set. This value was added to the value of each Background sample.


60
55
50
45
40
35
30
25
Barium, dissolved (µg/L)
Waterside Area
Background


0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
4,4-DDT (µg/L)
Waterside Area
Background


0.30
0.25
0.20
0.15
0.10
0.05
0.00
Anthracene (ug/L)
Waterside Area
Background


0.25
0.20
0.15
0.10
0.05
0.00
Pyrene (ug/L)
Waterside Area
Background

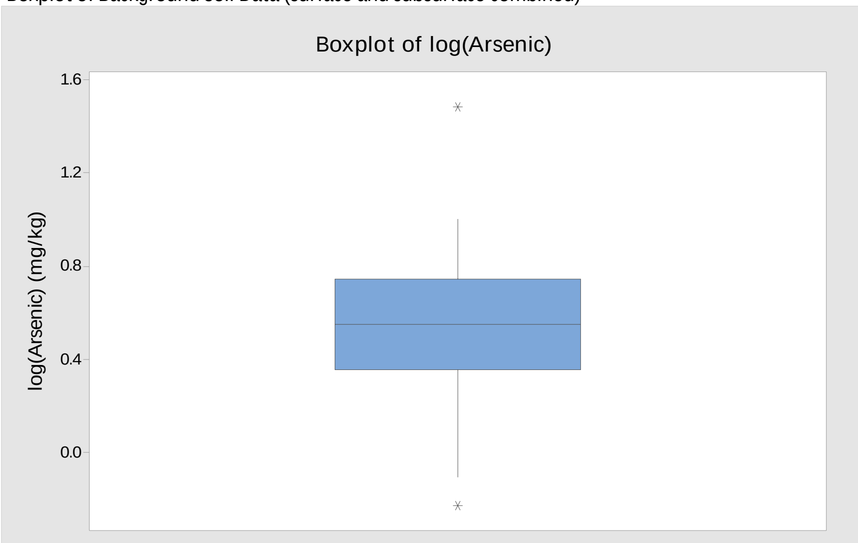
pepco
An Exelon Company

# Attachment C

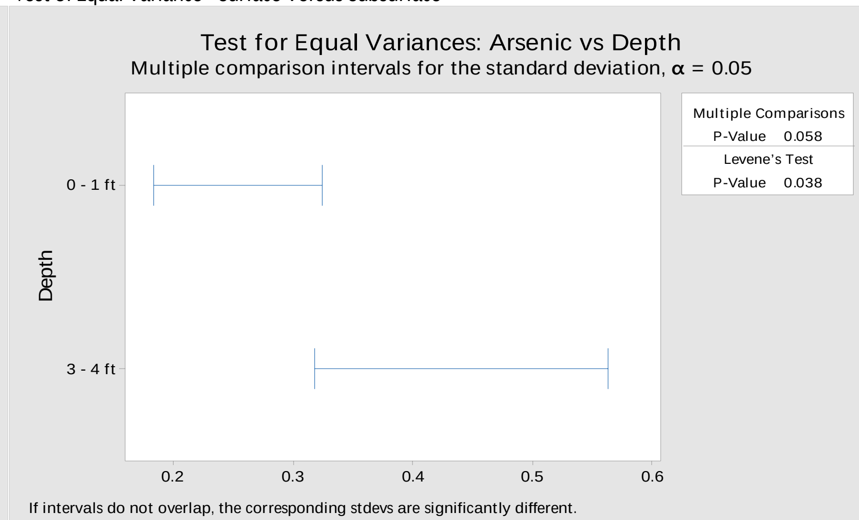
# Supporting Graphics - Soil

# Evaluation of Background Soil Dataset

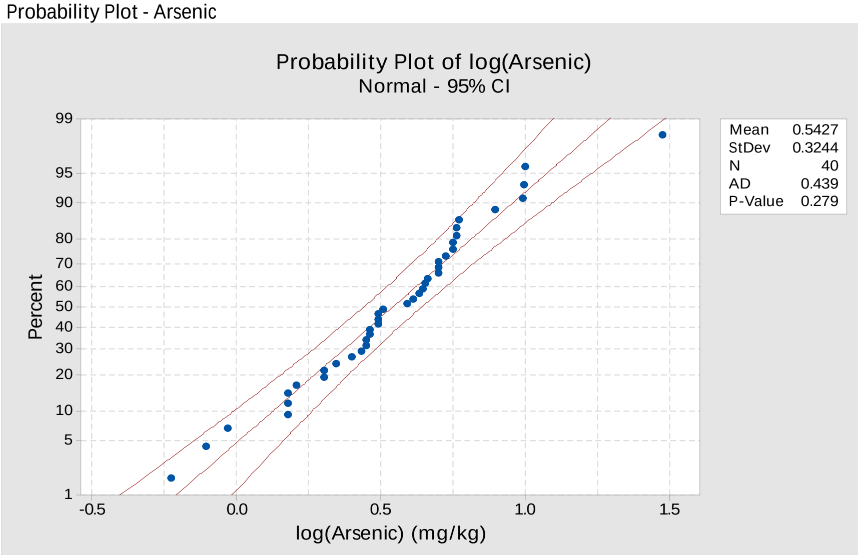
Boxplot of Background Soil Data (surface and subsurface combined)



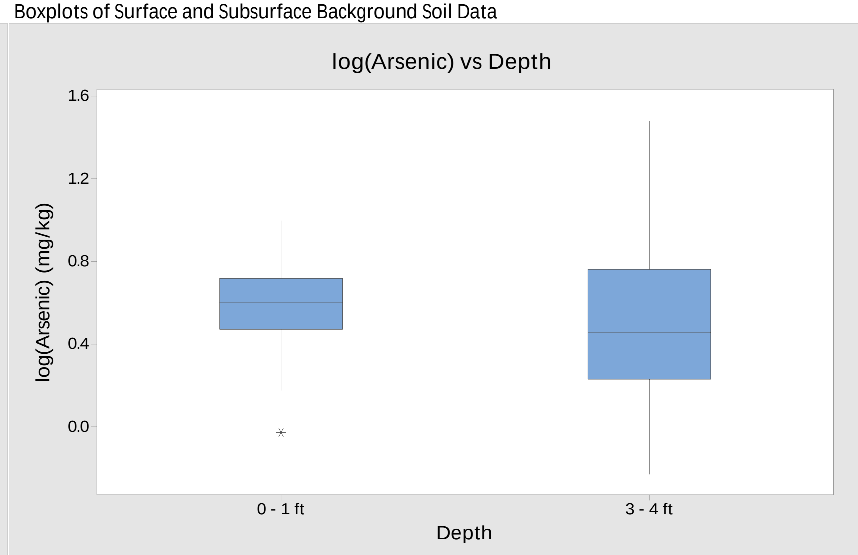

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Arsenic

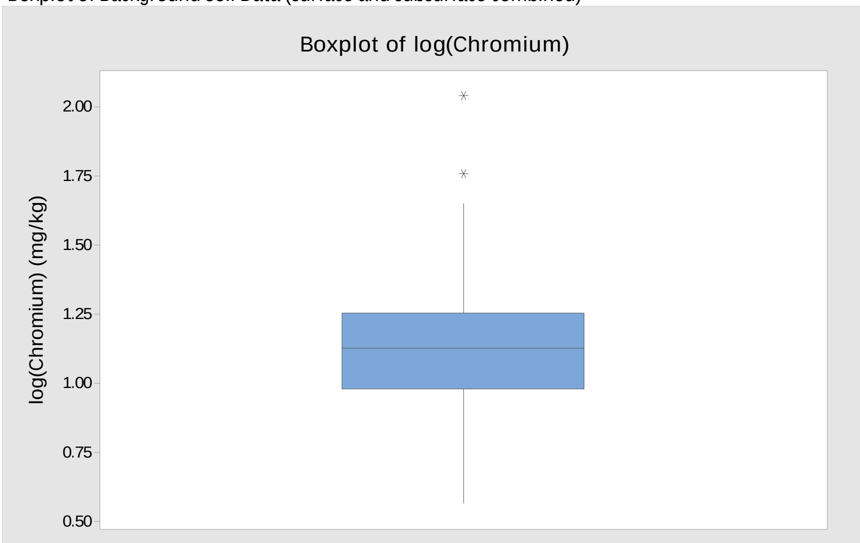



Boxplots of Surface and Subsurface Background Soil Data

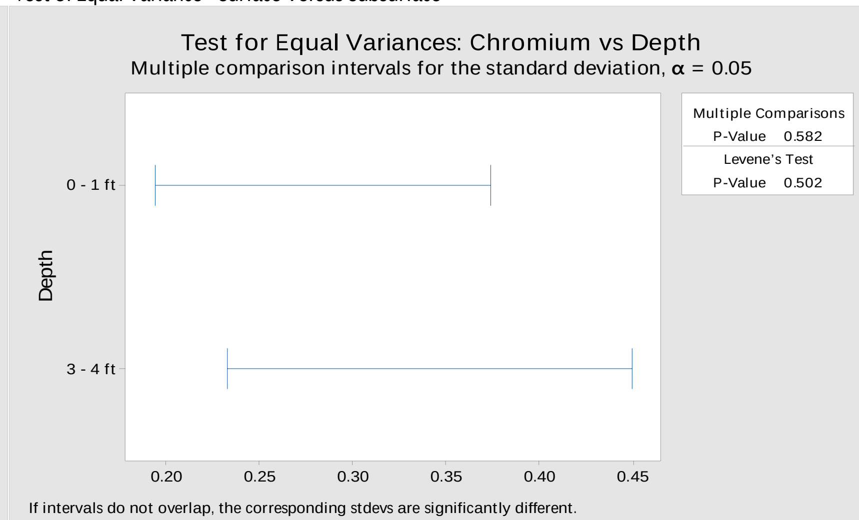



Notes:
All graphs created in Minitab, Version 18.
If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.
A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

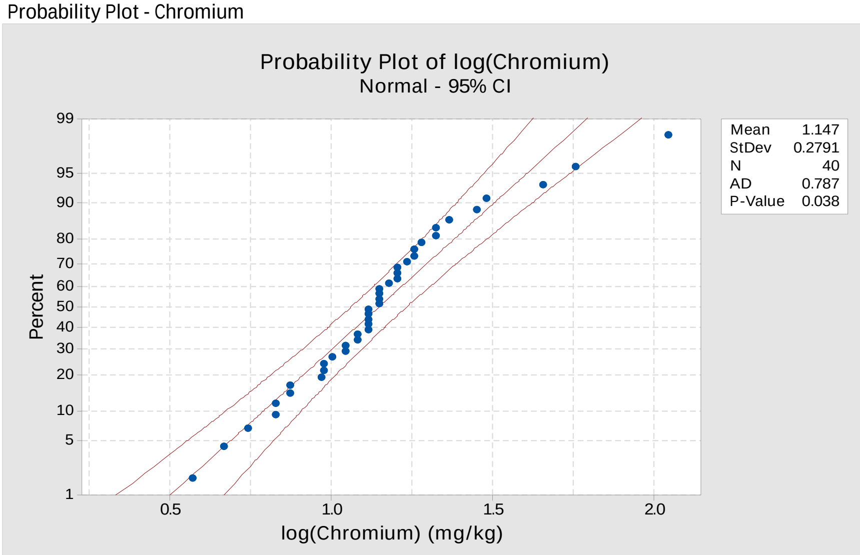
Boxplot of Background Soil Data (surface and subsurface combined)



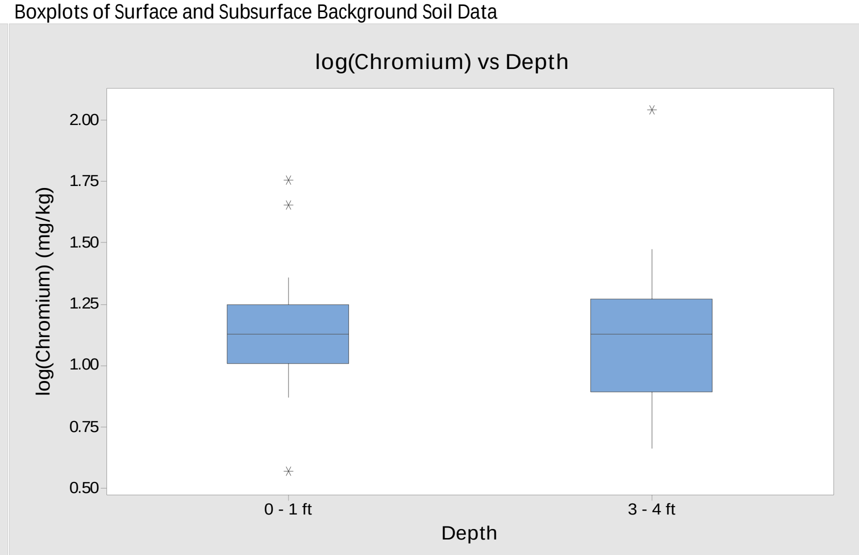

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Chromium




Boxplots of Surface and Subsurface Background Soil Data



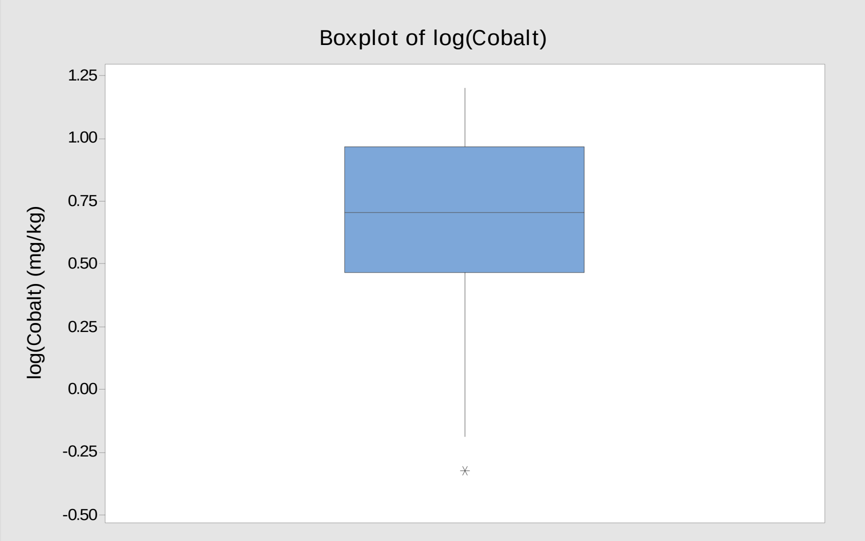

Notes:

All graphs created in Minitab, Version 18.

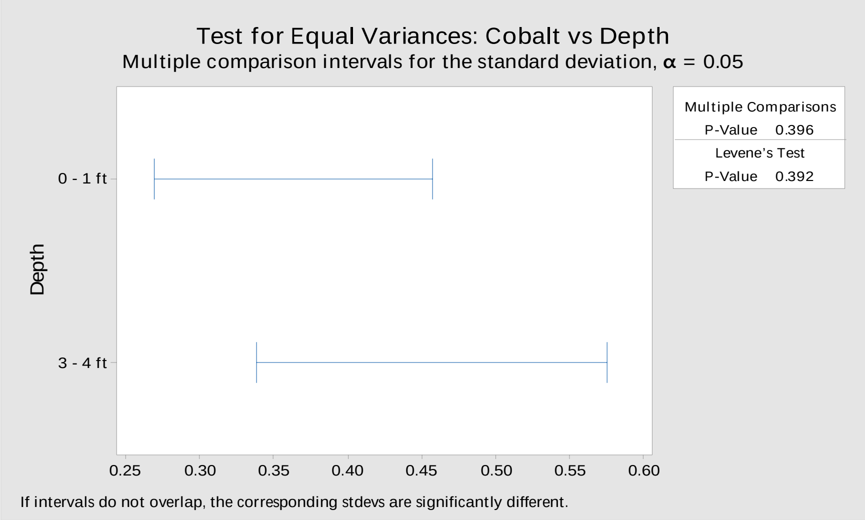
If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

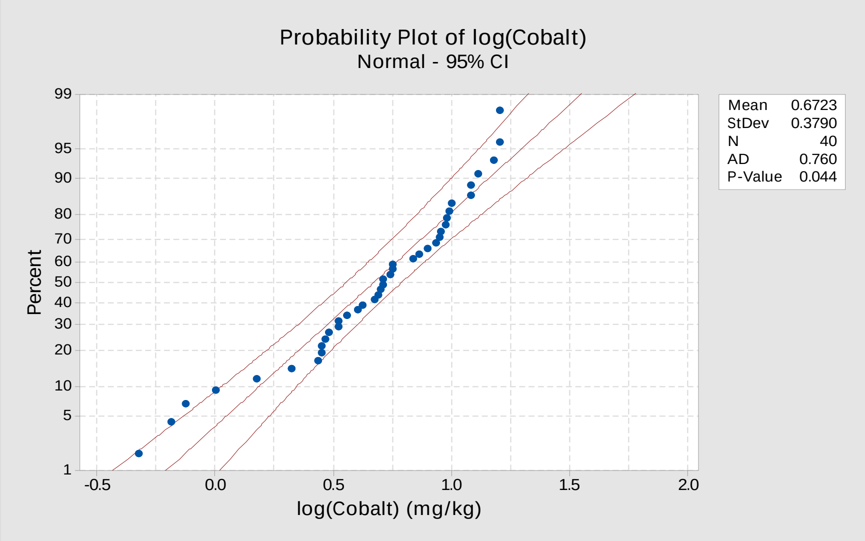
Boxplot of Background Soil Data (surface and subsurface combined)



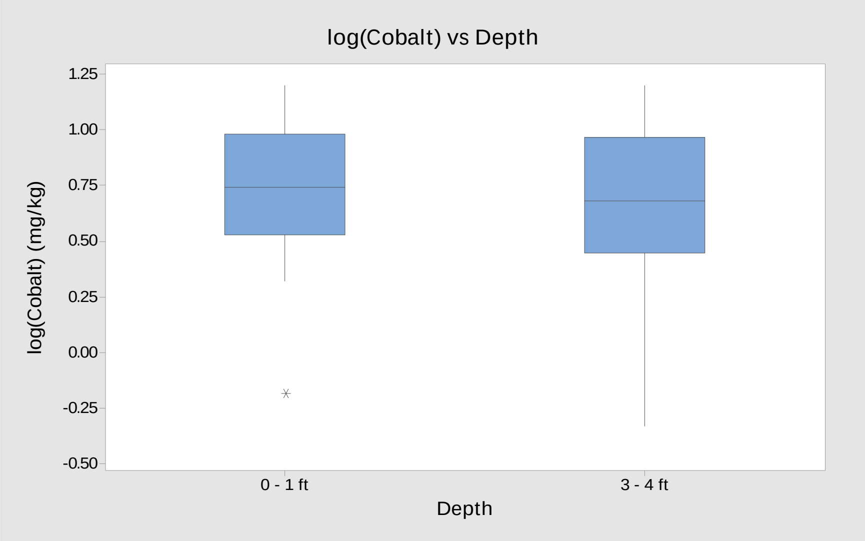

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Cobalt




Boxplots of Surface and Subsurface Background Soil Data



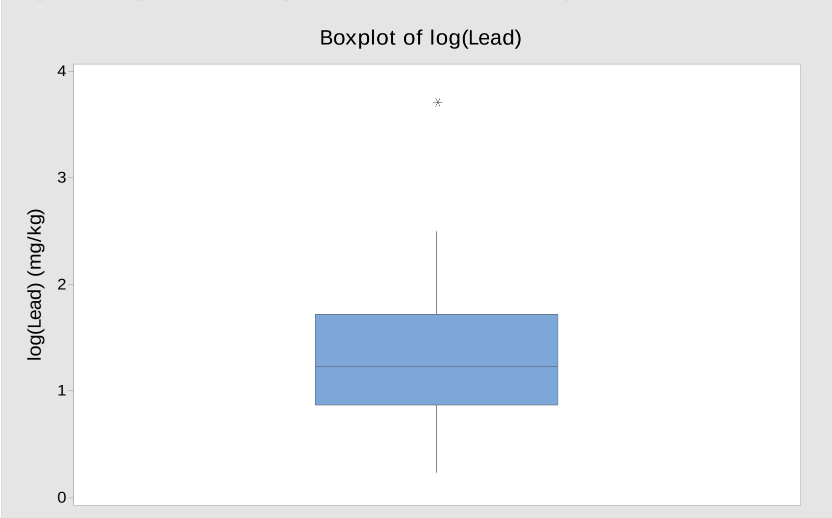

Notes:

All graphs created in Minitab, Version 18.

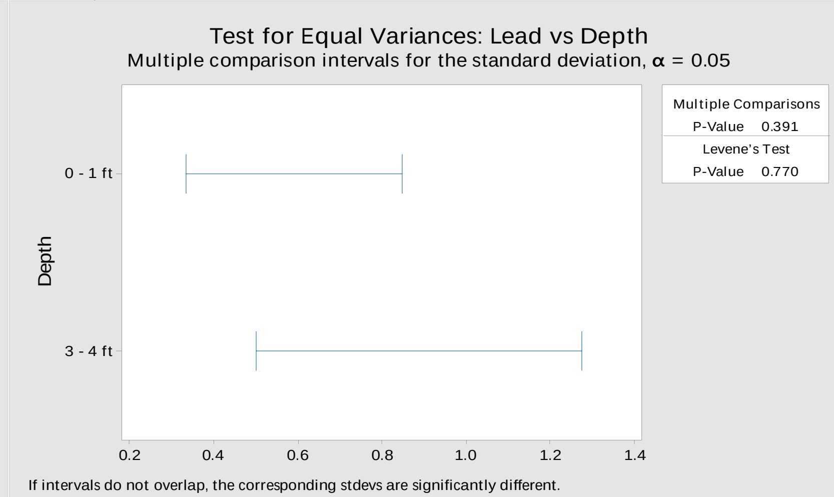
If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

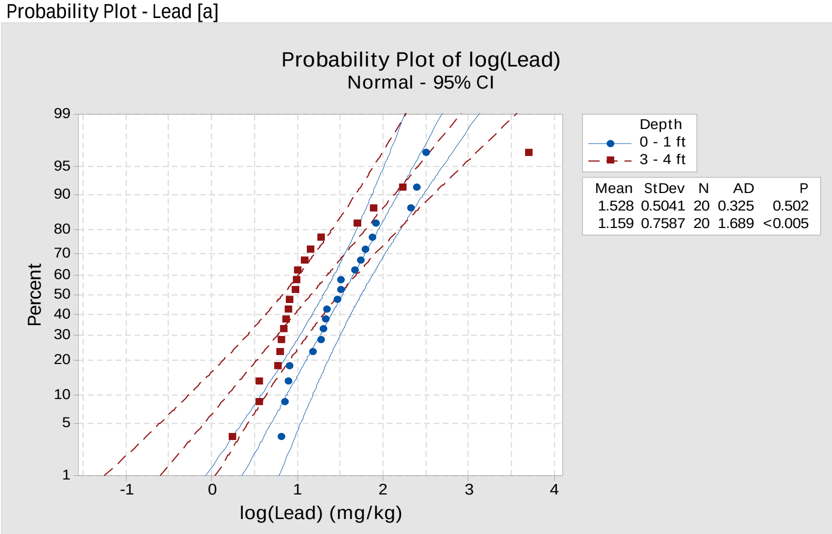
Boxplot of Background Soil Data (surface and subsurface combined)



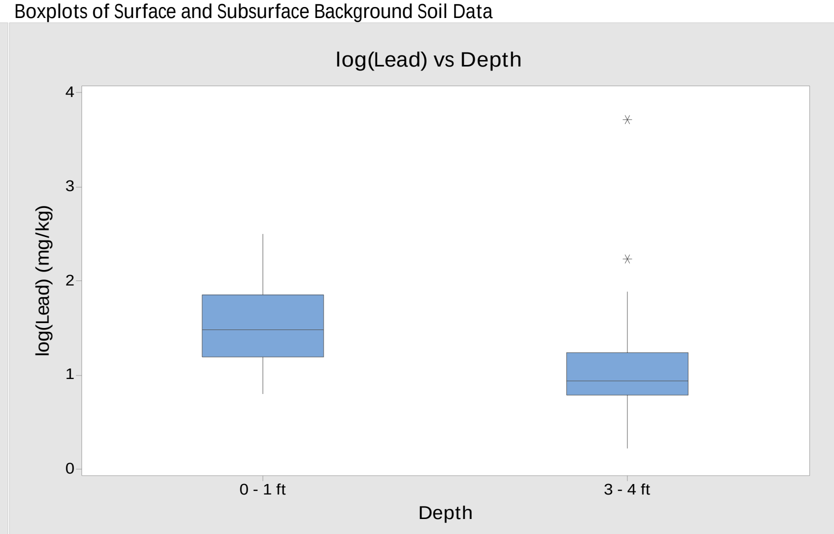

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Lead [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:

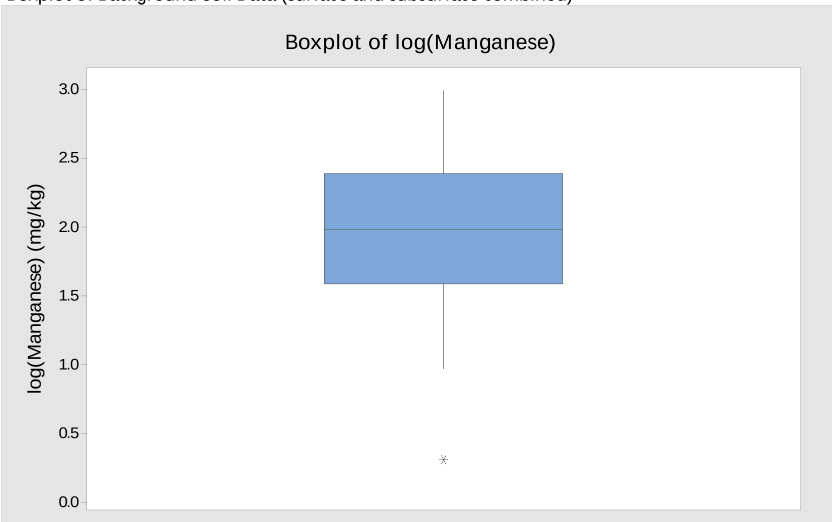
All graphs created in Minitab, Version 18.

If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

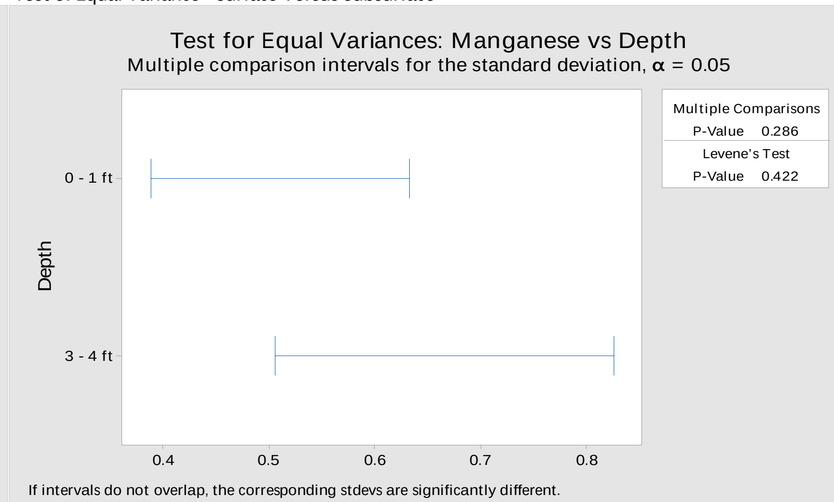
[a] The median surface and subsurface soil concentrations were found to be significantly different (p-value of 0.05) based on the non-parametric analysis of variance test.
Therefore, the probability plot displays the distribution of surface and subsurface separately.

A log transformation was conducted and results in normal (surface) and gamma (subsurface) distributions.
The log-transformed data are presented in the boxplots and probability plots.

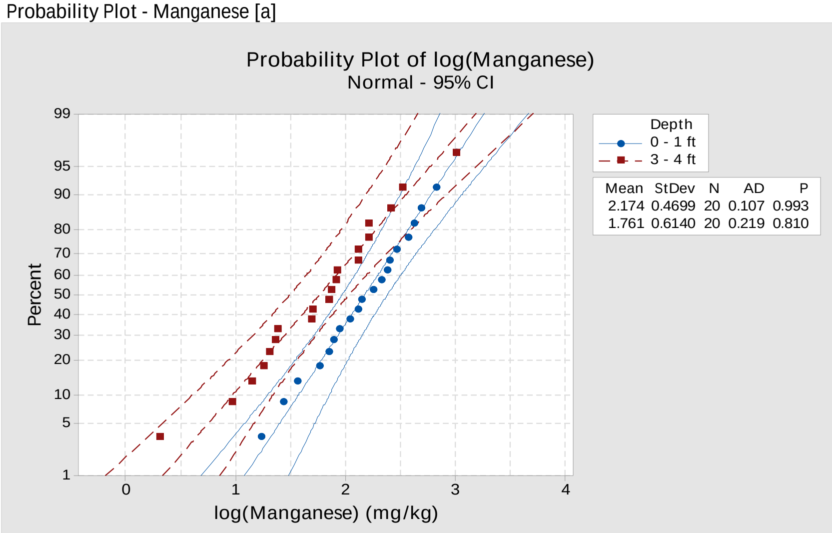
Boxplot of Background Soil Data (surface and subsurface combined)



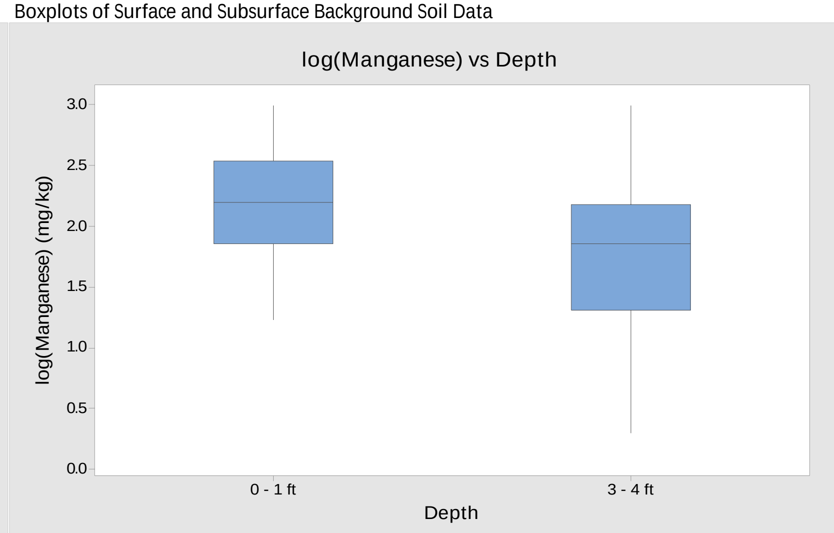

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Manganese [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:

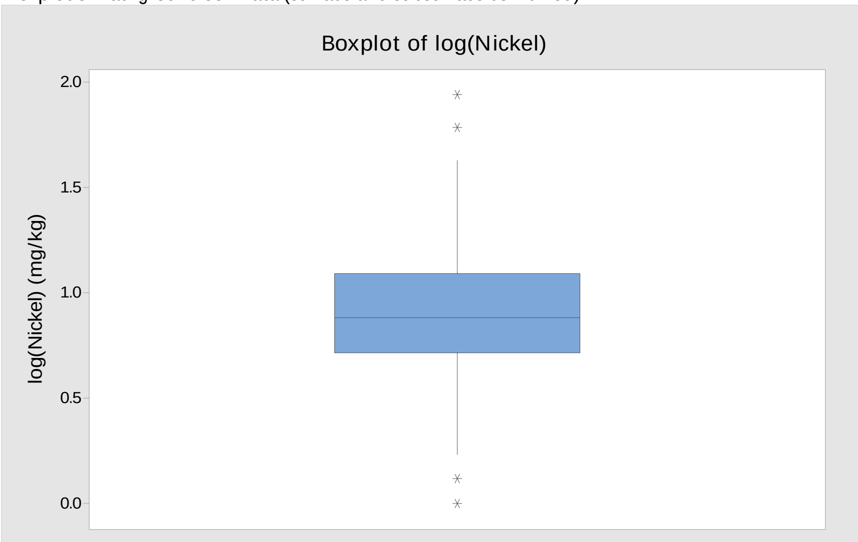
All graphs created in Minitab, Version 18.

If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

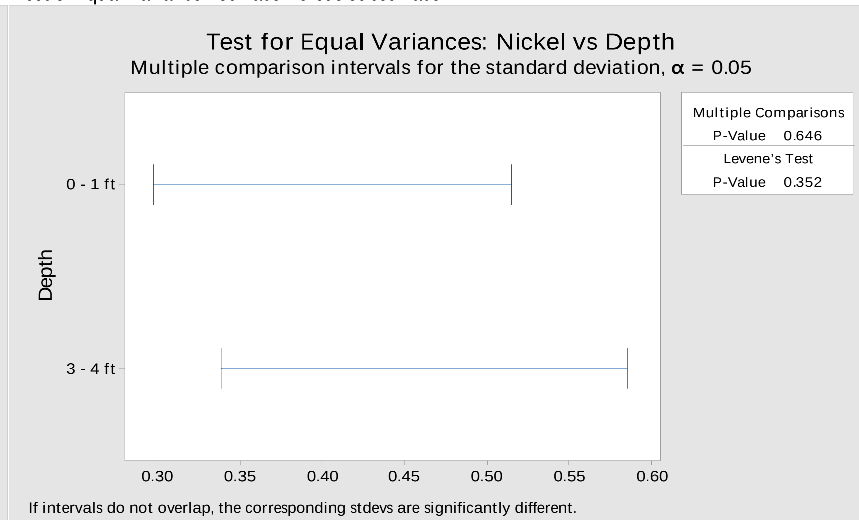
[a] The median surface and subsurface soil concentrations were found to be significantly different (p-value of 0.05) based on the non-parametric analysis of variance test. Therefore, the probability plot displays the distribution of surface and subsurface separately.

A log transformation was conducted and results in normal distributions for surface and subsurface. The log-transformed data are presented in the boxplots and probability plots.

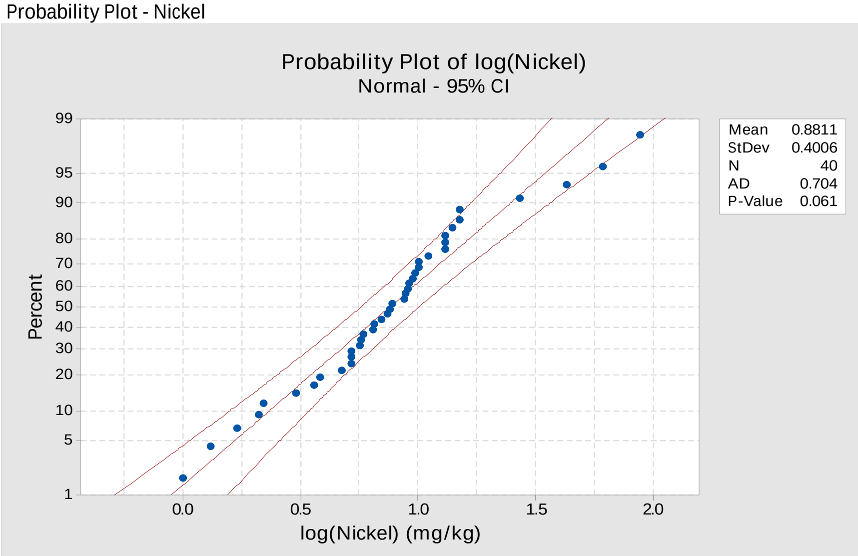
Boxplot of Background Soil Data (surface and subsurface combined)



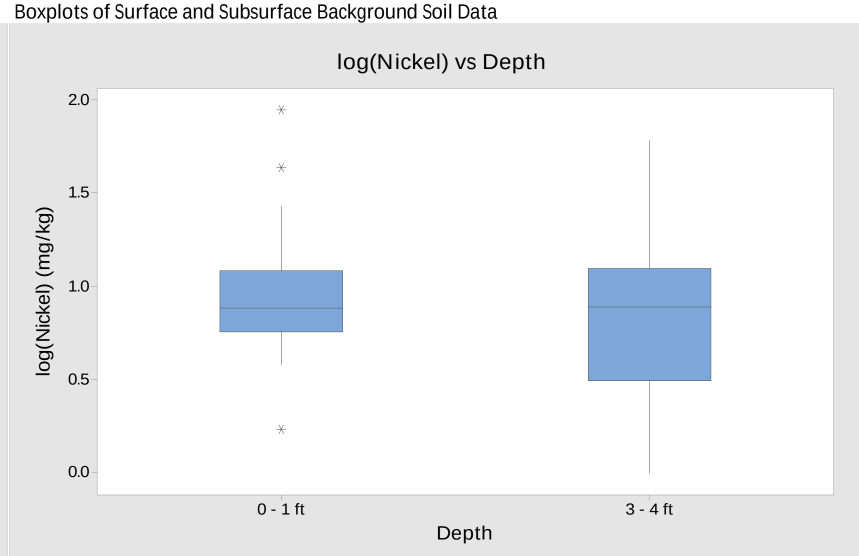

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Nickel




Boxplots of Surface and Subsurface Background Soil Data



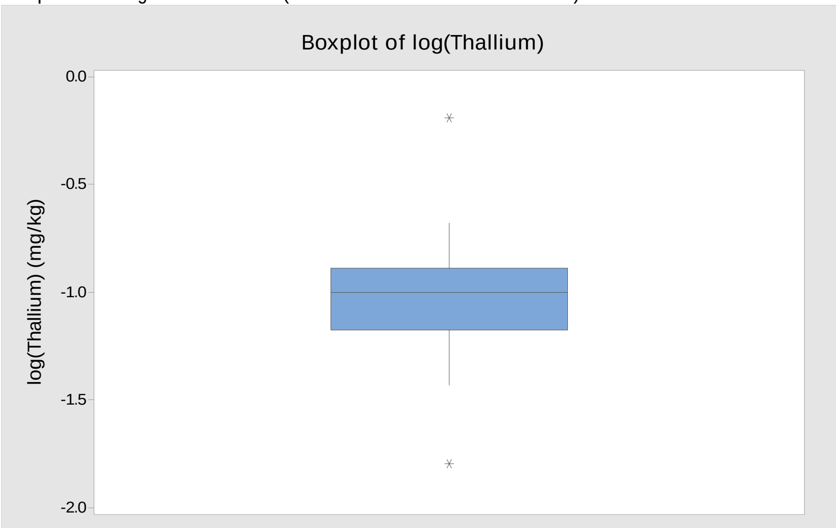

Notes:

All graphs created in Minitab, Version 18.

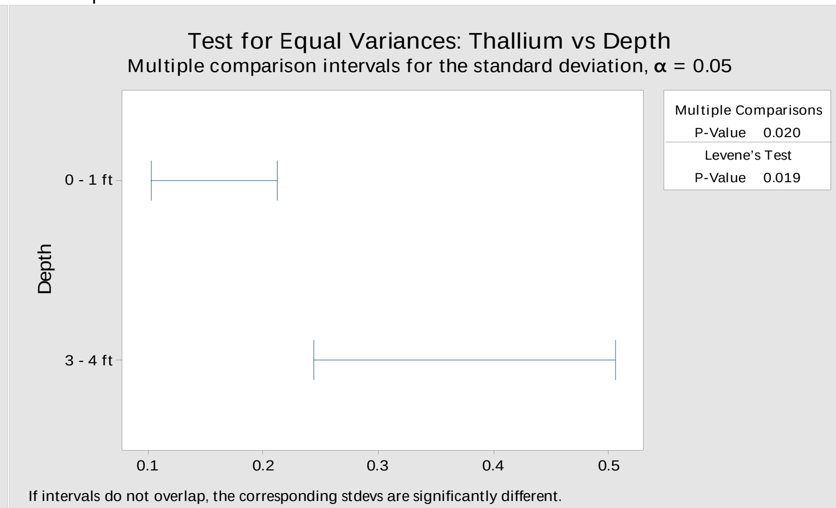
If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

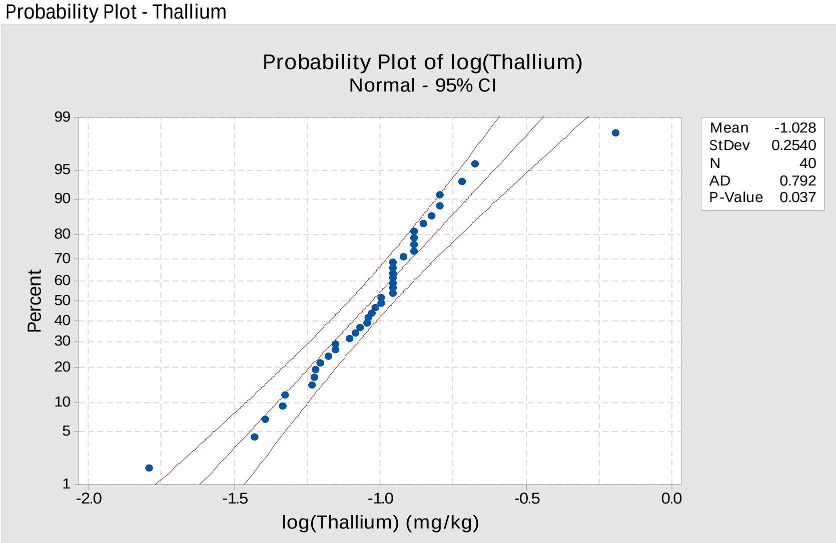
Boxplot of Background Soil Data (surface and subsurface combined)



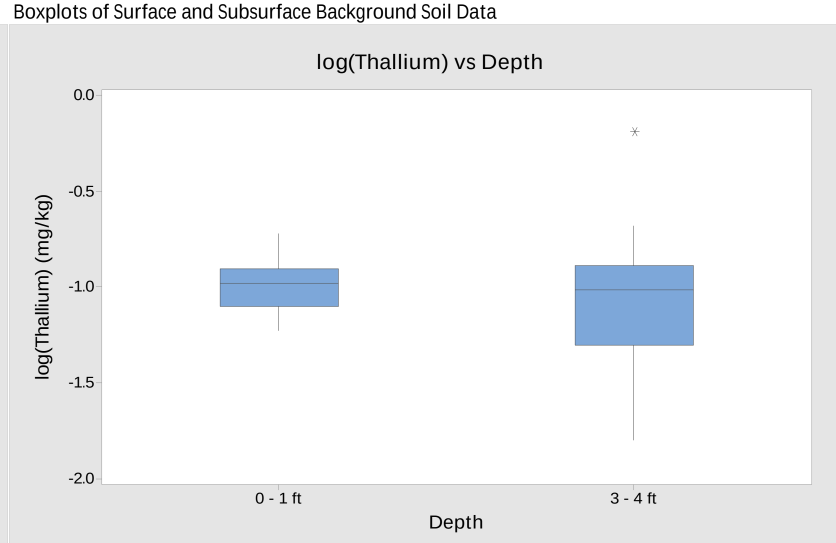

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Thallium




Boxplots of Surface and Subsurface Background Soil Data



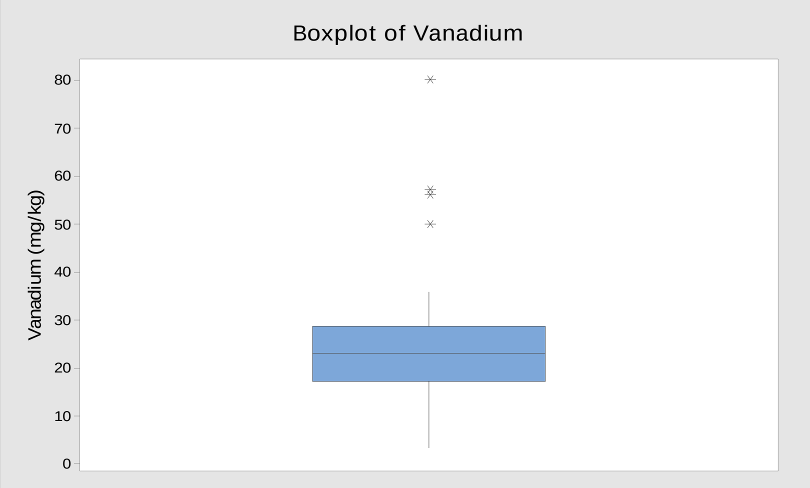

Notes:

All graphs created in Minitab, Version 18.

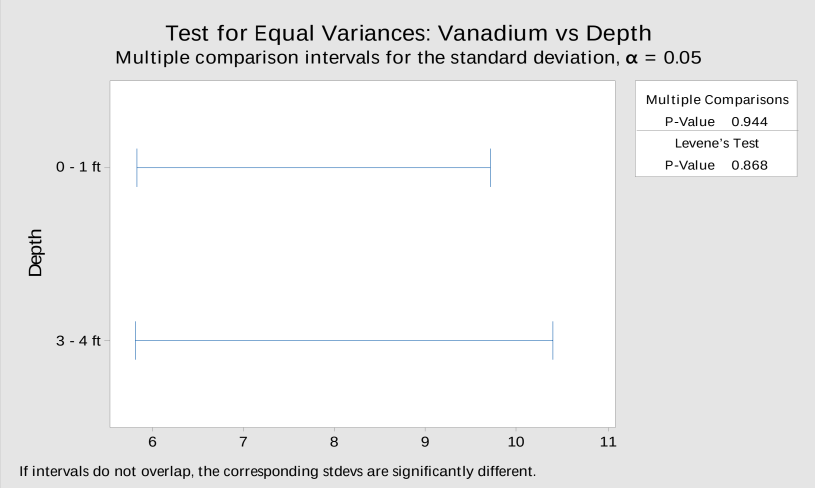
If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

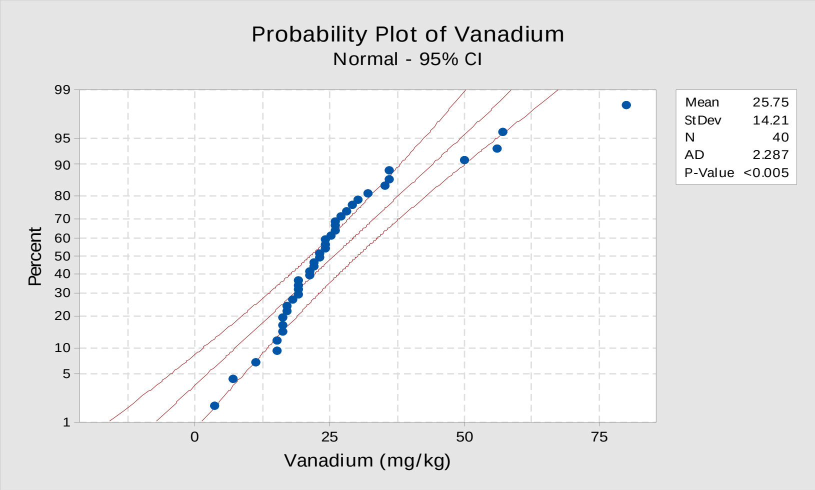
Boxplot of Background Soil Data (surface and subsurface combined)



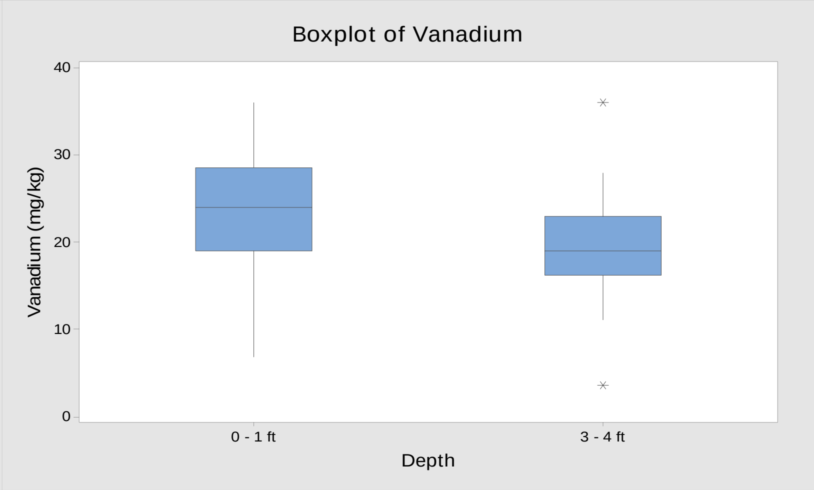

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Vanadium




Boxplots of Surface and Subsurface Background Soil Data

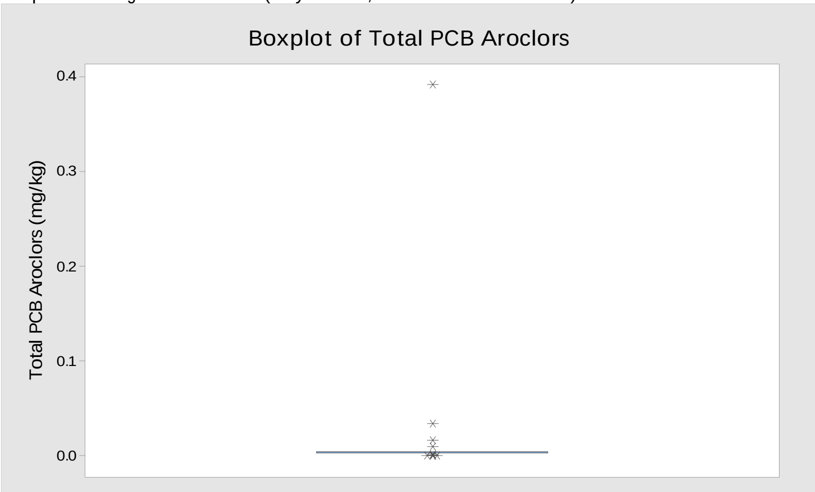



Notes:

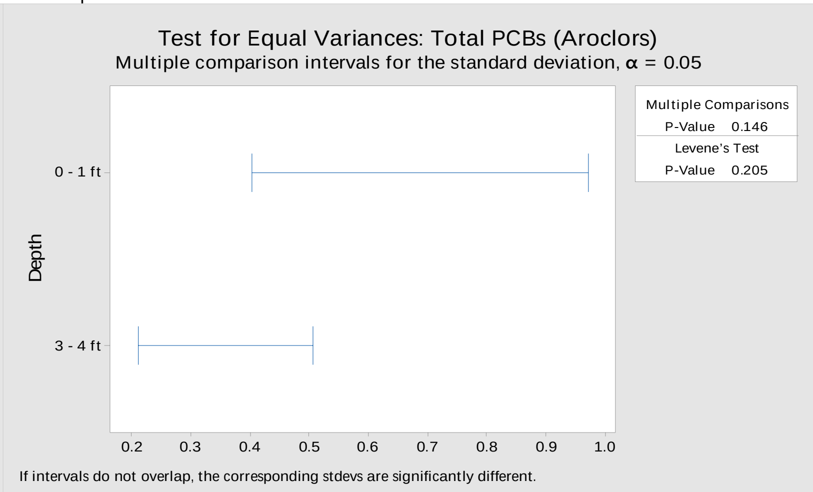
All graphs created in Minitab, Version 18.

If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

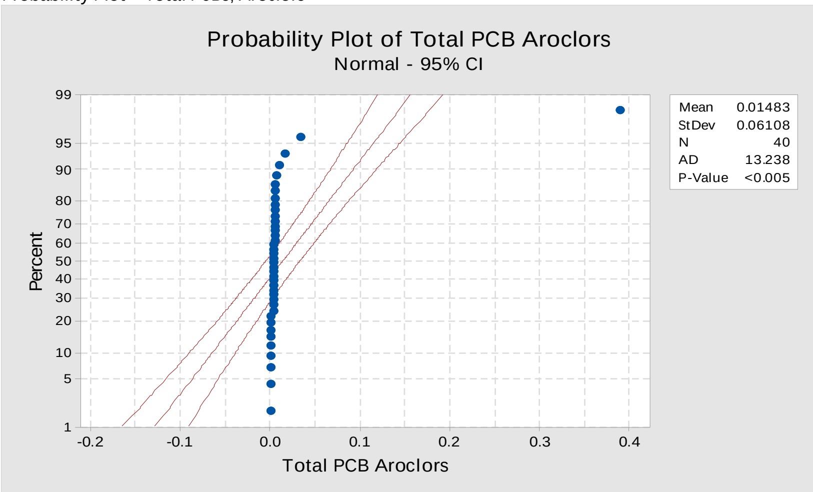
Boxplot of Background Soil Data (only surface; no detects in subsurface)



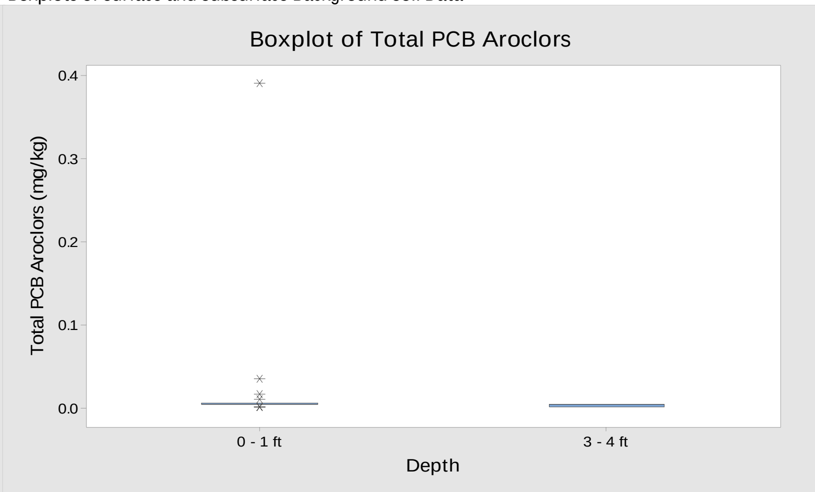

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Total PCBs, Aroclors




Boxplots of Surface and Subsurface Background Soil Data

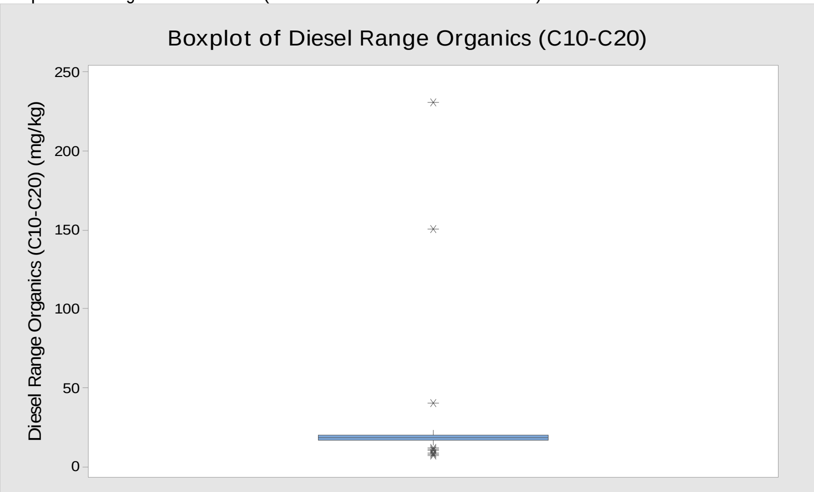



Notes:

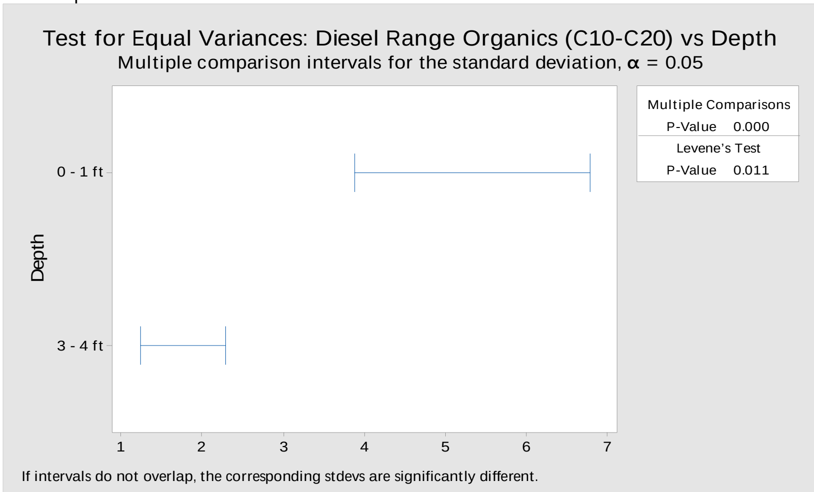
All graphs created in Minitab, Version 18.

If the surface and subsurface dataset includes non-detects, these values are included in the graphics using detection limits.

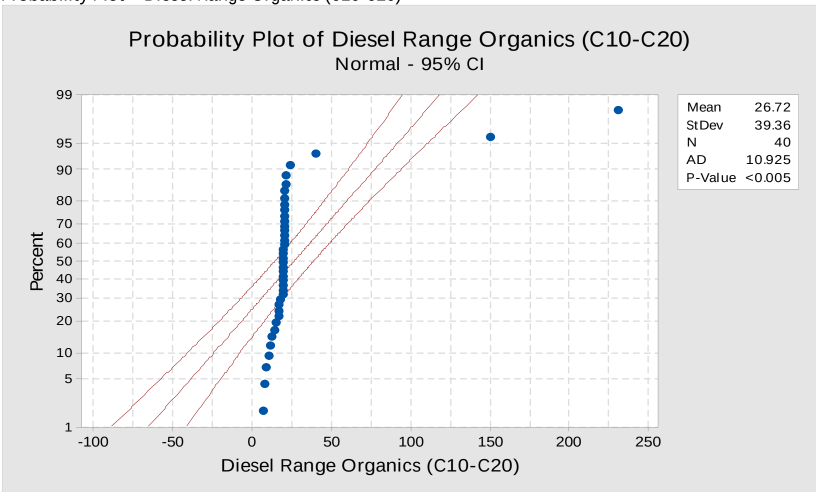
Boxplot of Background Soil Data (surface and subsurface combined)



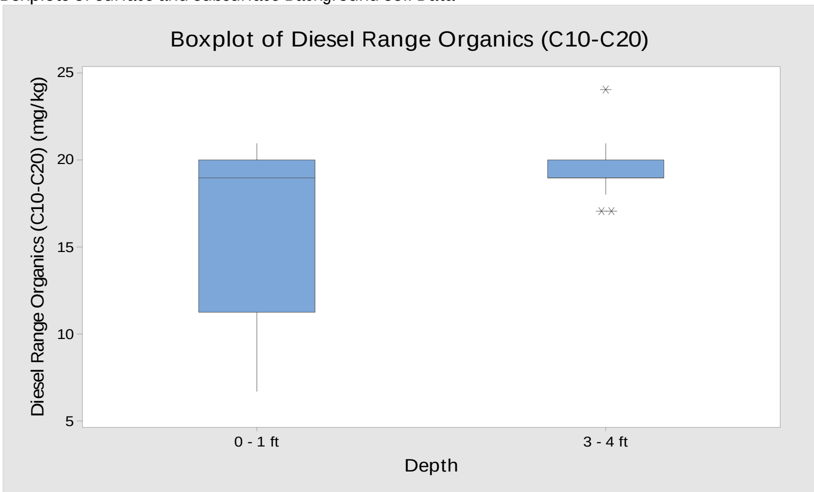

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Diesel Range Organics (C10-C20)




Boxplots of Surface and Subsurface Background Soil Data




Notes:

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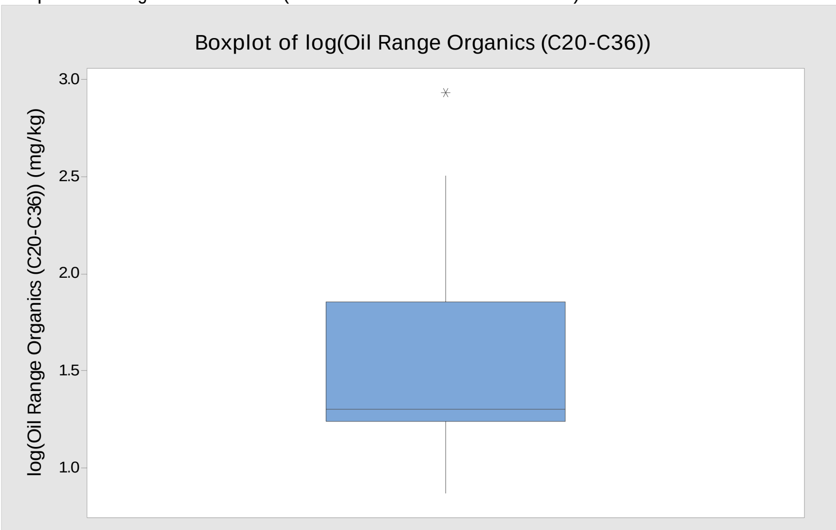
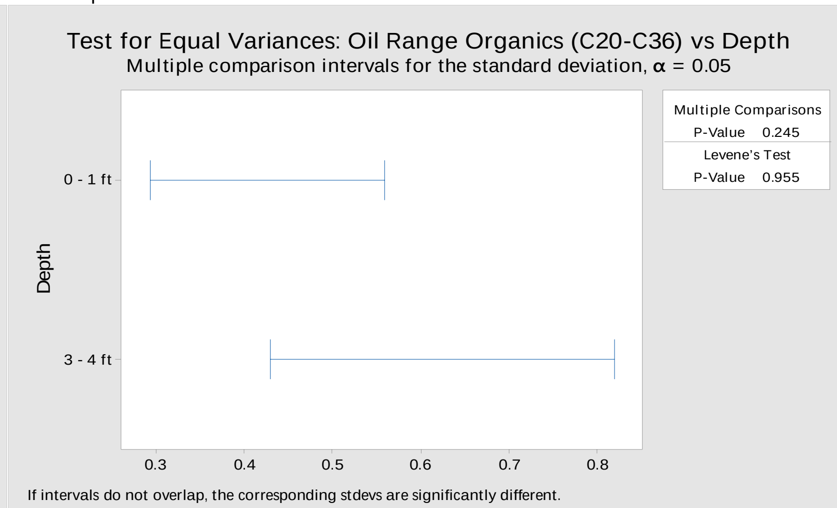
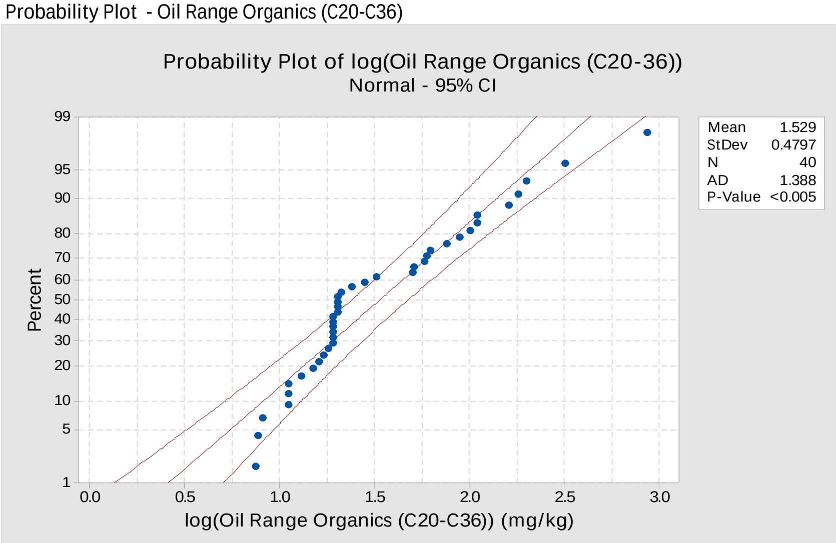
Boxplot of Background Soil Data (surface and subsurface combined)



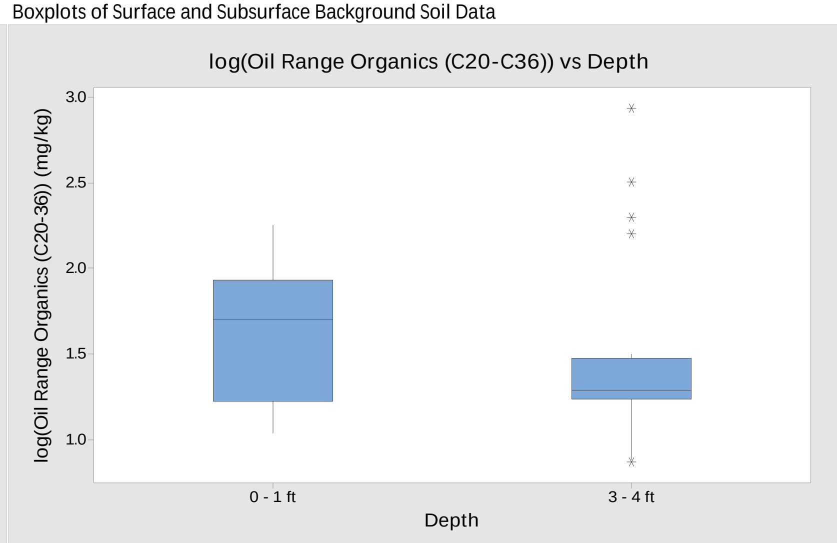

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Oil Range Organics (C20-C36)




Boxplots of Surface and Subsurface Background Soil Data




Notes:

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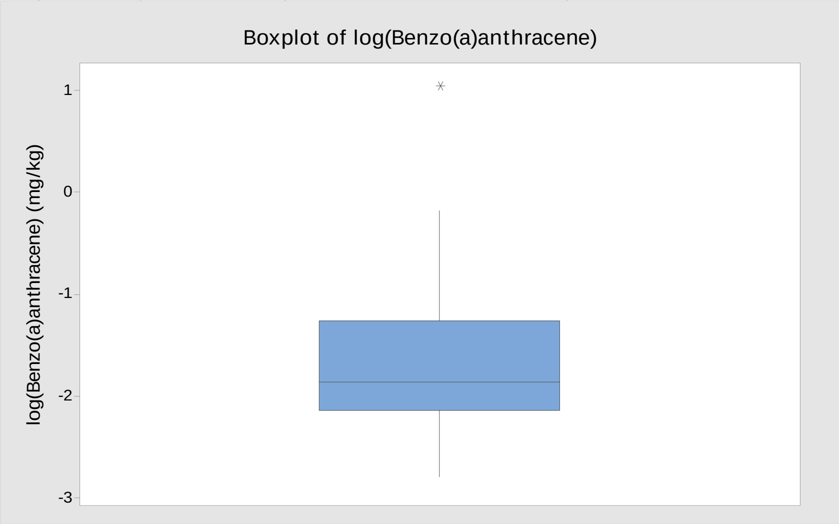
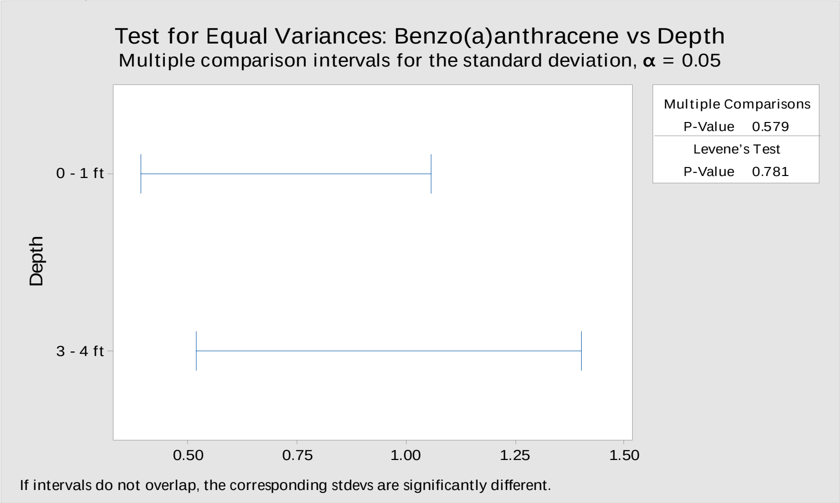
A log transformation was conducted and results in a normal distribution. The log-transformed data are presented in the boxplots and probability plots.

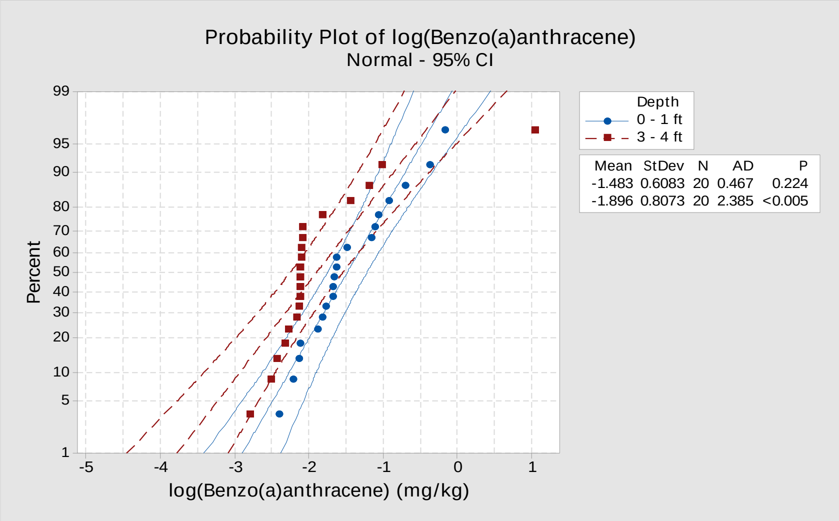
Boxplot of Background Soil Data (surface and subsurface combined)



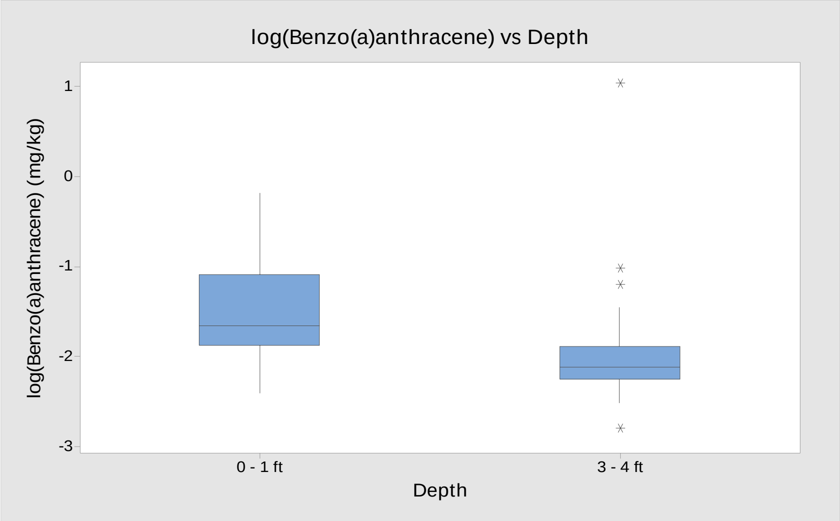

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Benzo(a)anthracene [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:

All graphs created in Minitab, Version 18.

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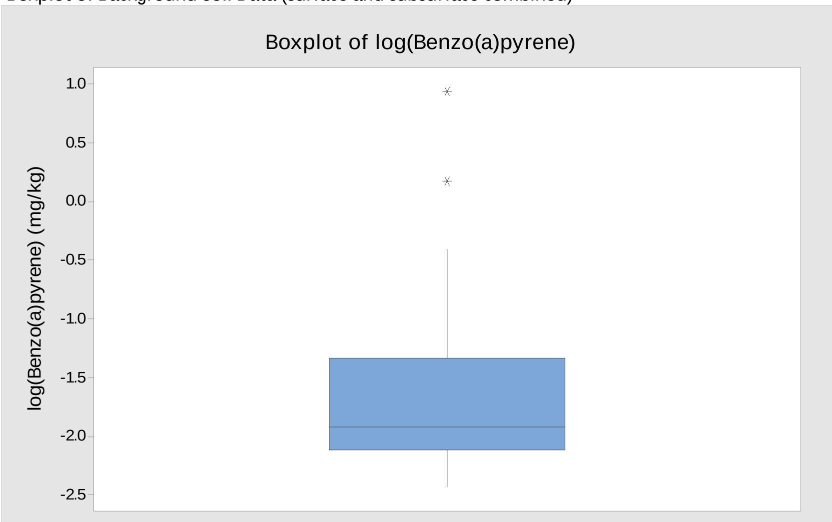
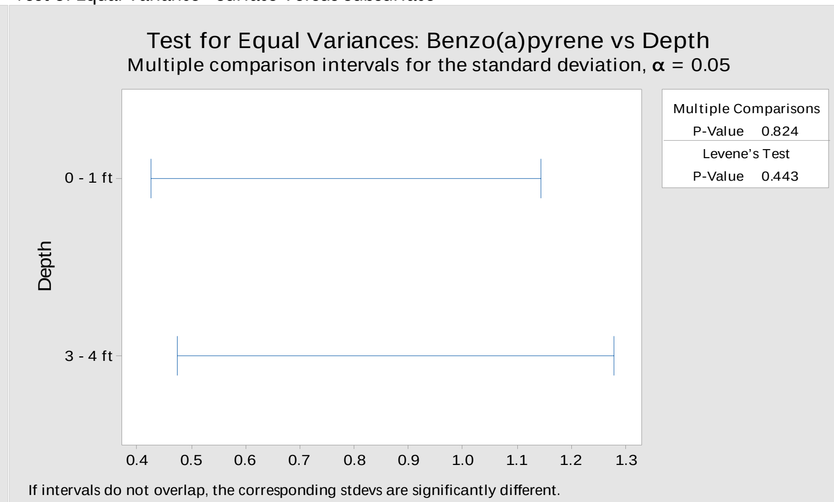
[a] The median surface and subsurface soil concentrations were found to be significantly different (p-value of 0.05) based on the non-parametric analysis of variance test.
Therefore, the probability plot displays the distribution of surface and subsurface separately.

A log transformation was conducted and results in approximate normal (surface) and no (subsurface) distributions.
The log-transformed data are presented in the boxplots and probability plots.

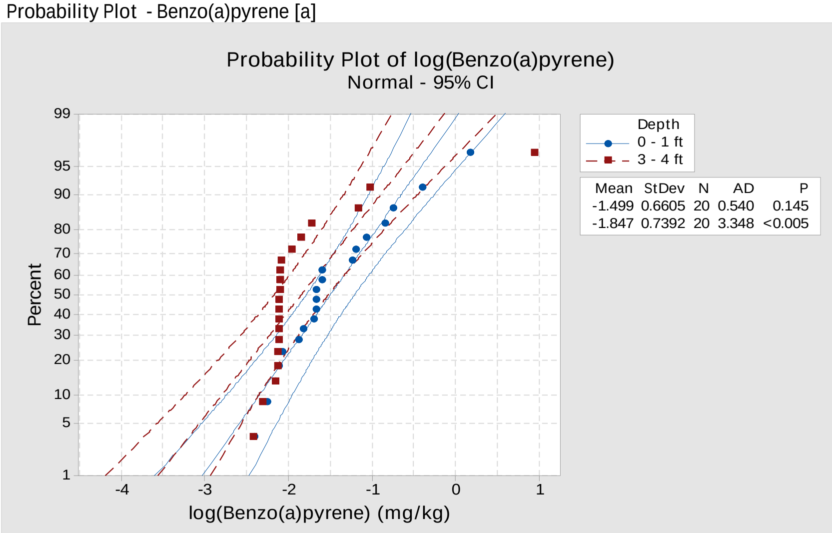
Boxplot of Background Soil Data (surface and subsurface combined)



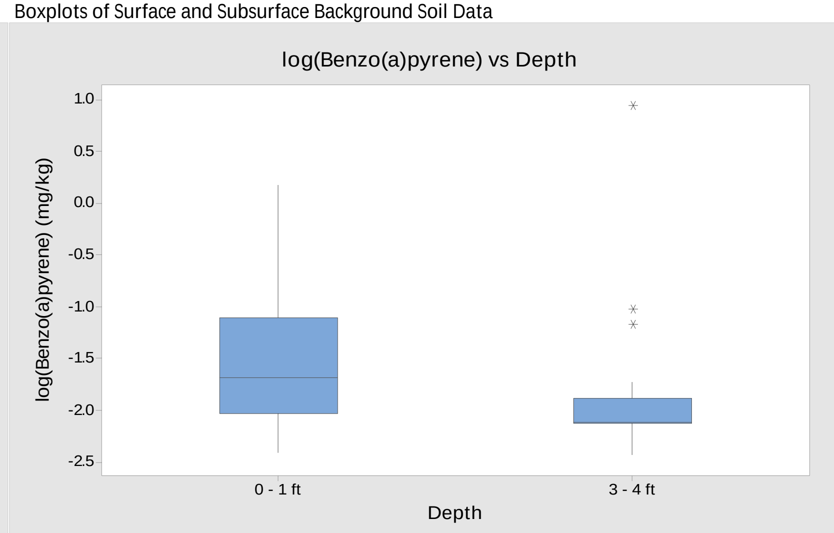

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Benzo(a)pyrene [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:

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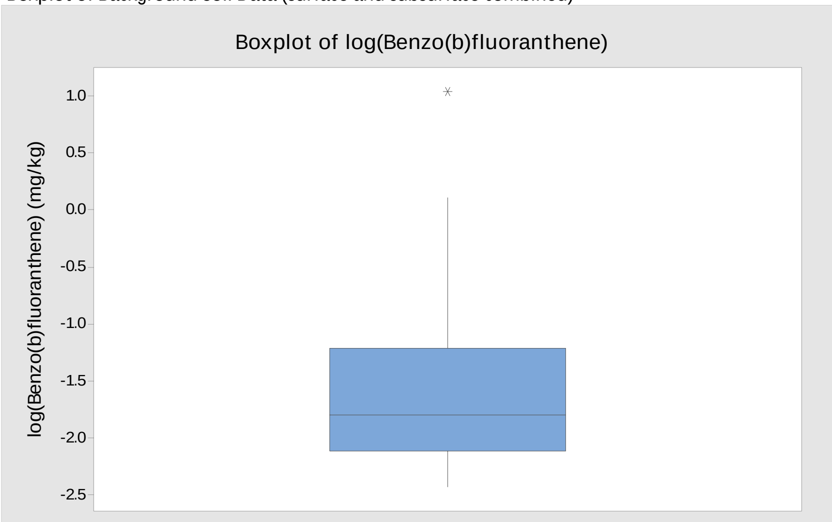
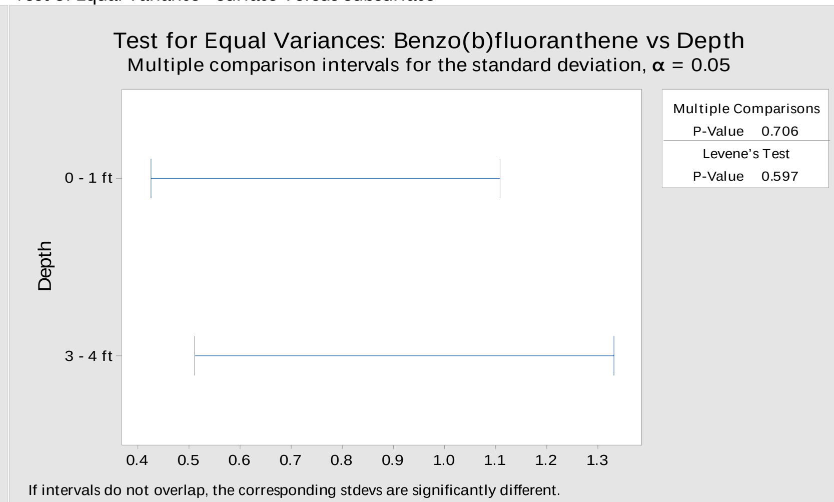
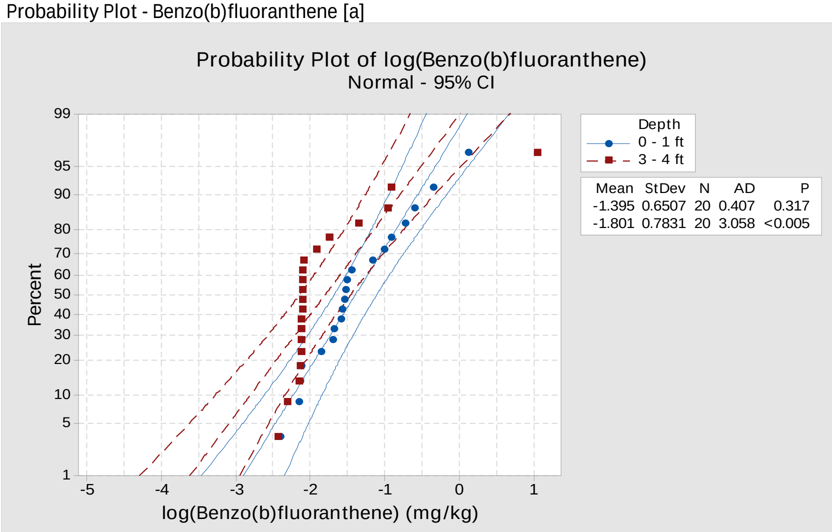
Boxplot of Background Soil Data (surface and subsurface combined)



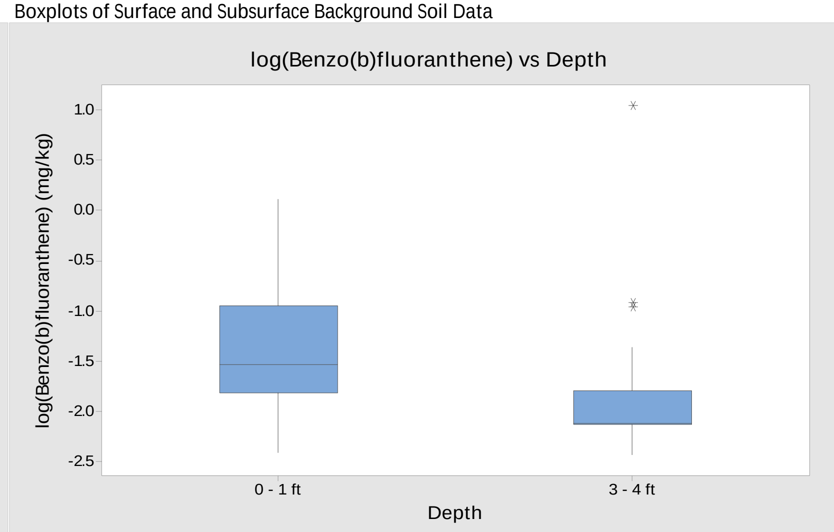

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Benzo(b)fluoranthene [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:

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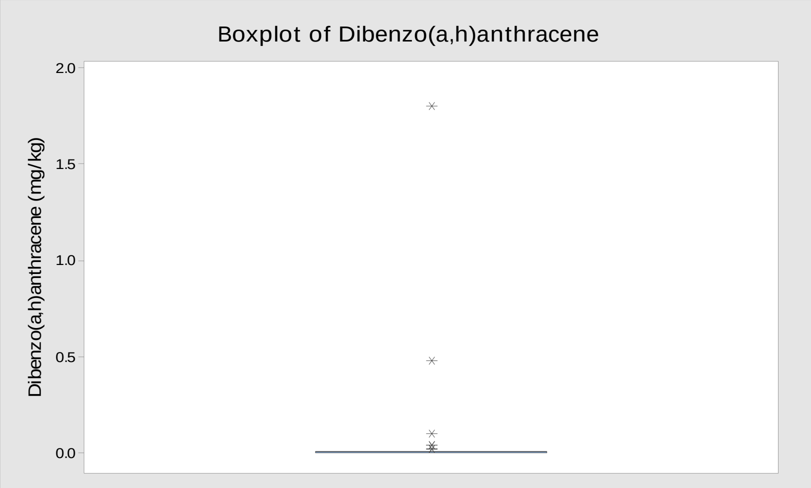
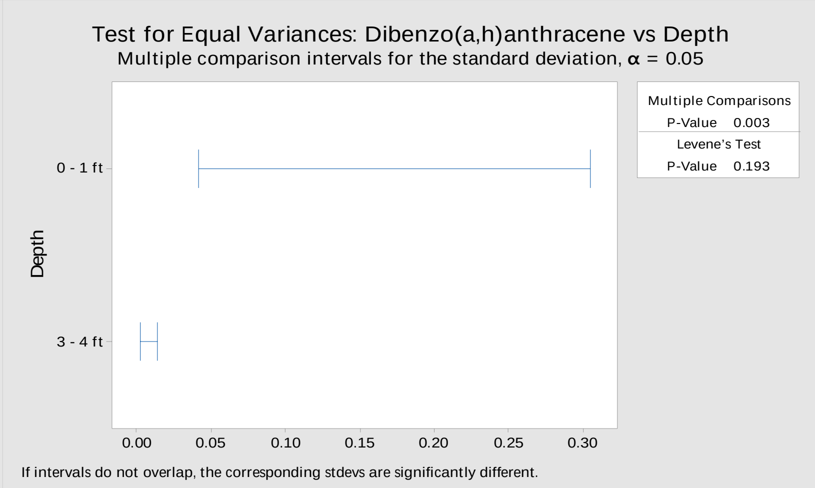
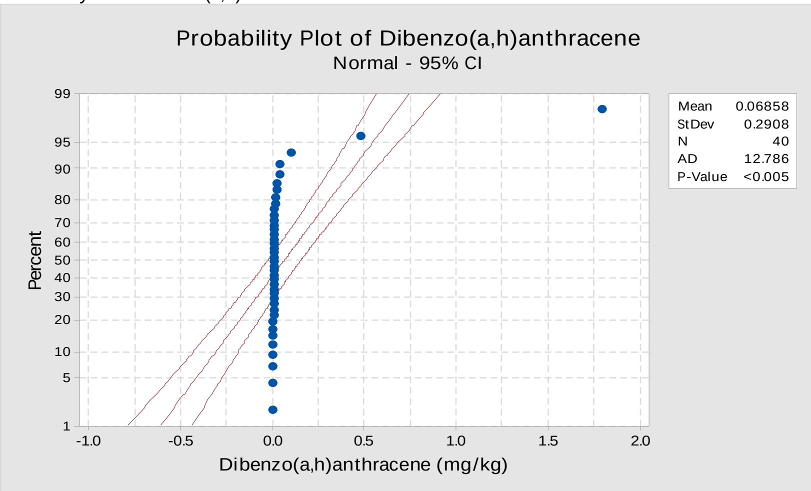
Boxplot of Background Soil Data (surface and subsurface combined)



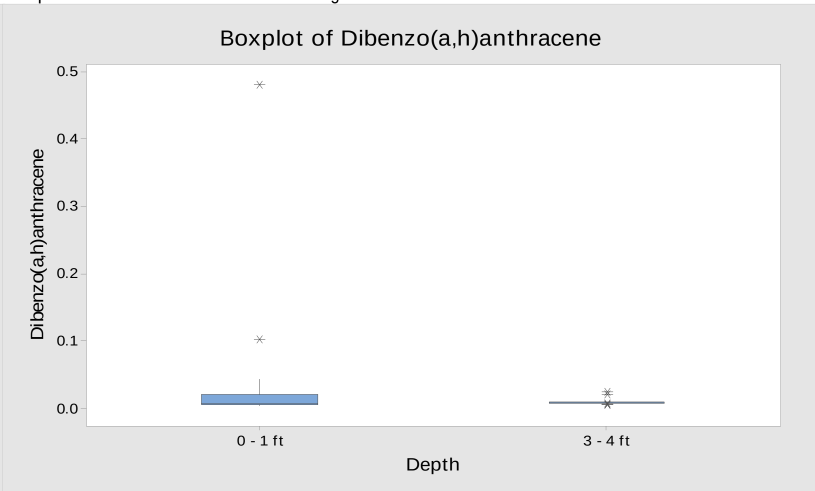

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Dibenzo(a,h)anthracene




Boxplots of Surface and Subsurface Background Soil Data




Notes:

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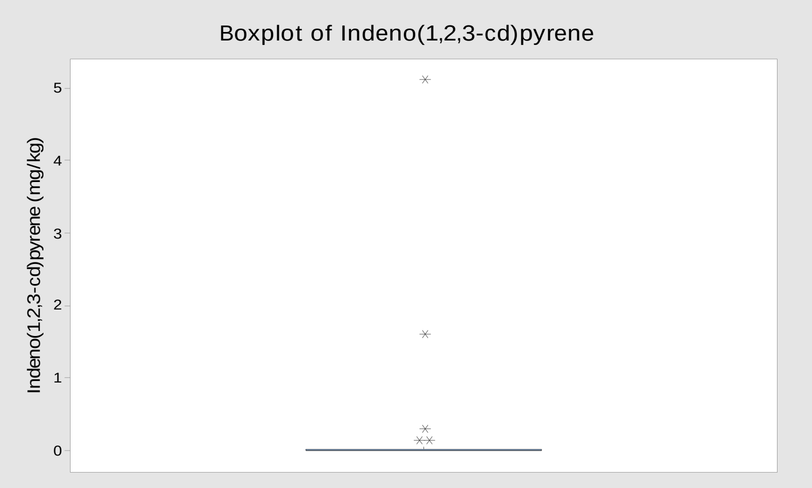
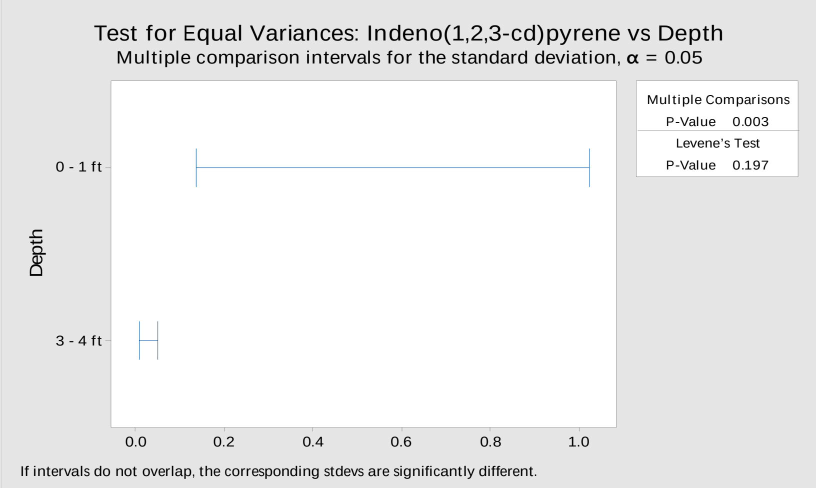
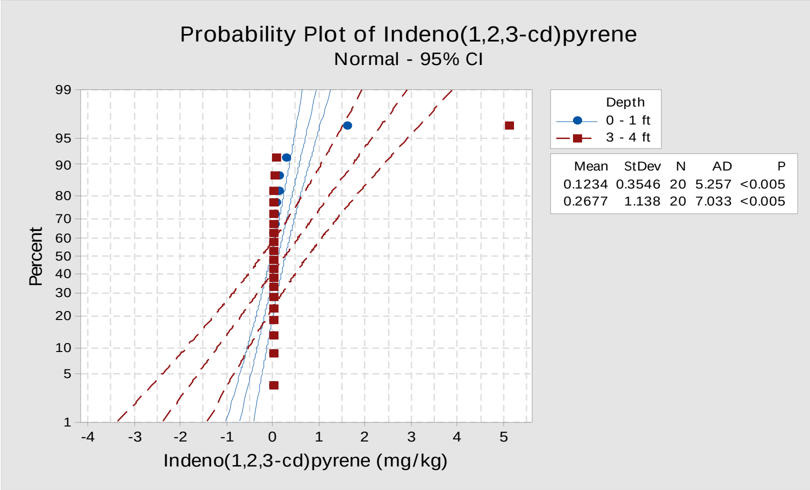
Boxplot of Background Soil Data (surface and subsurface combined)



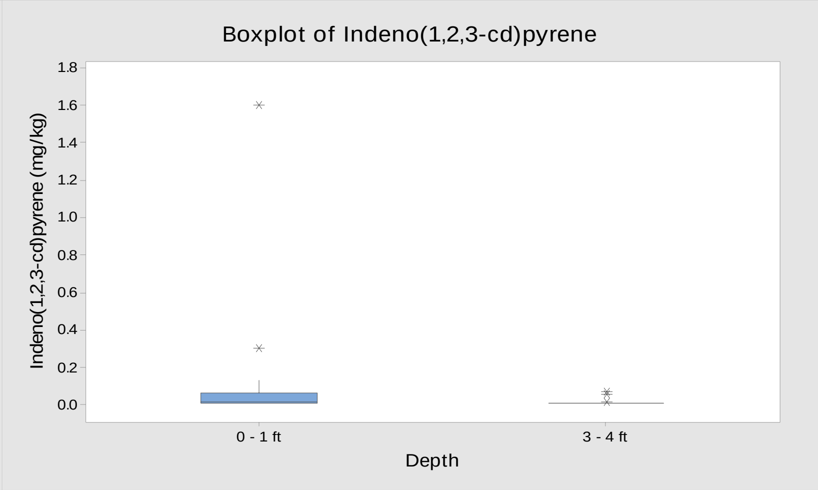

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Indeno(1,2,3-cd)pyrene [a]




Boxplots of Surface and Subsurface Background Soil Data




Notes:
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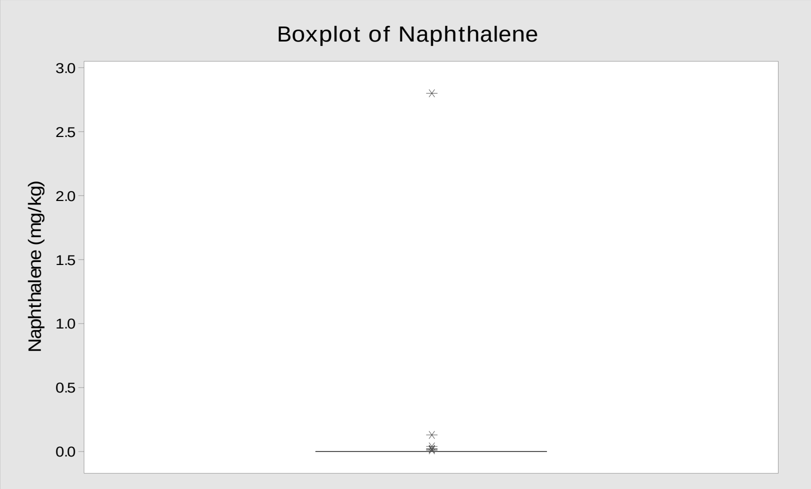
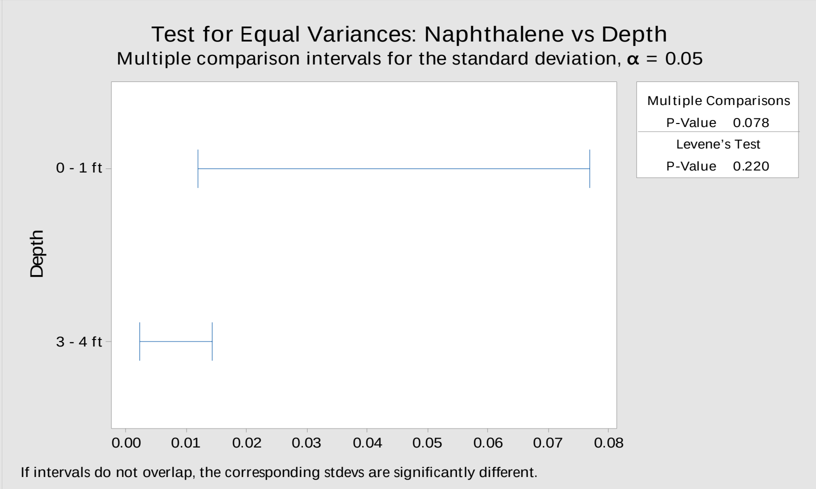
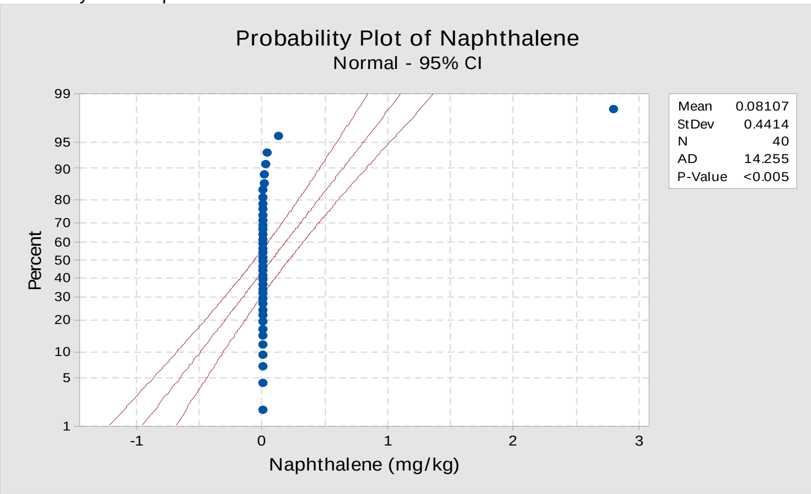
Boxplot of Background Soil Data (surface and subsurface combined)



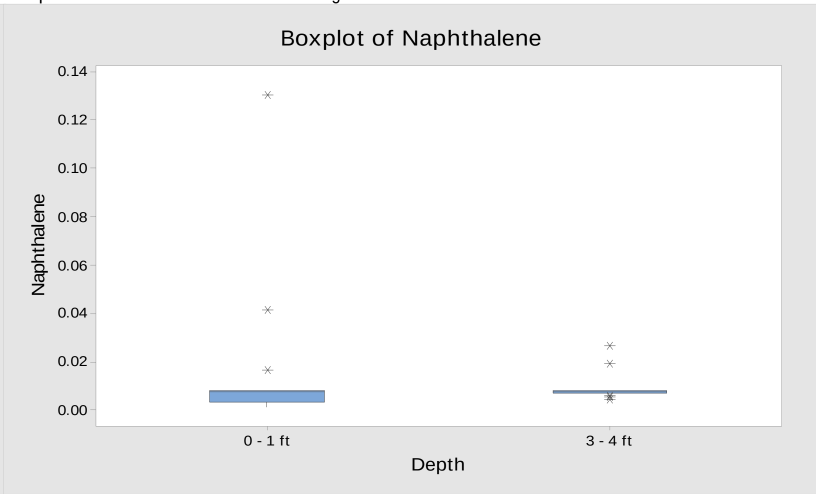

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - Naphthalene




Boxplots of Surface and Subsurface Background Soil Data

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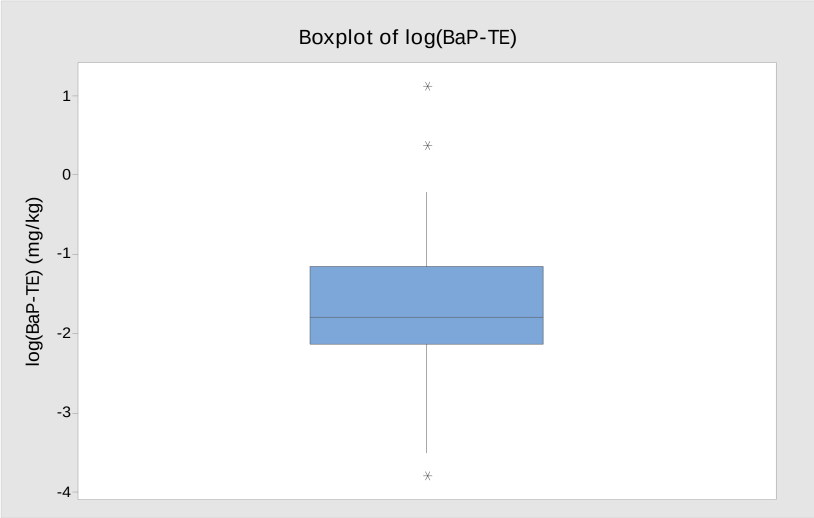
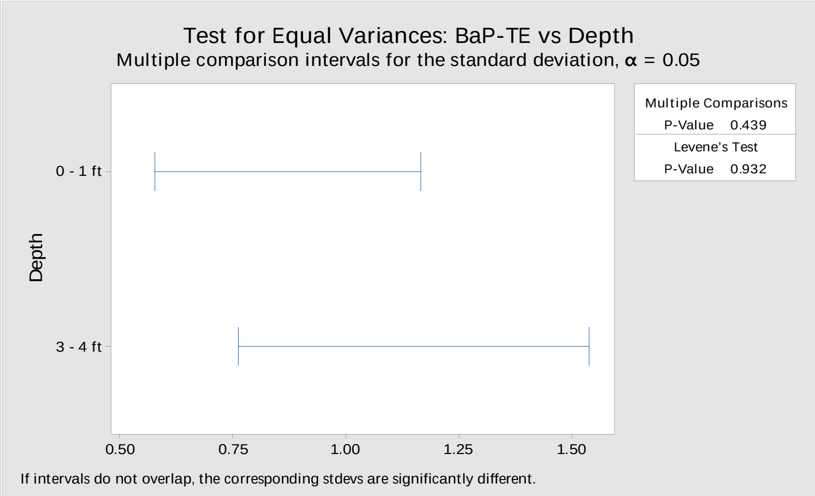
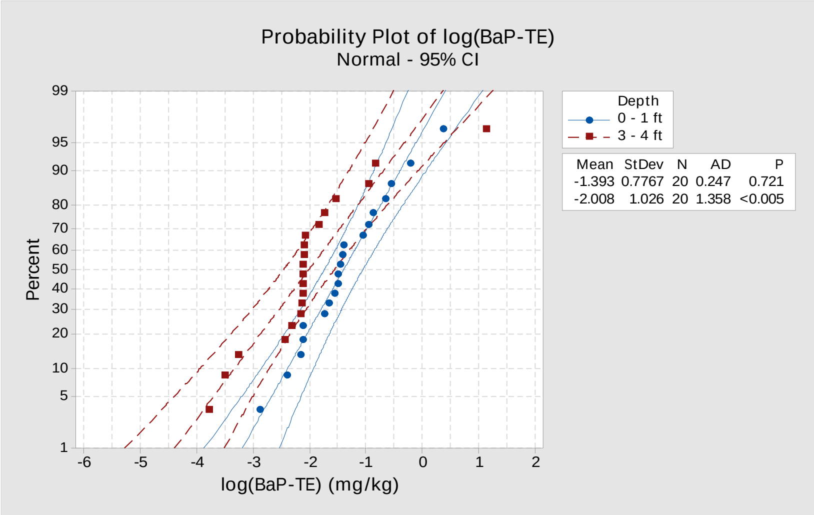
Boxplot of Background Soil Data (surface and subsurface combined)



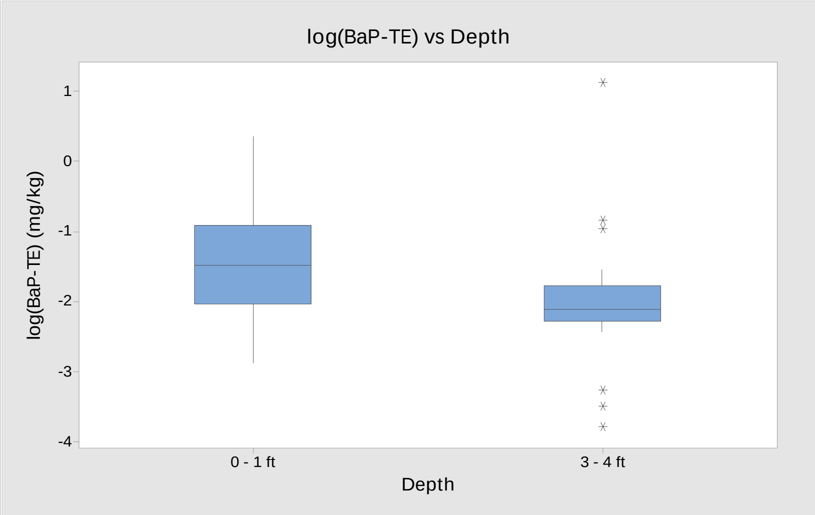

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - BAP-TE [a]




Boxplots of Surface and Subsurface Background Soil Data

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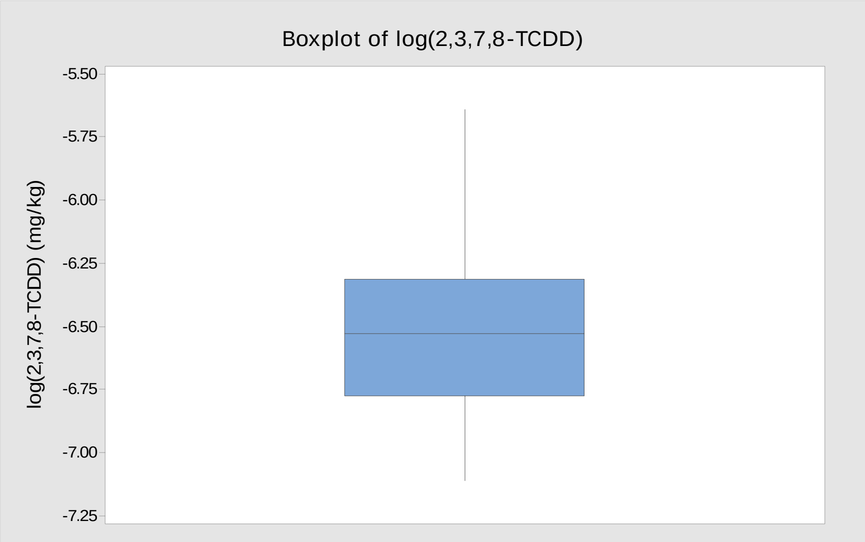
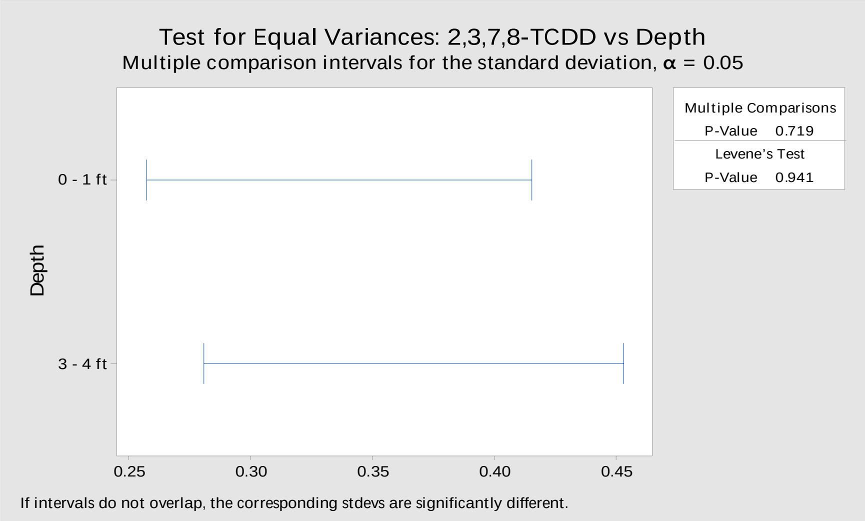
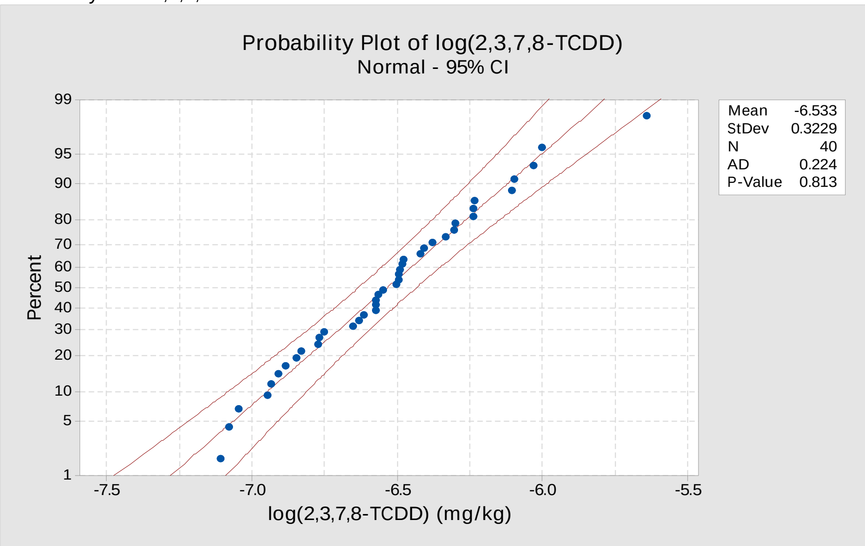
Boxplot of Background Soil Data (surface and subsurface combined)



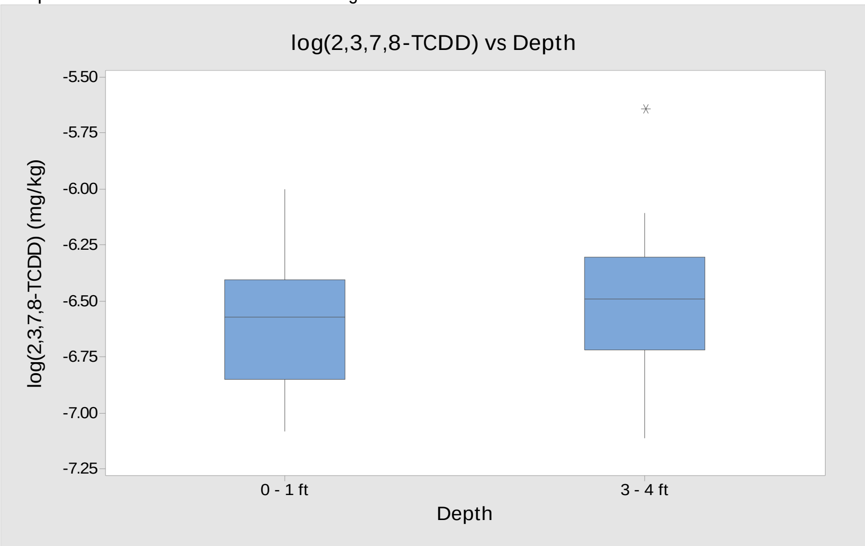

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - 2,3,7,8-TCDD




Boxplots of Surface and Subsurface Background Soil Data

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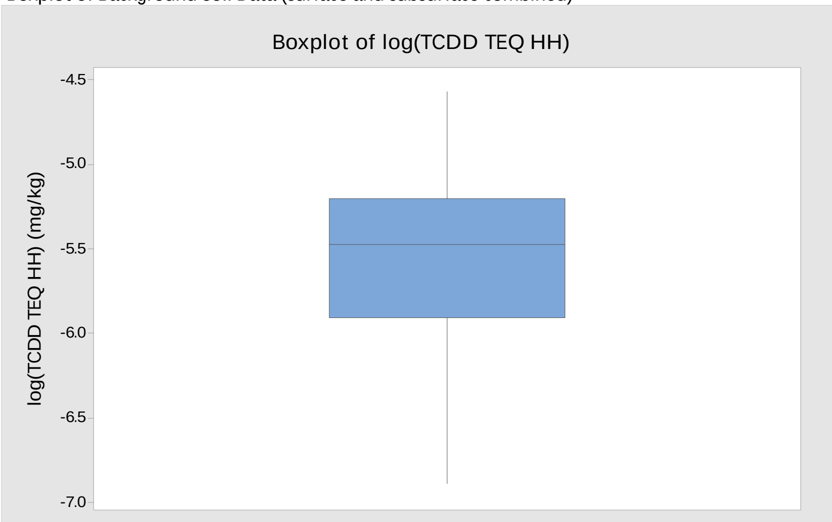
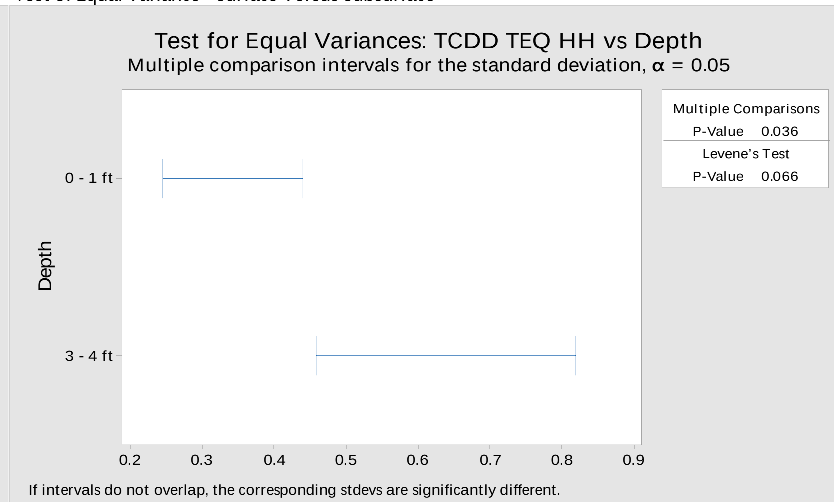
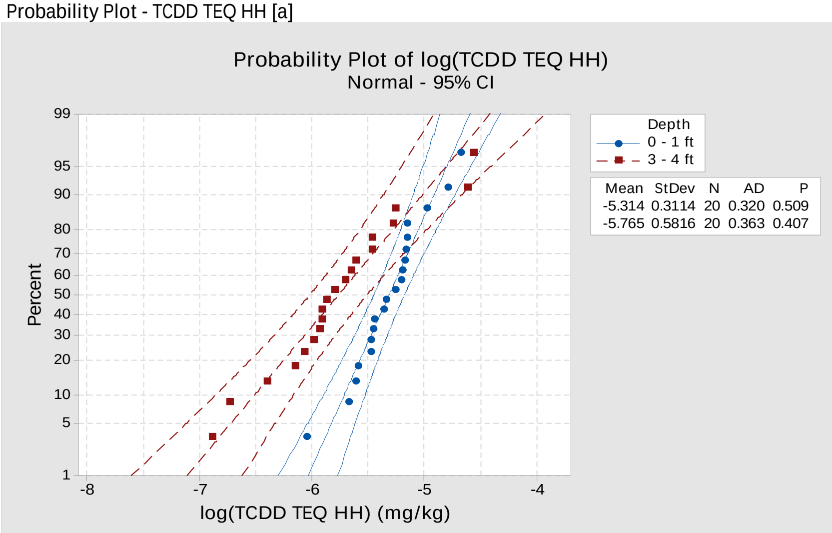
Boxplot of Background Soil Data (surface and subsurface combined)



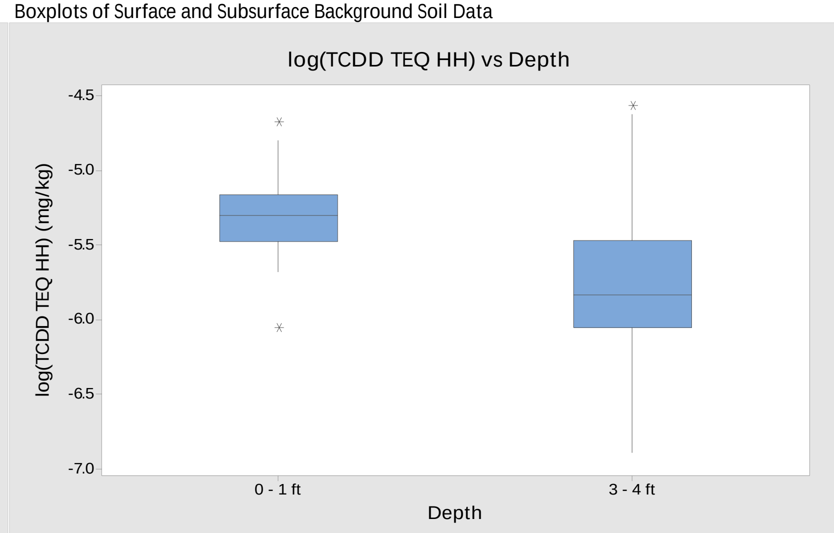

Test of Equal Variance - Surface Versus Subsurface




Probability Plot - TCDD TEQ HH [a]




Boxplots of Surface and Subsurface Background Soil Data

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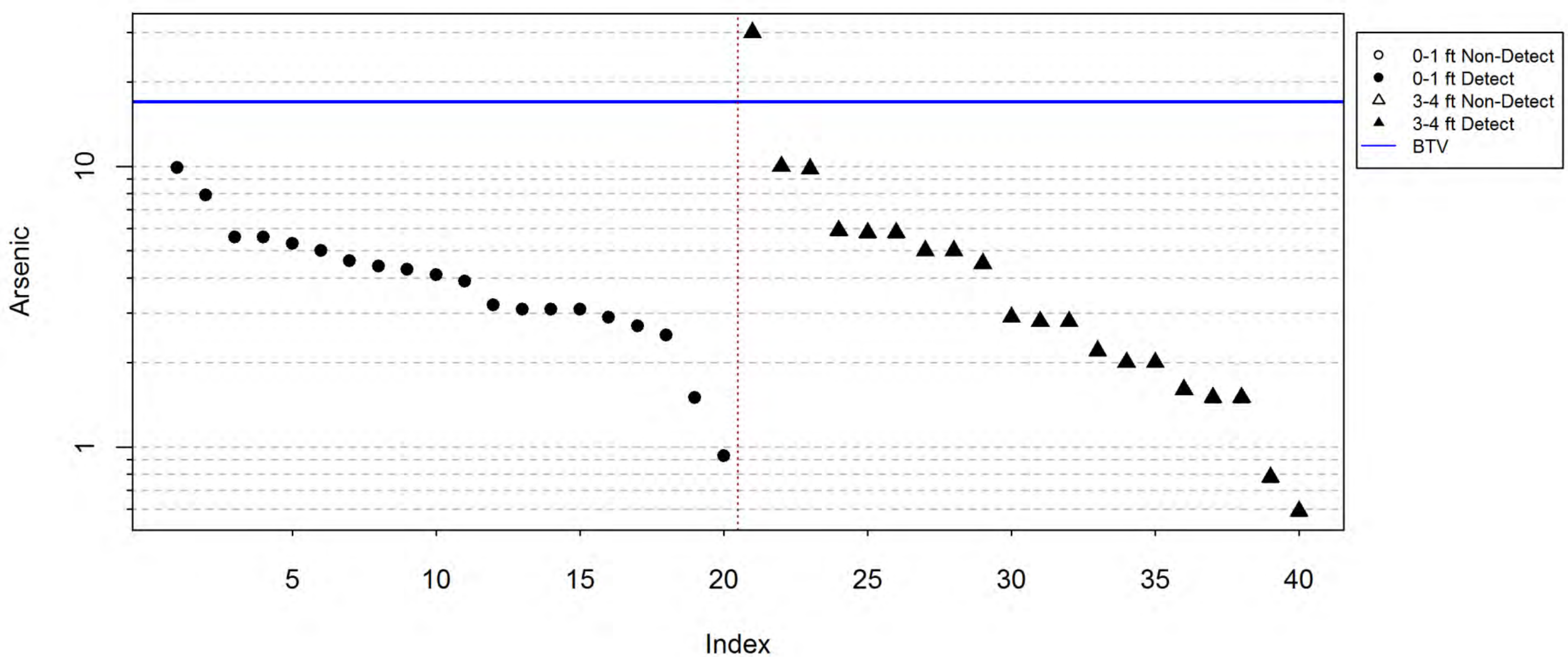
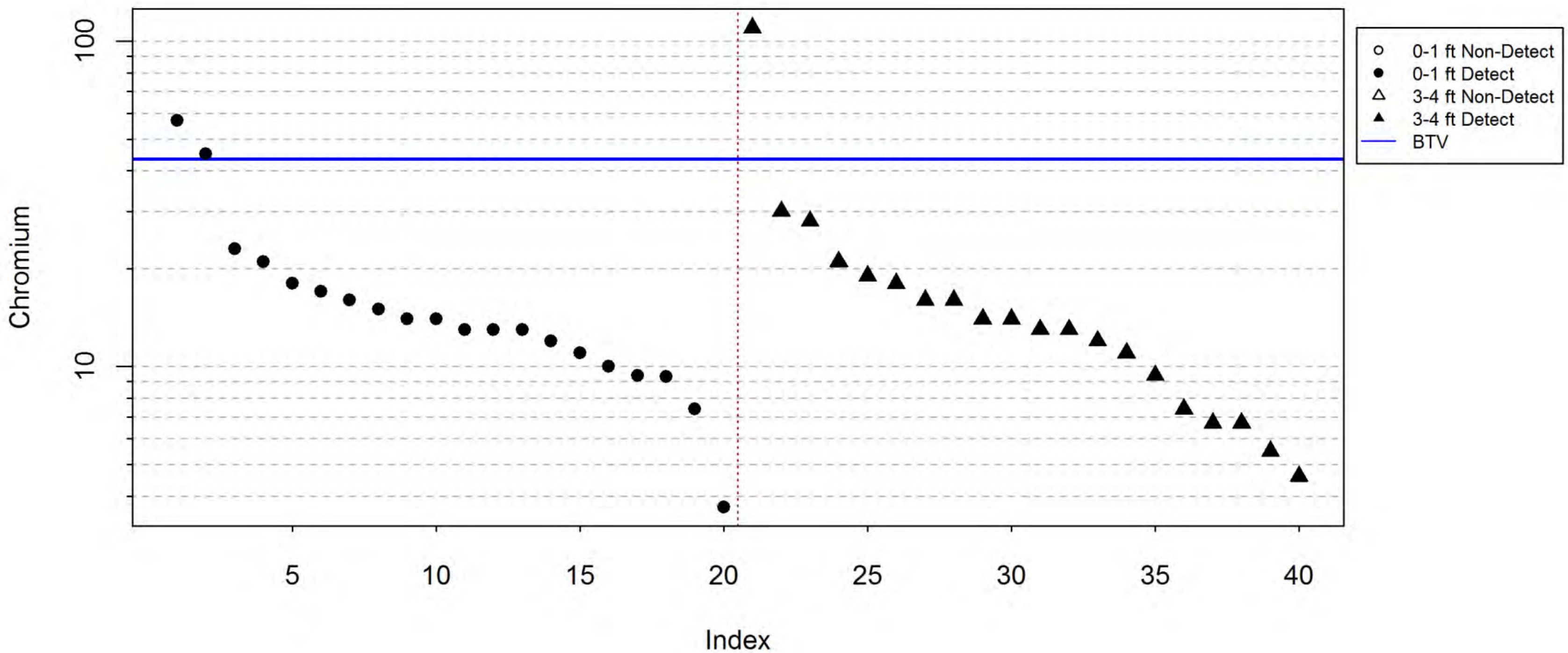
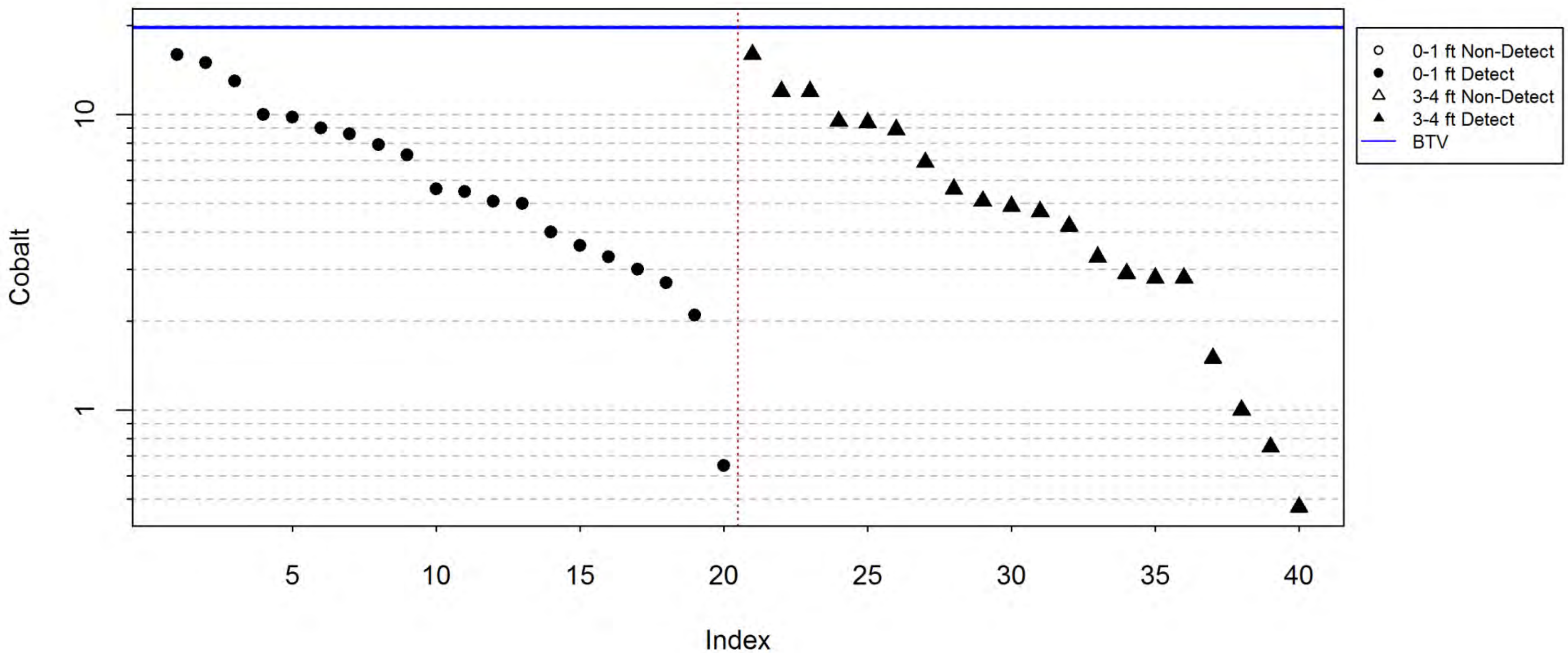
**Index Plots of BTVs and Background Soil Datasets**



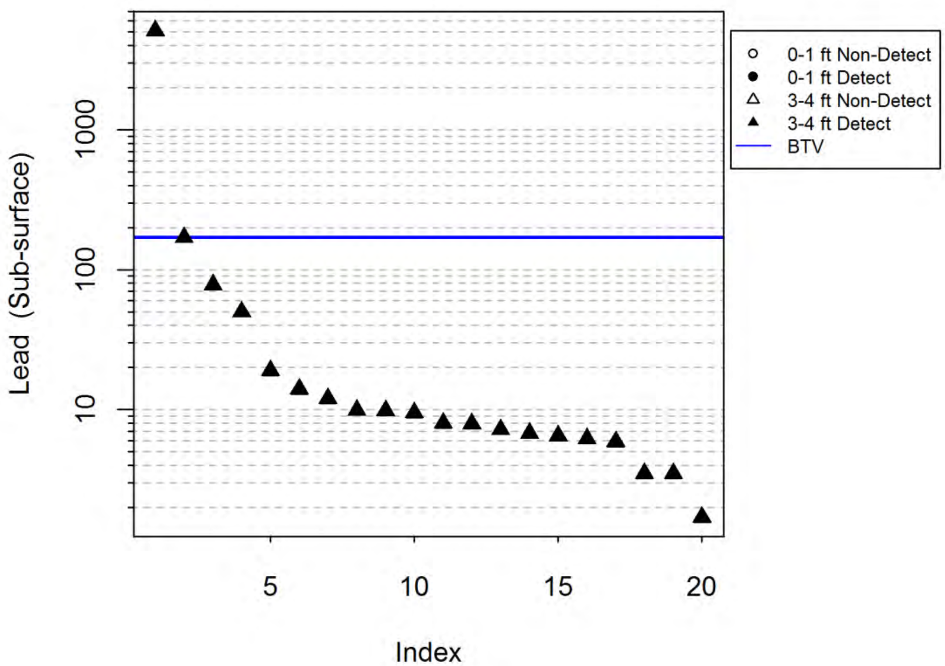

Concentrations in milligrams/kilogram (mg/kg).

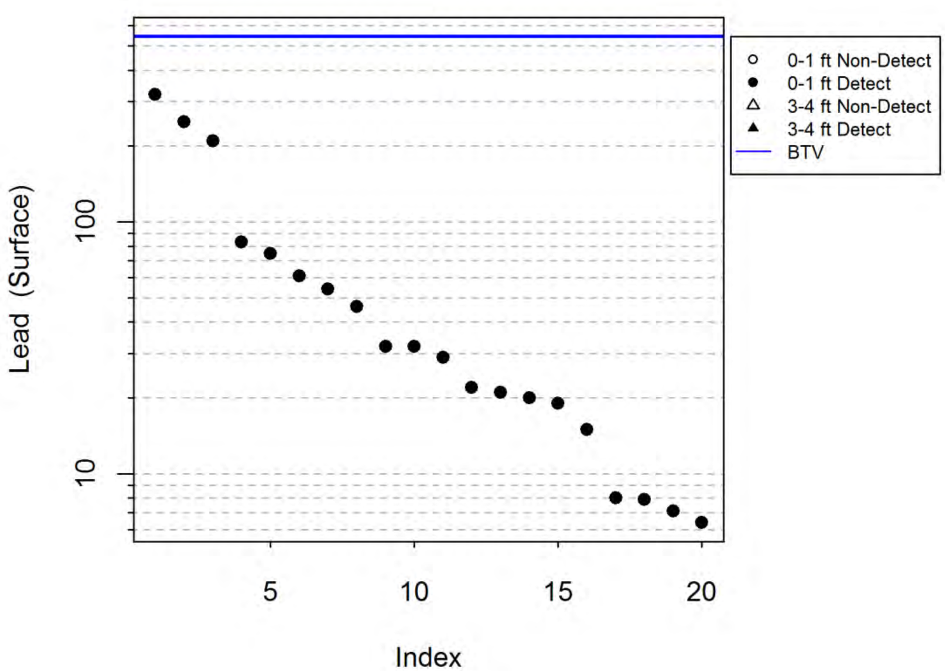



Concentrations in milligrams/kilogram (mg/kg).

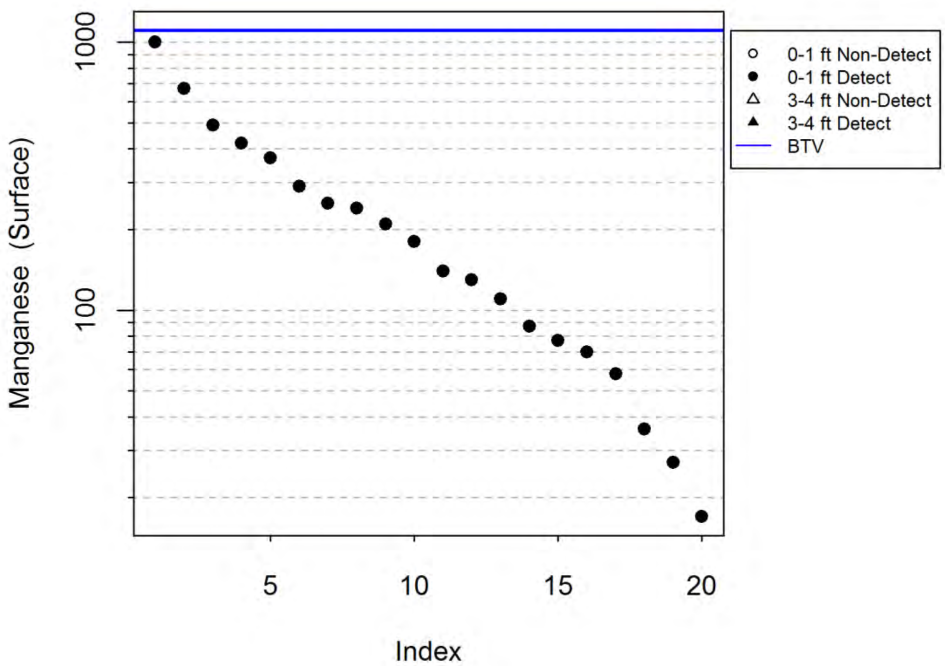


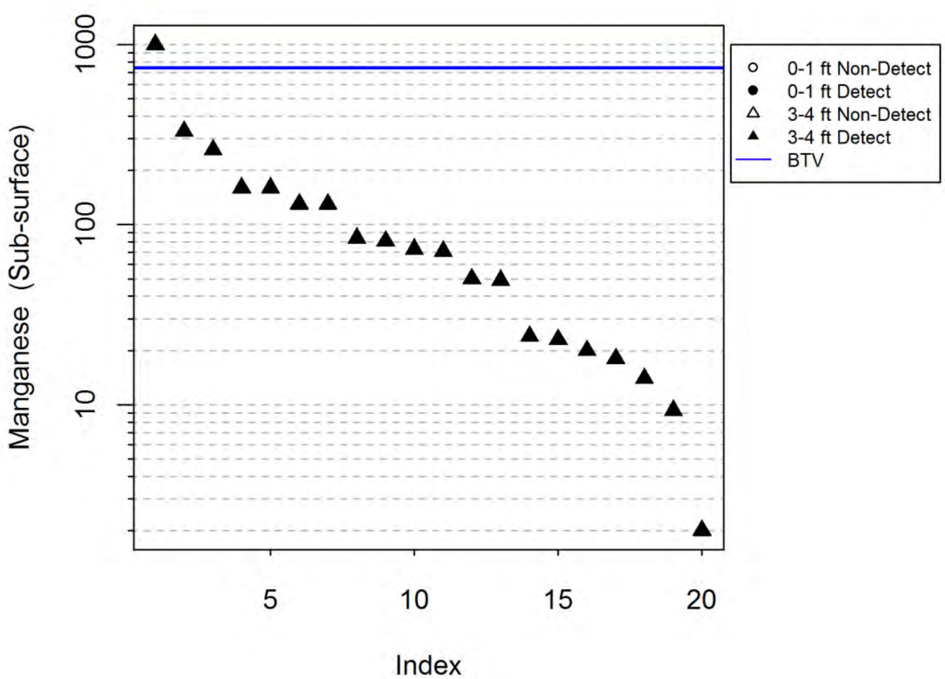

Concentrations in milligrams/kilogram (mg/kg).



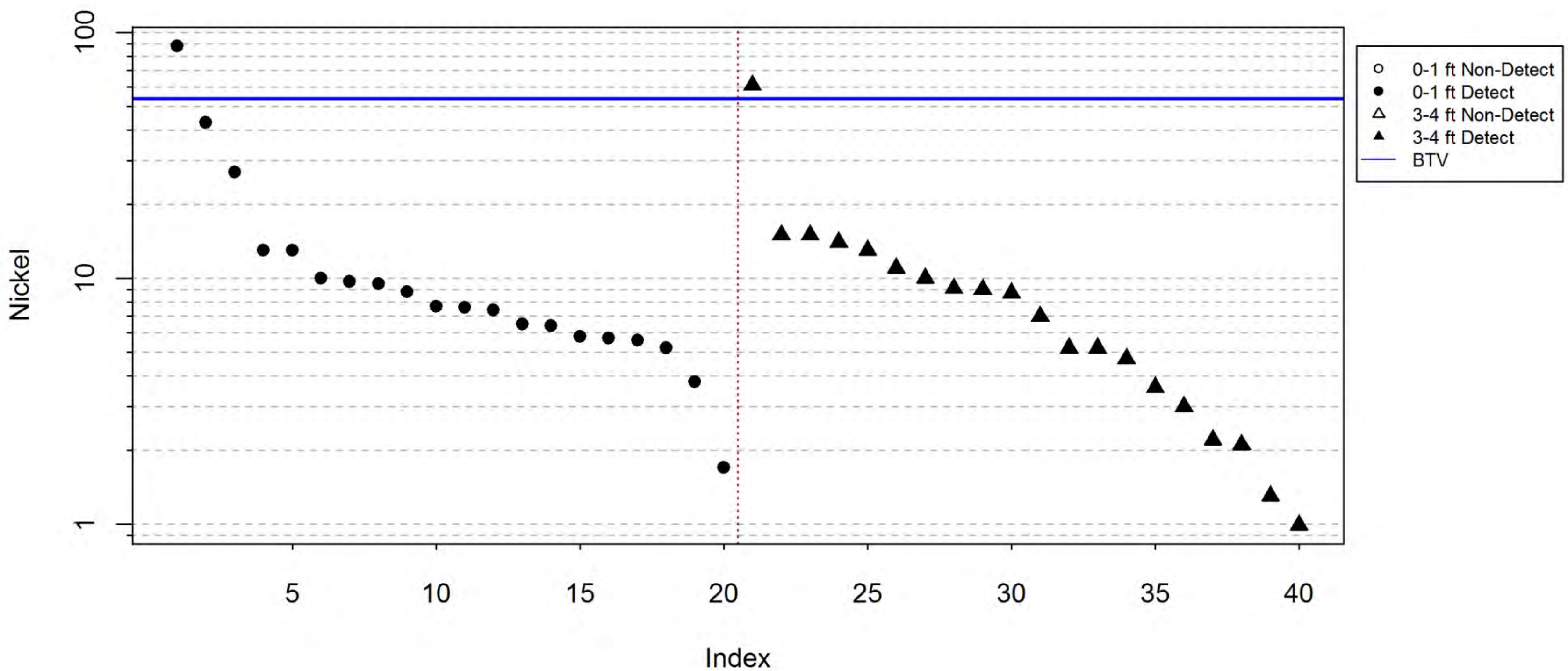




Concentrations in milligrams/kilogram (mg/kg).

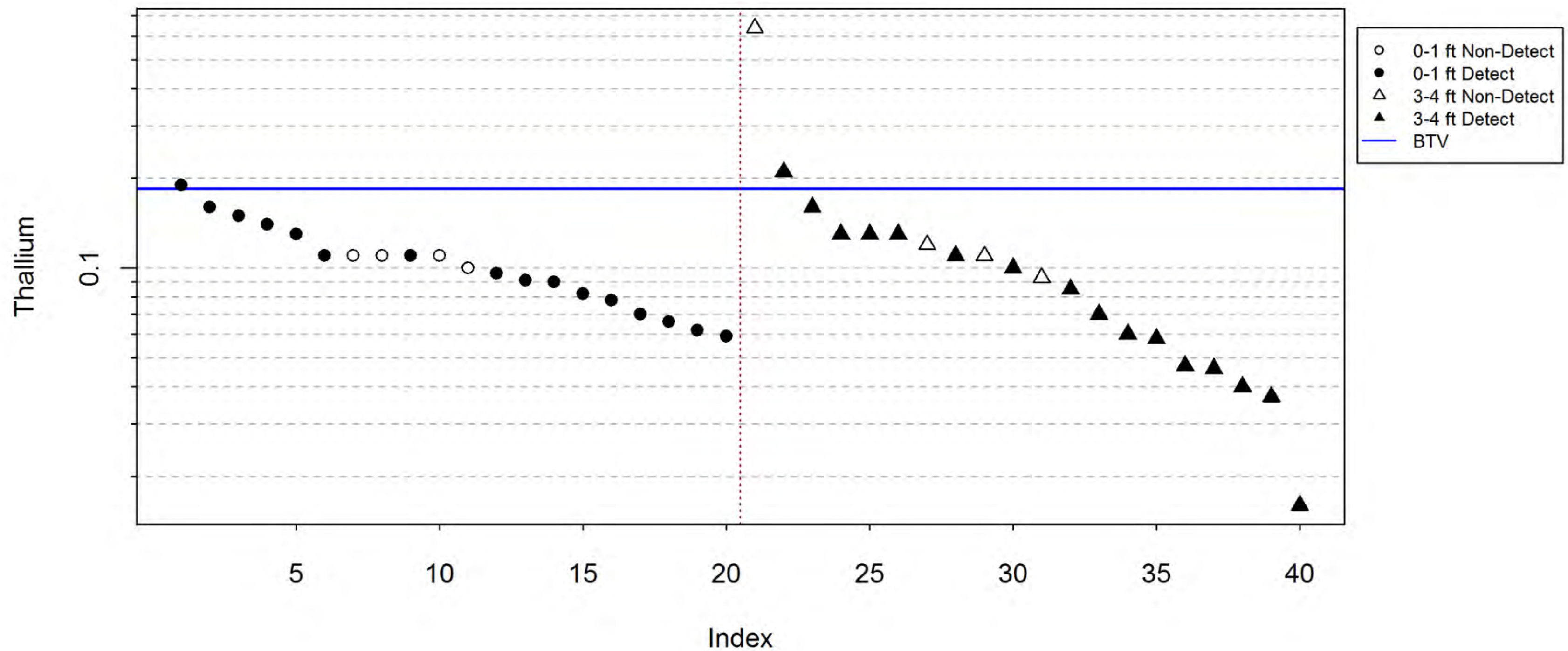


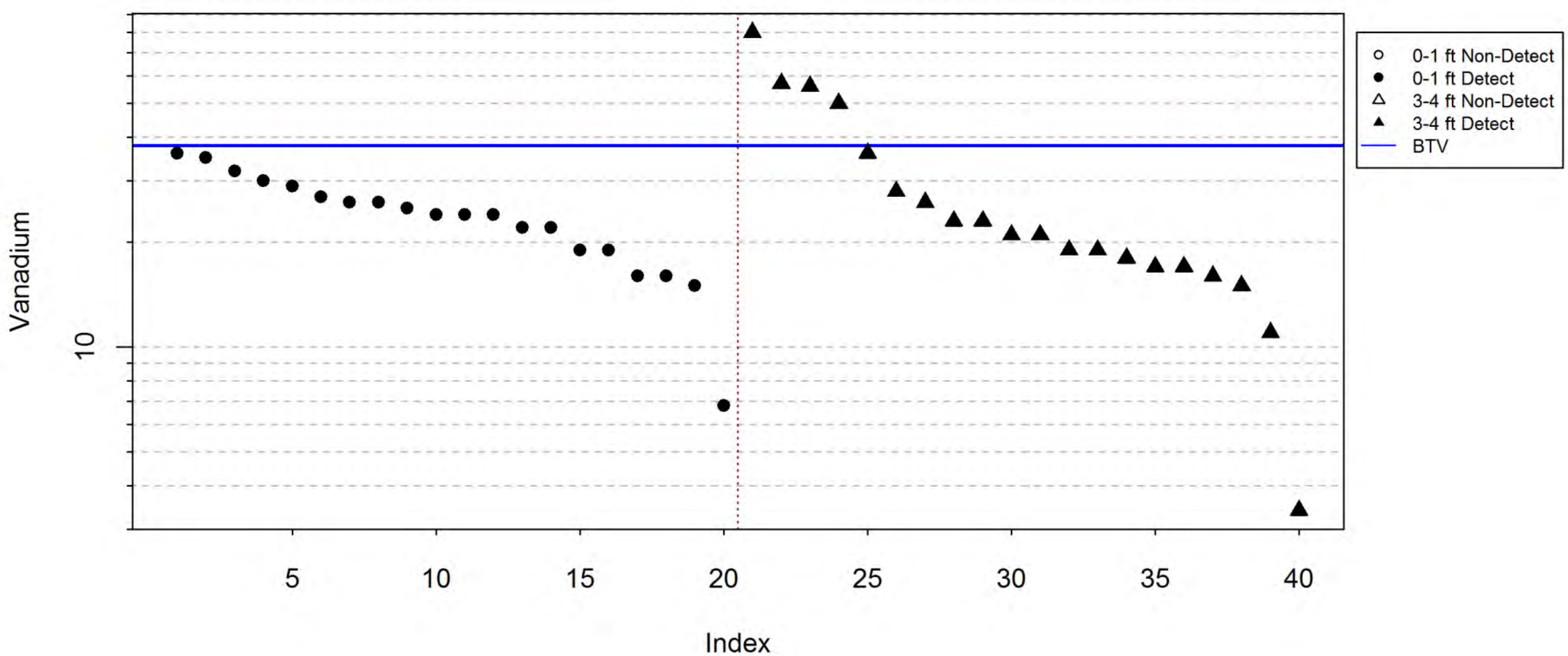

Concentrations in milligrams/kilogram (mg/kg).



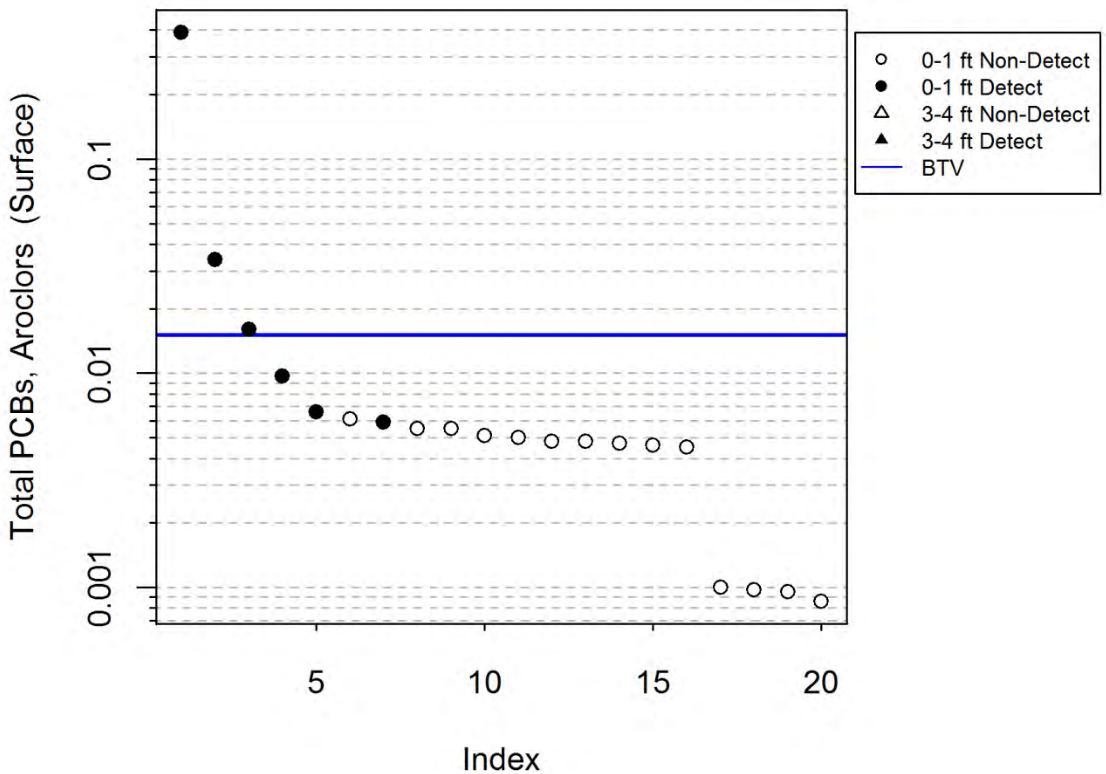

Concentrations in milligrams/kilogram (mg/kg).



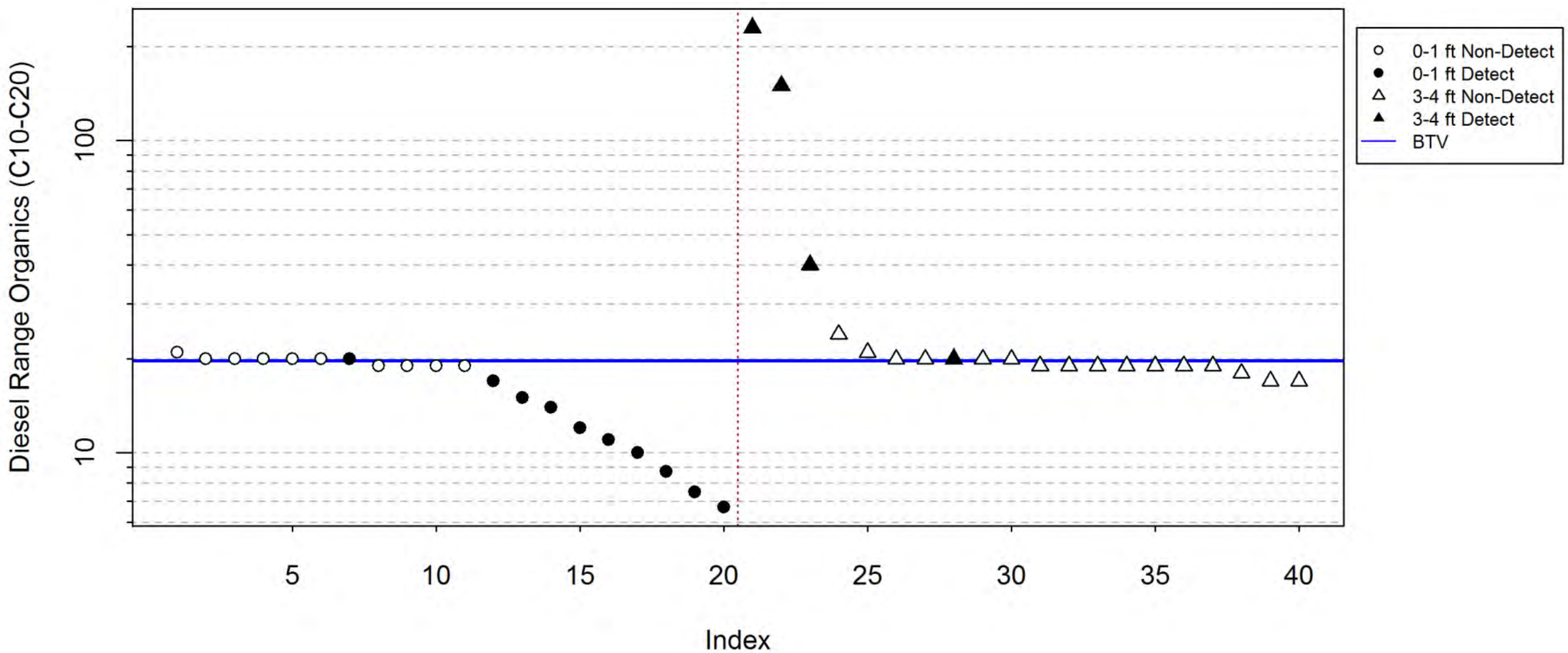

Concentrations in milligrams/kilogram (mg/kg).




Concentrations in milligrams/kilogram (mg/kg).




Concentrations in milligrams/kilogram (mg/kg).

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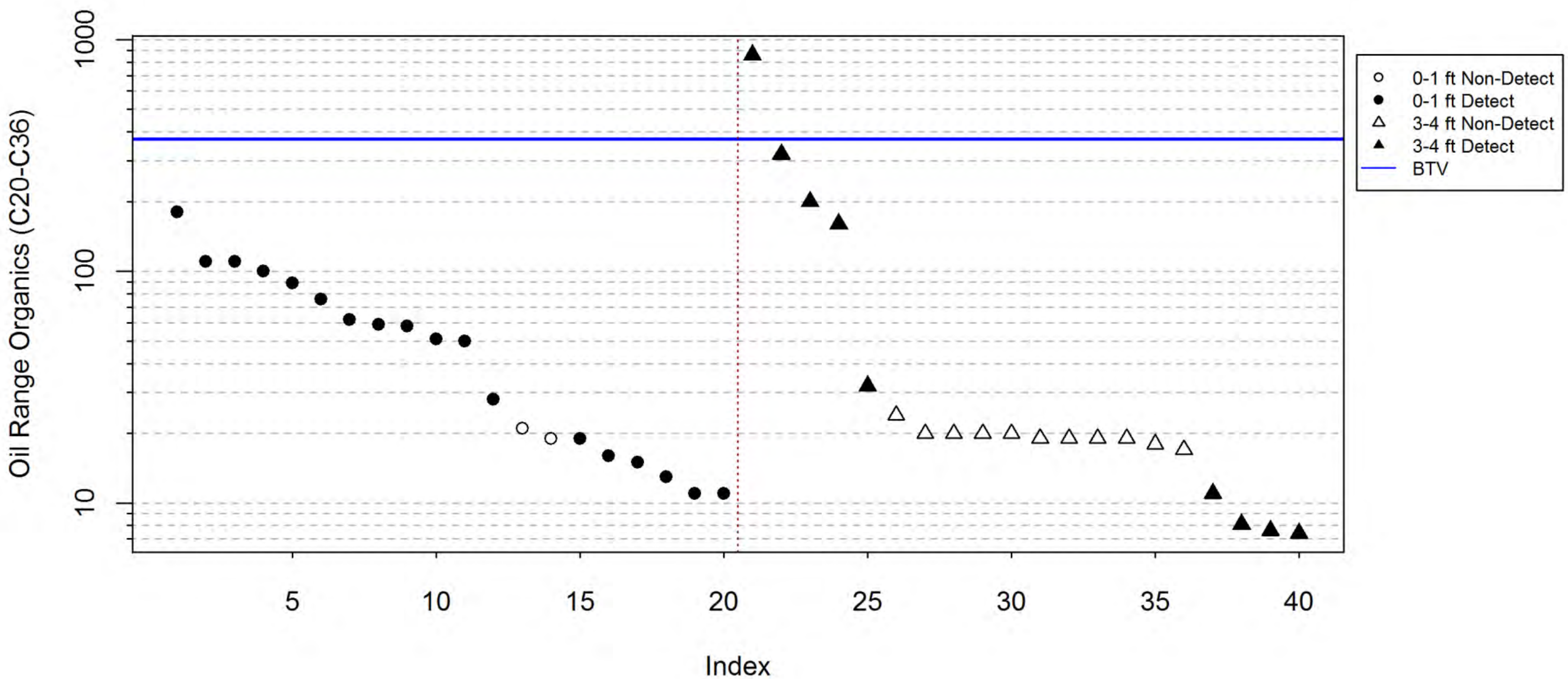


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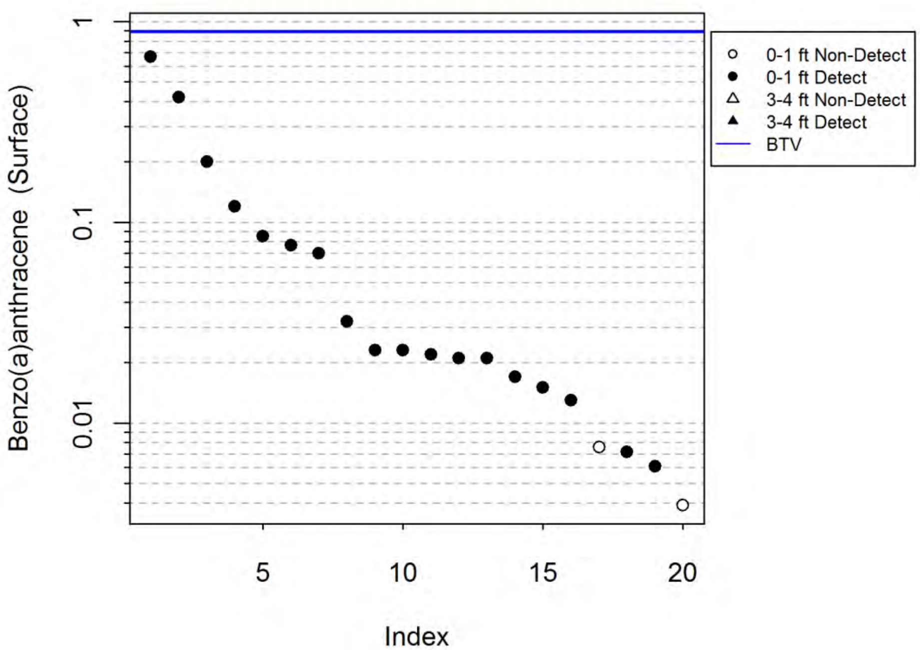
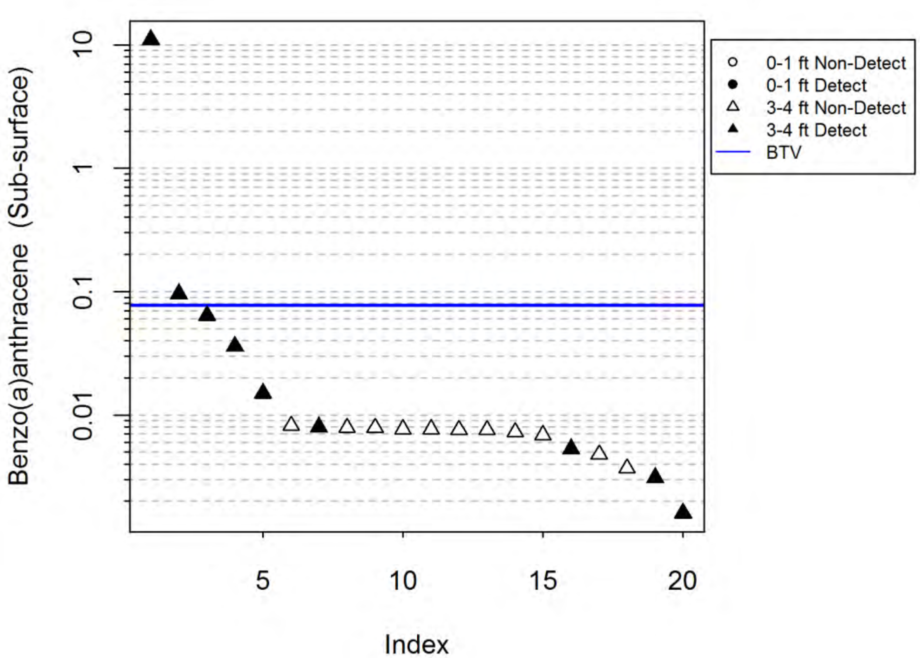
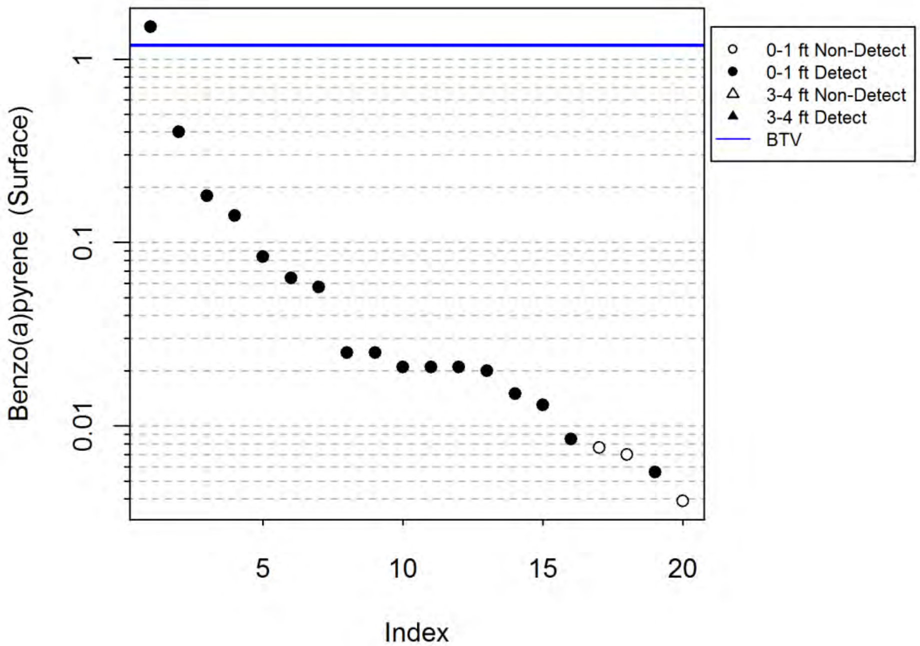
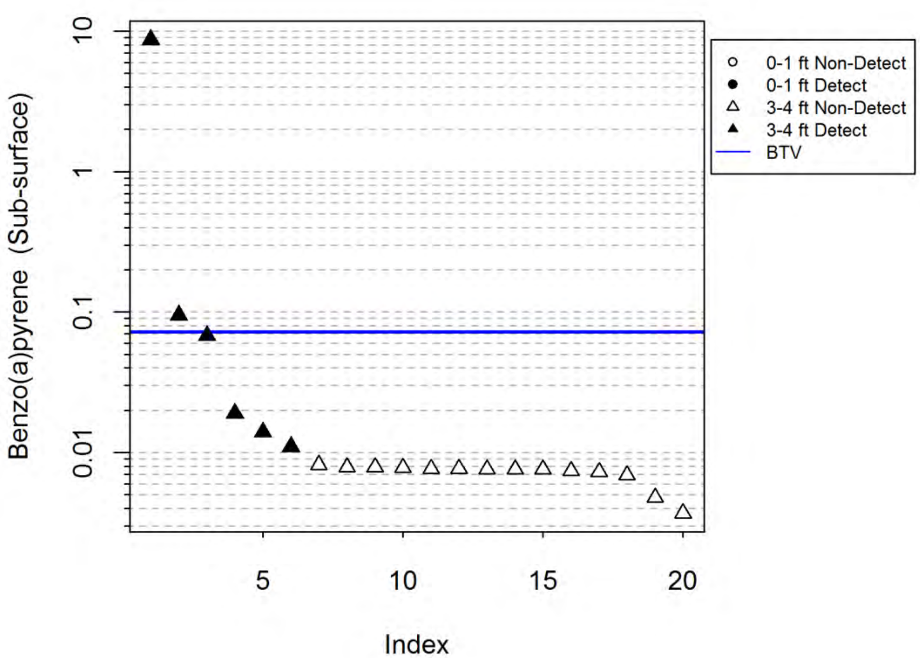


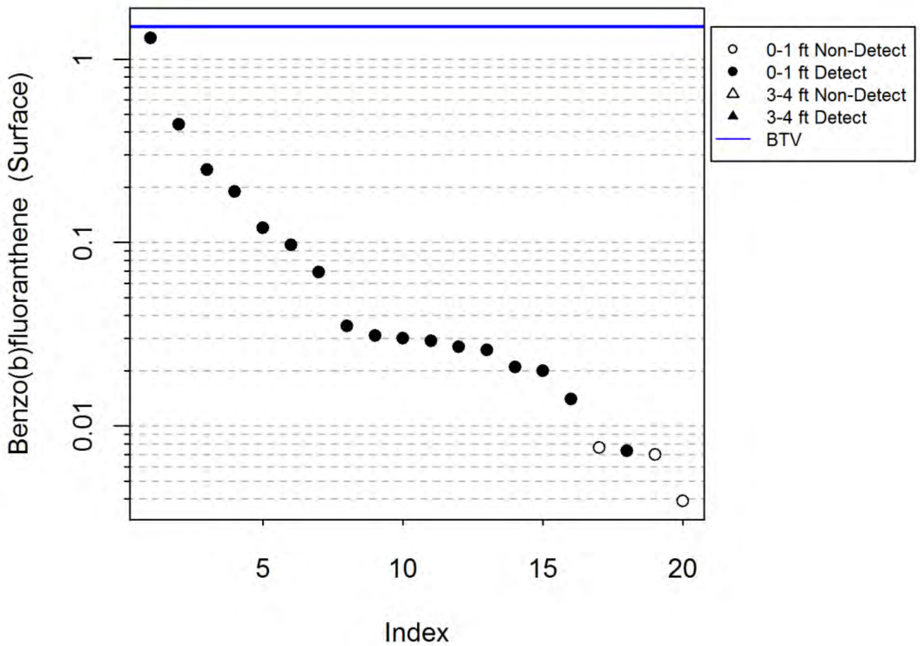



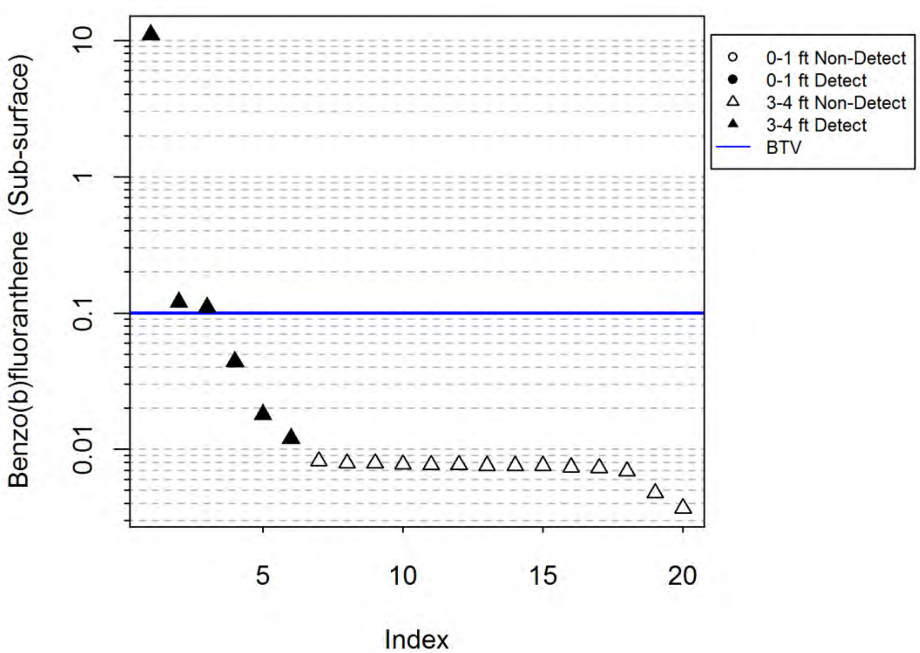

Concentrations in milligrams/kilogram (mg/kg).

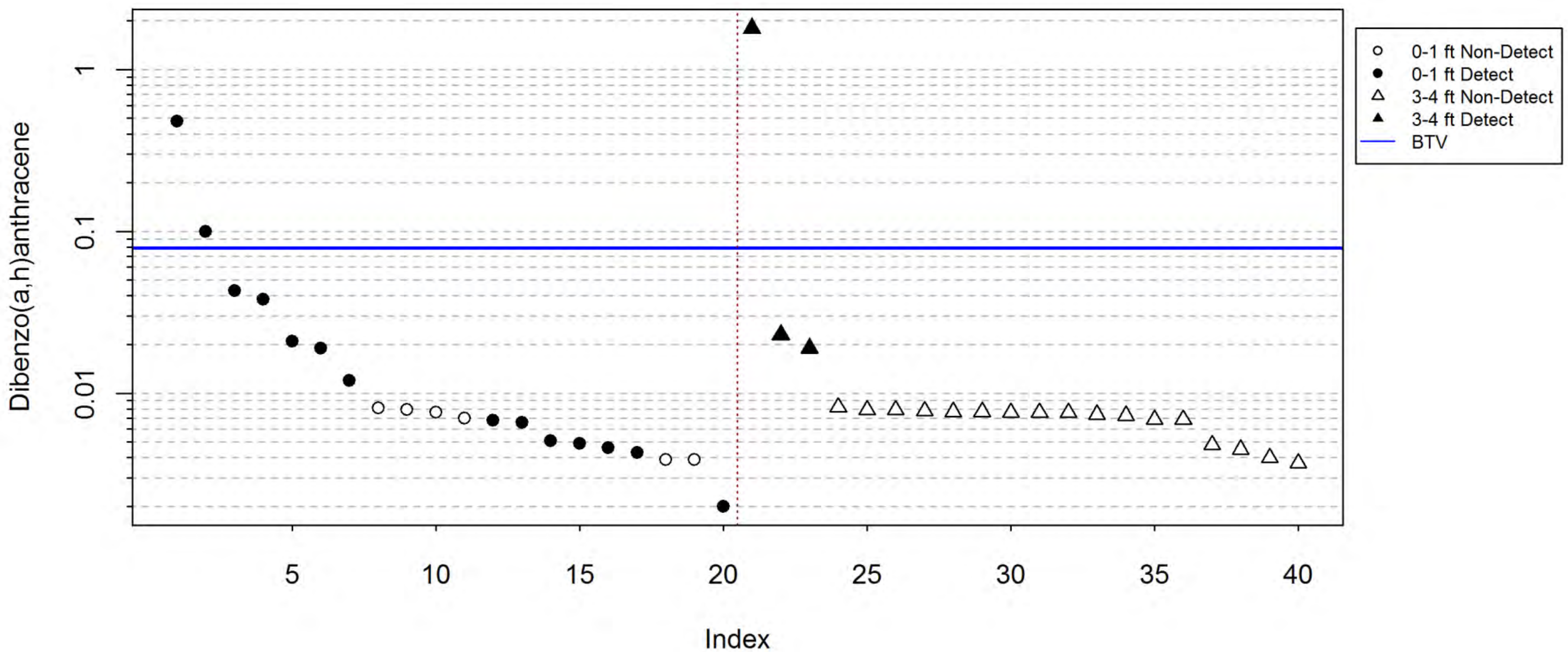



Concentrations in milligrams/kilogram (mg/kg).

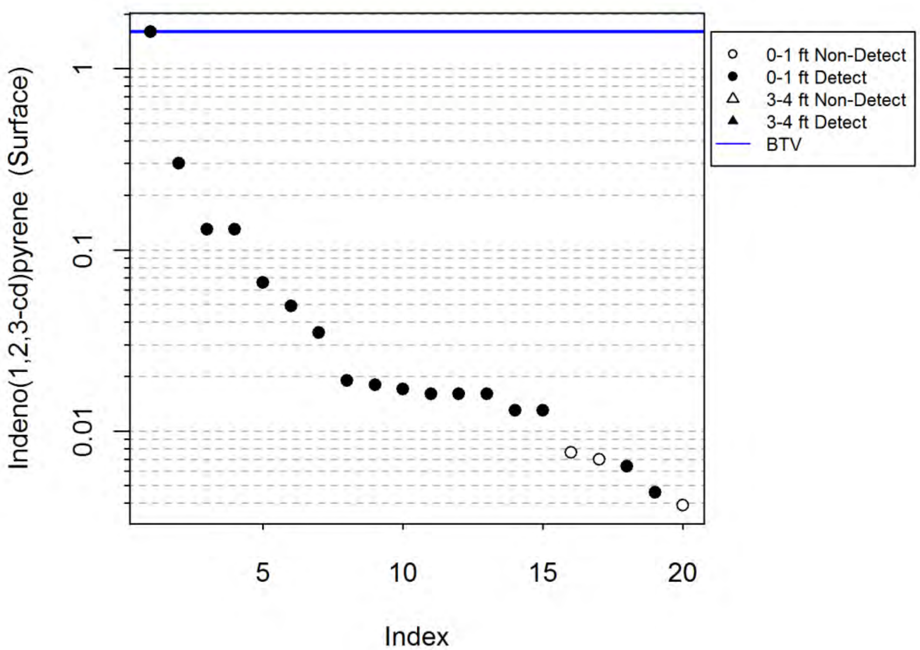

Benzo(b)fluoranthene (Surface)
1
0.1
0.01
5
10
15
20
Index
0-1 ft Non-Detect
0-1 ft Detect
3-4 ft Non-Detect
3-4 ft Detect
BTV

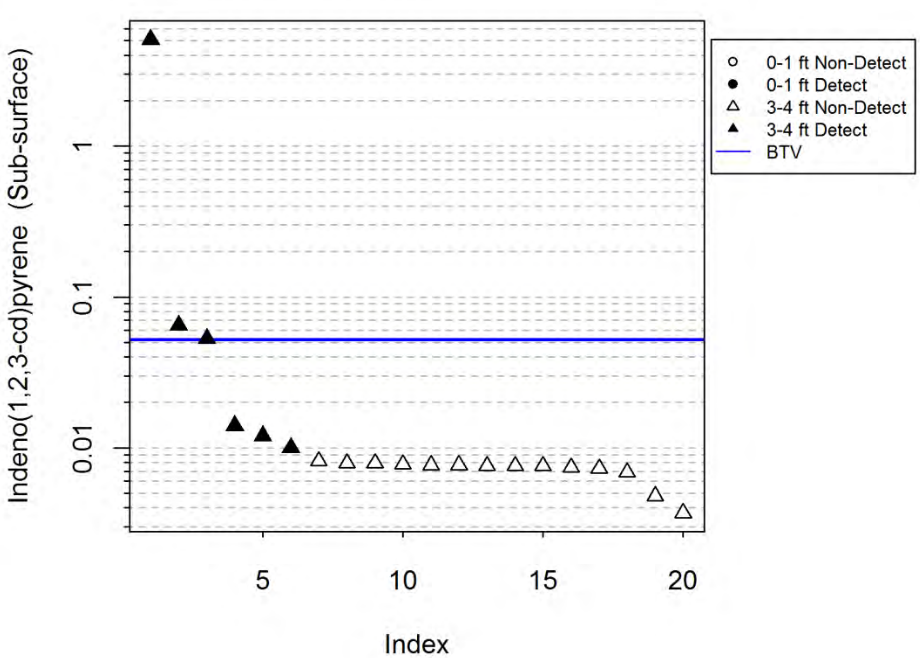

Benzo(b)fluoranthene (Sub-surface)
10
1
0.1
0.01
5
10
15
20
Index
0-1 ft Non-Detect
0-1 ft Detect
3-4 ft Non-Detect
3-4 ft Detect
BTV



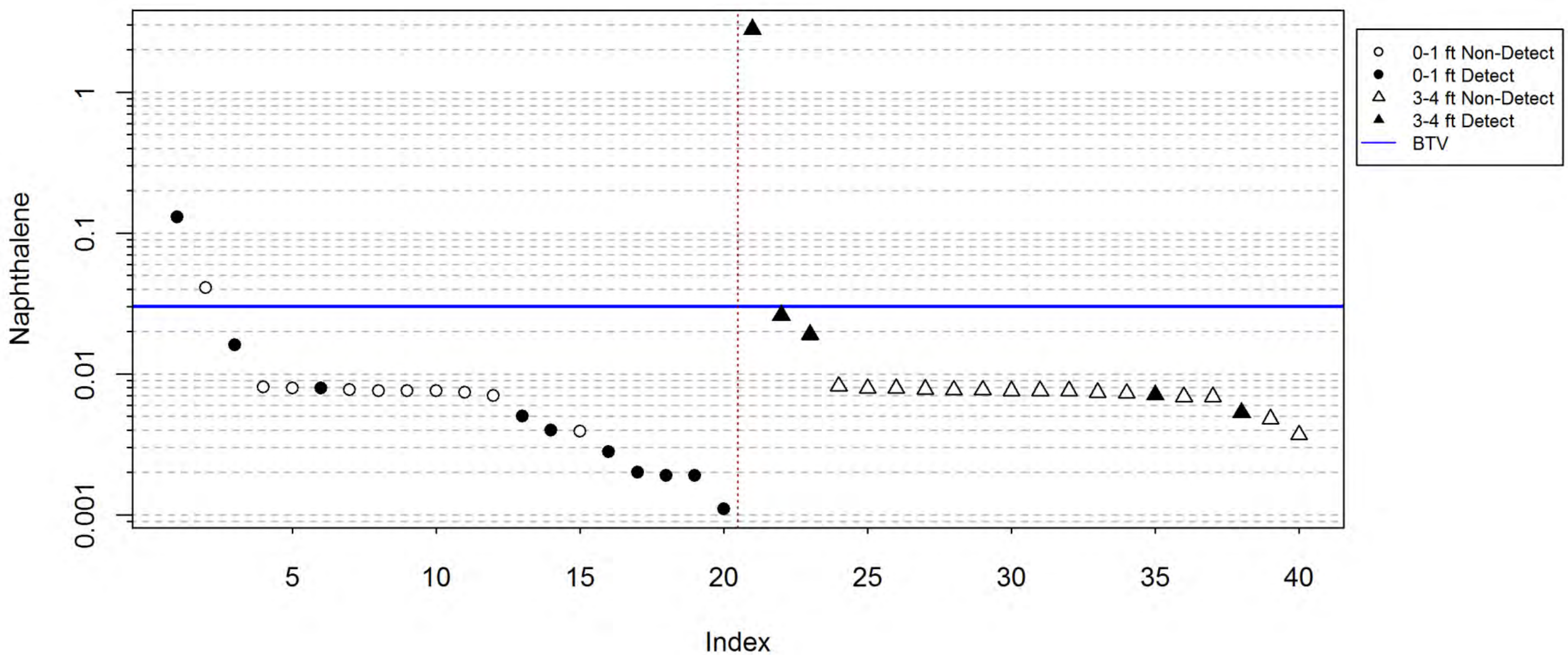

Concentrations in milligrams/kilogram (mg/kg).

Index Plots of Constituents in Background Soil



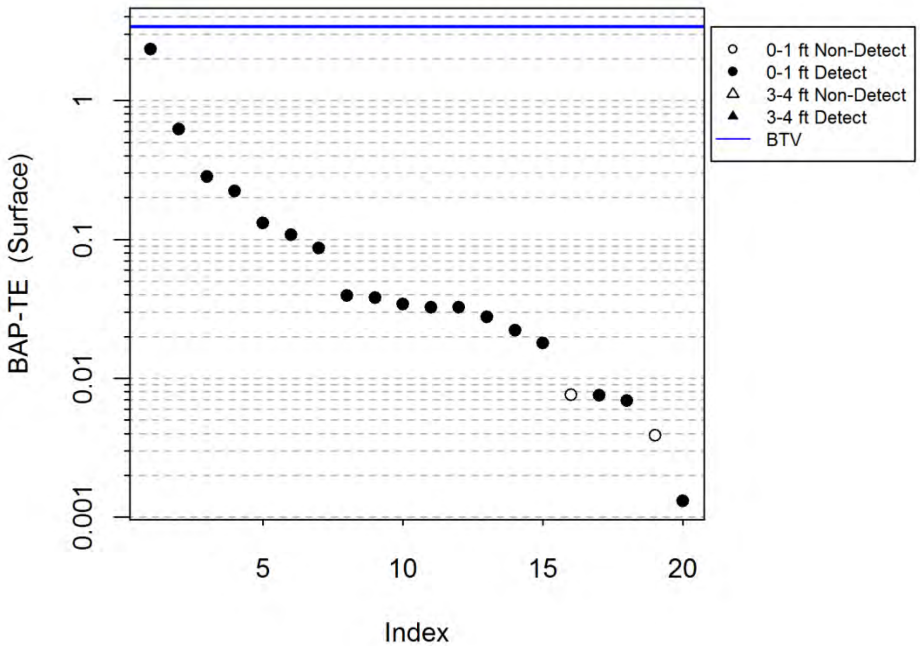



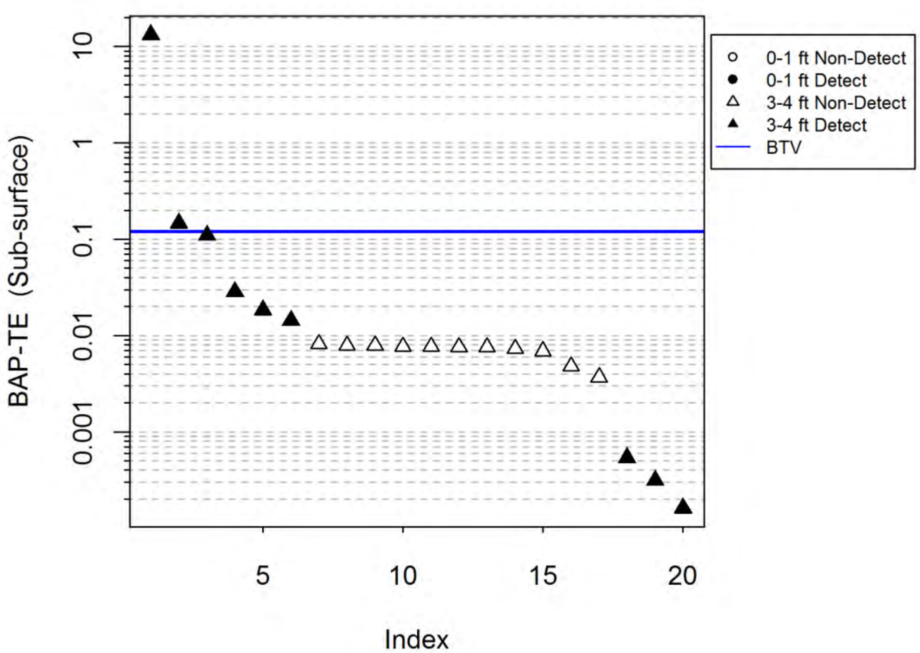

Concentrations in milligrams/kilogram (mg/kg).



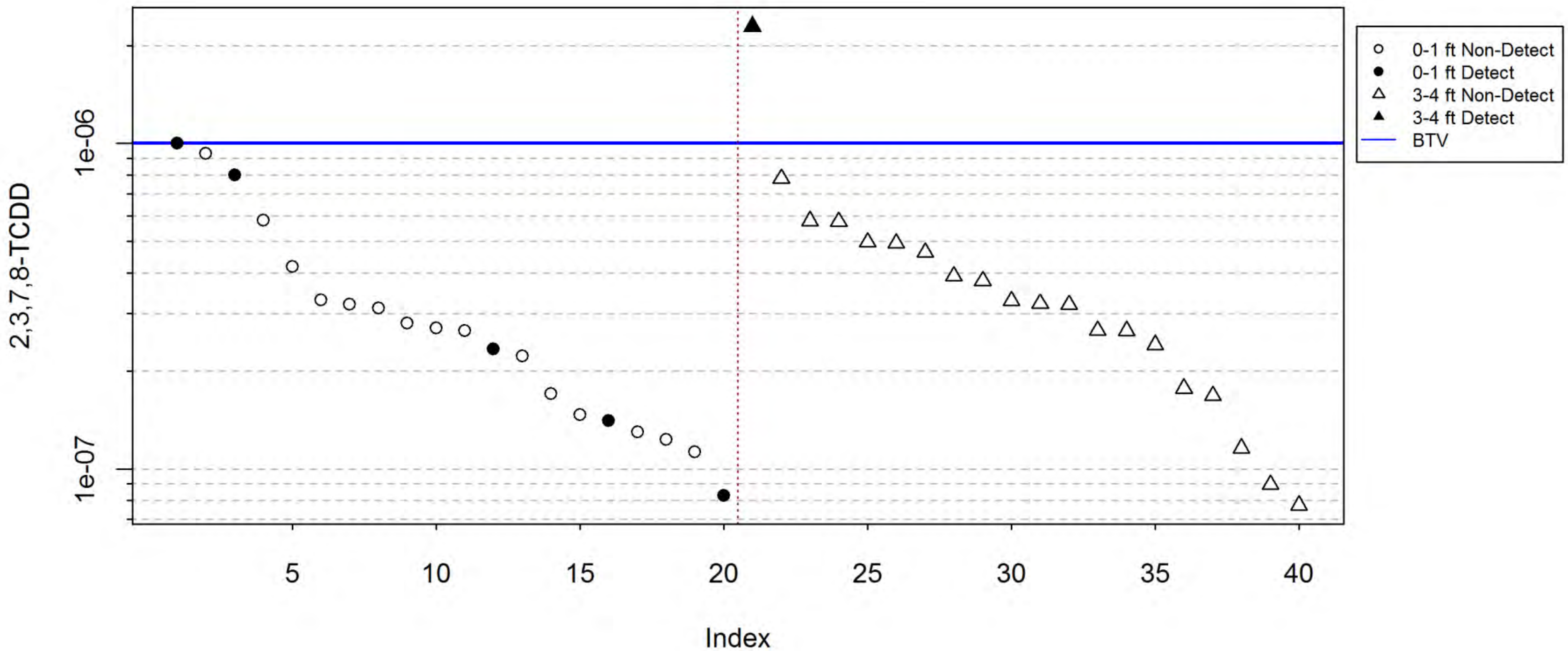

Concentrations in milligrams/kilogram (mg/kg).

Index Plots of Constituents in Background Soil



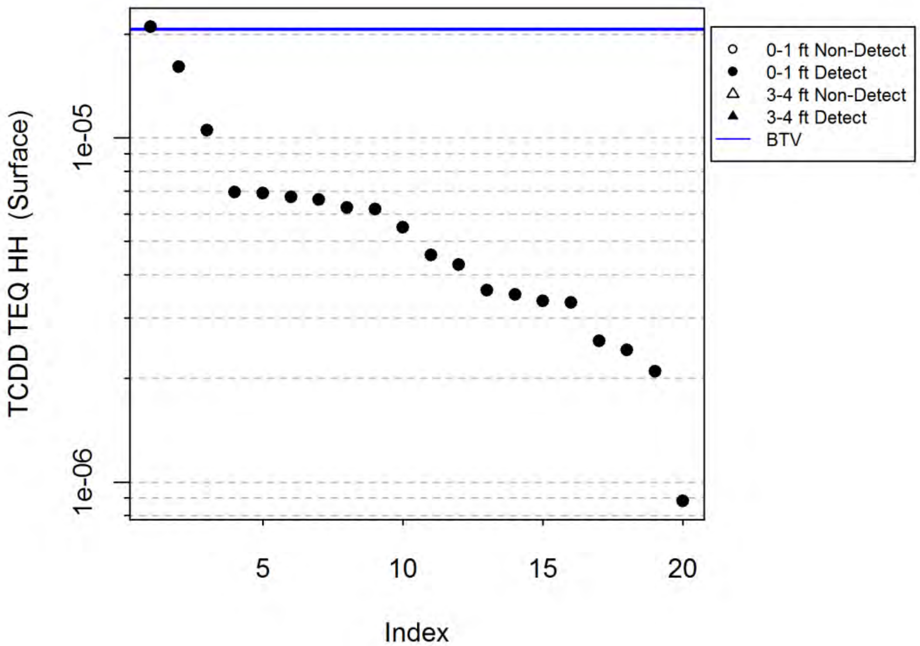



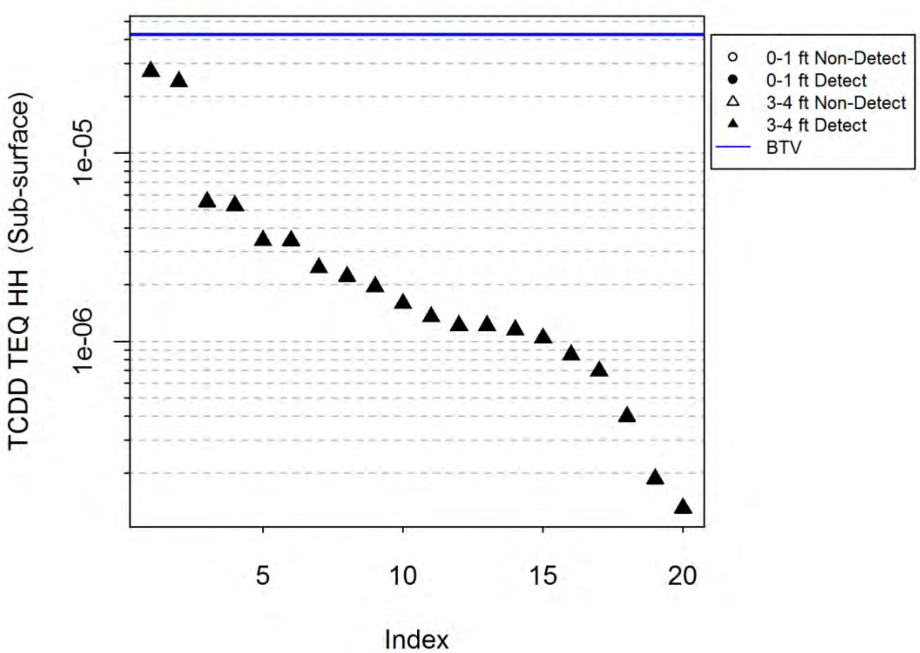

Concentrations in milligrams/kilogram (mg/kg).




Concentrations in milligrams/kilogram (mg/kg).

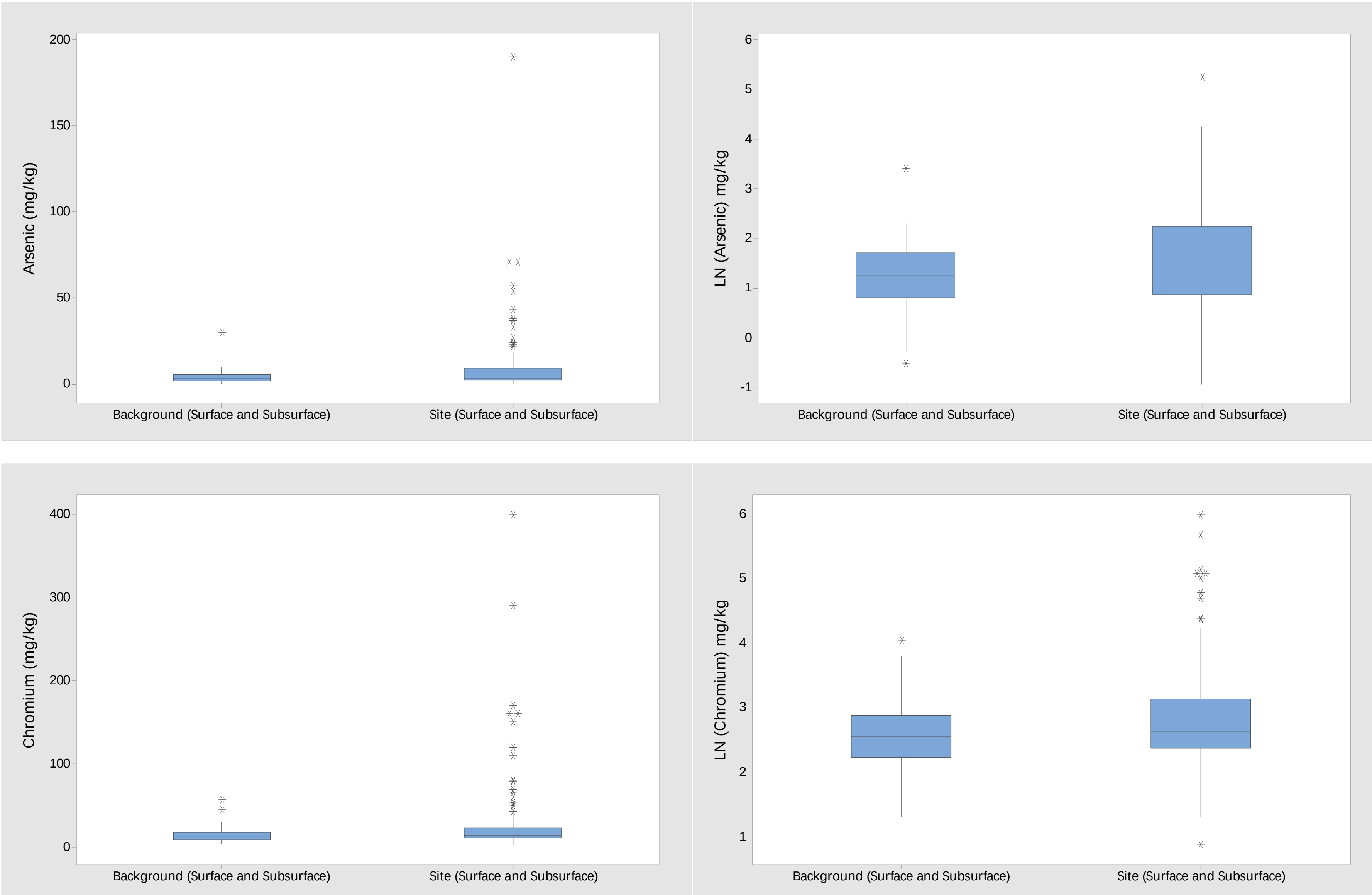
Index Plots of Constituents in Background Soil

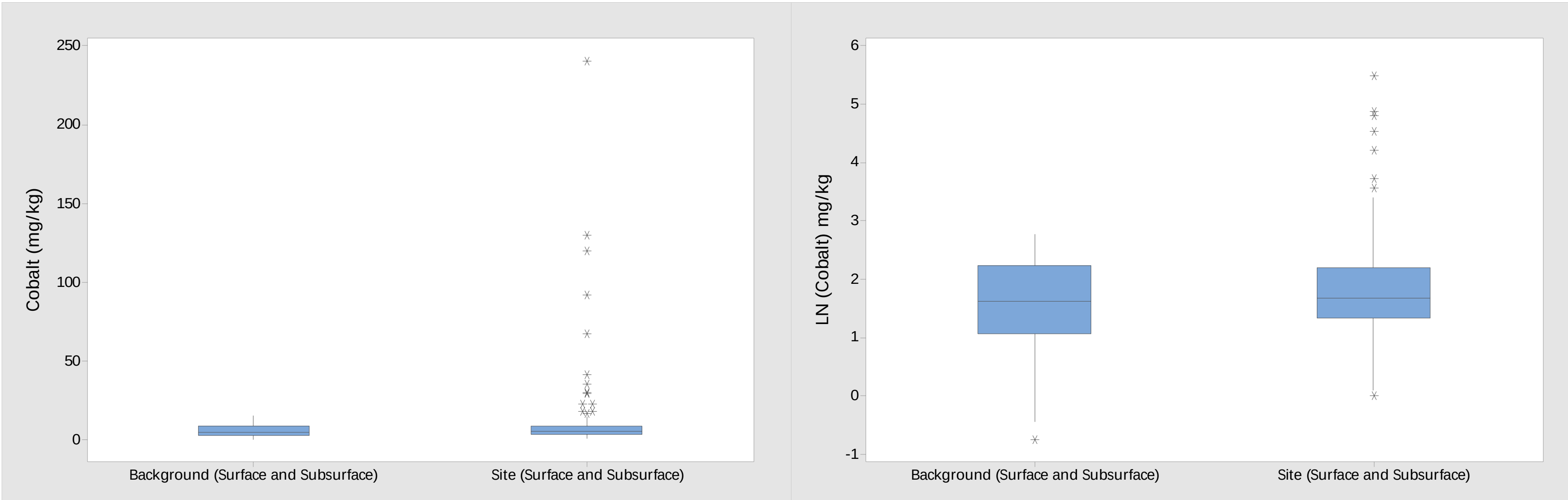


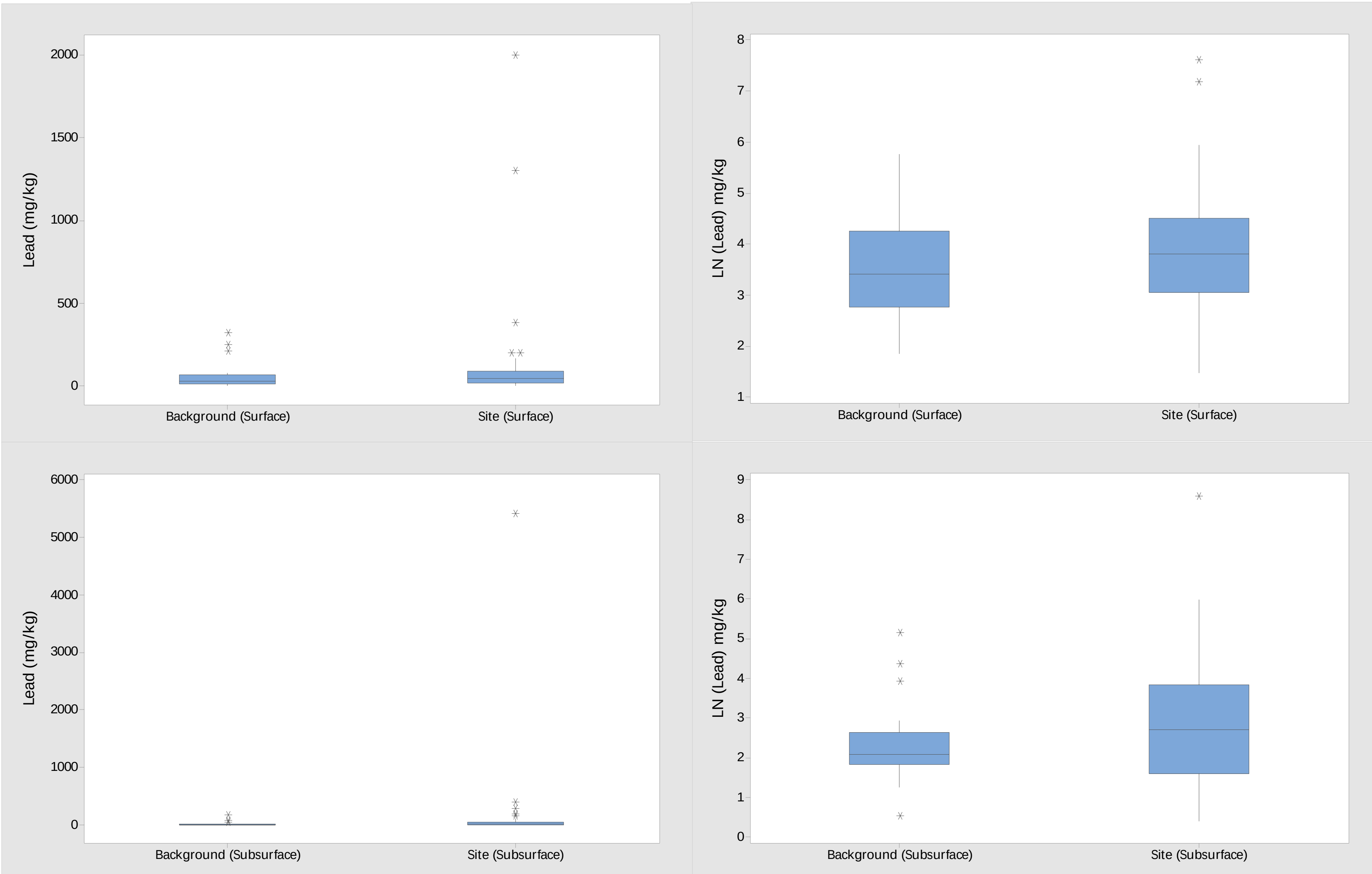

Concentrations in milligrams/kilogram (mg/kg).

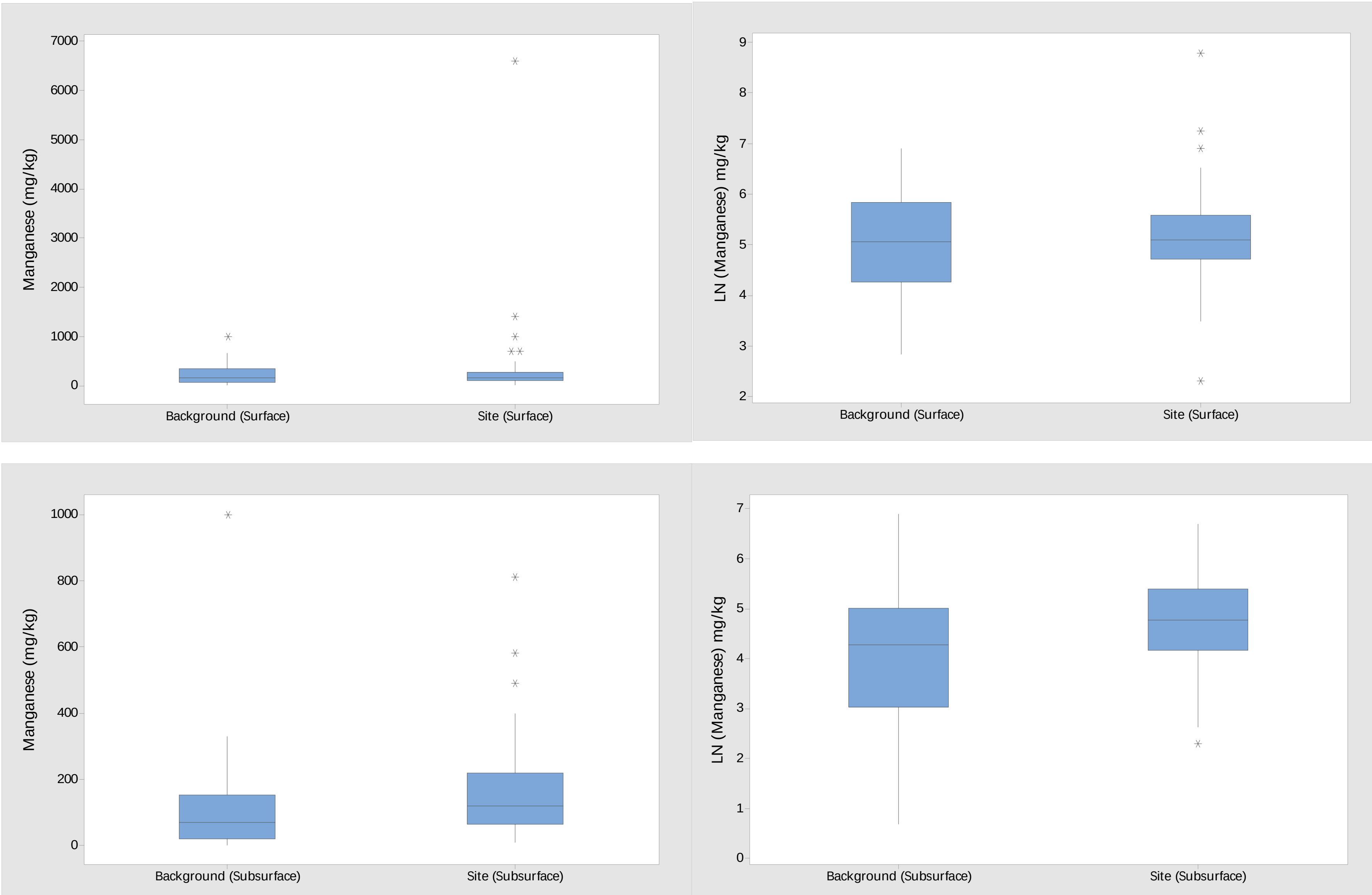
## Boxplot Comparisons of Site and Background Soil Datasets

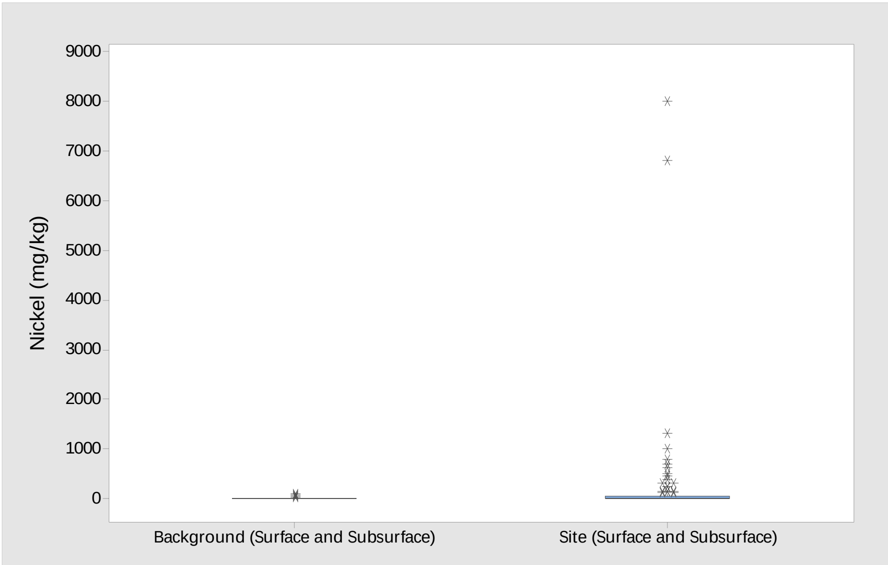

Arsenic (mg/kg)
200
150
100
50
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Arsenic) mg/kg
6
5
4
3
2
1
0
-1
Background (Surface and Subsurface)
Site (Surface and Subsurface)
Chromium (mg/kg)
400
300
200
100
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Chromium) mg/kg
6
5
4
3
2
1
Background (Surface and Subsurface)
Site (Surface and Subsurface)

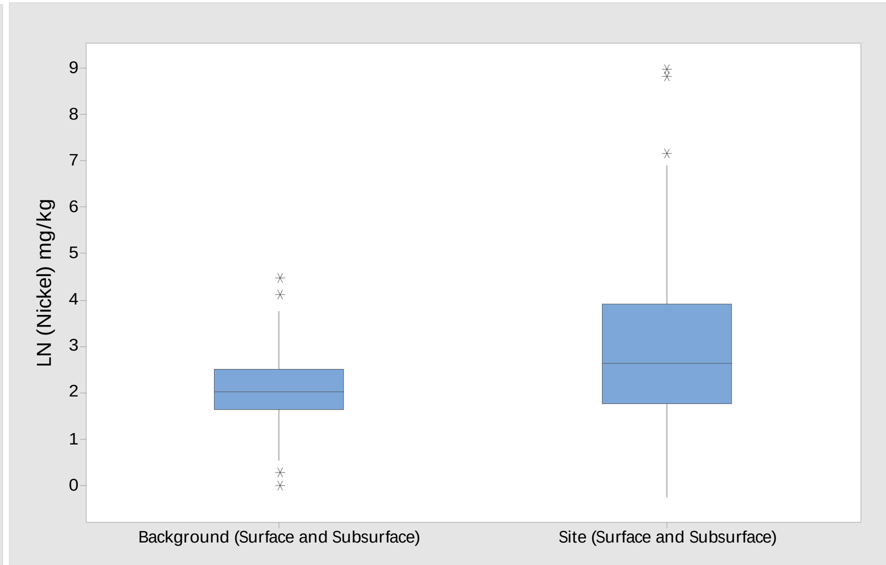


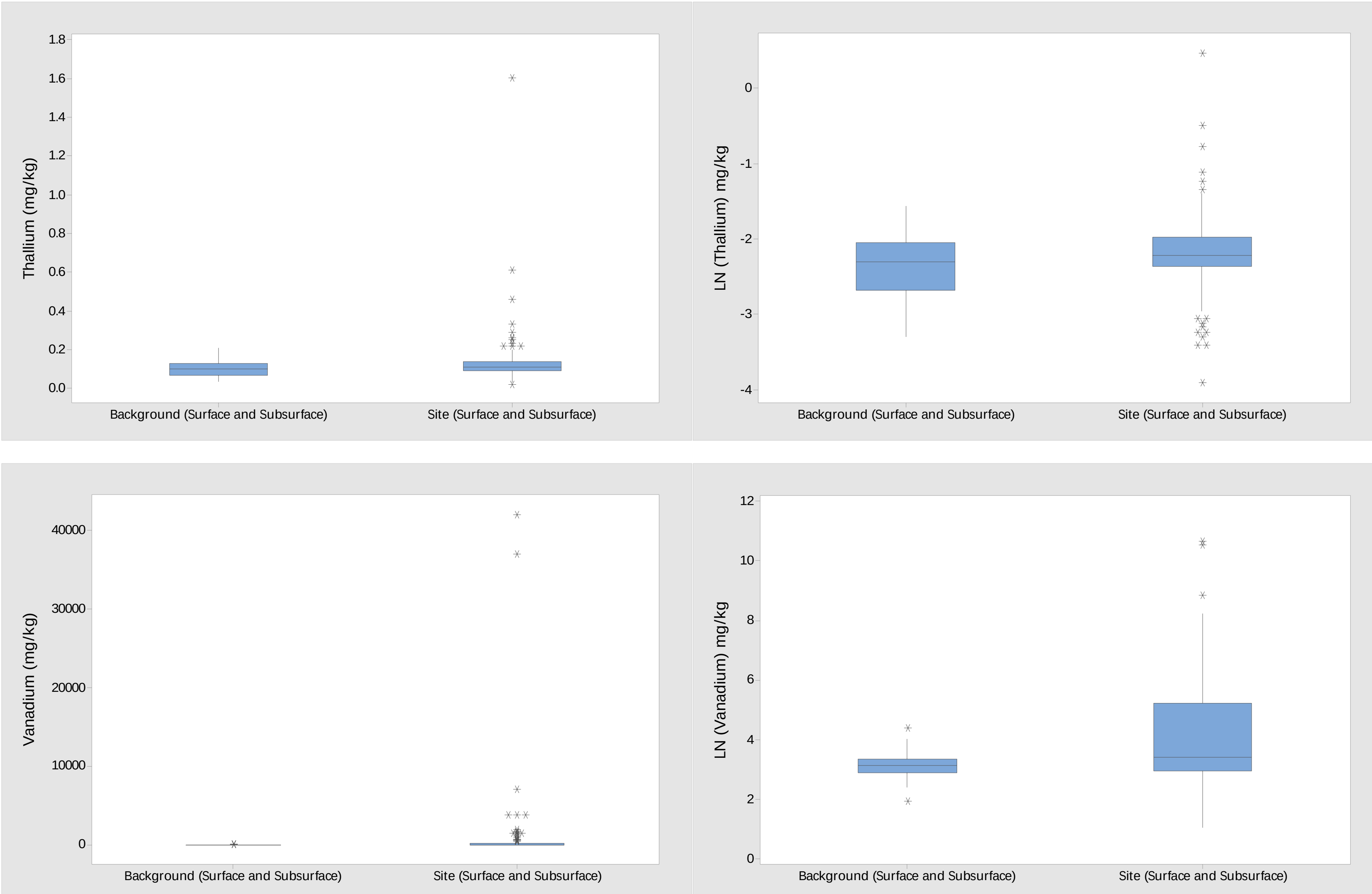
250
200
150
100
50
0
Cobalt (mg/kg)
Background (Surface and Subsurface)
Site (Surface and Subsurface)
6
5
4
3
2
1
0
-1
LN (Cobalt) mg/kg
Background (Surface and Subsurface)
Site (Surface and Subsurface)


Lead (mg/kg)
2000
1500
1000
500
0
Background (Surface)
Site (Surface)
LN (Lead) mg/kg
8
7
6
5
4
3
2
1
Background (Surface)
Site (Surface)
Lead (mg/kg)
6000
5000
4000
3000
2000
1000
0
Background (Subsurface)
Site (Subsurface)
LN (Lead) mg/kg
9
8
7
6
5
4
3
2
1
0
Background (Subsurface)
Site (Subsurface)

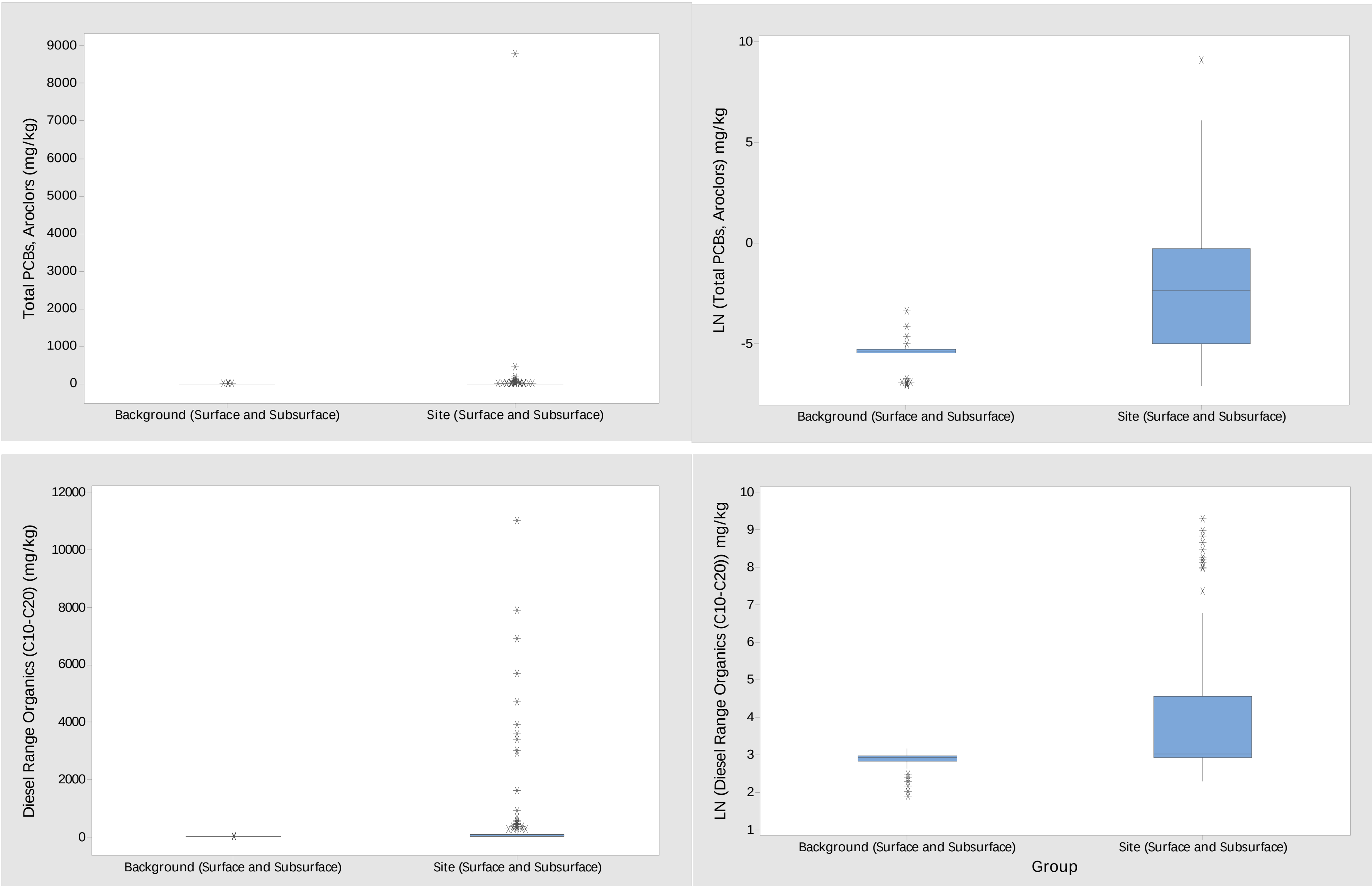

Manganese (mg/kg)
7000
6000
5000
4000
3000
2000
1000
0
Background (Surface)
Site (Surface)
LN (Manganese) mg/kg
9
8
7
6
5
4
3
2
Background (Surface)
Site (Surface)
Manganese (mg/kg)
1000
800
600
400
200
0
Background (Subsurface)
Site (Subsurface)
LN (Manganese) mg/kg
7
6
5
4
3
2
1
0
Background (Subsurface)
Site (Subsurface)


9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Nickel (mg/kg)
Background (Surface and Subsurface)
Site (Surface and Subsurface)

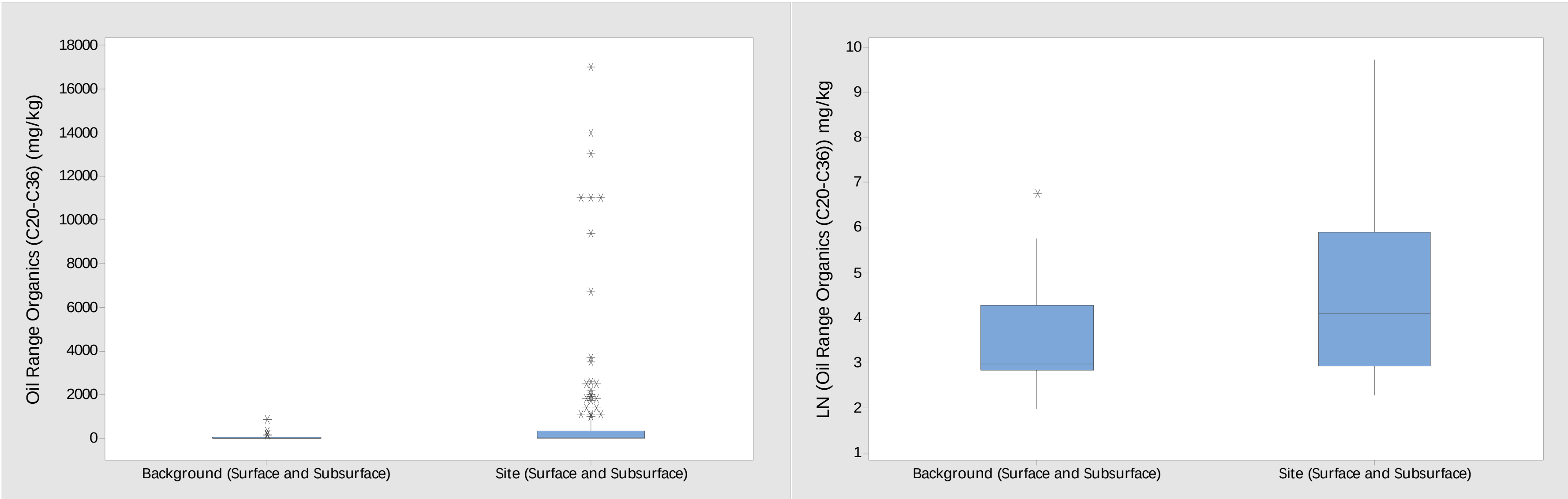

9
8
7
6
5
4
3
2
1
0
LN (Nickel) mg/kg
Background (Surface and Subsurface)
Site (Surface and Subsurface)



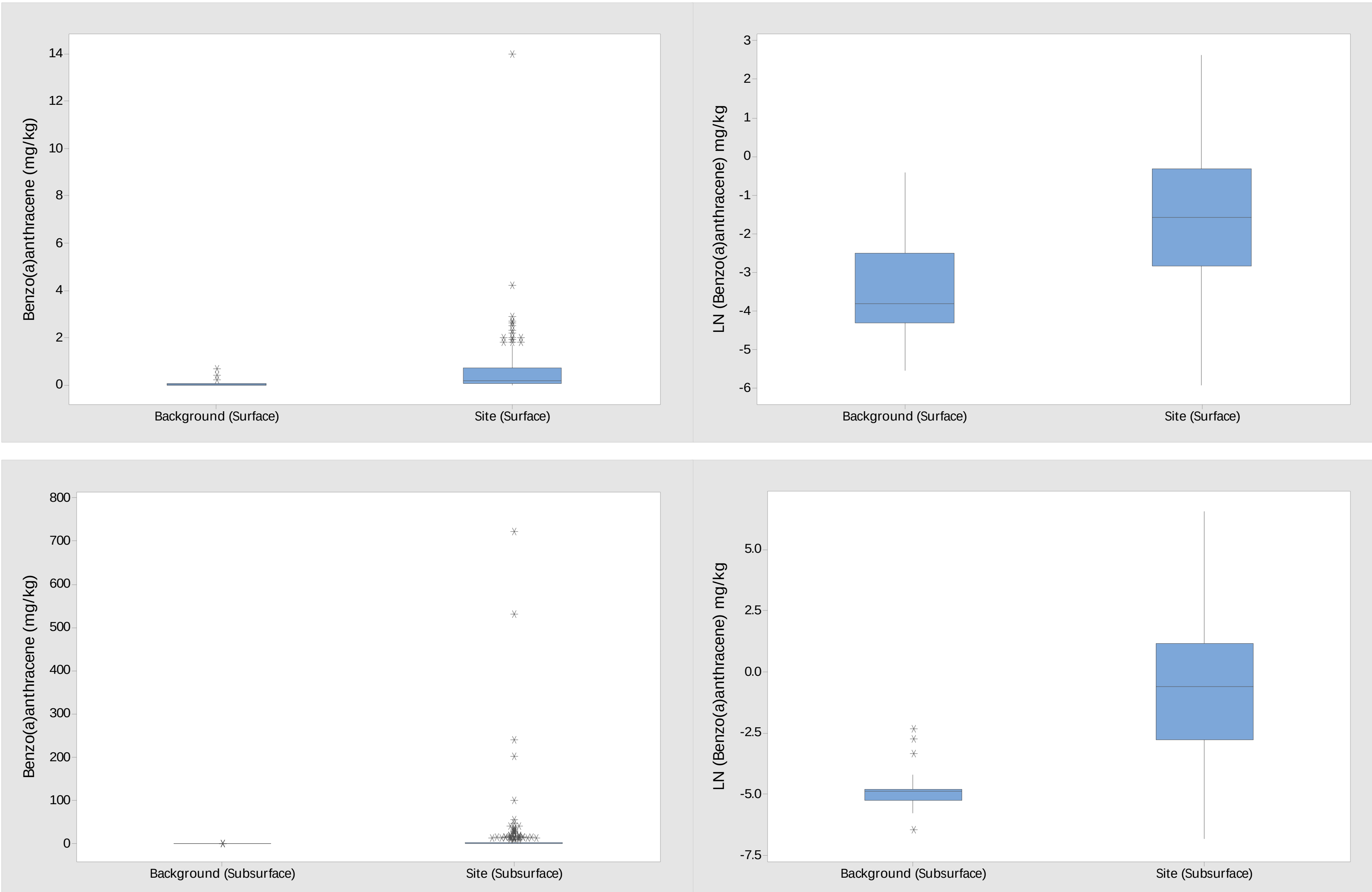
Thallium (mg/kg)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Thallium) mg/kg
0
-1
-2
-3
-4
Background (Surface and Subsurface)
Site (Surface and Subsurface)
Vanadium (mg/kg)
40000
30000
20000
10000
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Vanadium) mg/kg
12
10
8
6
4
2
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)

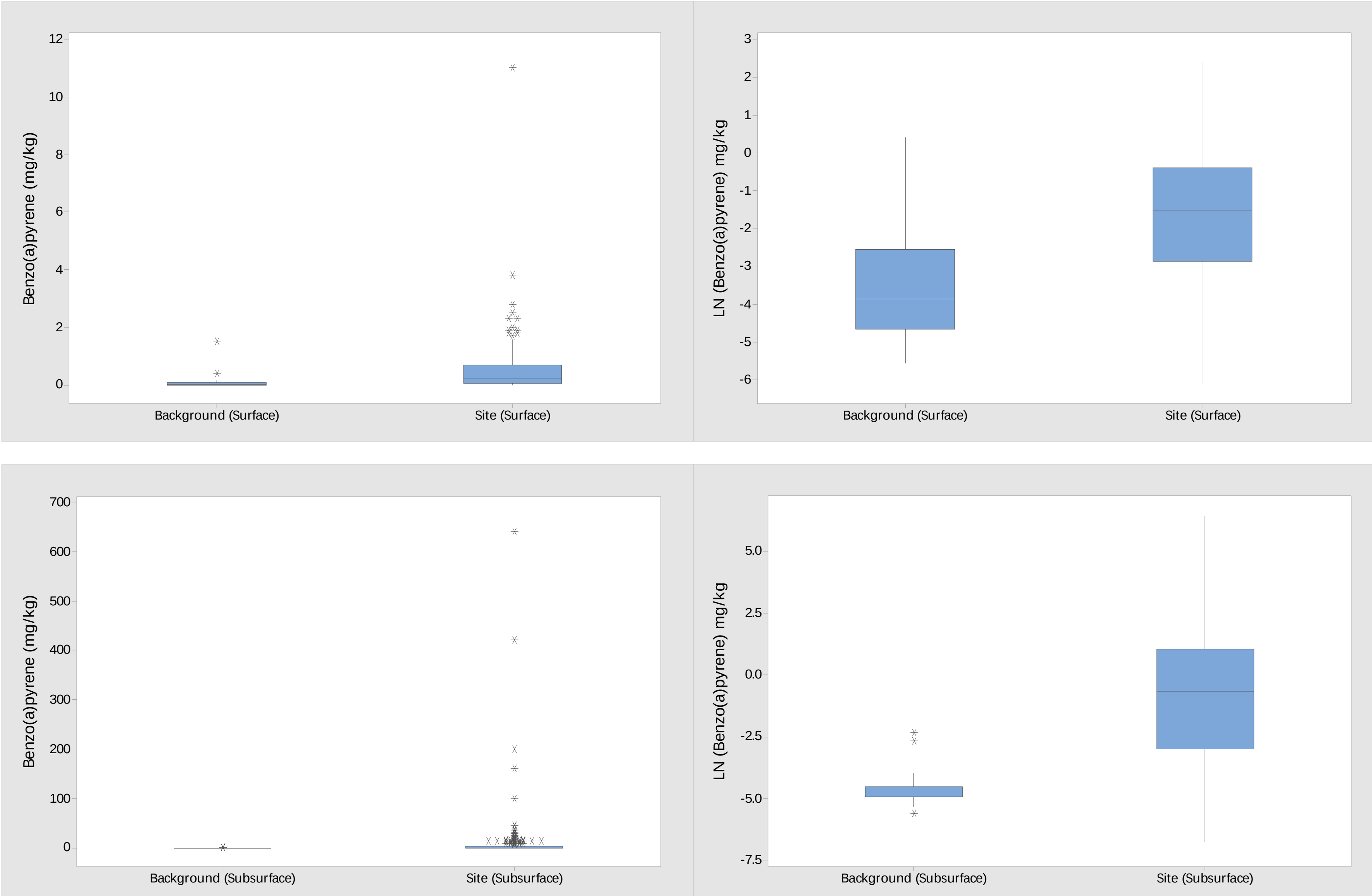


Total PCBs, Aroclors (mg/kg)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Total PCBs, Aroclors) mg/kg
10
5
0
-5
Background (Surface and Subsurface)
Site (Surface and Subsurface)
Diesel Range Organics (C10-C20) (mg/kg)
12000
10000
8000
6000
4000
2000
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Diesel Range Organics (C10-C20)) mg/kg
10
9
8
7
6
5
4
3
2
1
Background (Surface and Subsurface)
Site (Surface and Subsurface)
Group

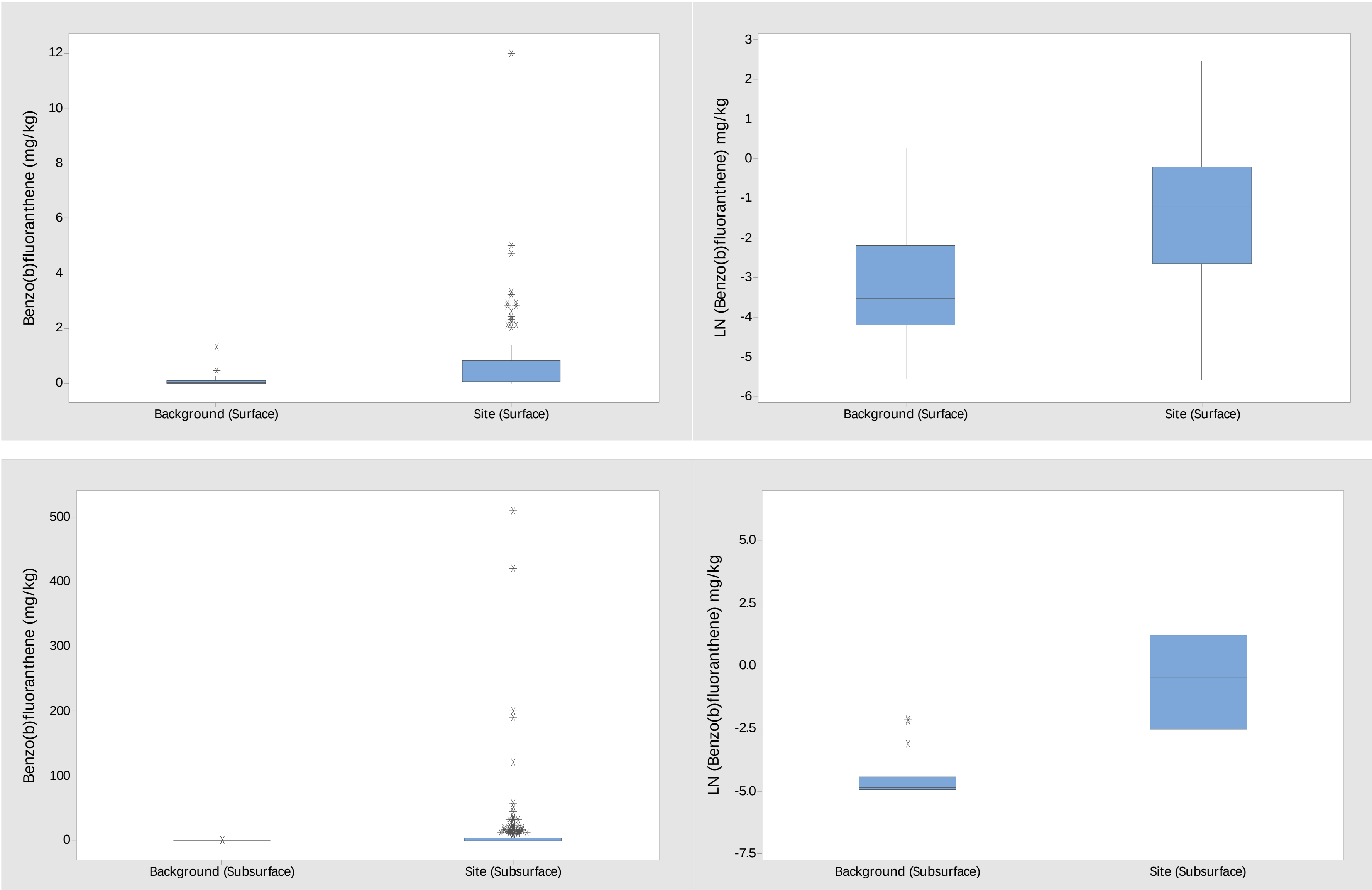


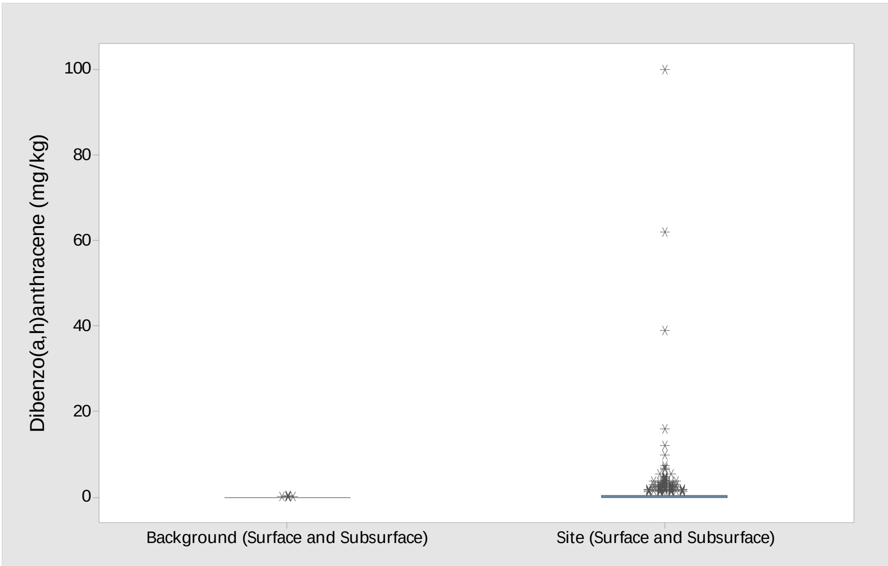
Oil Range Organics (C20-C36) (mg/kg)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Oil Range Organics (C20-C36)) mg/kg
10
9
8
7
6
5
4
3
2
1
Background (Surface and Subsurface)
Site (Surface and Subsurface)


Benzo(a)anthracene (mg/kg)
14
12
10
8
6
4
2
0
Background (Surface)
Site (Surface)
LN (Benzo(a)anthracene) mg/kg
3
2
1
0
-1
-2
-3
-4
-5
-6
Background (Surface)
Site (Surface)
Benzo(a)anthracene (mg/kg)
800
700
600
500
400
300
200
100
0
Background (Subsurface)
Site (Subsurface)
LN (Benzo(a)anthracene) mg/kg
5.0
2.5
0.0
-2.5
-5.0
-7.5
Background (Subsurface)
Site (Subsurface)

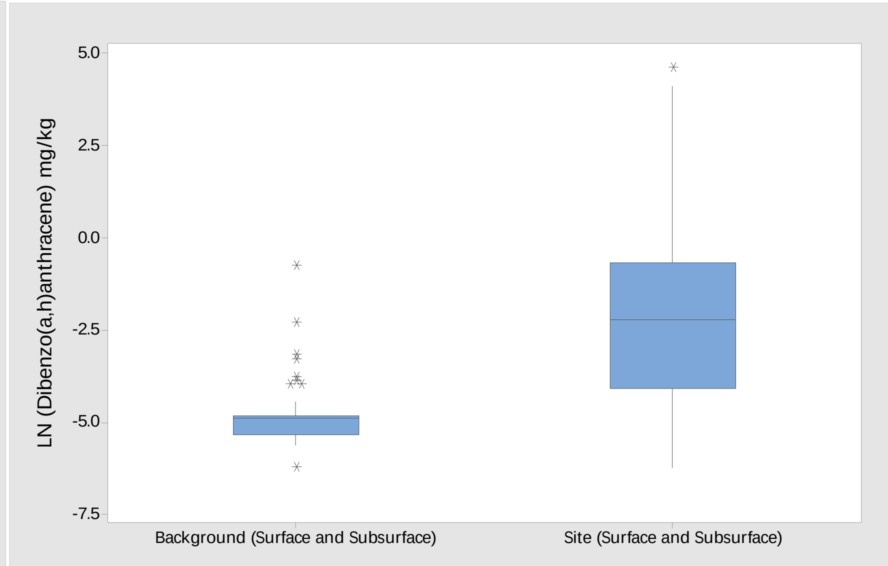


Benzo(a)pyrene (mg/kg)
0
2
4
6
8
10
12
Background (Surface)
Site (Surface)
LN (Benzo(a)pyrene) mg/kg
-6
-5
-4
-3
-2
-1
0
1
2
3
Background (Surface)
Site (Surface)
Benzo(a)pyrene (mg/kg)
0
100
200
300
400
500
600
700
Background (Subsurface)
Site (Subsurface)
LN (Benzo(a)pyrene) mg/kg
-7.5
-5.0
-2.5
0.0
2.5
5.0
Background (Subsurface)
Site (Subsurface)

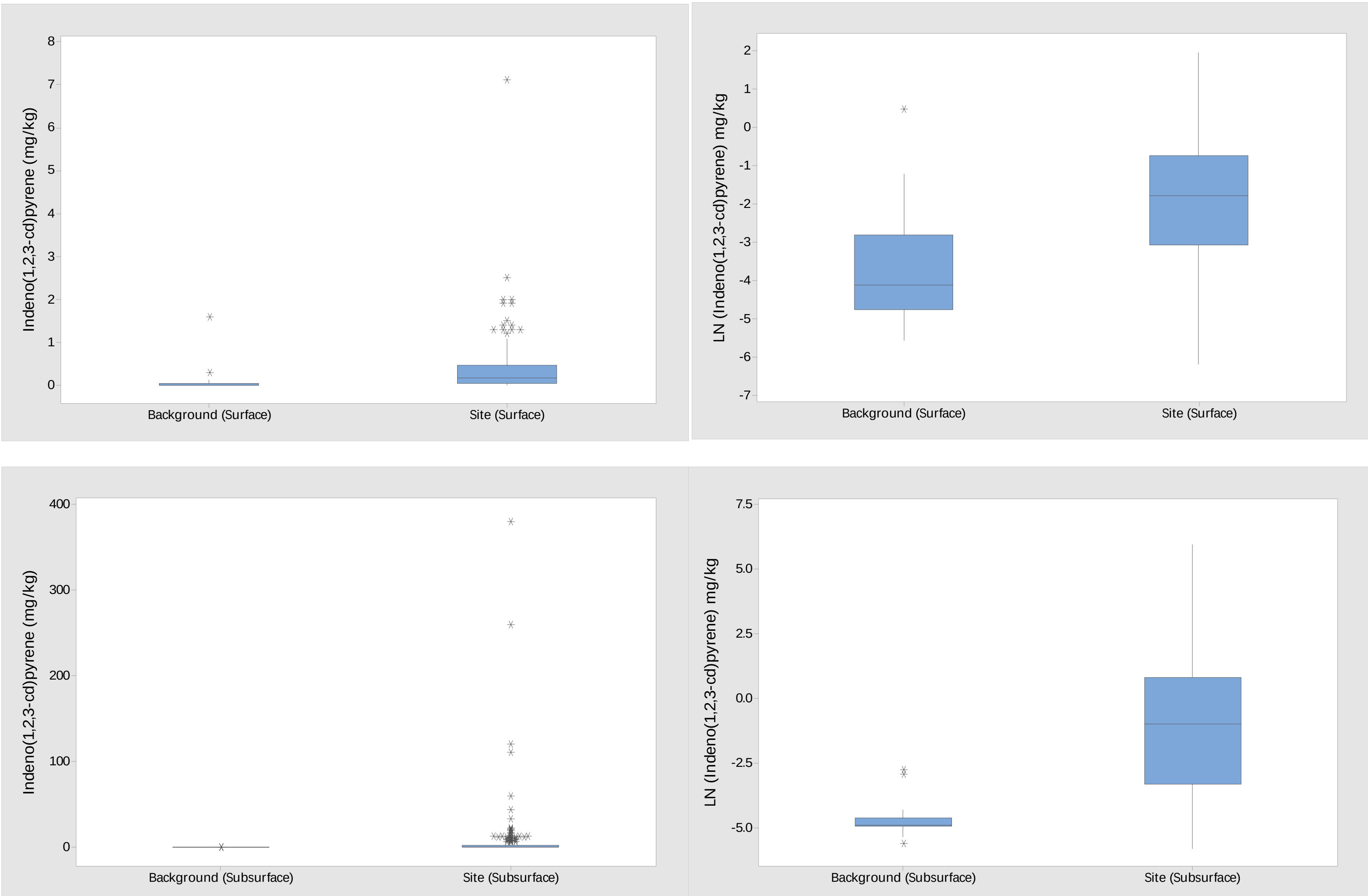

Benzo(b)fluoranthene (mg/kg)
12
10
8
6
4
2
0
Background (Surface)
Site (Surface)
LN (Benzo(b)fluoranthene) mg/kg
3
2
1
0
-1
-2
-3
-4
-5
-6
Background (Surface)
Site (Surface)
Benzo(b)fluoranthene (mg/kg)
500
400
300
200
100
0
Background (Subsurface)
Site (Subsurface)
LN (Benzo(b)fluoranthene) mg/kg
5.0
2.5
0.0
-2.5
-5.0
-7.5
Background (Subsurface)
Site (Subsurface)

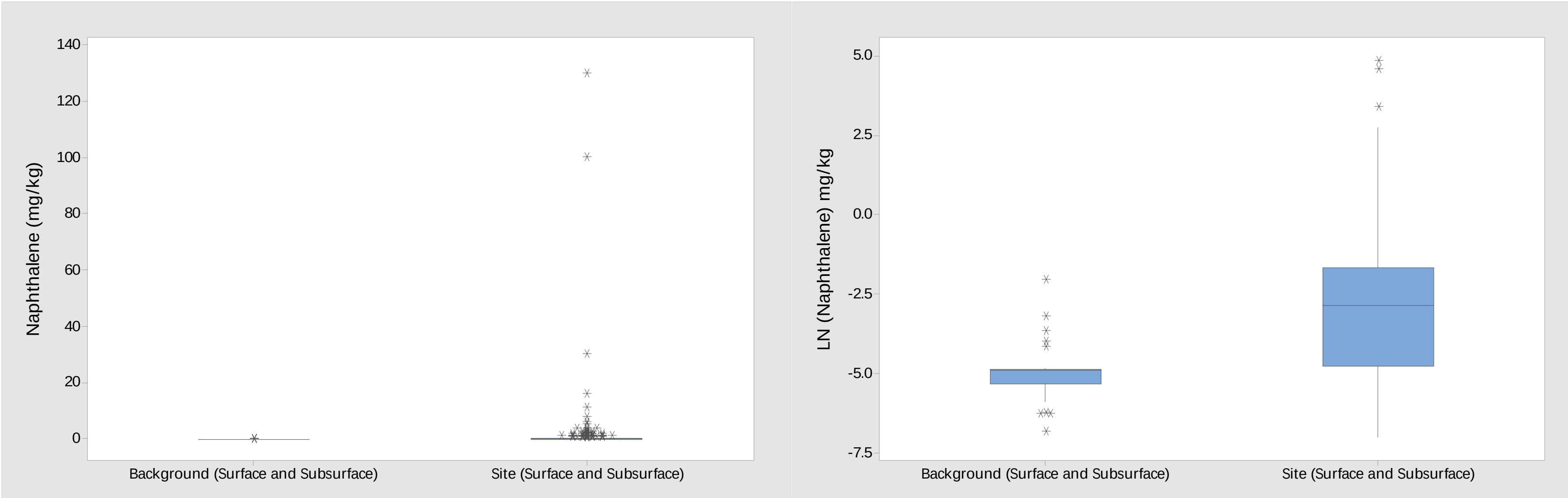


Dibenzo(a,h)anthracene (mg/kg)
100
80
60
40
20
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)

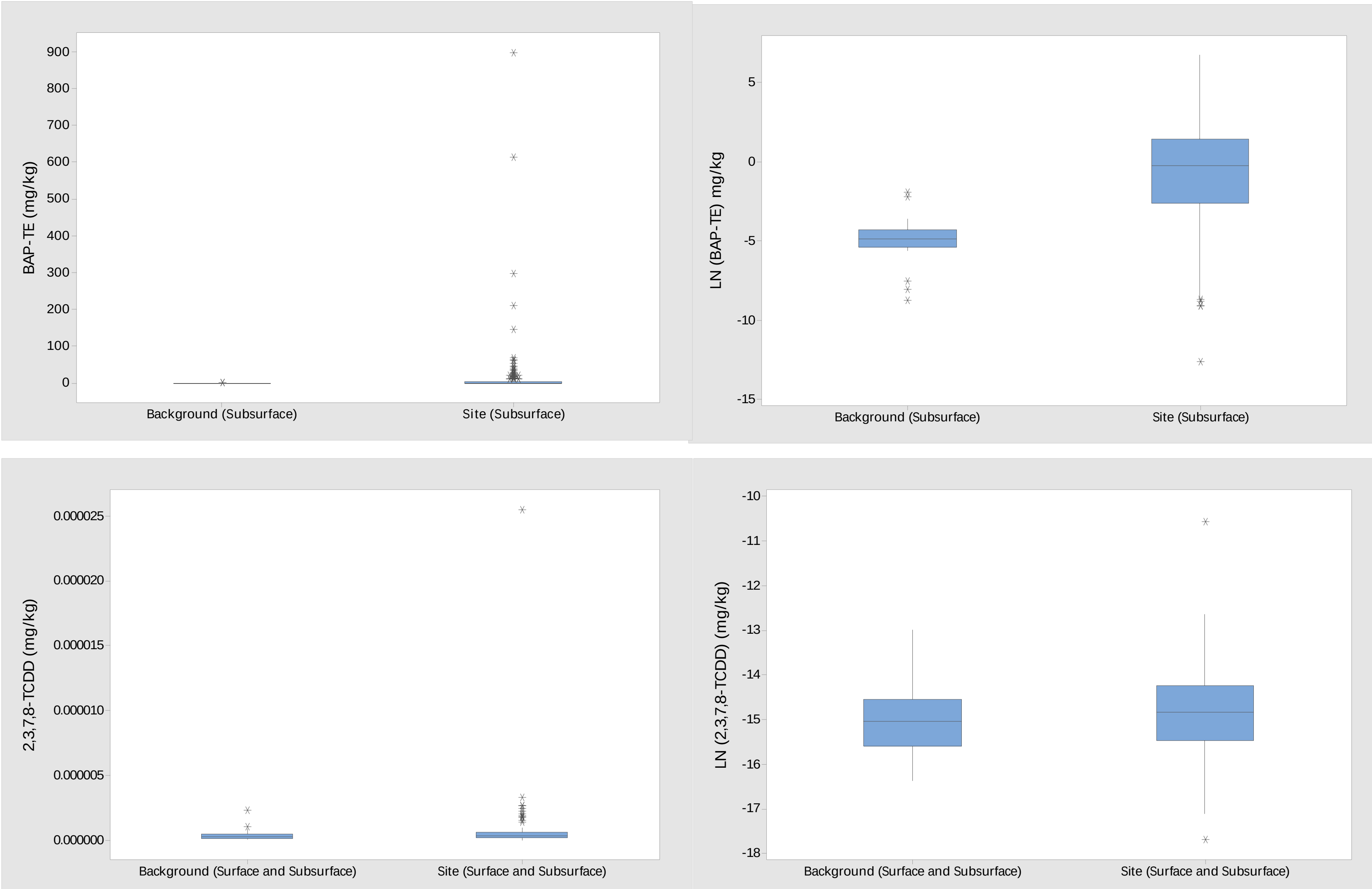



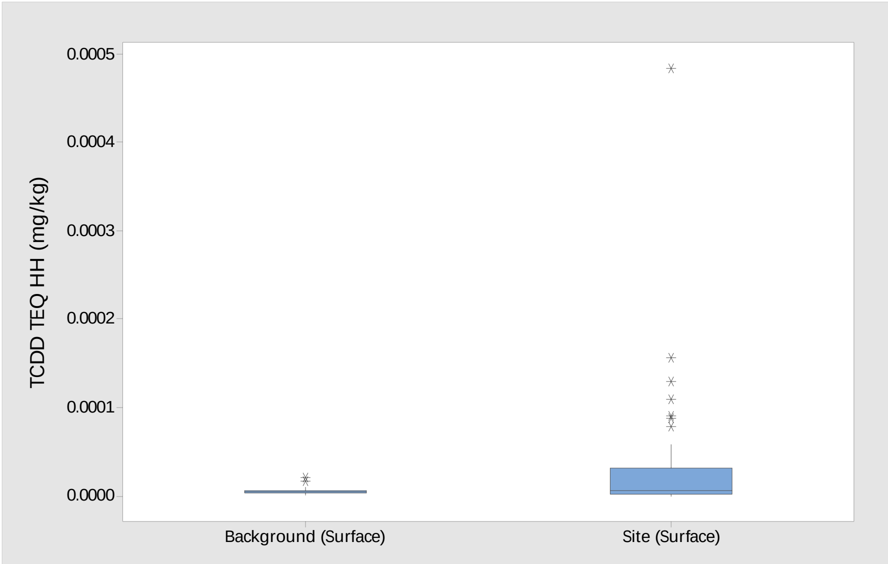
LN (Dibenzo(a,h)anthracene) mg/kg
5.0
2.5
0.0
-2.5
-5.0
-7.5
Background (Surface and Subsurface)
Site (Surface and Subsurface)

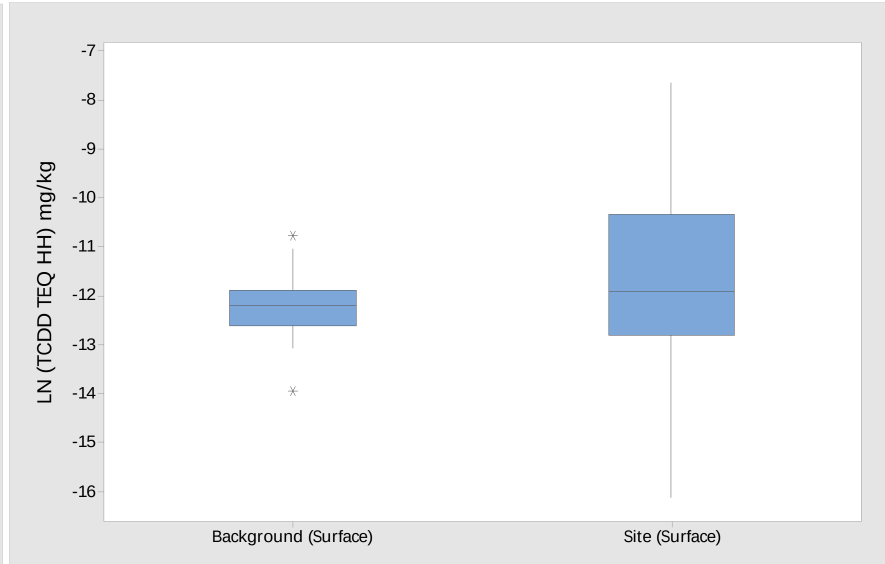

Indeno(1,2,3-cd)pyrene (mg/kg)
8
7
6
5
4
3
2
1
0
Background (Surface)
Site (Surface)
LN (Indeno(1,2,3-cd)pyrene) mg/kg
2
1
0
-1
-2
-3
-4
-5
-6
-7
Background (Surface)
Site (Surface)
Indeno(1,2,3-cd)pyrene (mg/kg)
400
300
200
100
0
Background (Subsurface)
Site (Subsurface)
LN (Indeno(1,2,3-cd)pyrene) mg/kg
7.5
5.0
2.5
0.0
-2.5
-5.0
Background (Subsurface)
Site (Subsurface)

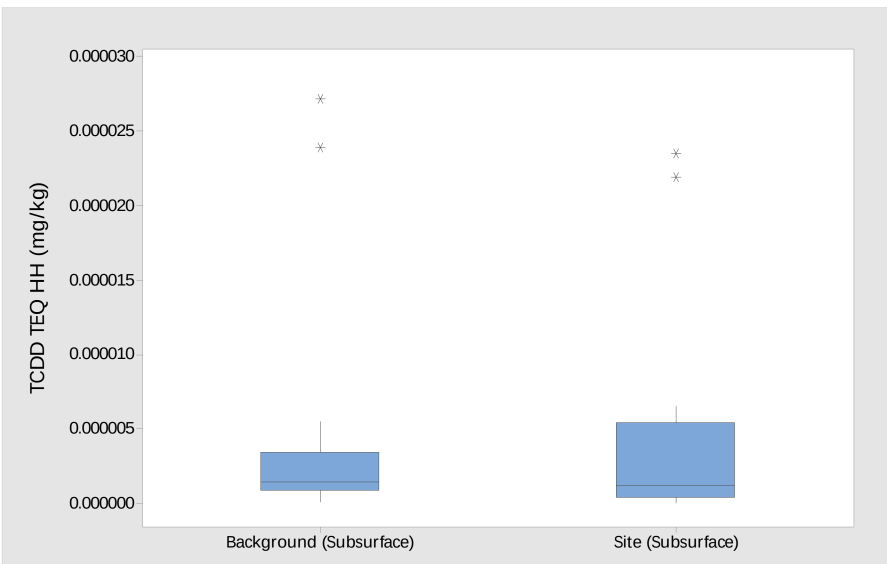


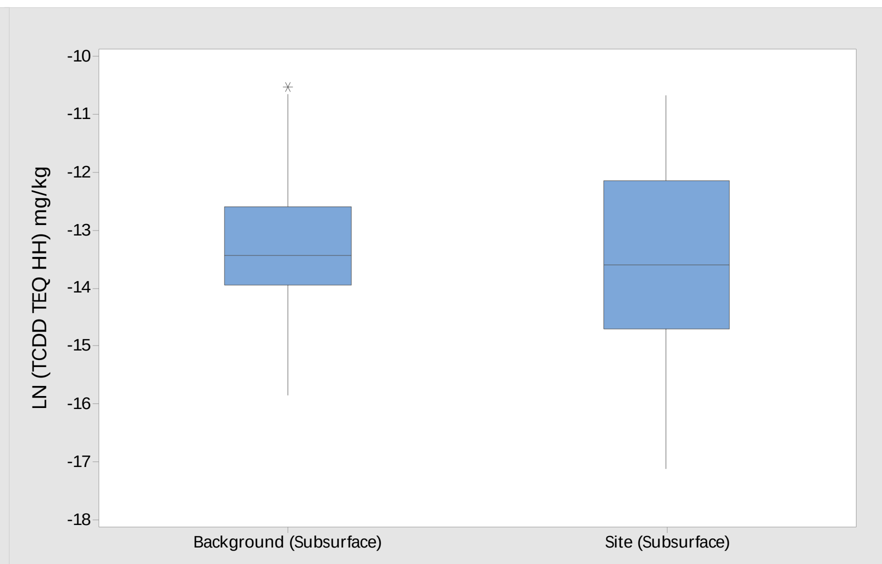
Naphthalene (mg/kg)
140
120
100
80
60
40
20
0
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (Naphthalene) mg/kg
5.0
2.5
0.0
-2.5
-5.0
-7.5
Background (Surface and Subsurface)
Site (Surface and Subsurface)


BAP-TE (mg/kg)
900
800
700
600
500
400
300
200
100
0
Background (Subsurface)
Site (Subsurface)
LN (BAP-TE) mg/kg
5
0
-5
-10
-15
Background (Subsurface)
Site (Subsurface)
2,3,7,8-TCDD (mg/kg)
0.000025
0.000020
0.000015
0.000010
0.000005
0.000000
Background (Surface and Subsurface)
Site (Surface and Subsurface)
LN (2,3,7,8-TCDD) (mg/kg)
-10
-11
-12
-13
-14
-15
-16
-17
-18
Background (Surface and Subsurface)
Site (Surface and Subsurface)

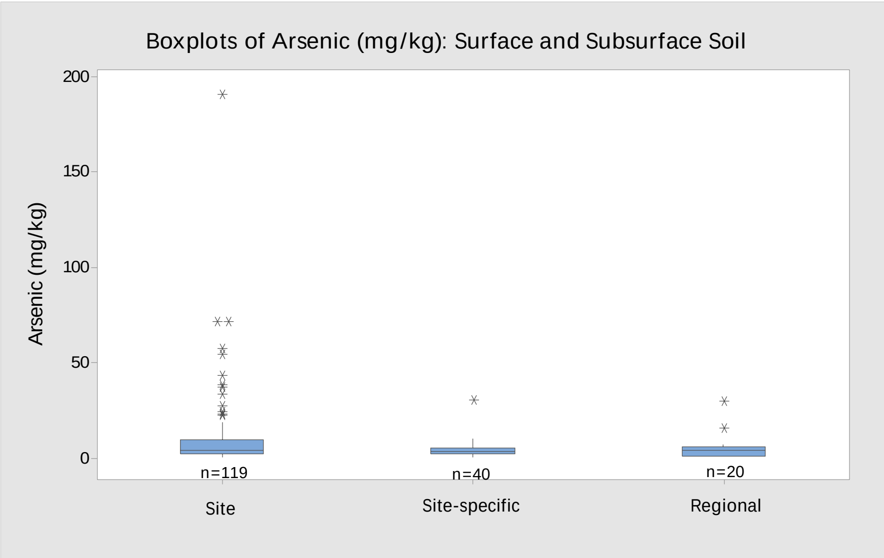

TCDD TEQ HH (mg/kg)
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
Background (Surface)
Site (Surface)

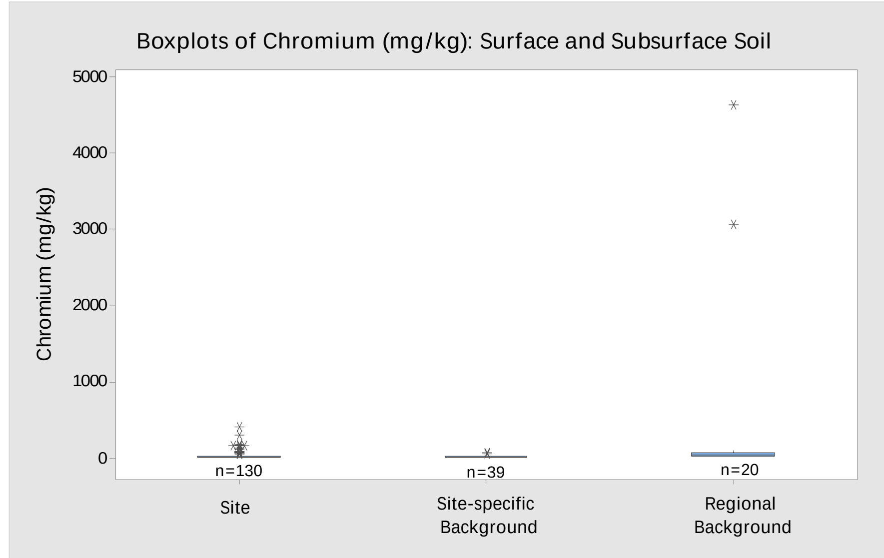

LN (TCDD TEQ HH) mg/kg
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
Background (Surface)
Site (Surface)

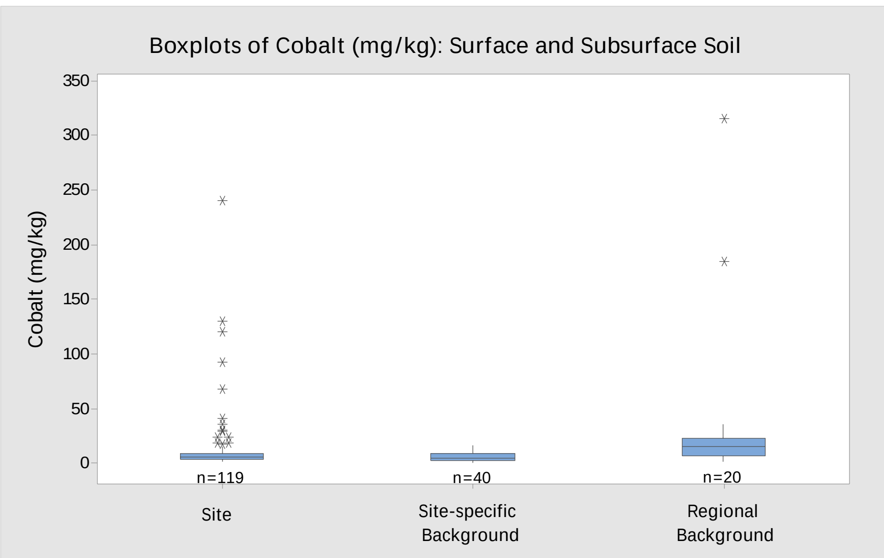

TCDD TEQ HH (mg/kg)
0.000030
0.000025
0.000020
0.000015
0.000010
0.000005
0.000000
Background (Subsurface)
Site (Subsurface)

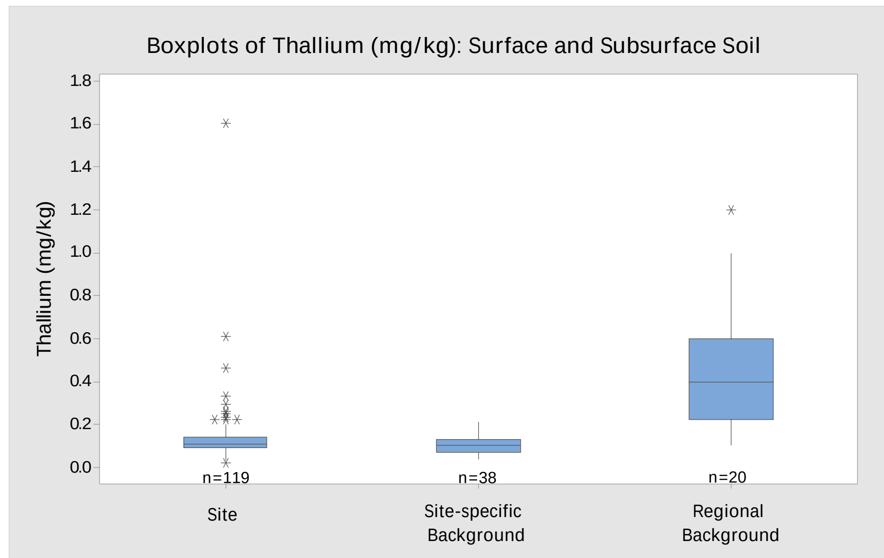

LN (TCDD TEQ HH) mg/kg
-10
-11
-12
-13
-14
-15
-16
-17
-18
Background (Subsurface)
Site (Subsurface)

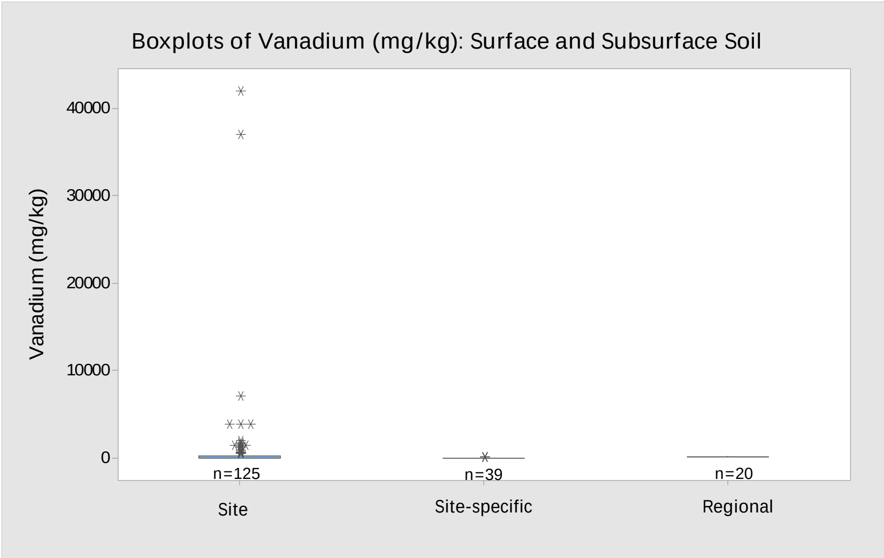
# Comparison of Site, Site-specific Background and Regional Background Soil Datasets


Boxplots of Arsenic (mg/kg): Surface and Subsurface Soil
Arsenic (mg/kg)
200
150
100
50
0
n=119
n=40
n=20
Site
Site-specific
Regional


Boxplots of Chromium (mg/kg): Surface and Subsurface Soil
Chromium (mg/kg)
5000
4000
3000
2000
1000
0
n=130
n=39
n=20
Site
Site-specific Background
Regional Background


Boxplots of Cobalt (mg/kg): Surface and Subsurface Soil
Cobalt (mg/kg)
350
300
250
200
150
100
50
0
n=119
n=40
n=20
Site
Site-specific Background
Regional Background


Boxplots of Thallium (mg/kg): Surface and Subsurface Soil
Thallium (mg/kg)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
n=119
n=38
n=20
Site
Site-specific Background
Regional Background



Boxplots of Vanadium (mg/kg): Surface and Subsurface Soil
Vanadium (mg/kg)
40000
30000
20000
10000
0
n=125
n=39
n=20
Site
Site-specific
Regional

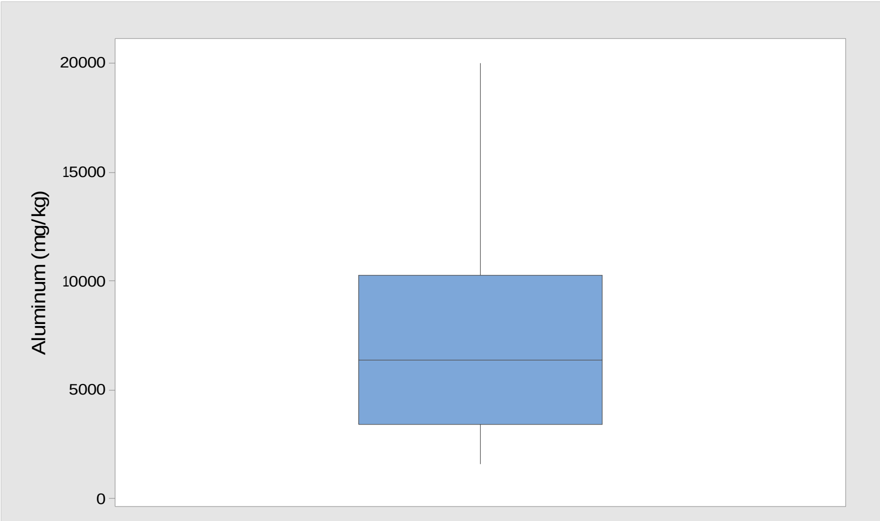
An Exelon Company

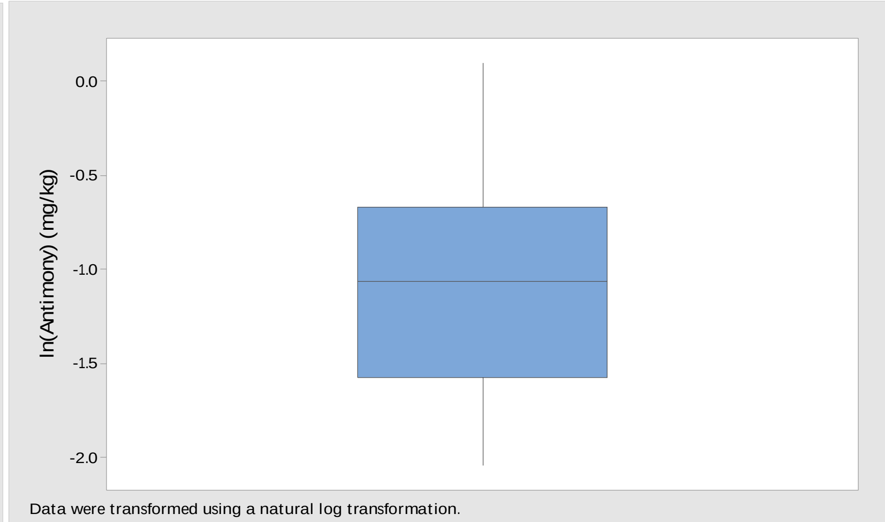
# Attachment D

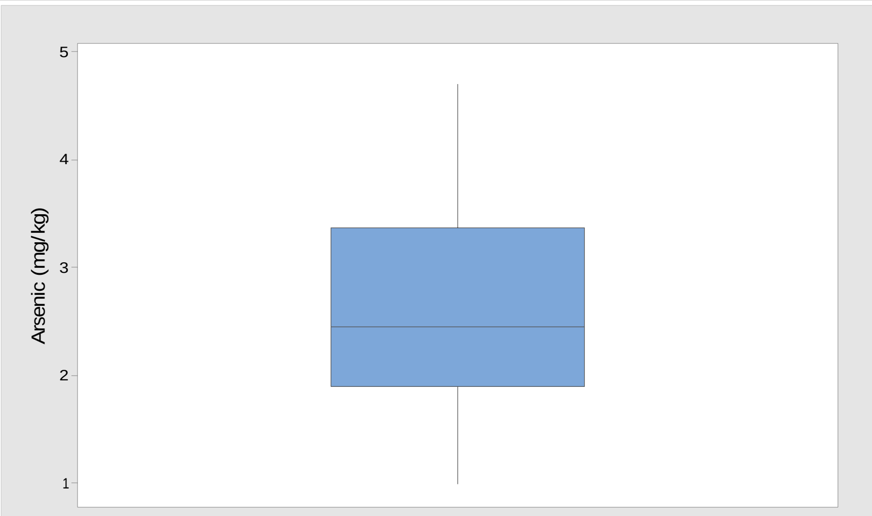
# Supporting Graphics – Sediment

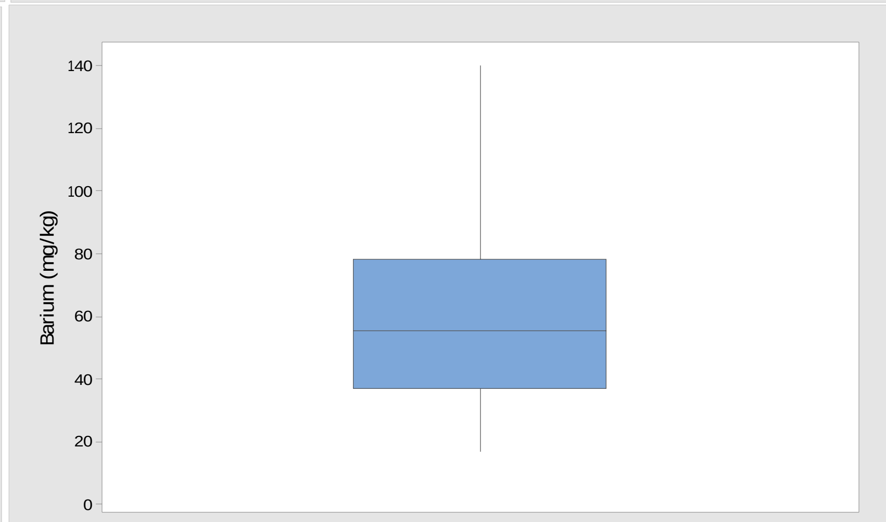
# Evaluation of Background Sediment Dataset

Boxplots of Background Sediment

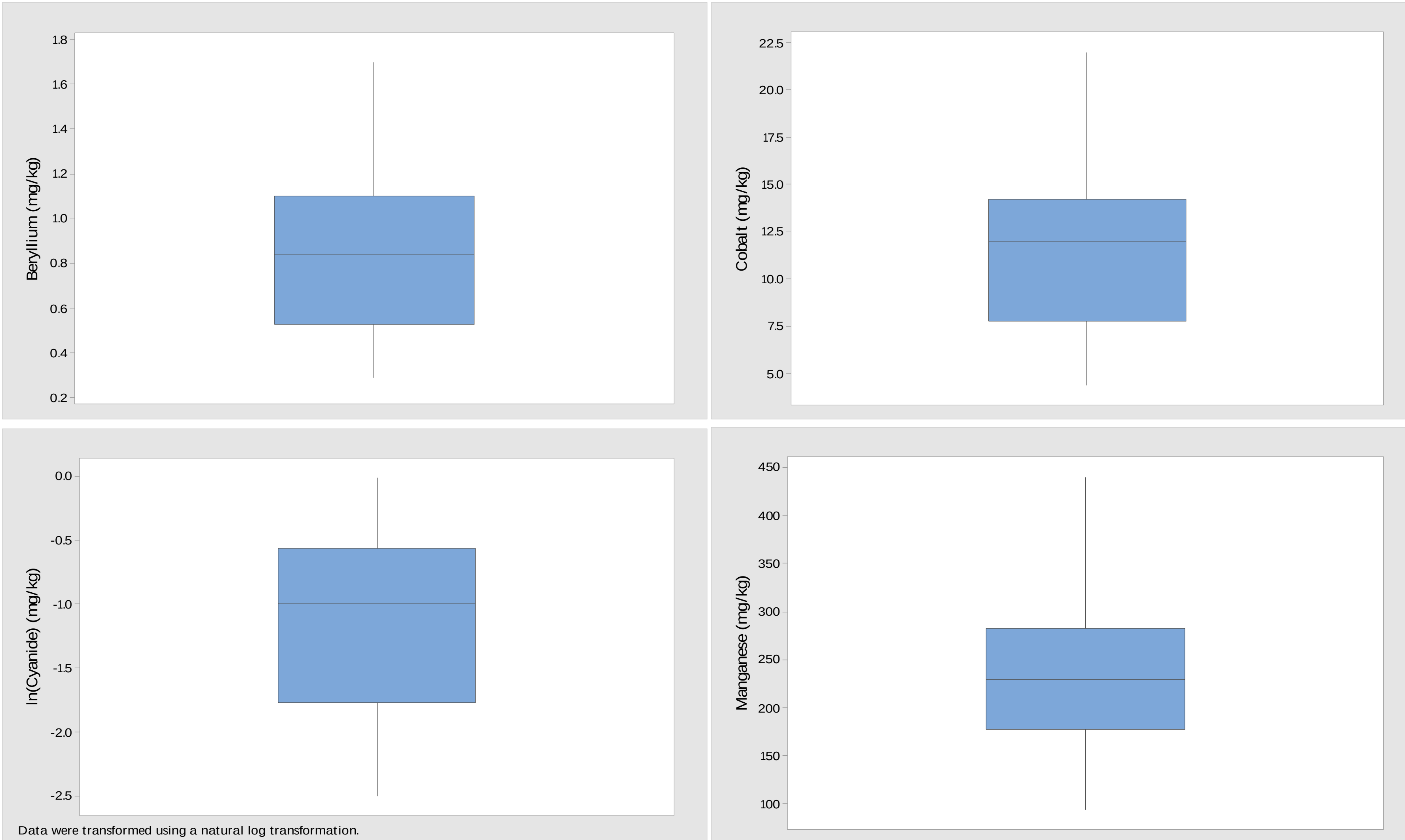


Boxplots of Background Sediment



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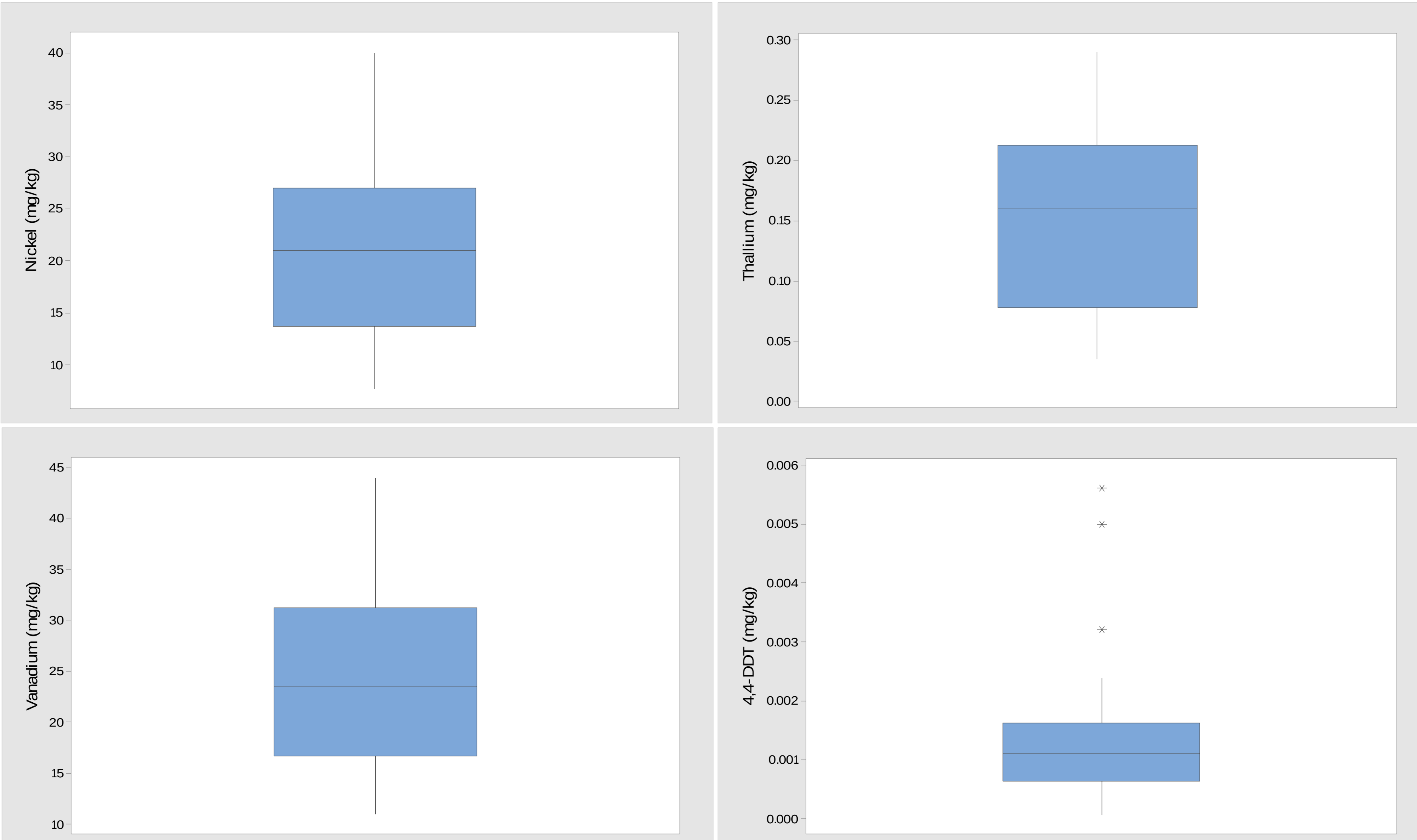

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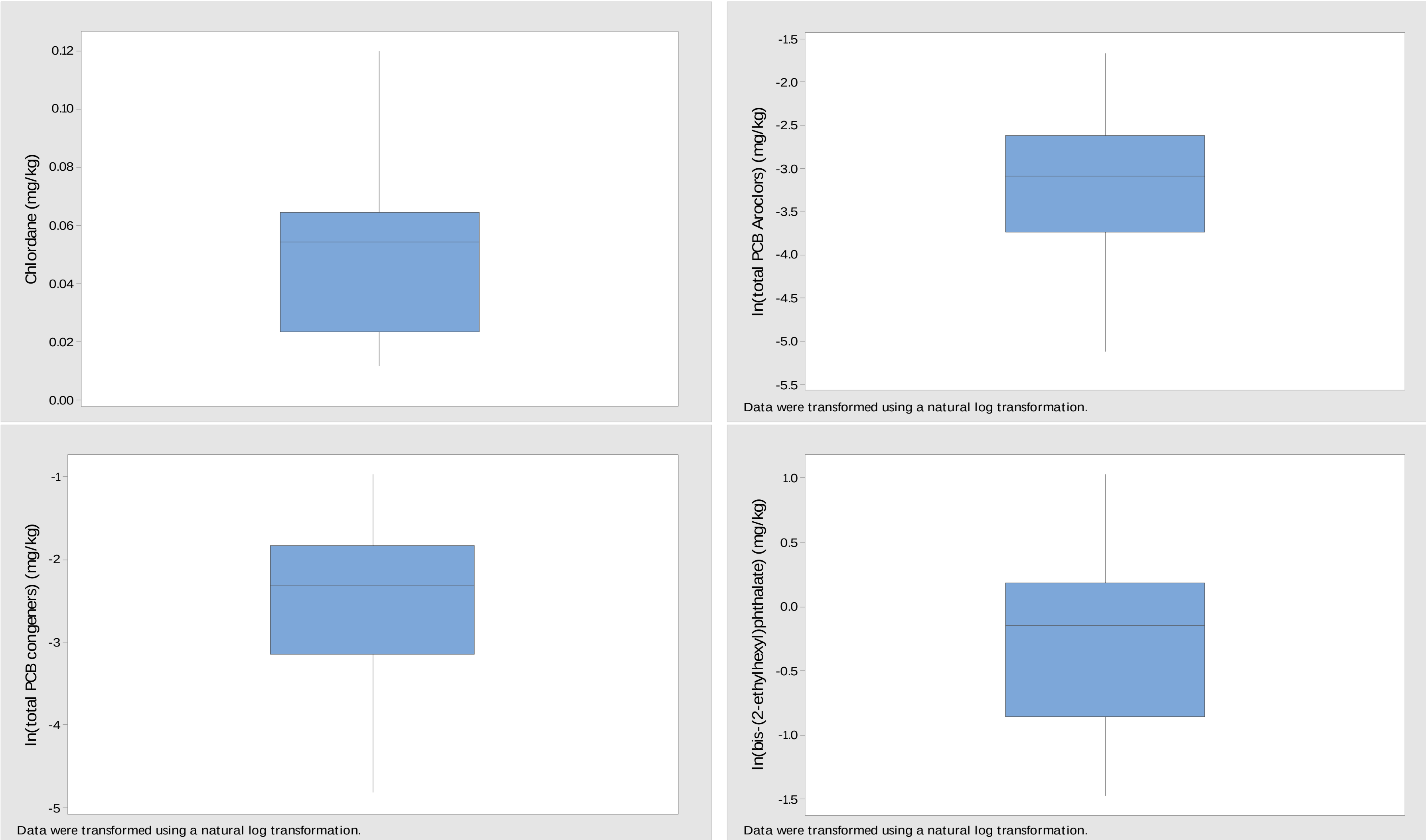

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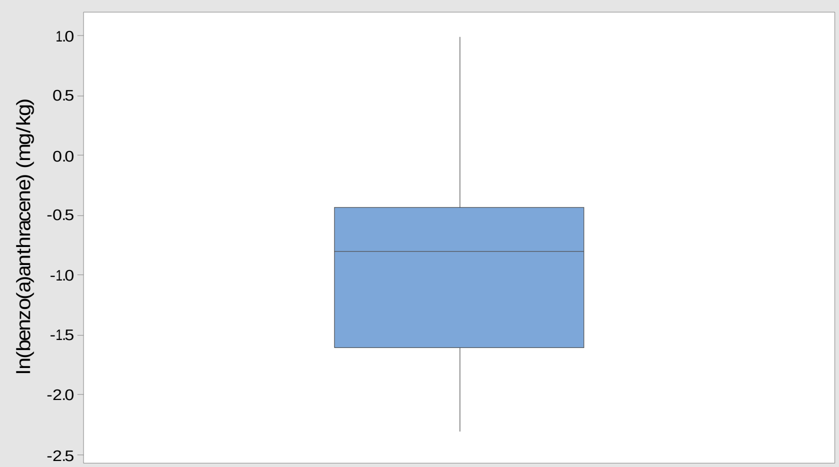


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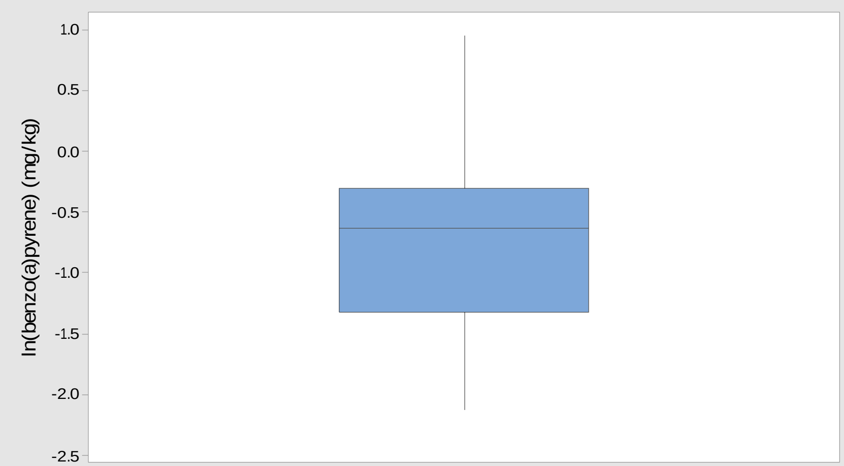


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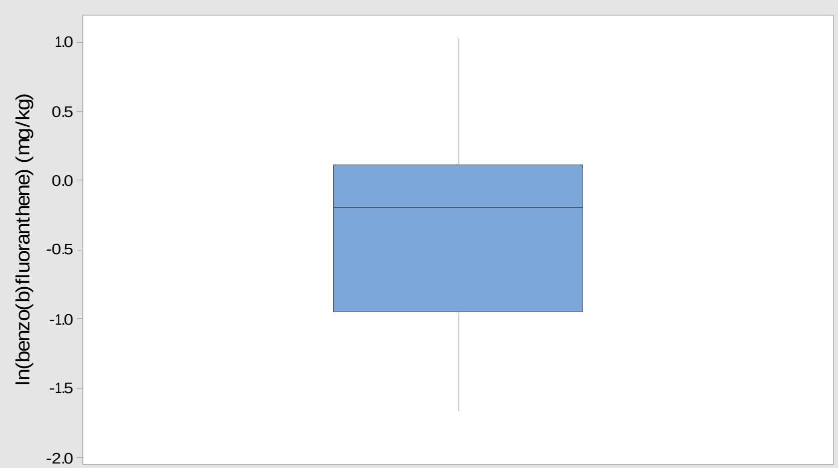


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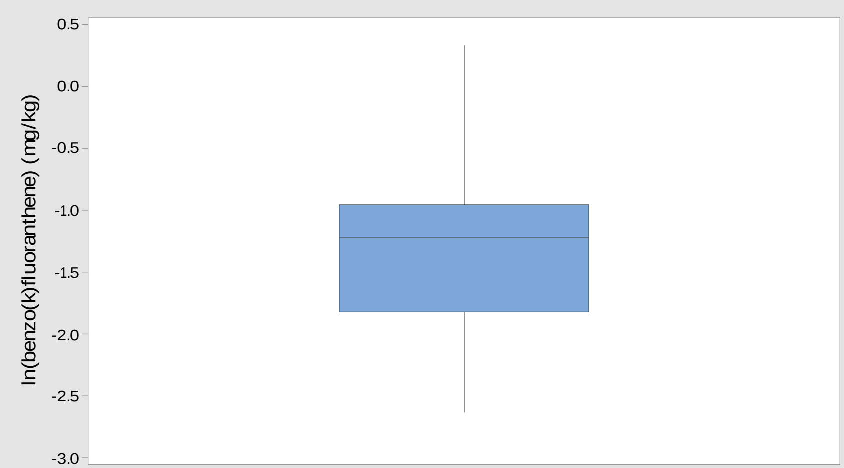


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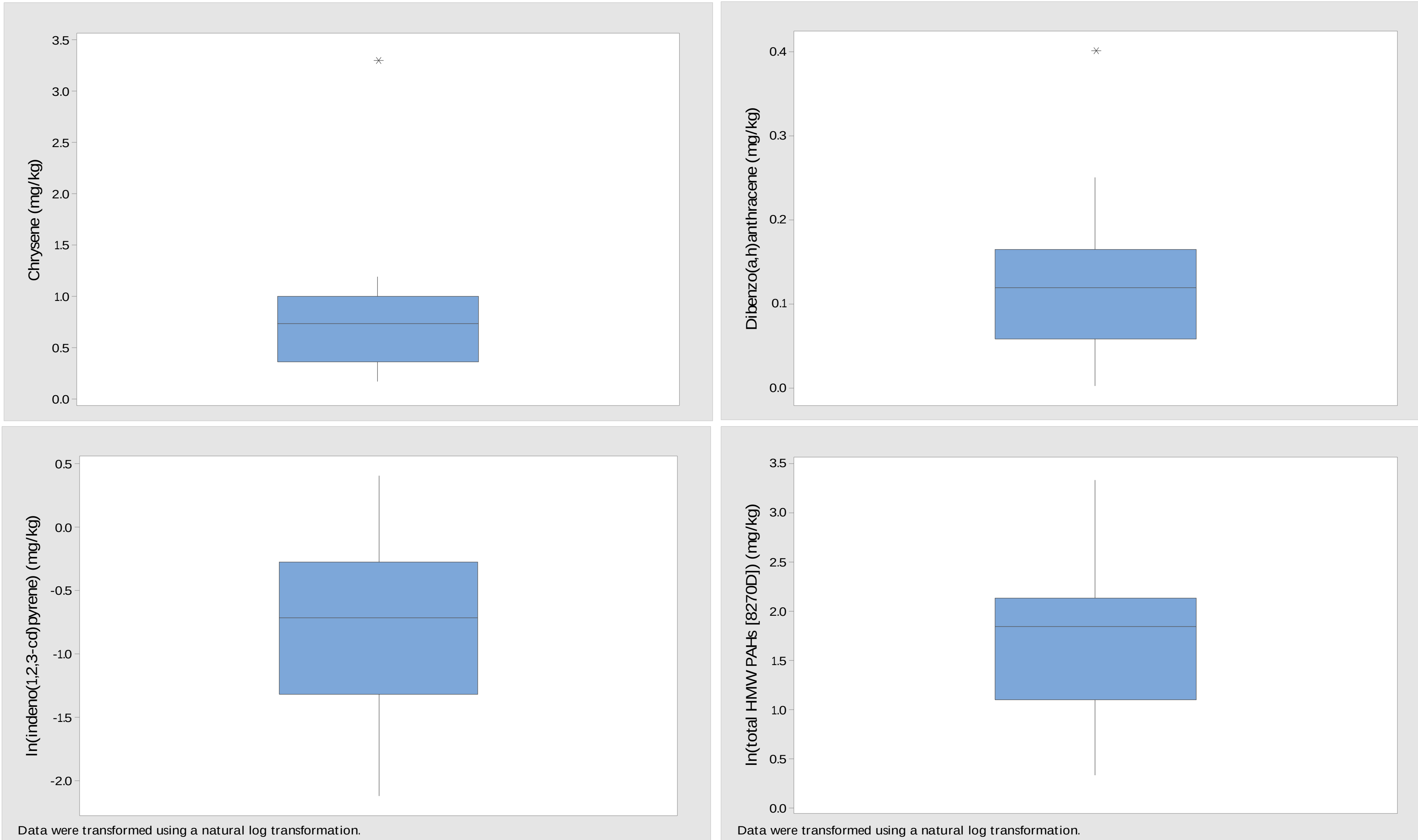
Boxplots of Background Sediment



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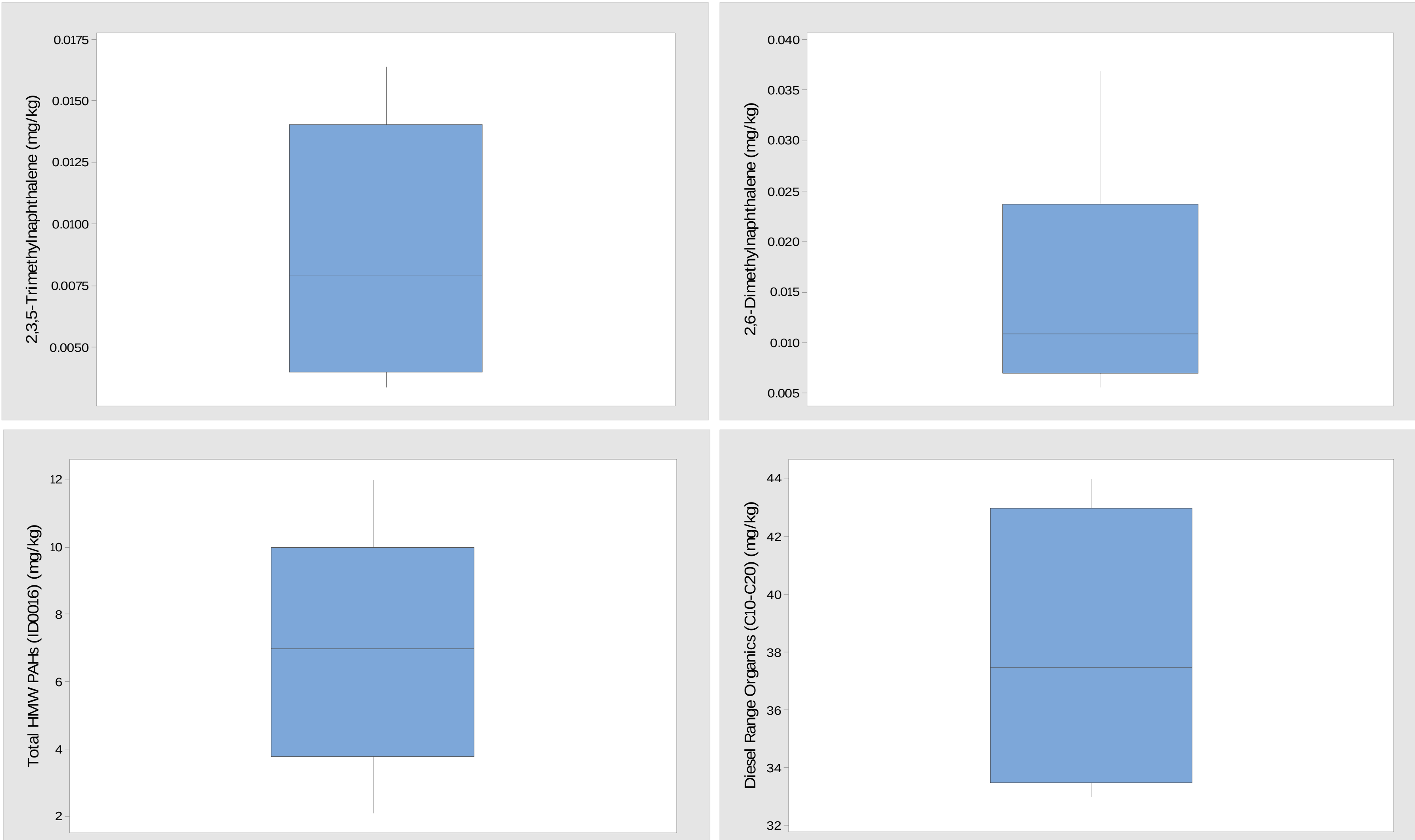

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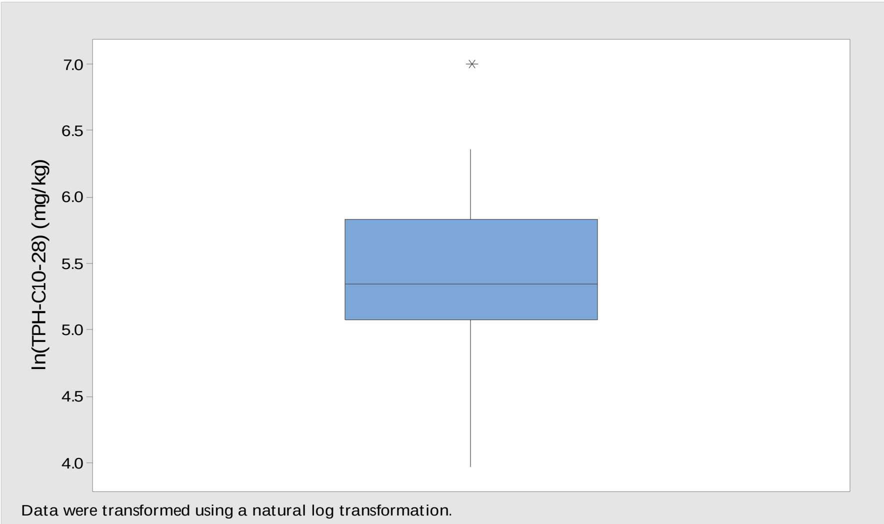
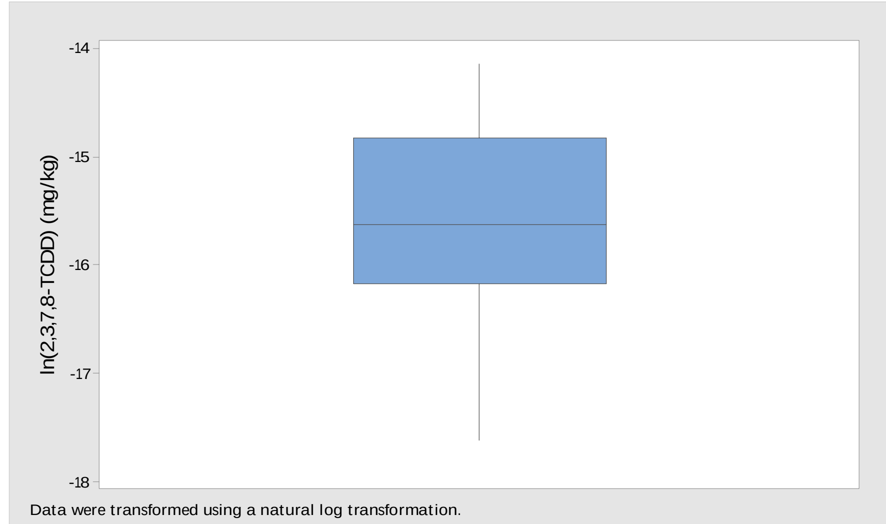
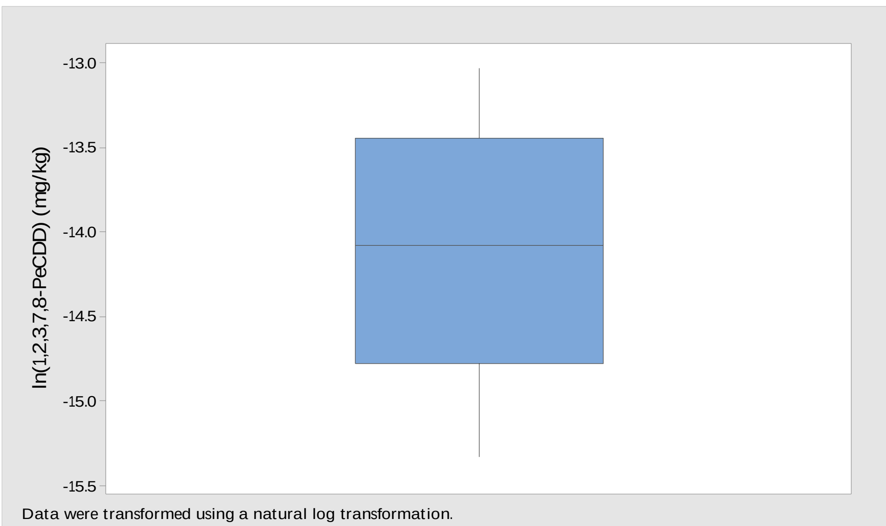
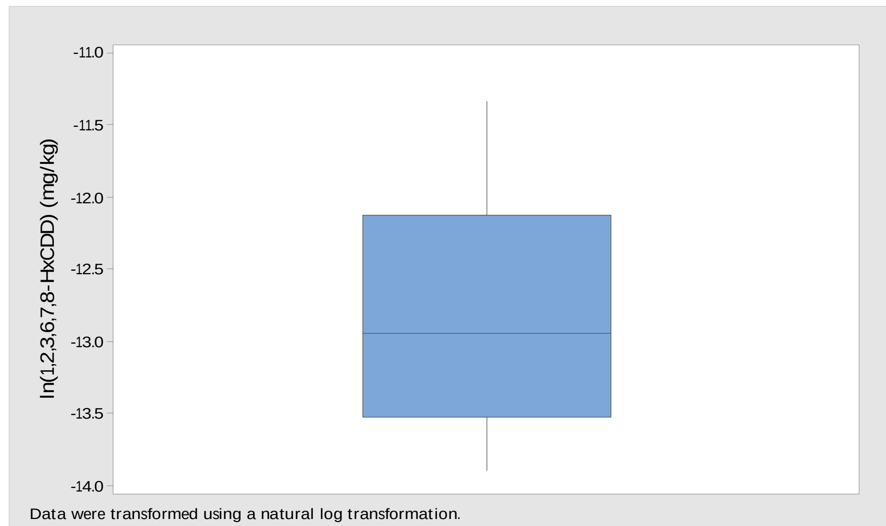
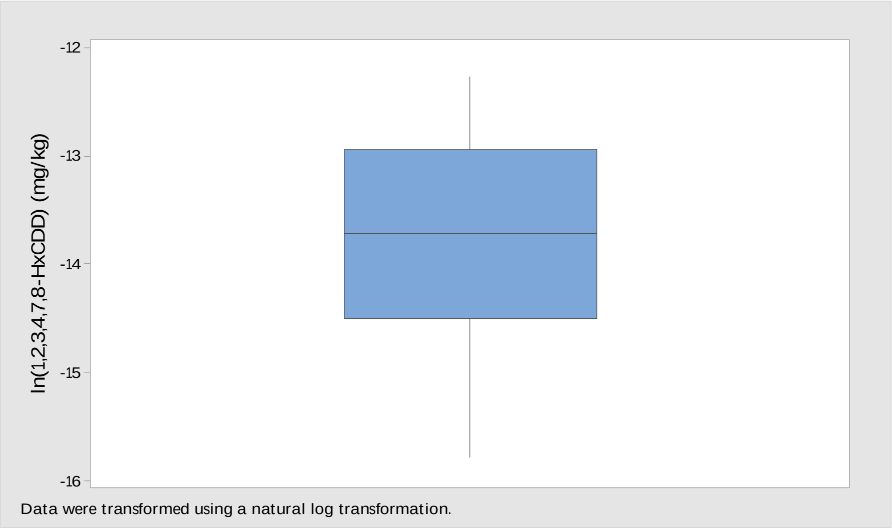


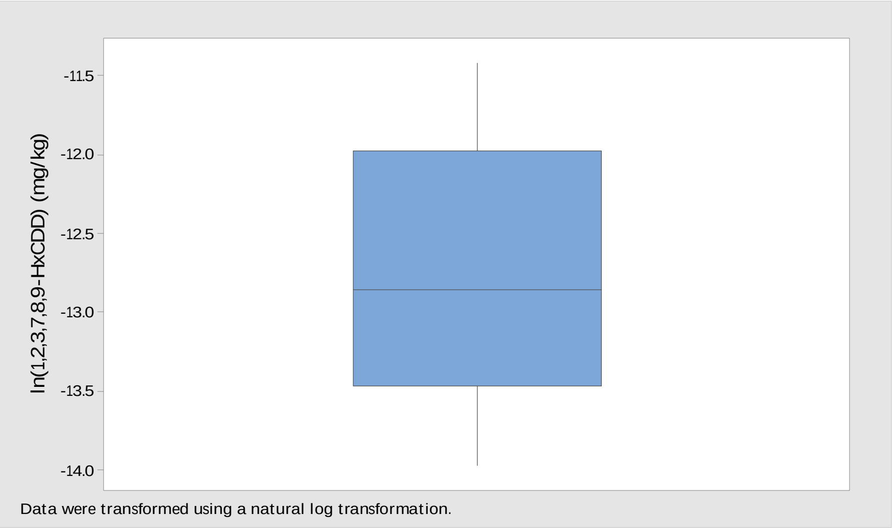



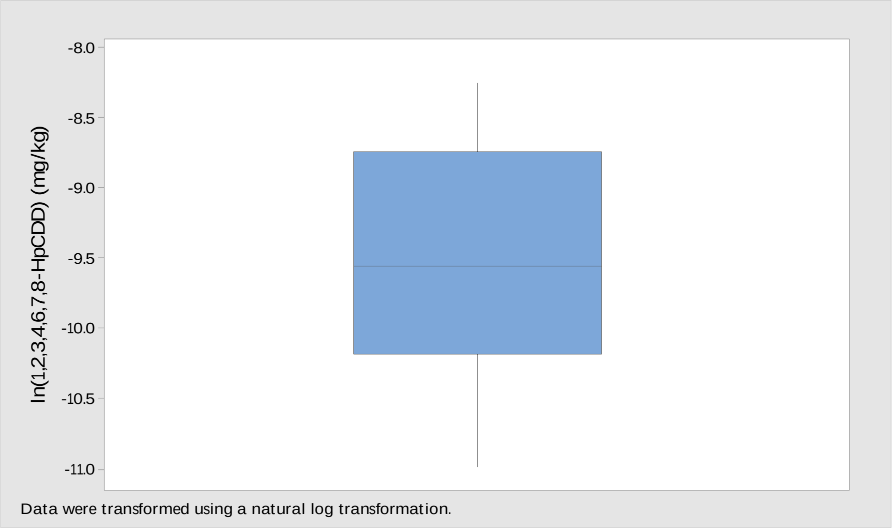



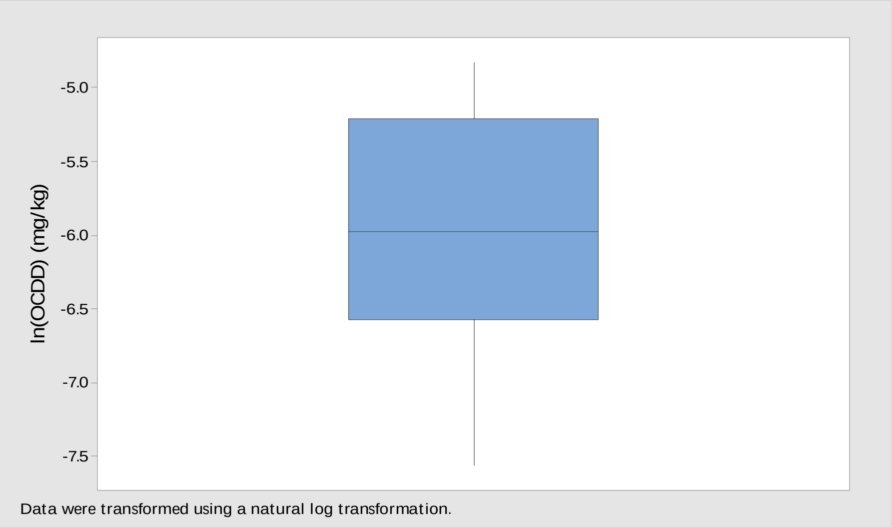



Boxplots of Background Sediment

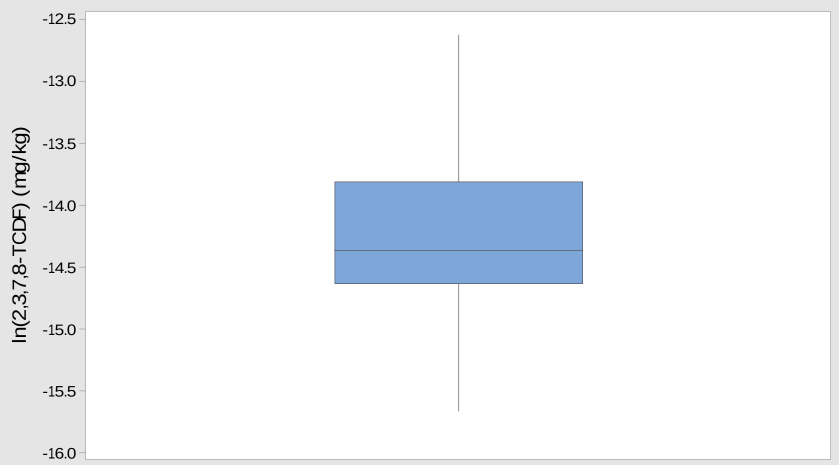


Boxplots of Background Sediment

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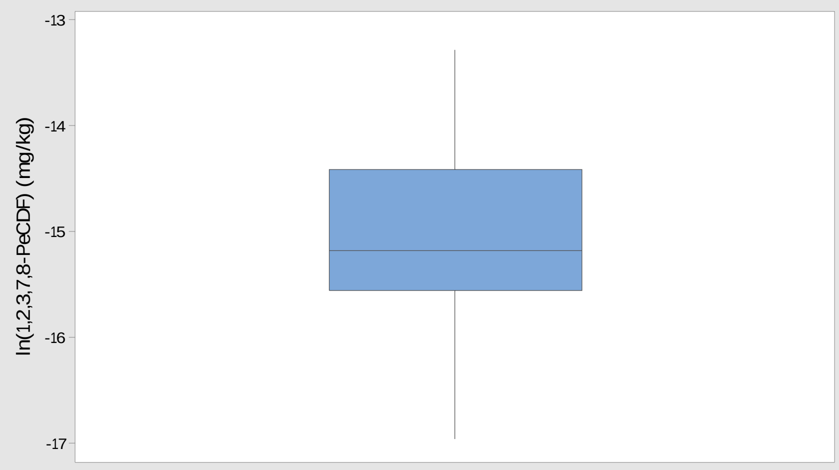


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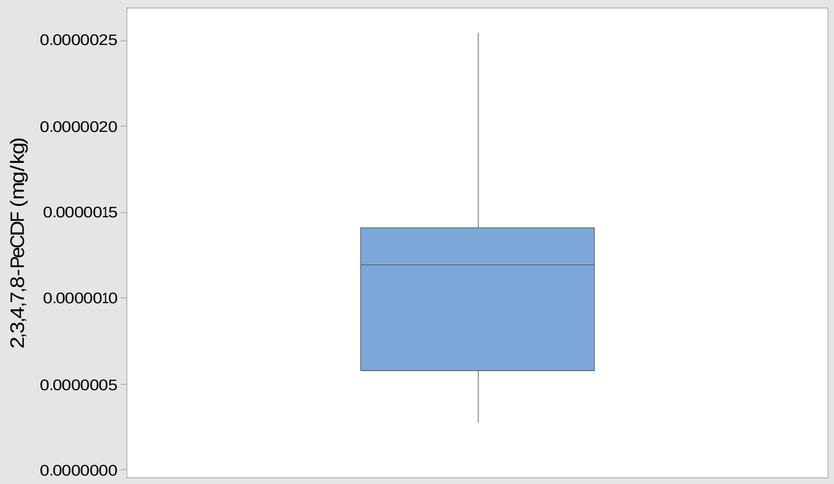


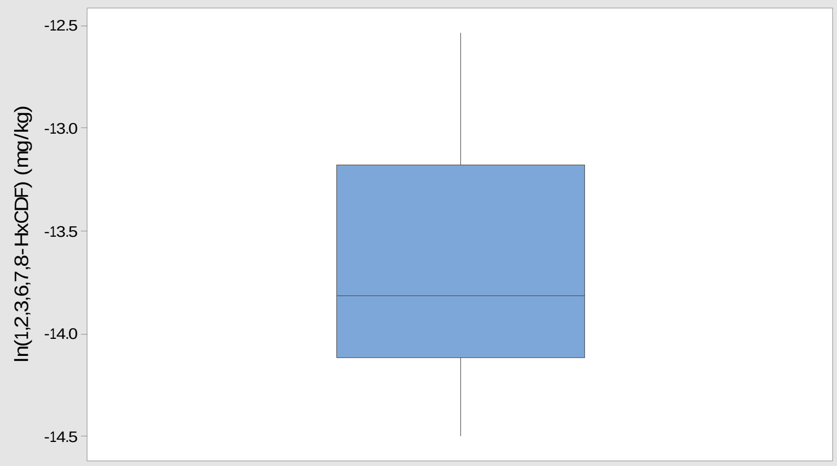


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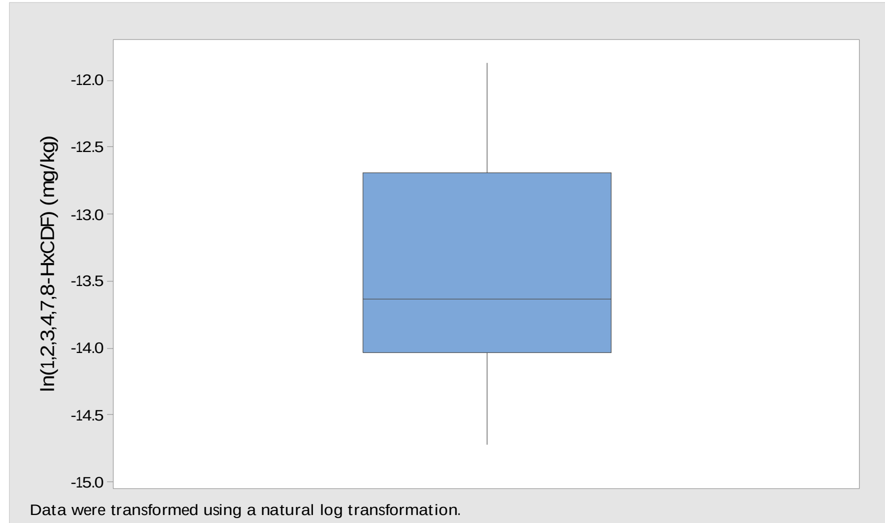
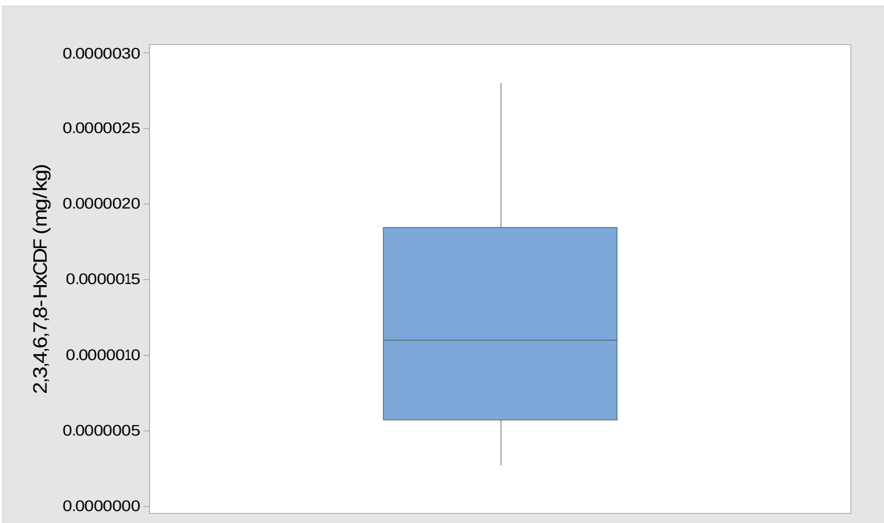
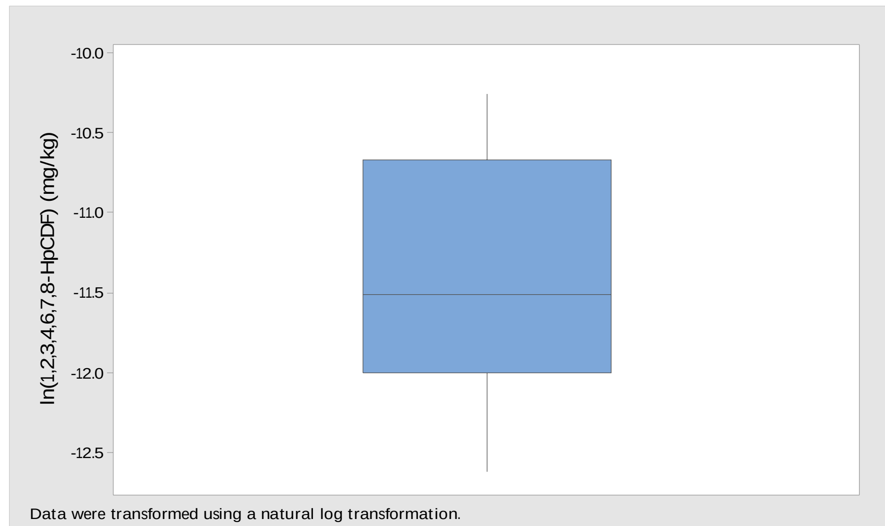
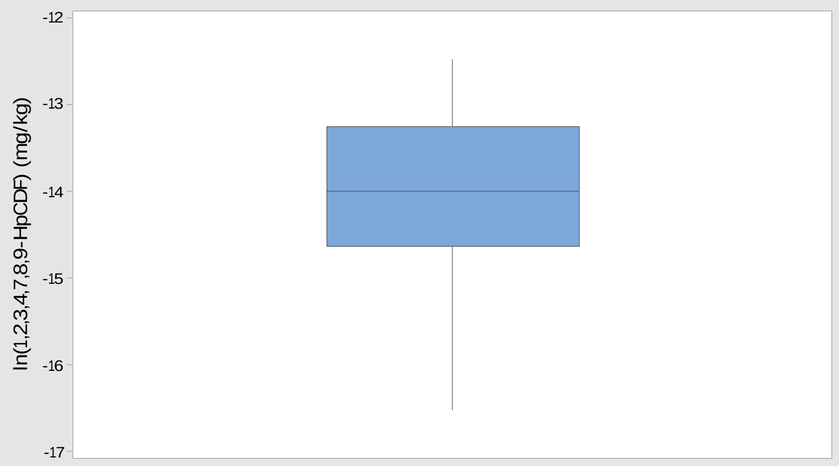
Boxplots of Background Sediment

Boxplots of Background Sediment

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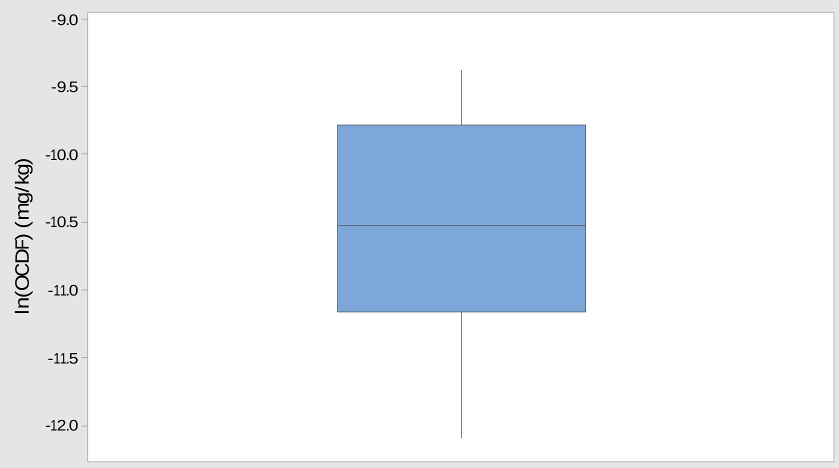


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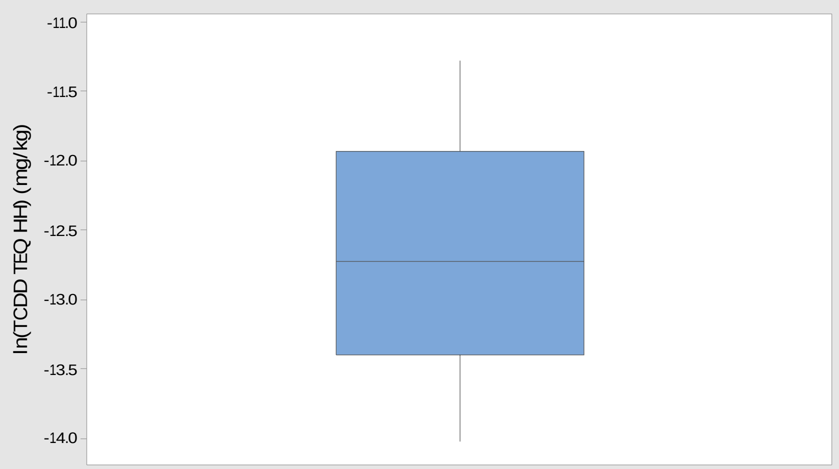


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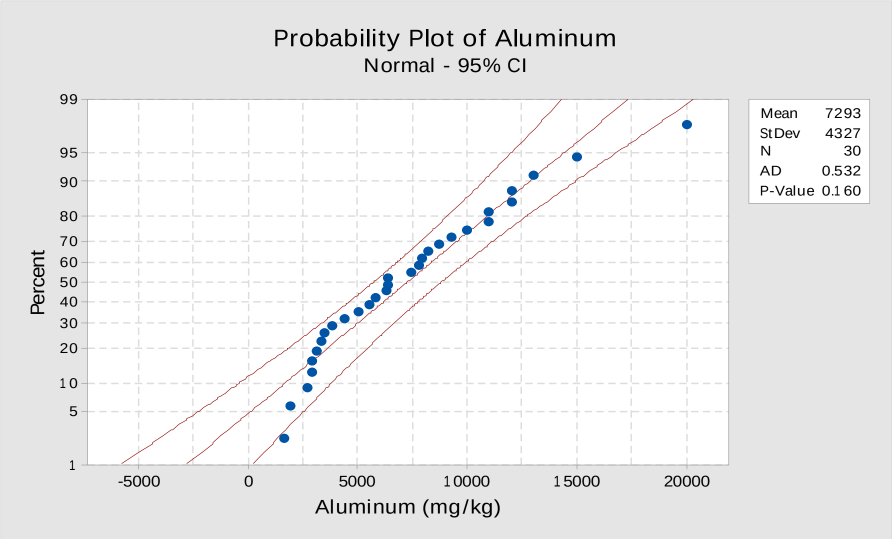
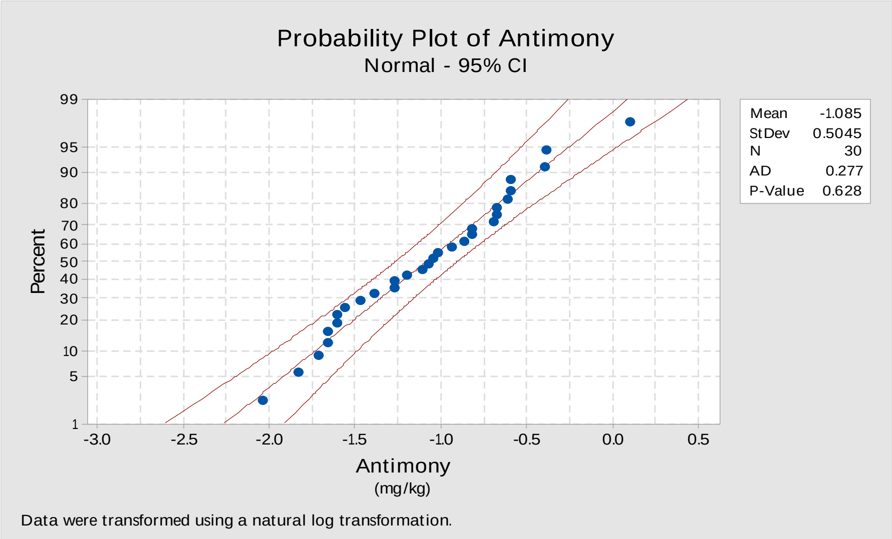
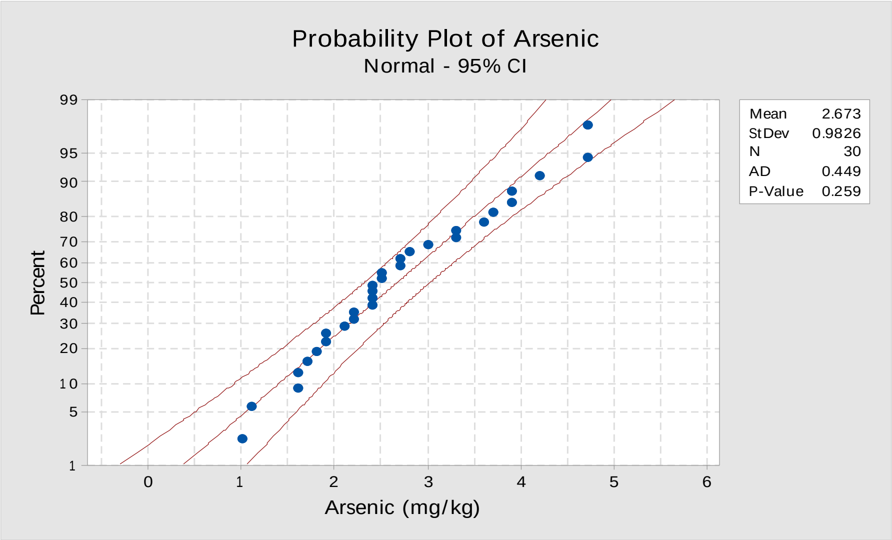
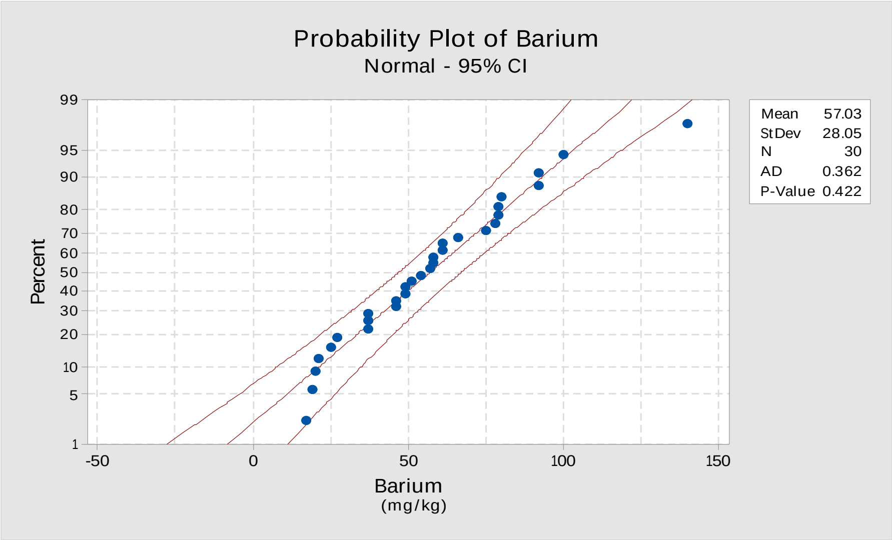
Probability Plots of Background Sediment

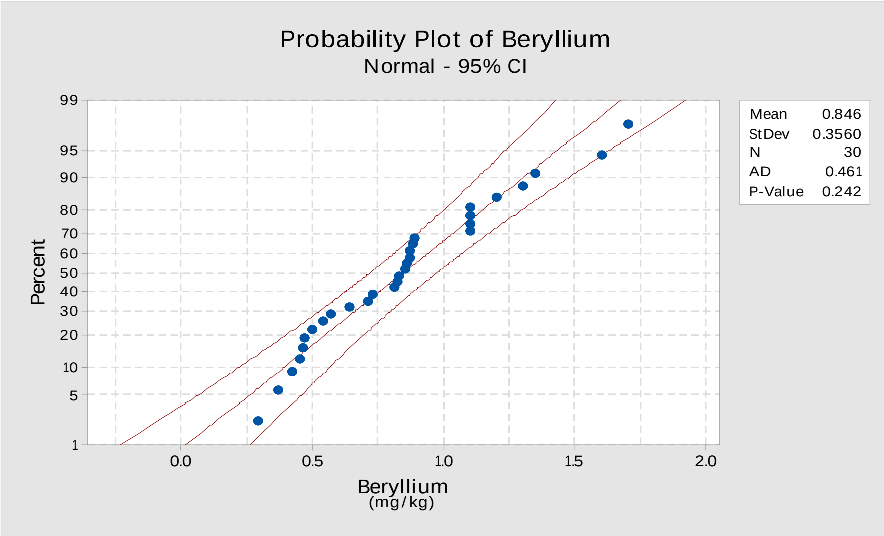


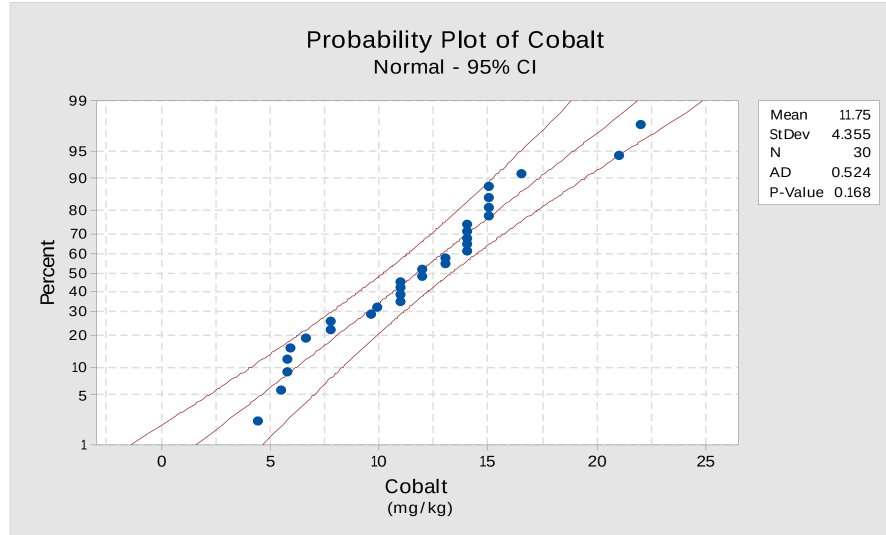



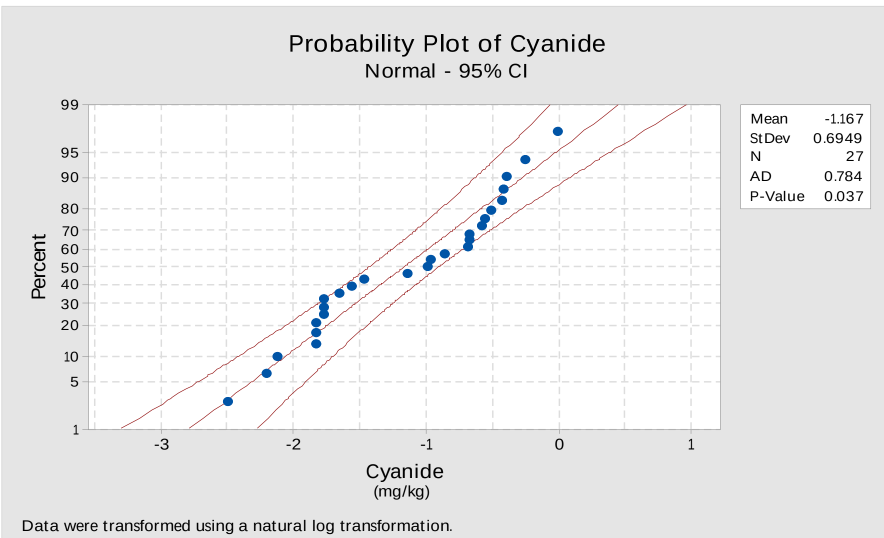



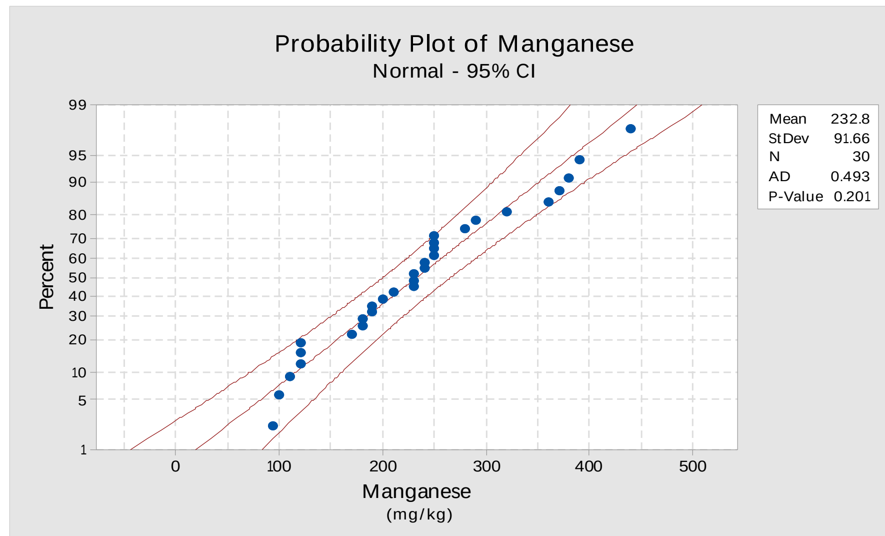



Probability Plots of Background Sediment

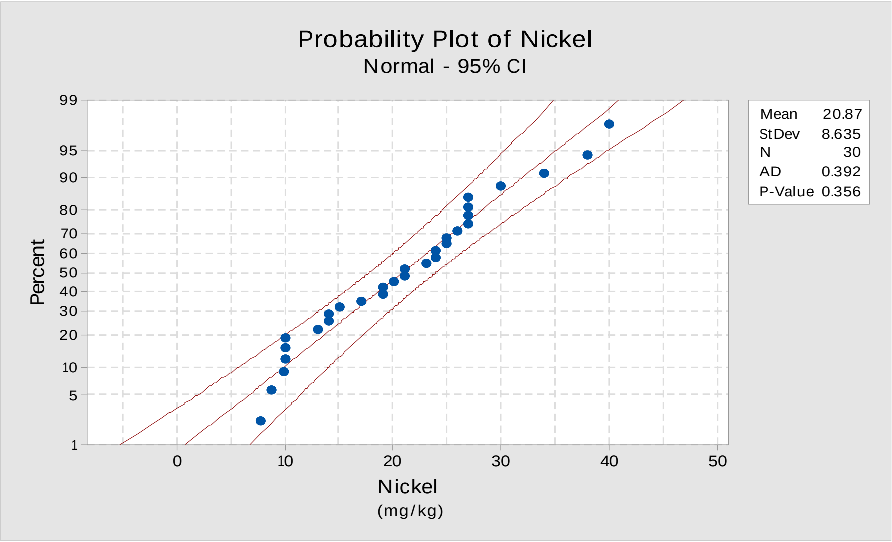


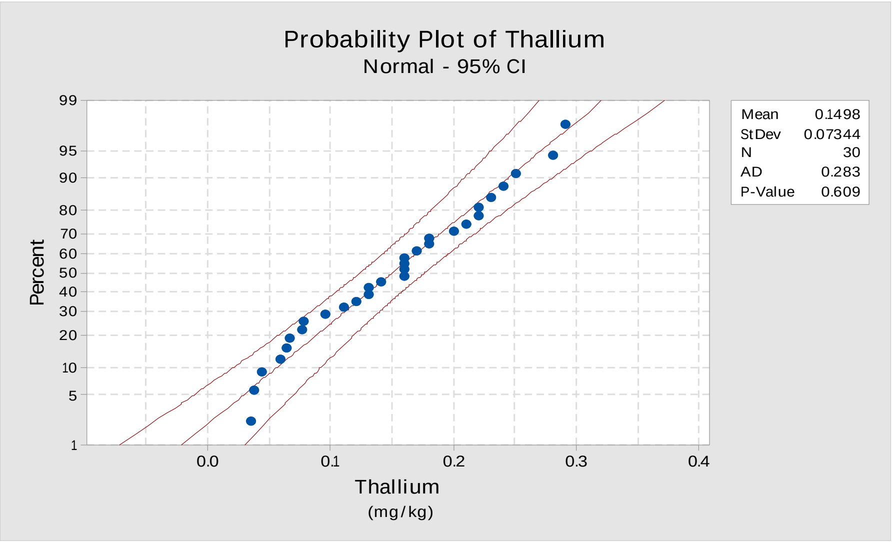



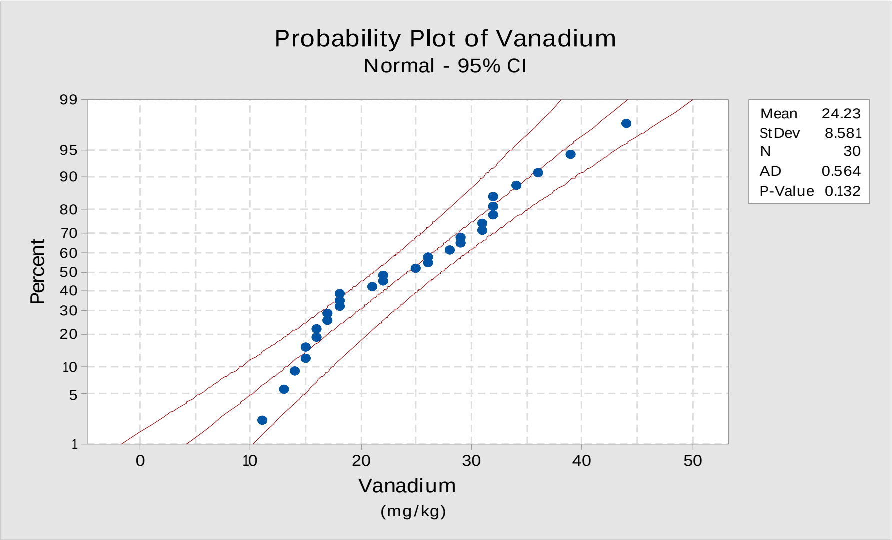



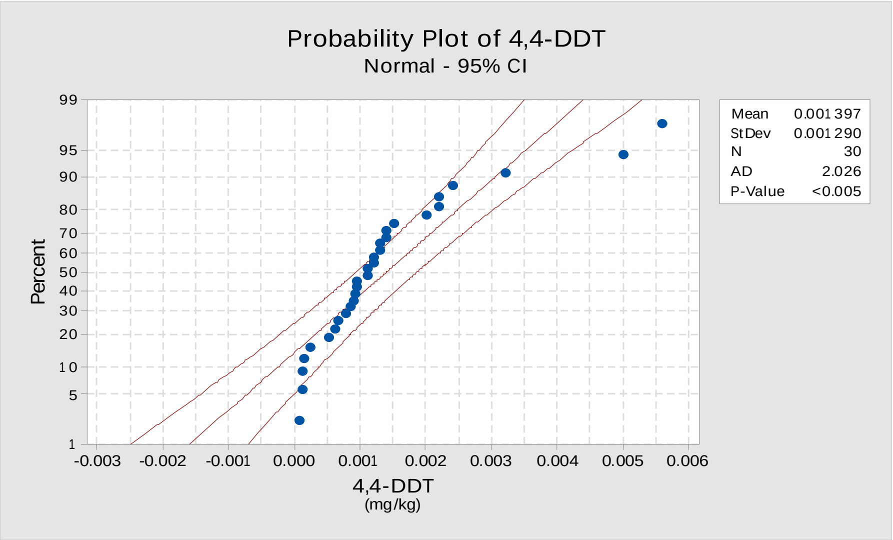



Probability Plots of Background Sediment

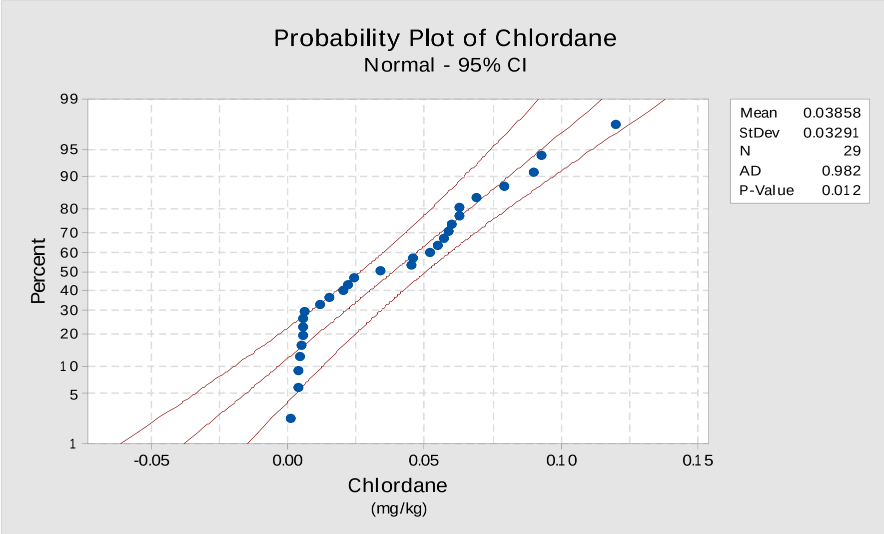


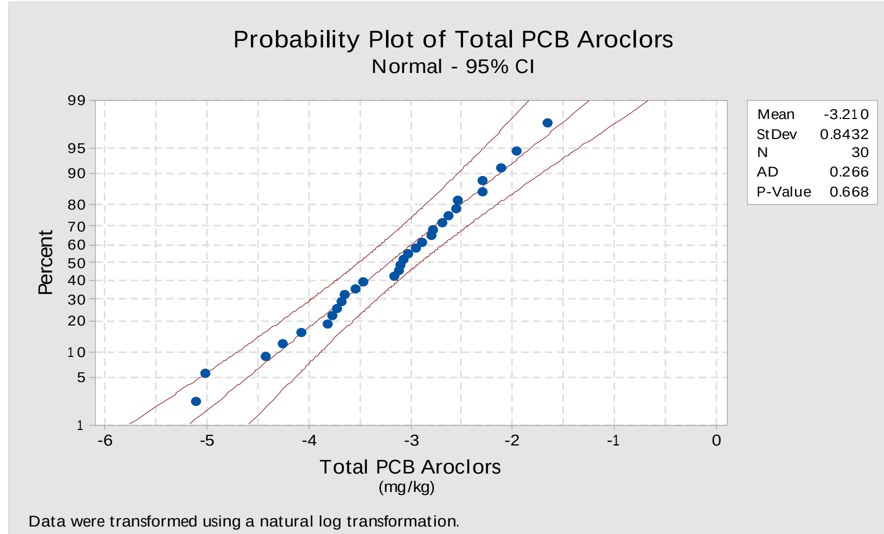



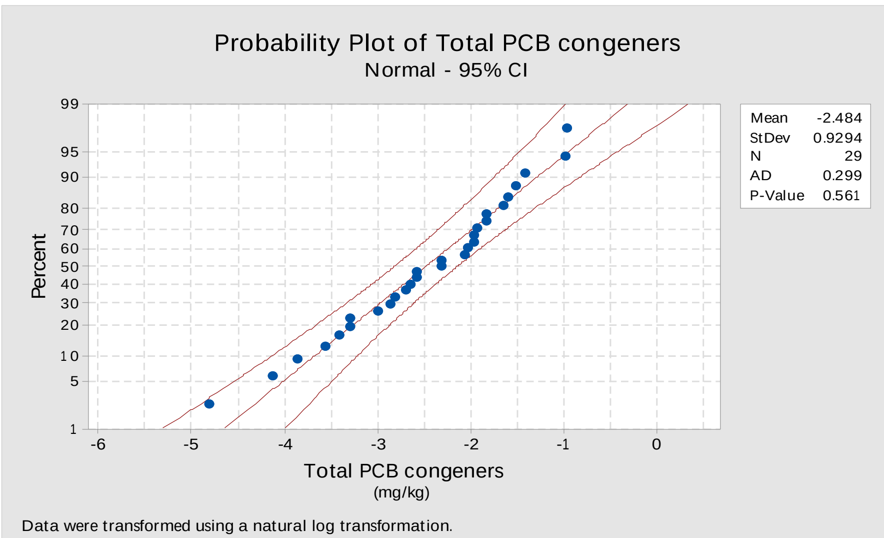



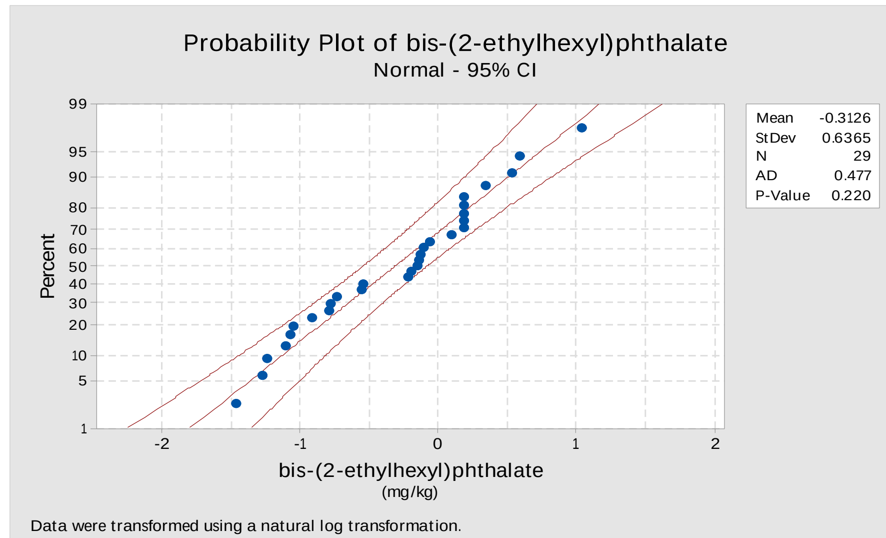



Probability Plots of Background Sediment



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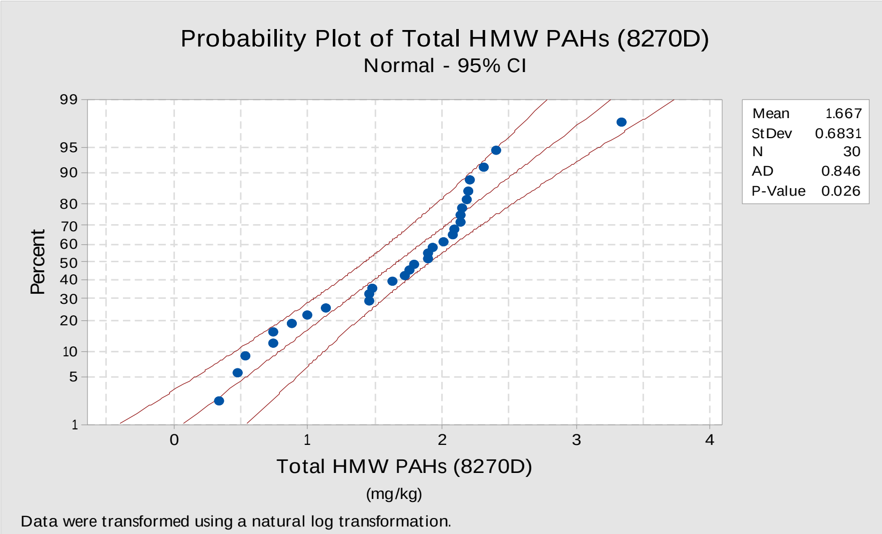


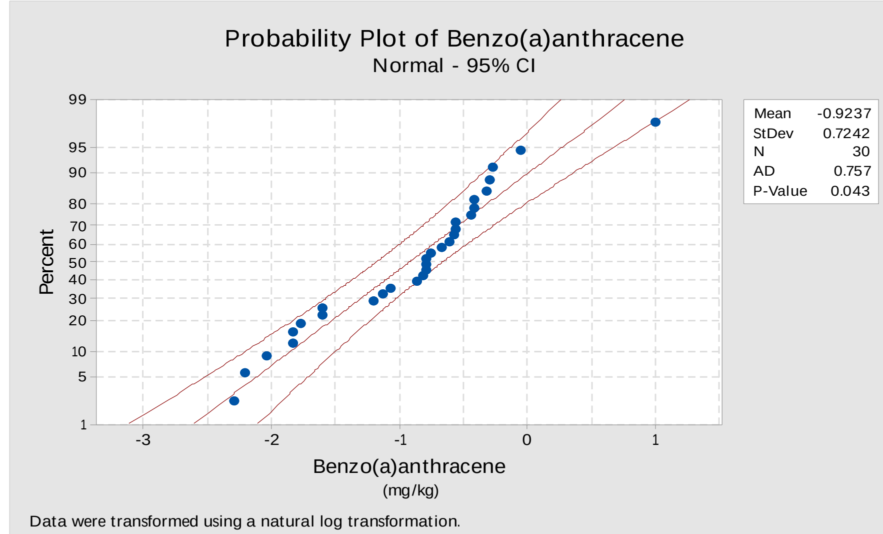


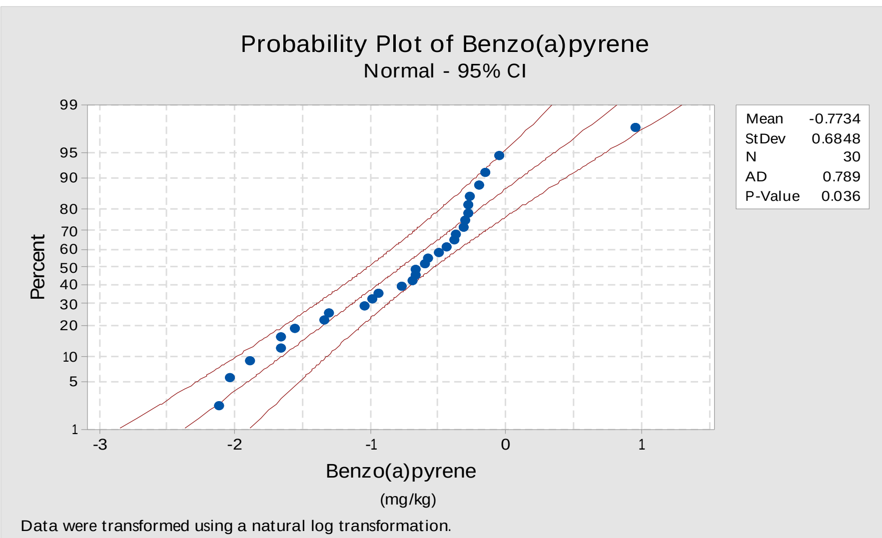


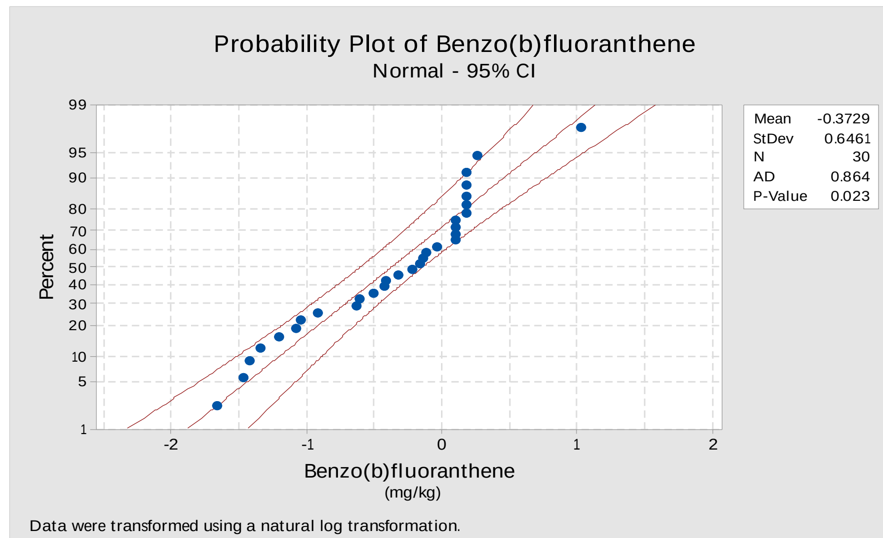

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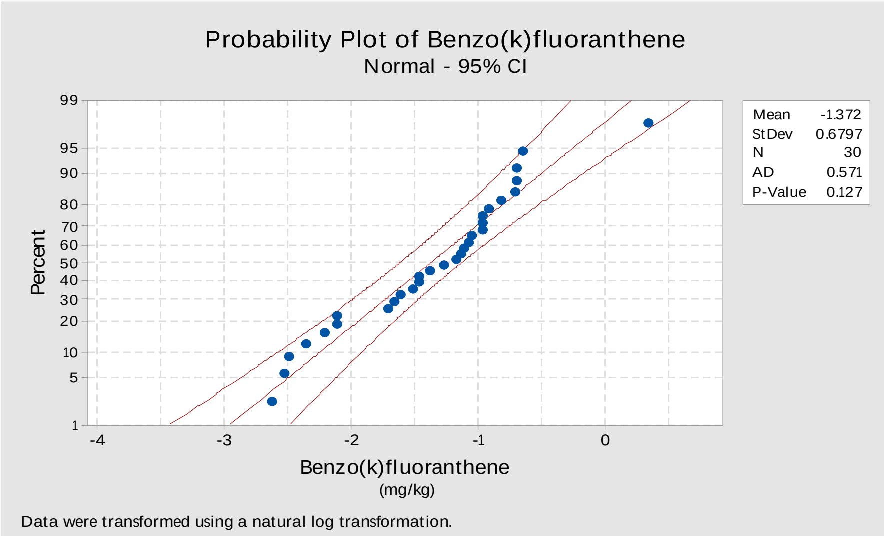
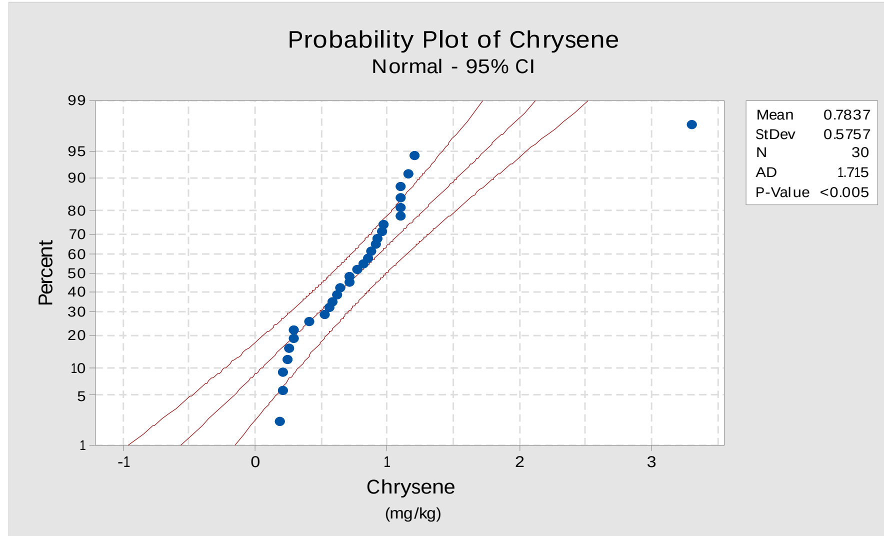
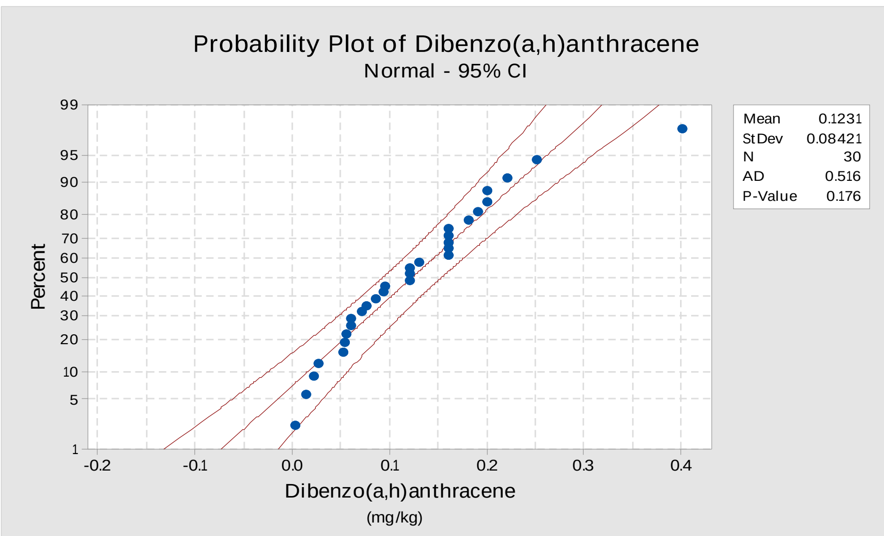
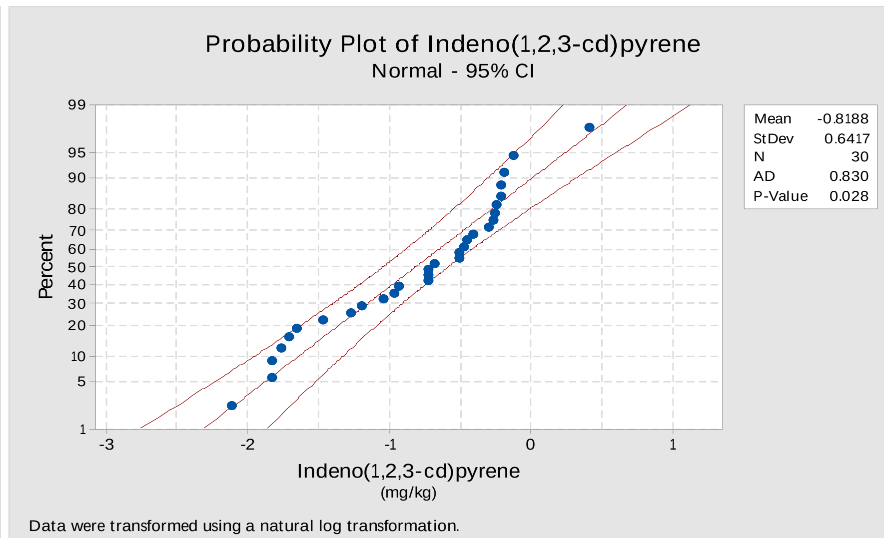
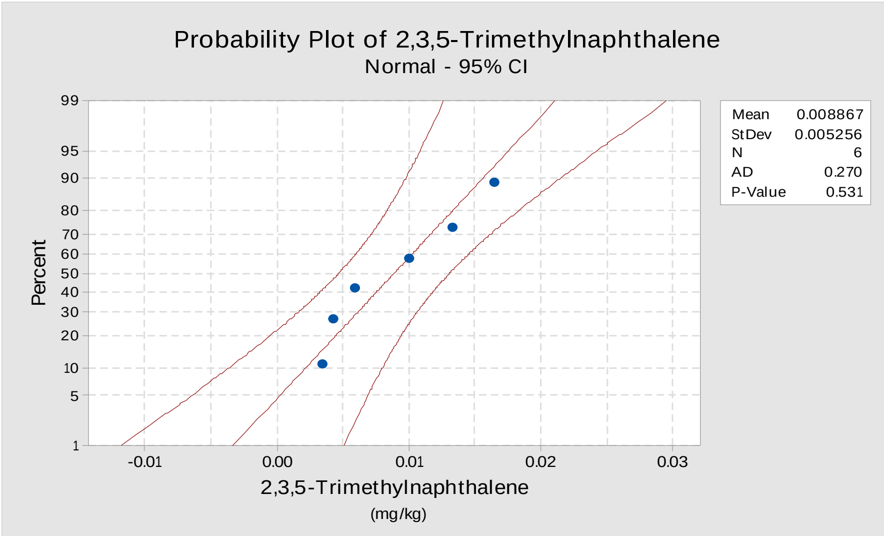


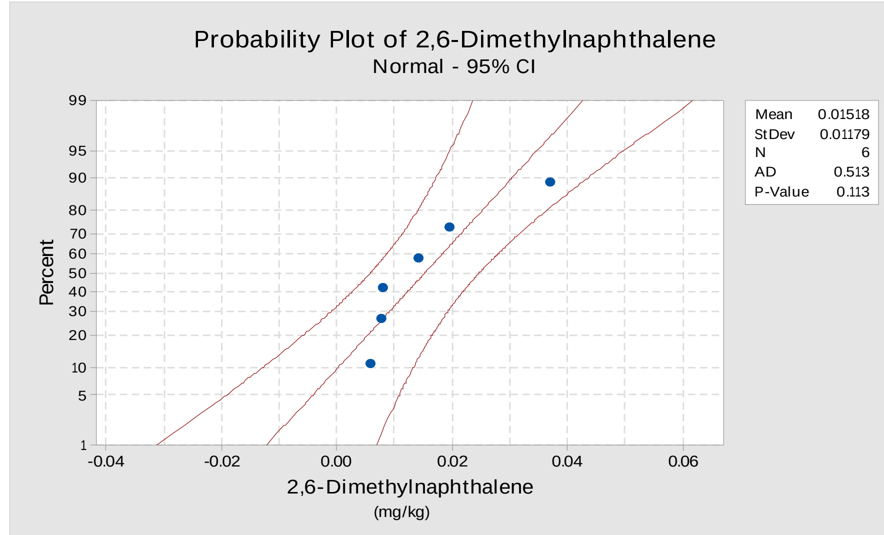



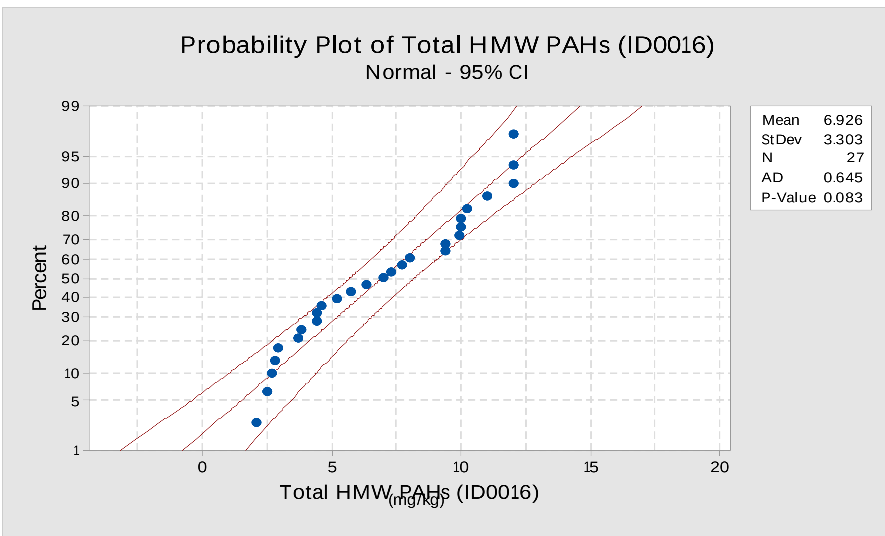



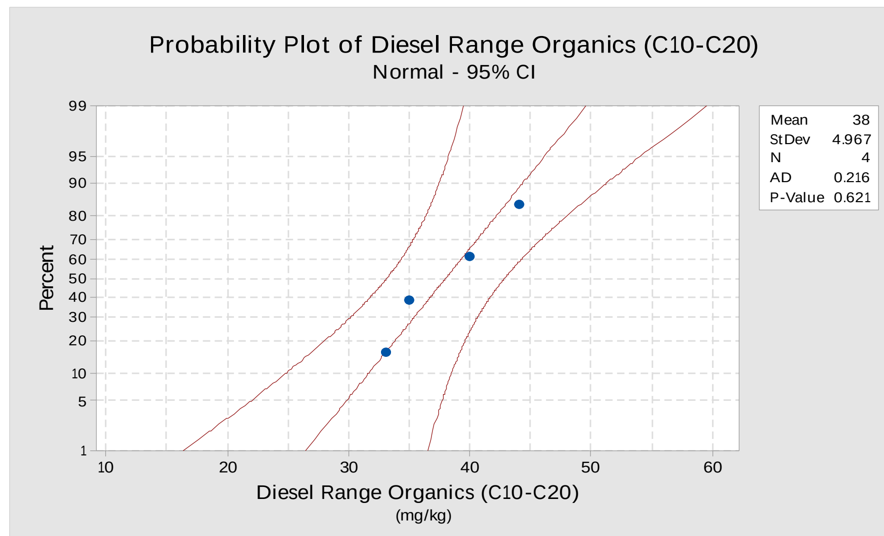



Probability Plots of Background Sediment

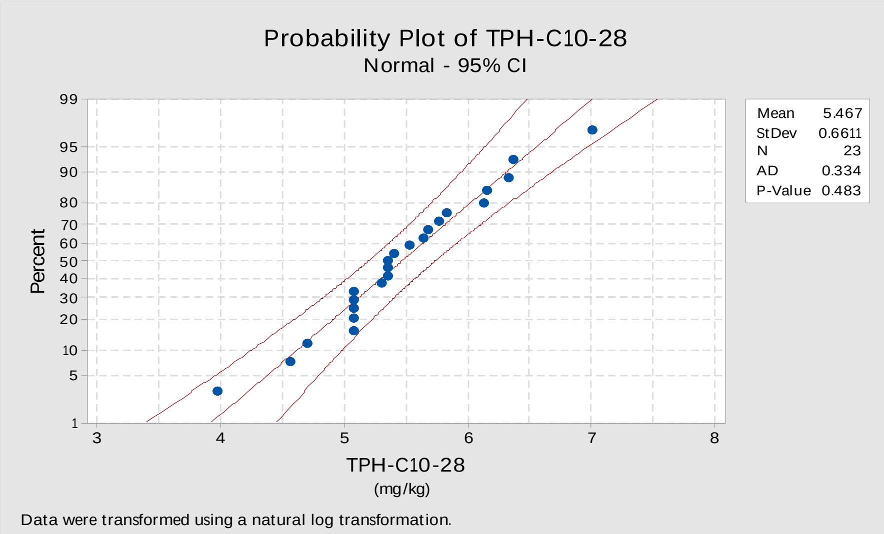


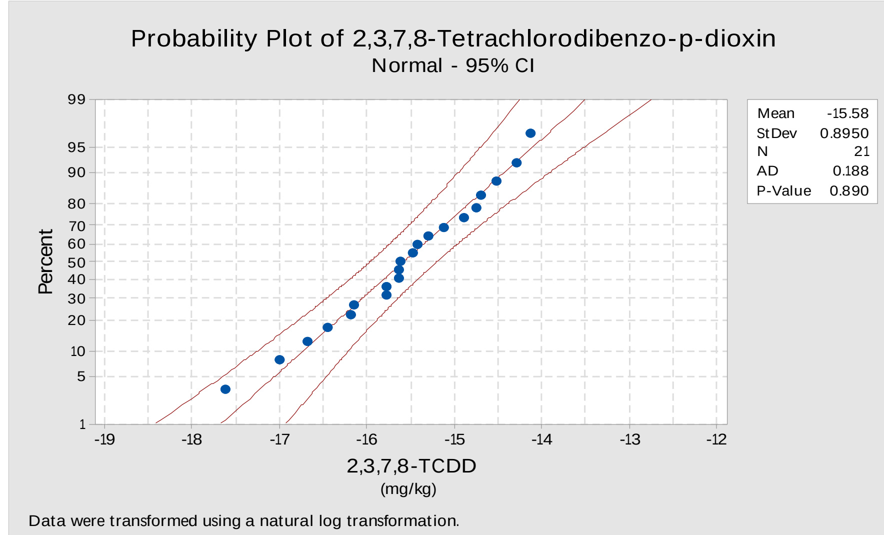



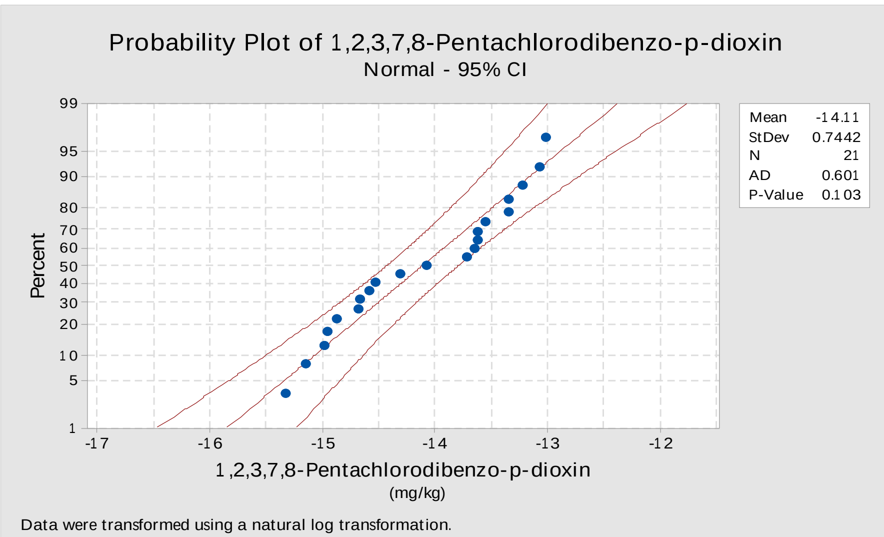



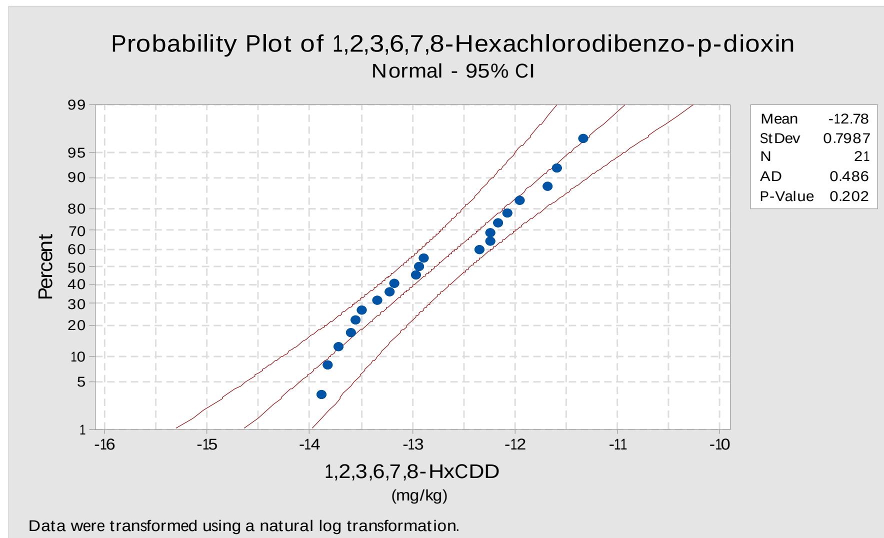



Probability Plots of Background Sediment

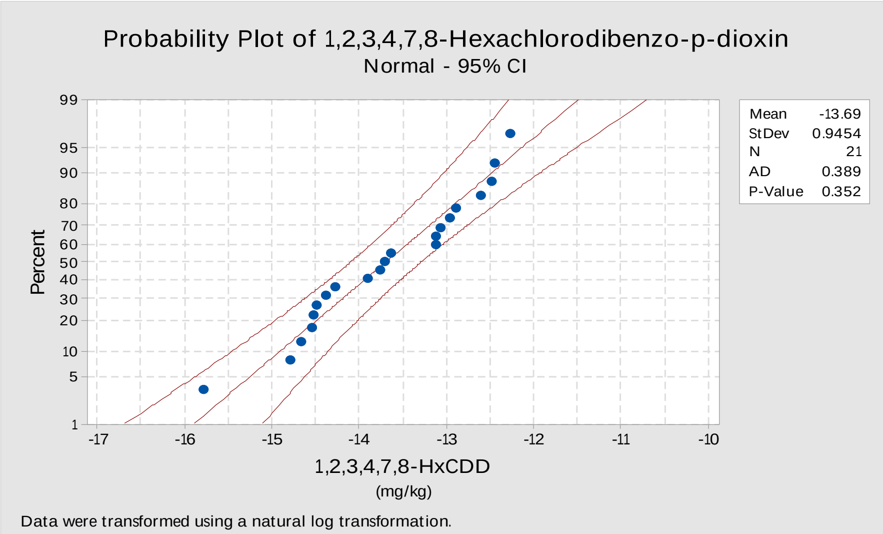


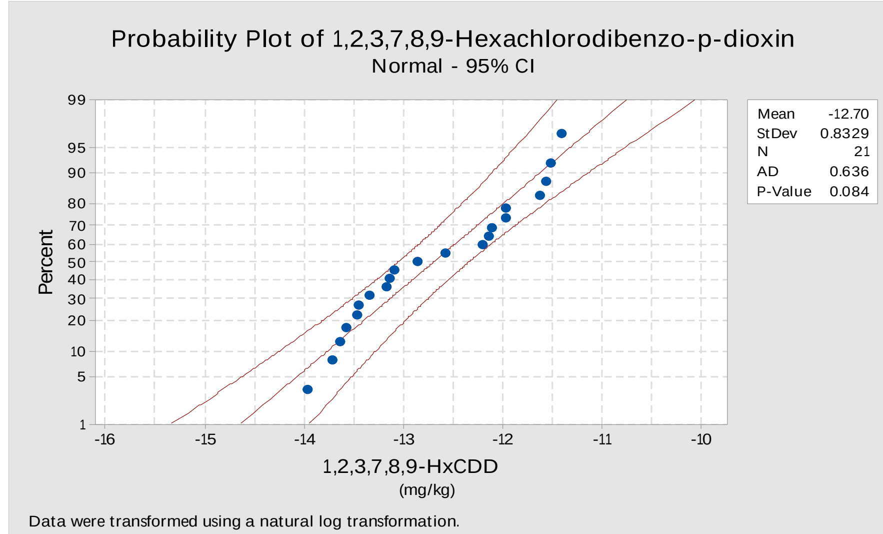



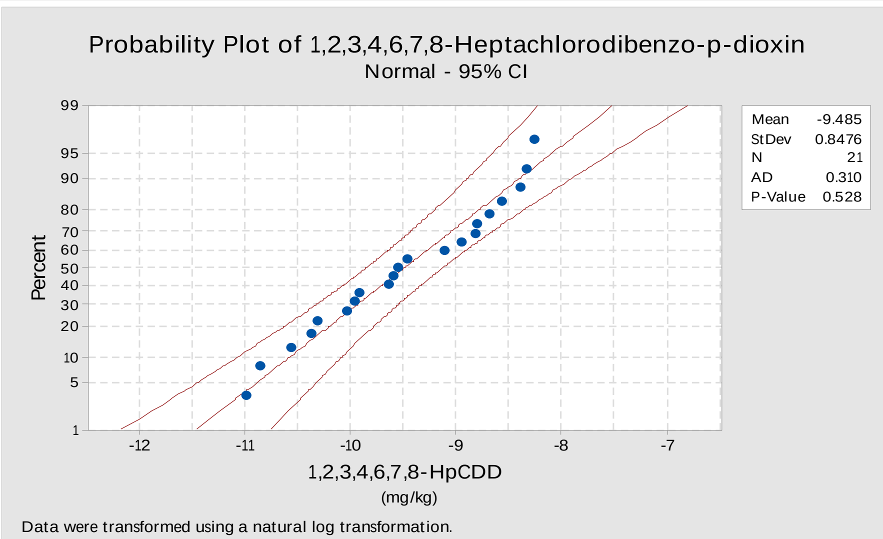



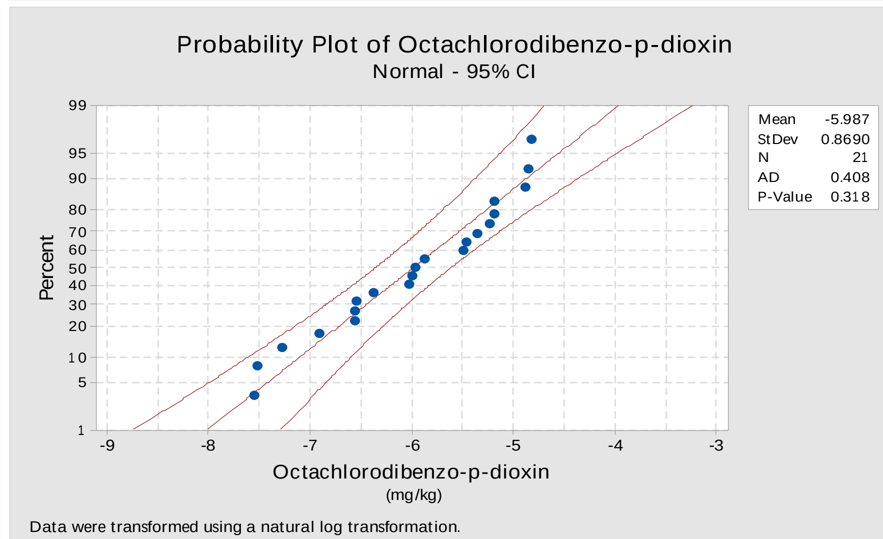



Probability Plots of Background Sediment



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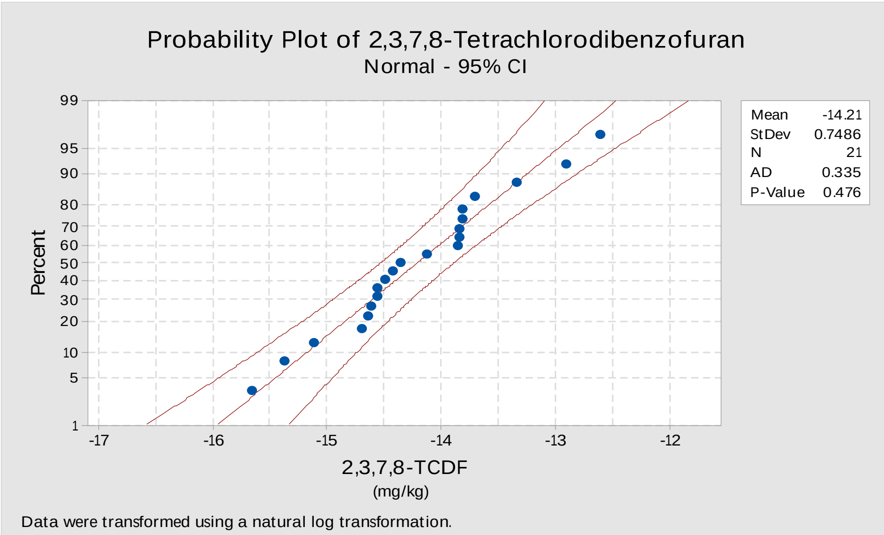
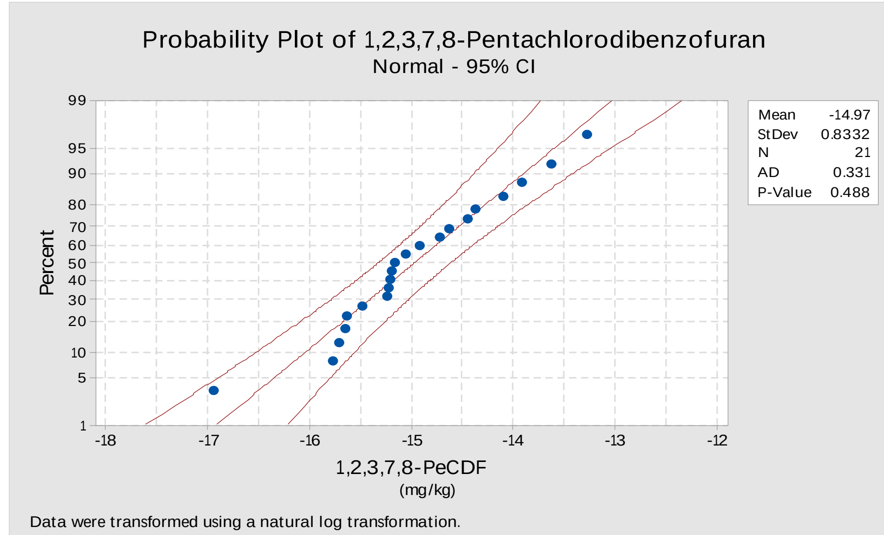
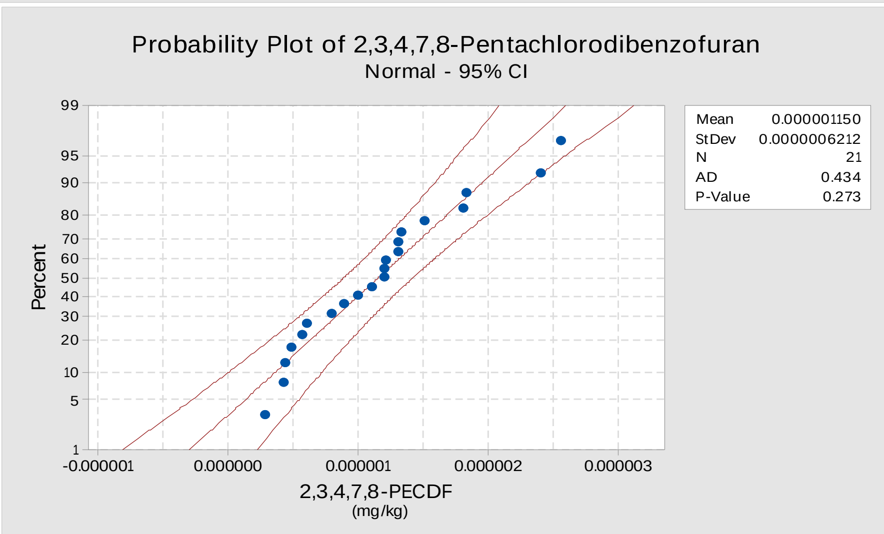
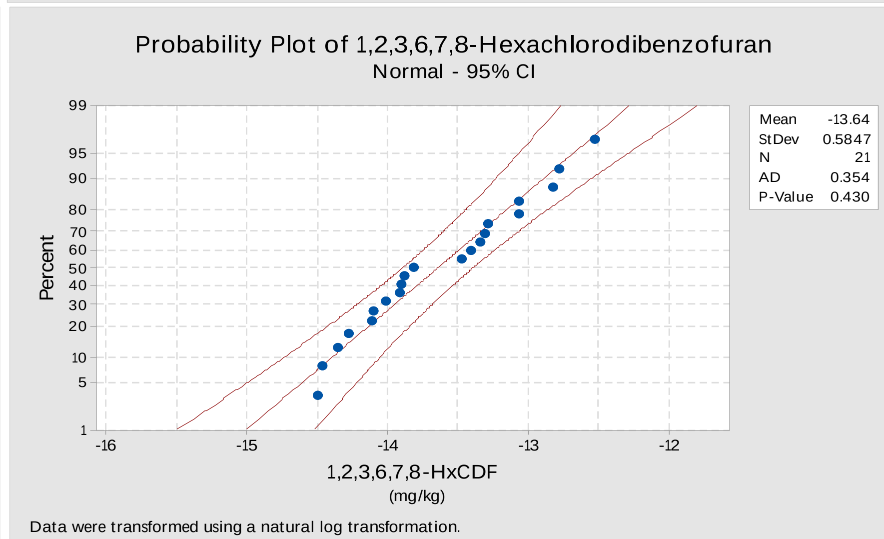
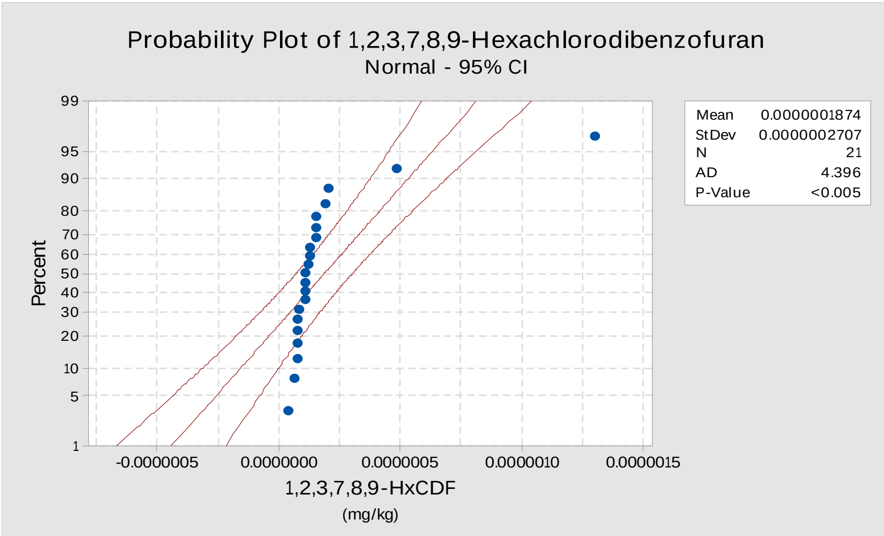


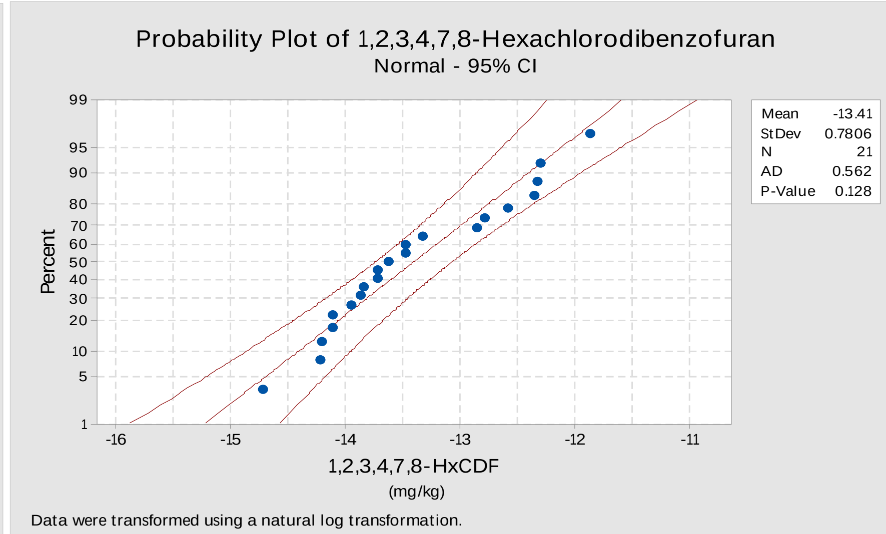



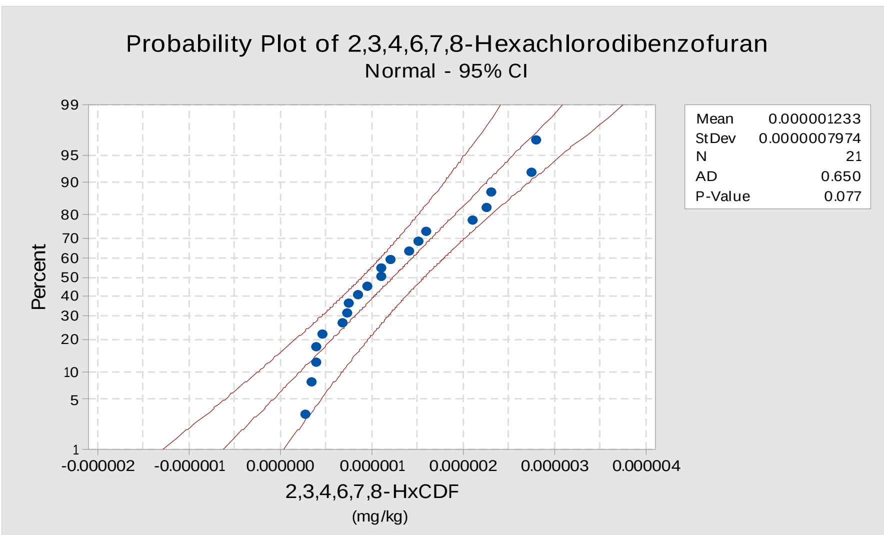



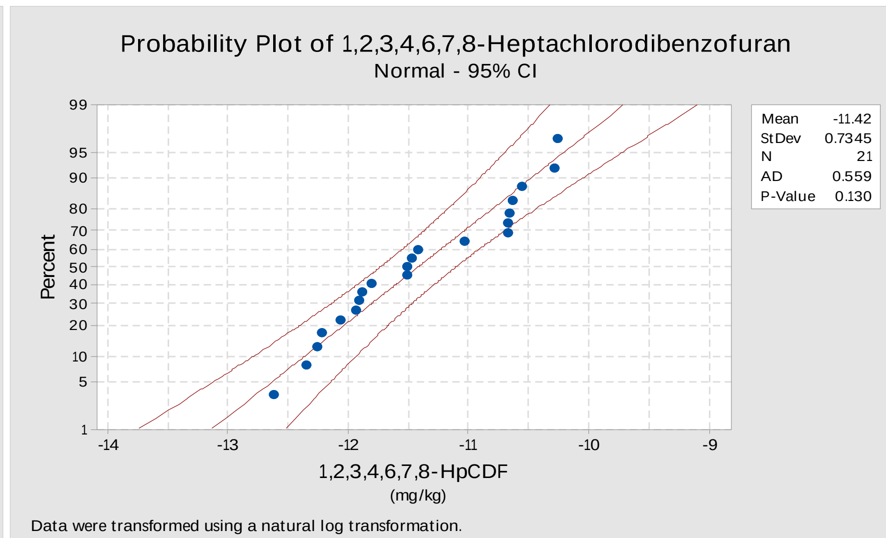



Probability Plots of Background Sediment

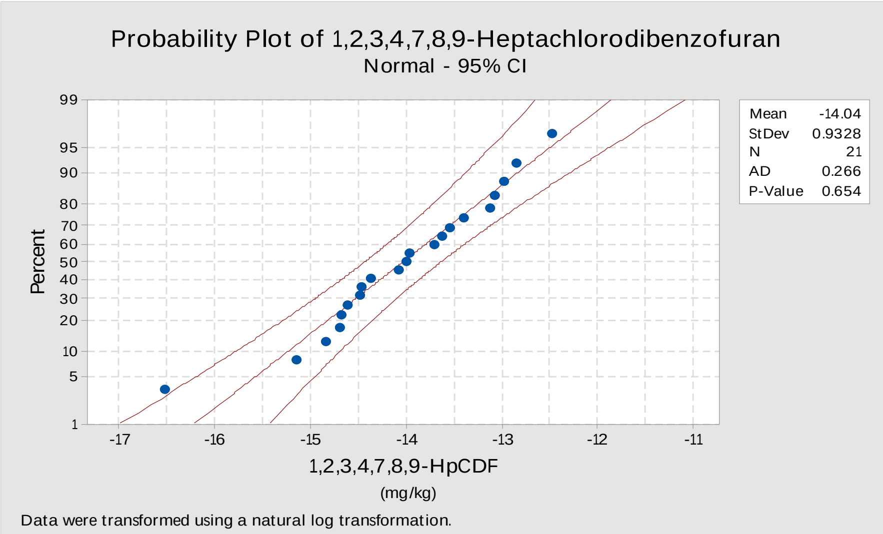


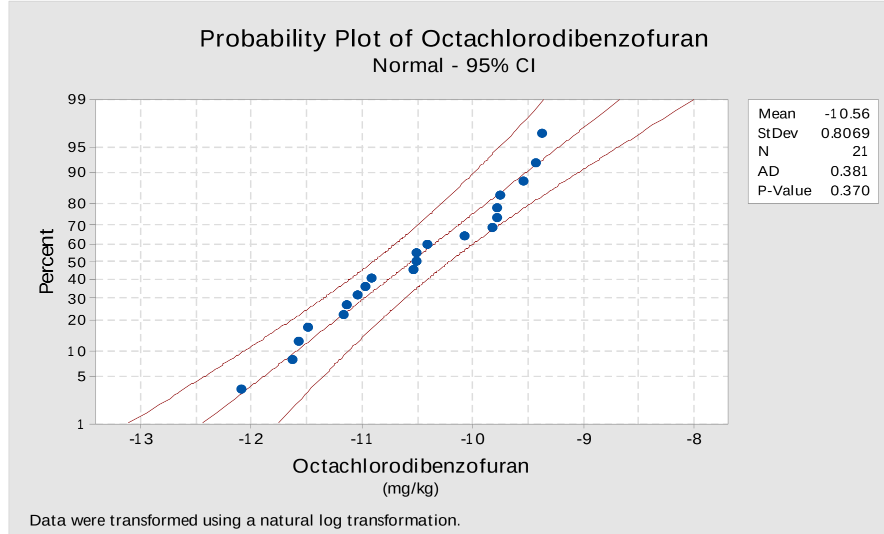



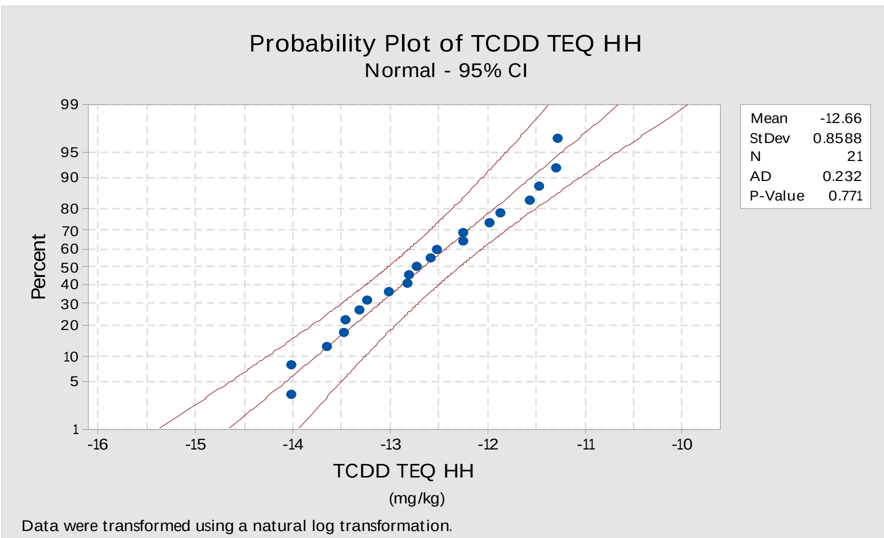



Probability Plots of Background Sediment

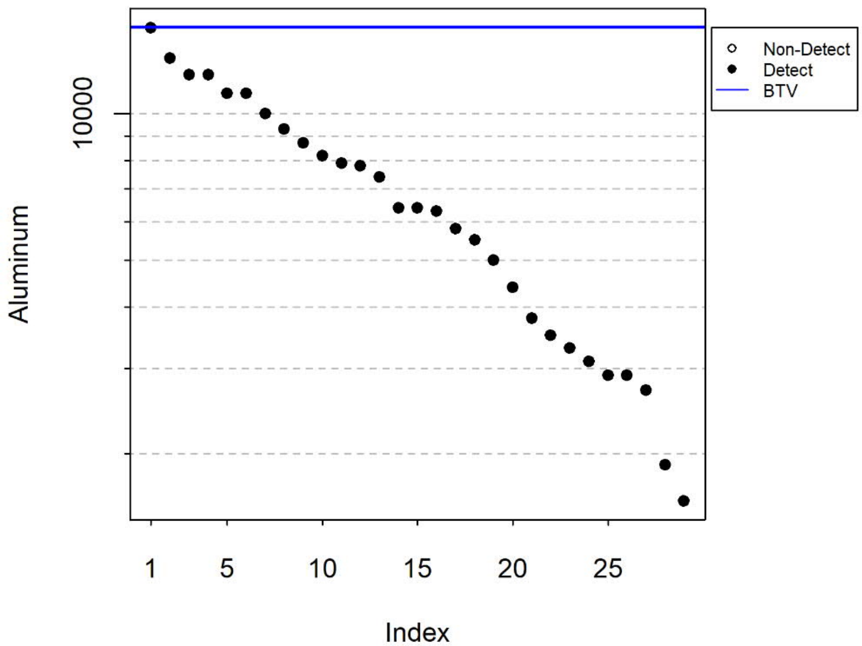


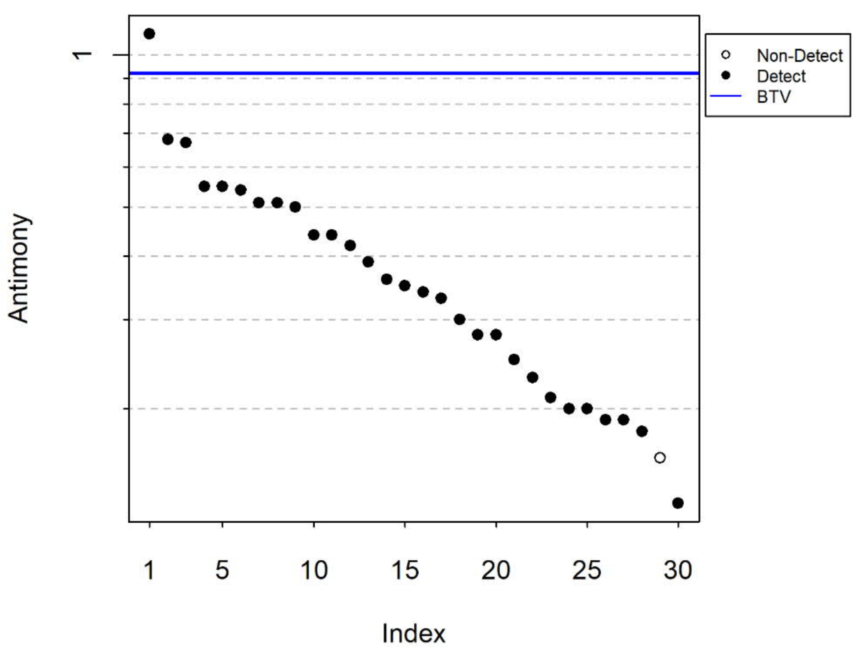



# Index Plots of BTVs and Background Sediment Datasets

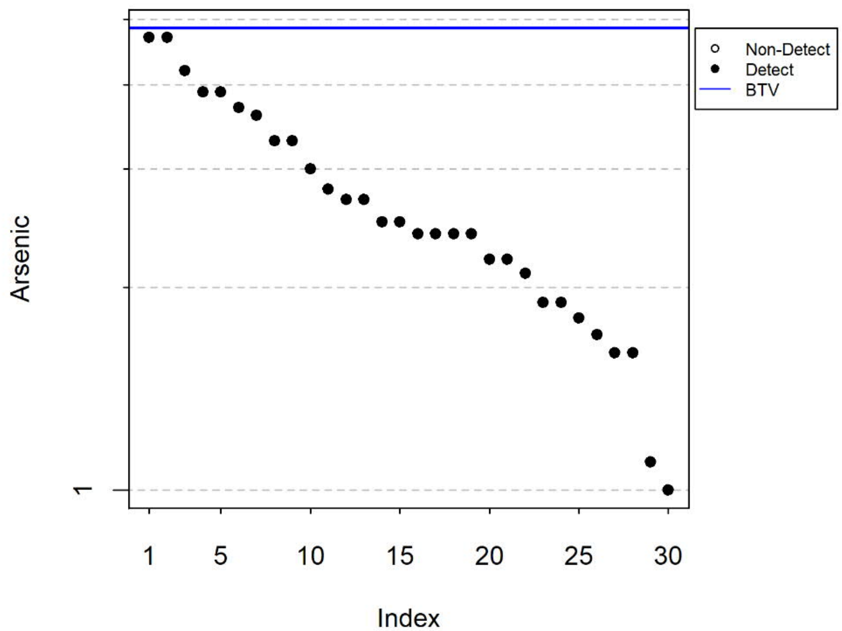
Index Plots of Background Sediment

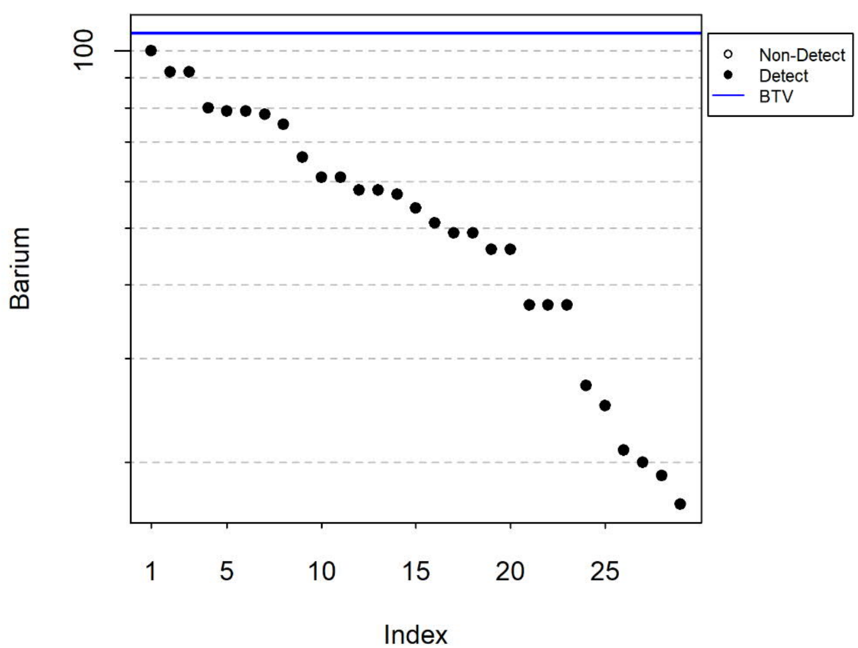



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

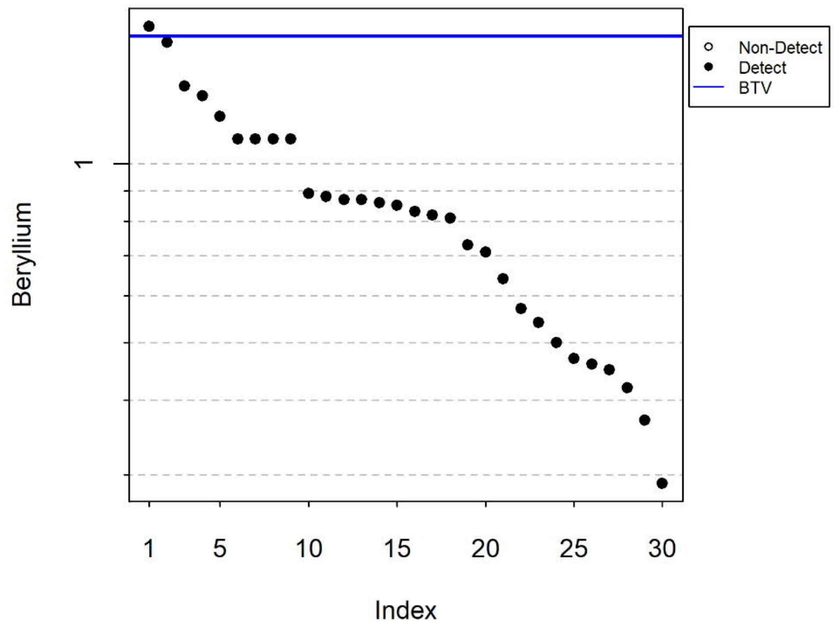
Index Plots of Background Sediment

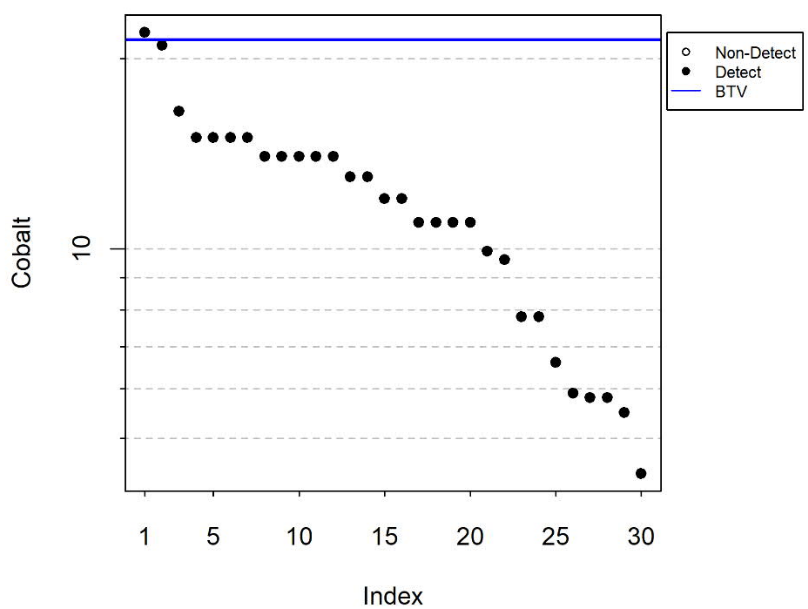



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

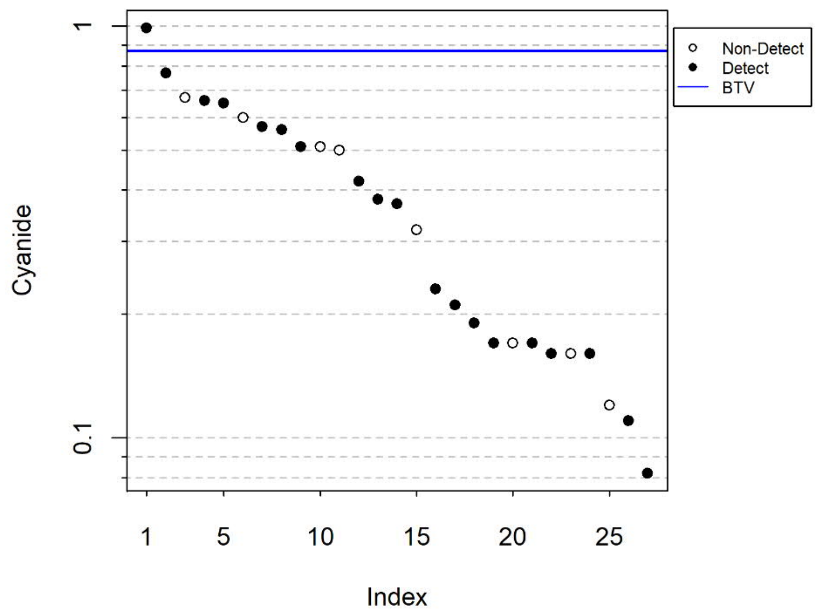
Index Plots of Background Sediment

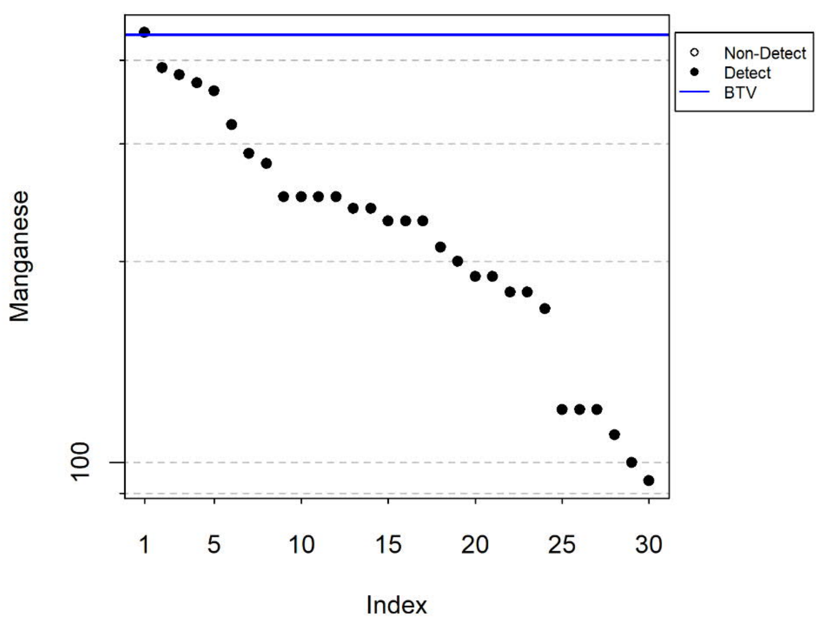



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

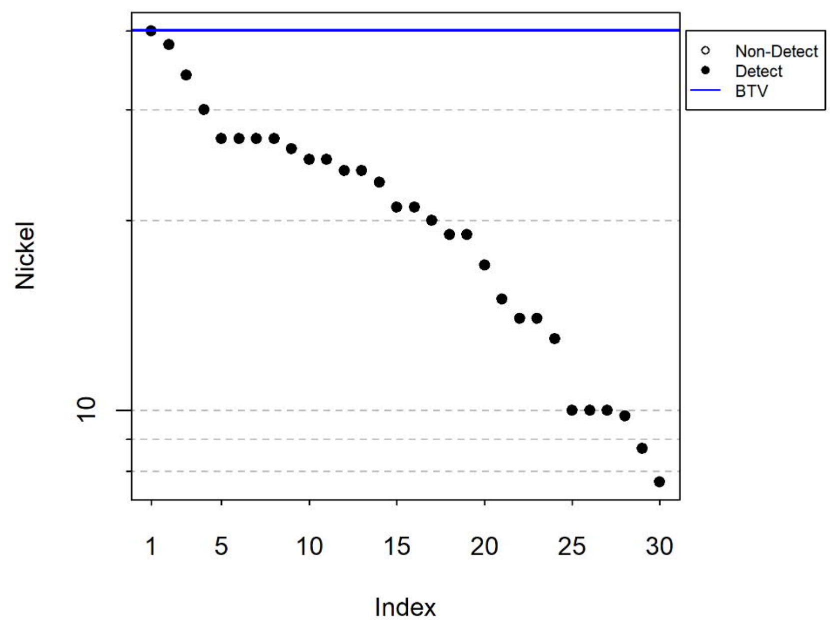
Index Plots of Background Sediment

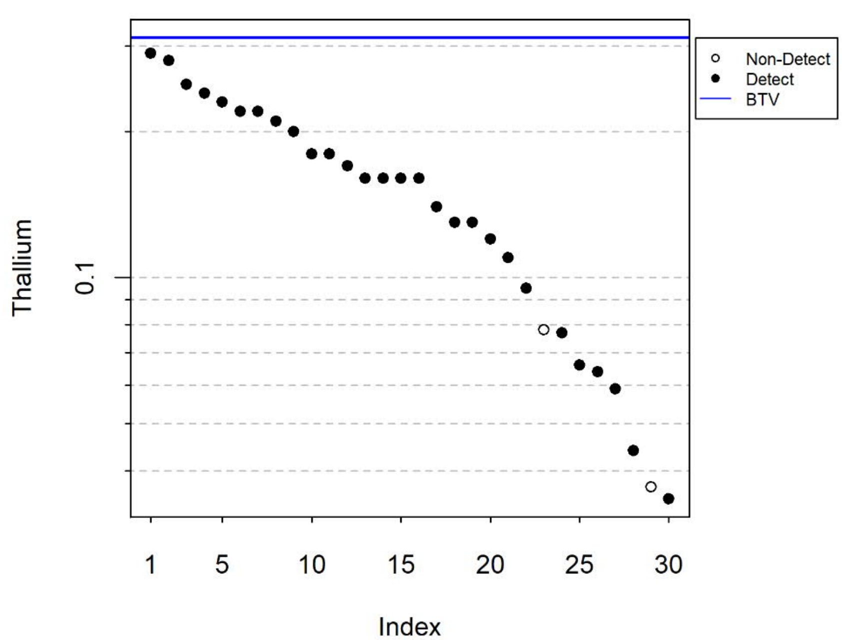



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

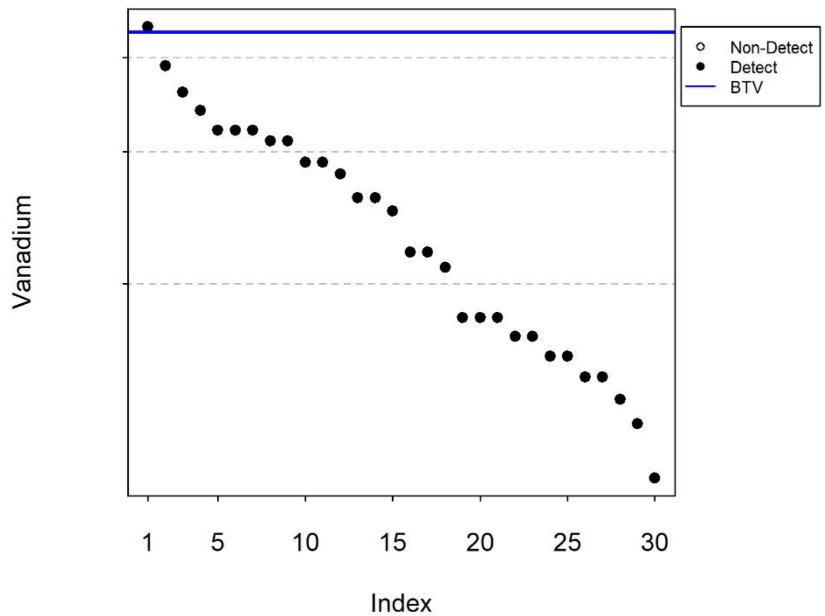
Index Plots of Background Sediment



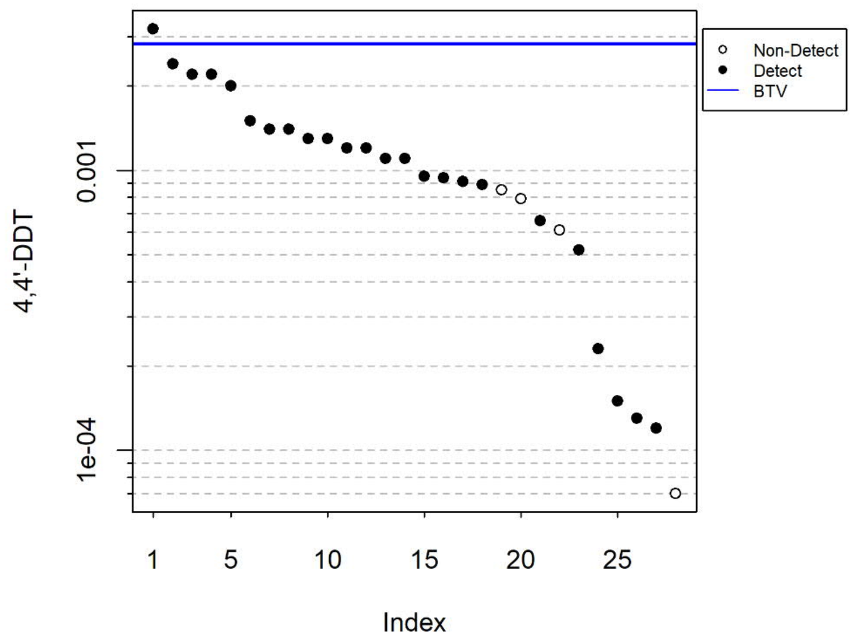

The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

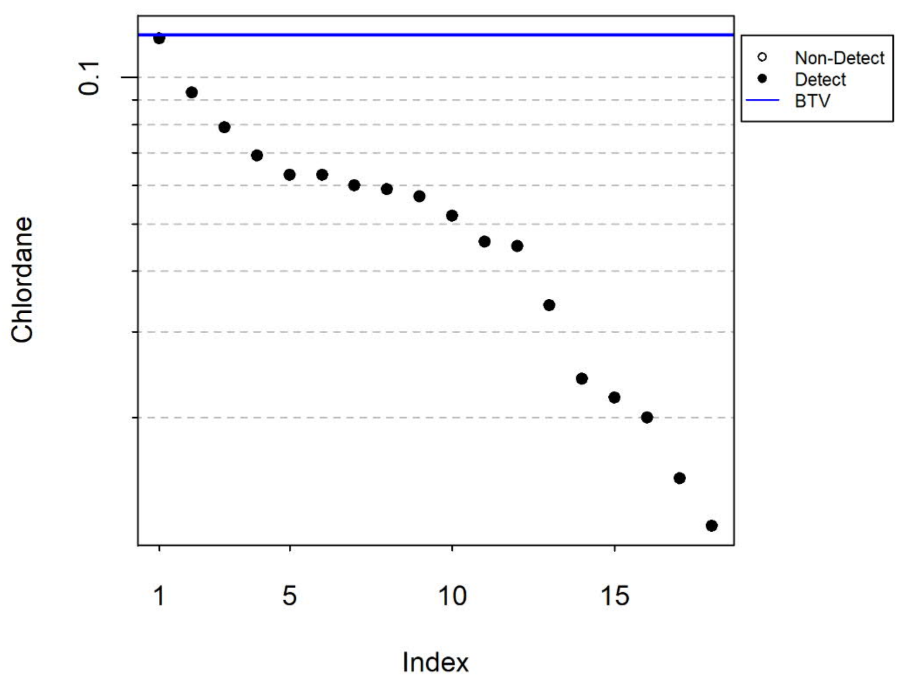
Index Plots of Background Sediment




The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

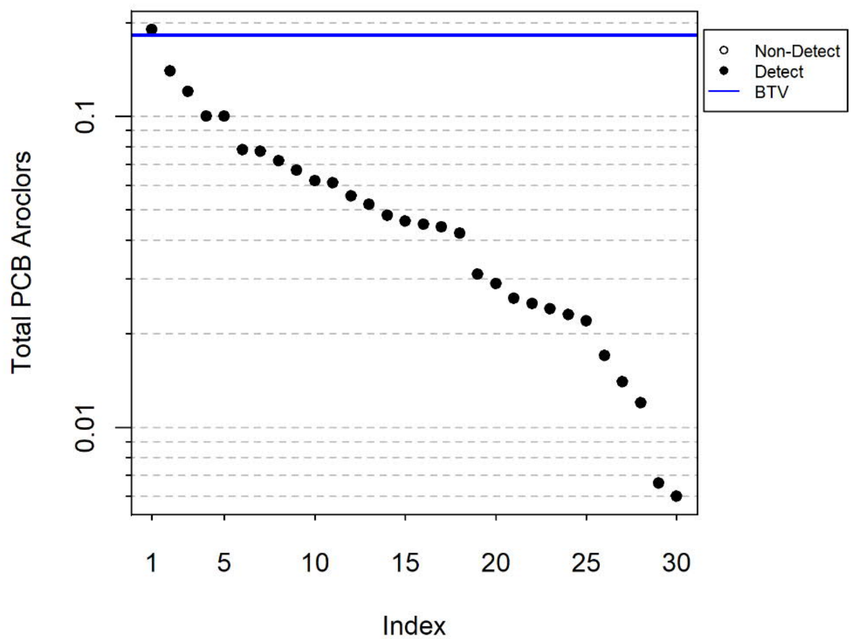
Index Plots of Background Sediment

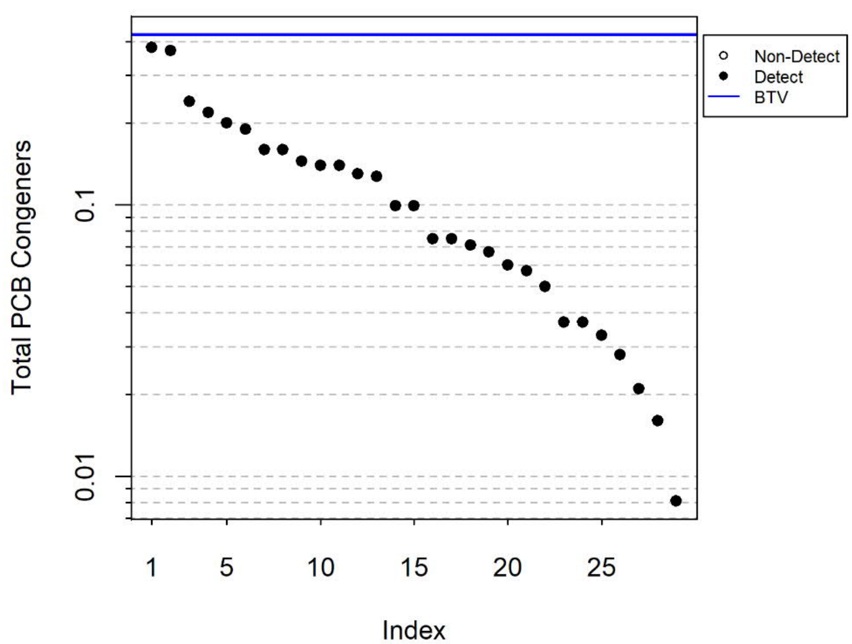



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

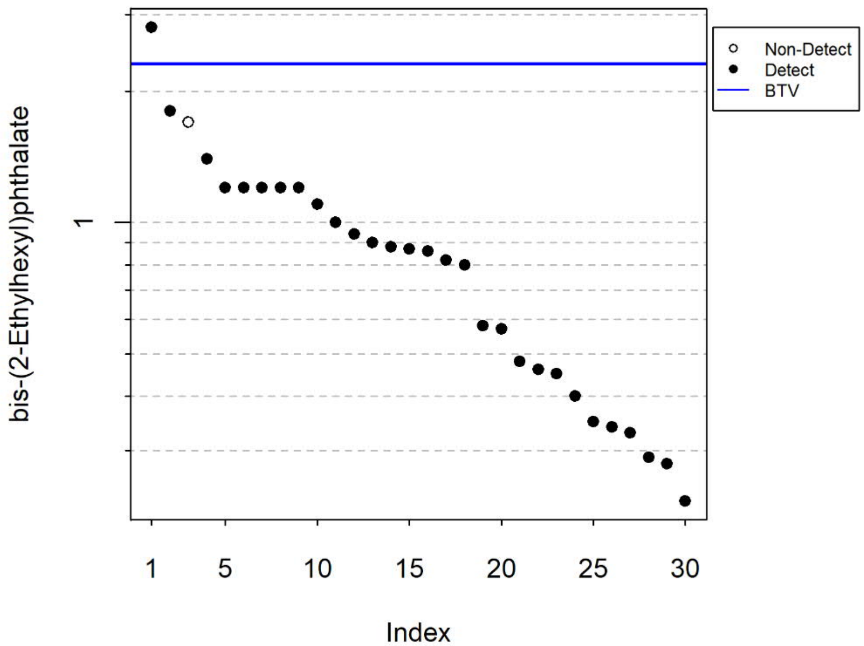
Index Plots of Background Sediment

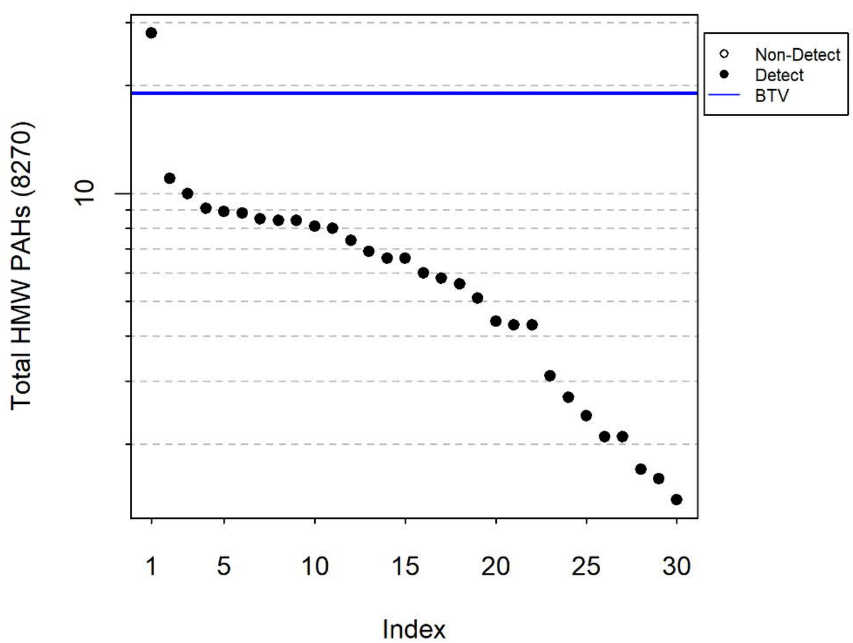



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

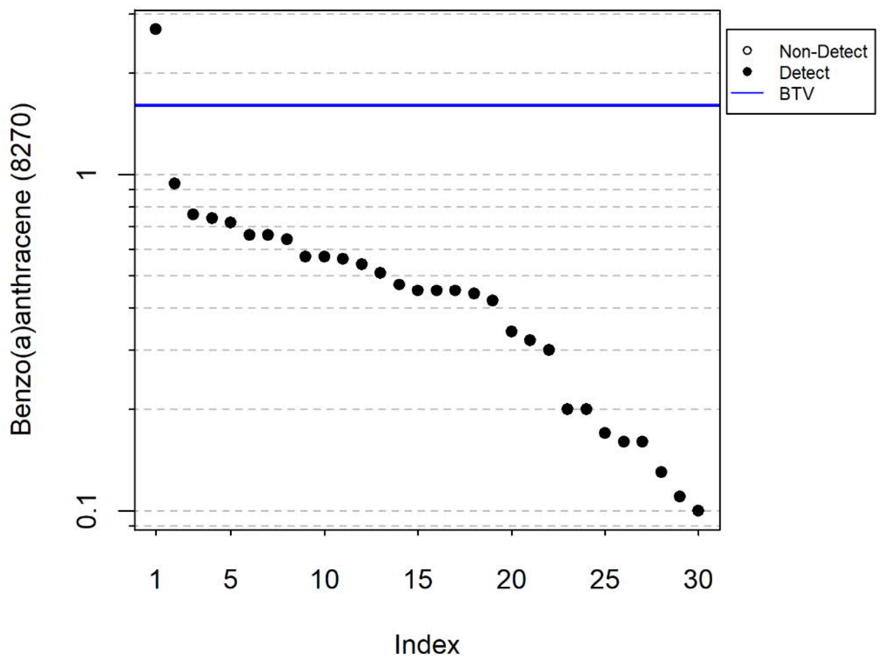
Index Plots of Background Sediment

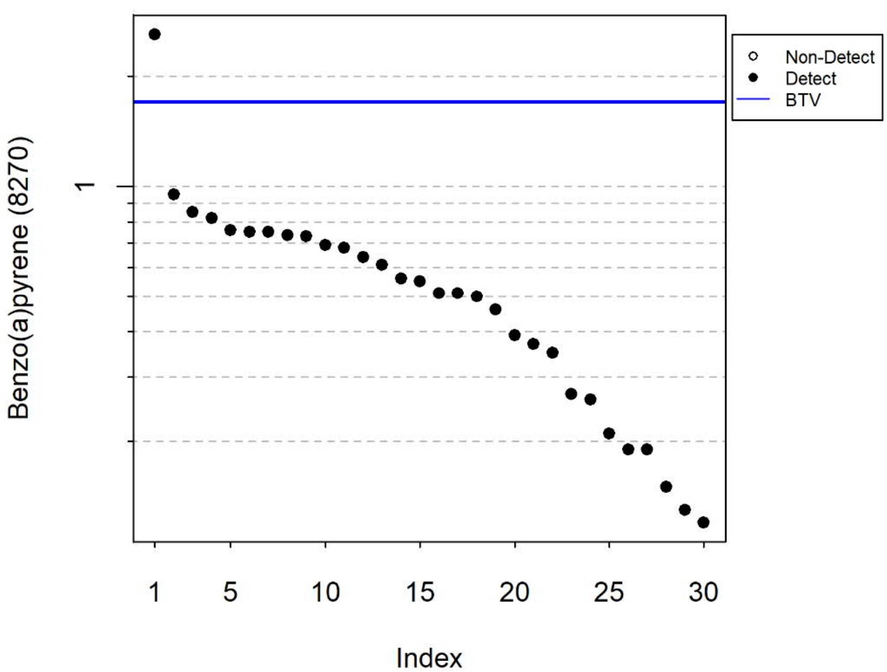



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

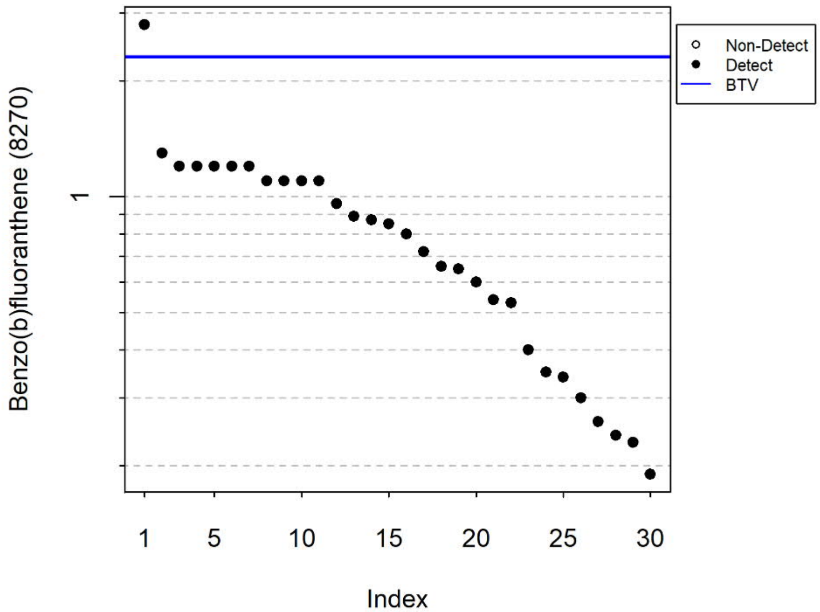
Index Plots of Background Sediment

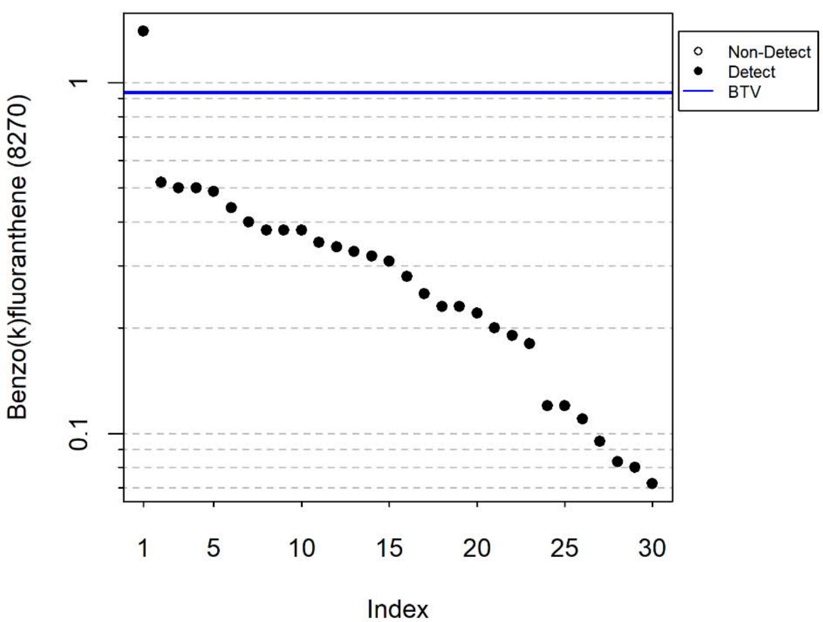



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

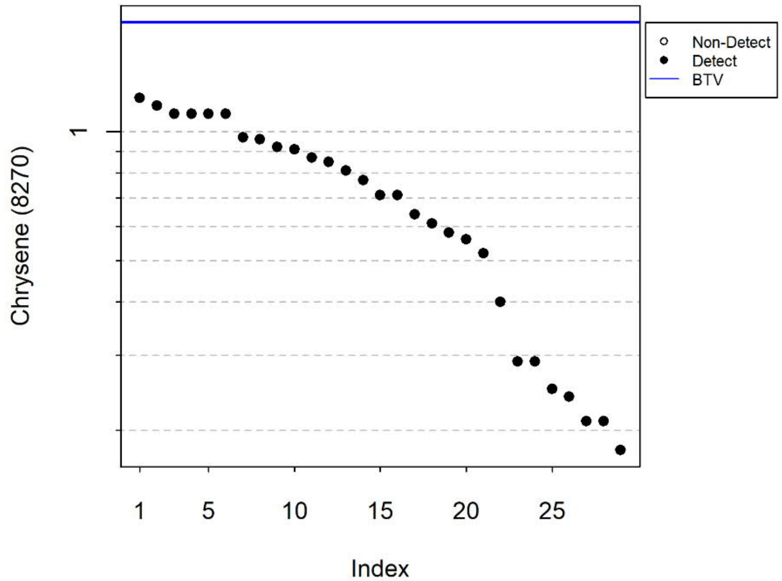
Index Plots of Background Sediment

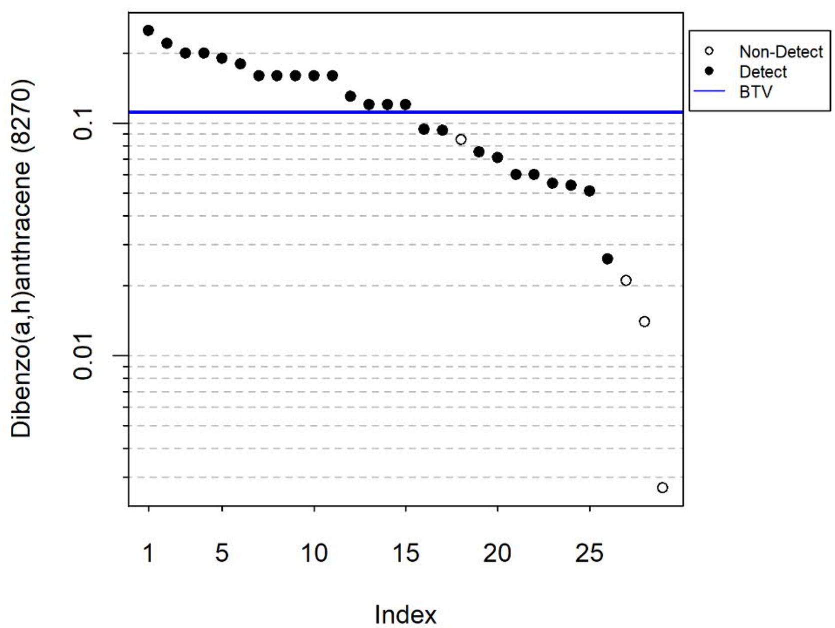


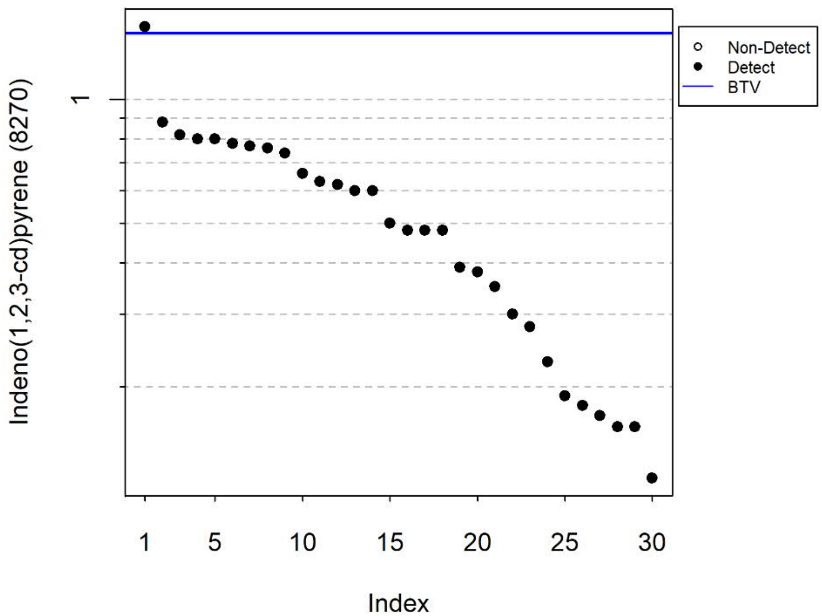

The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

Index Plots of Background Sediment



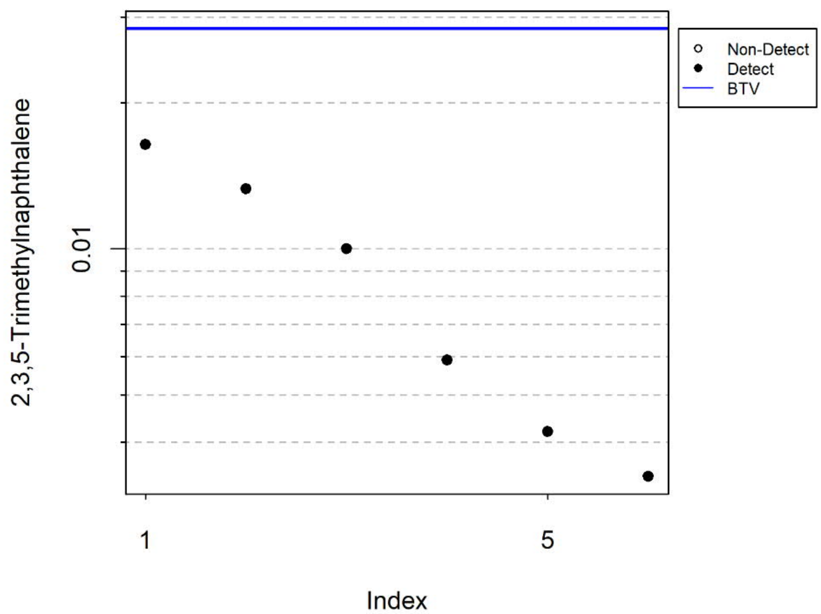



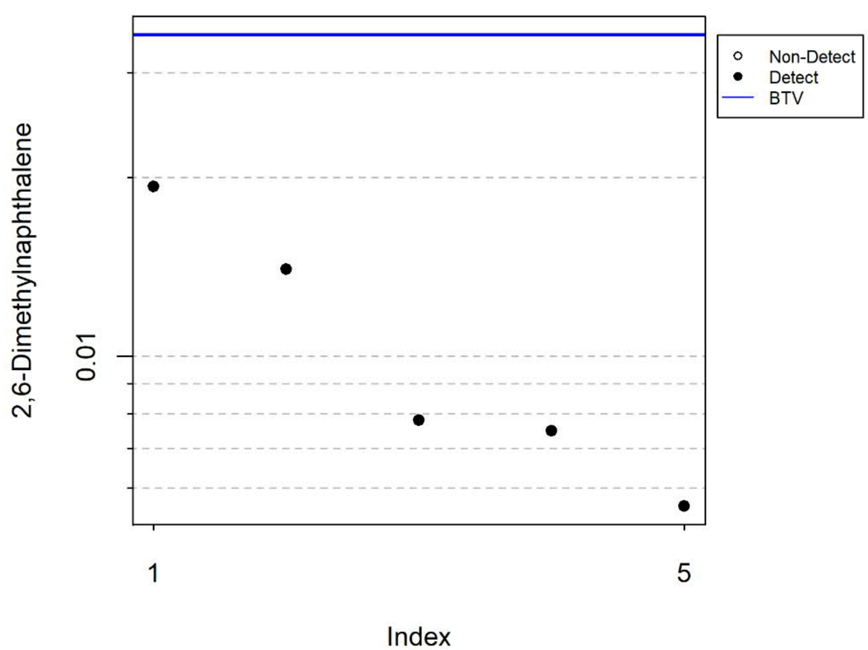

The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).




The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

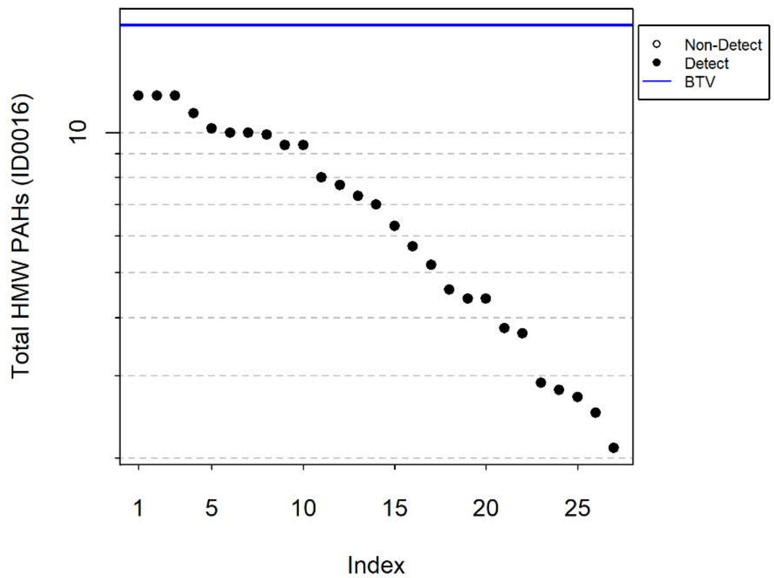
Index Plots of Background Sediment

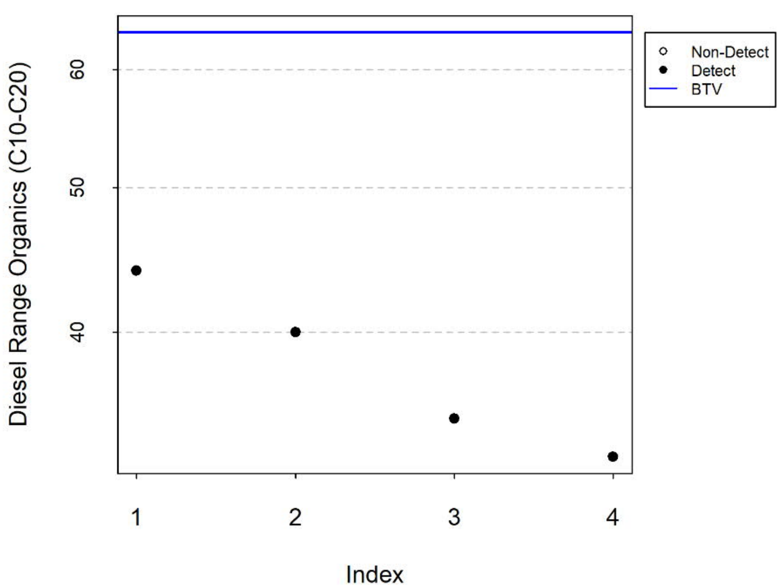



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

Index Plots of Background Sediment

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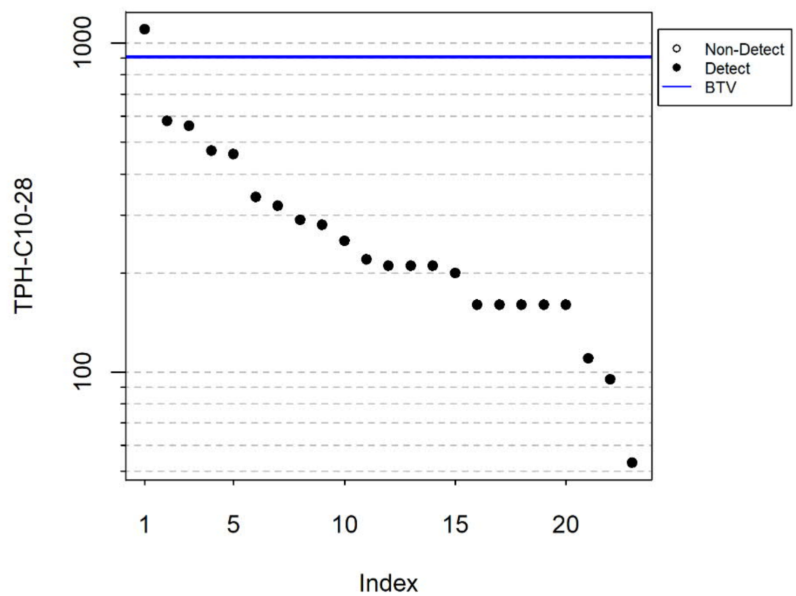
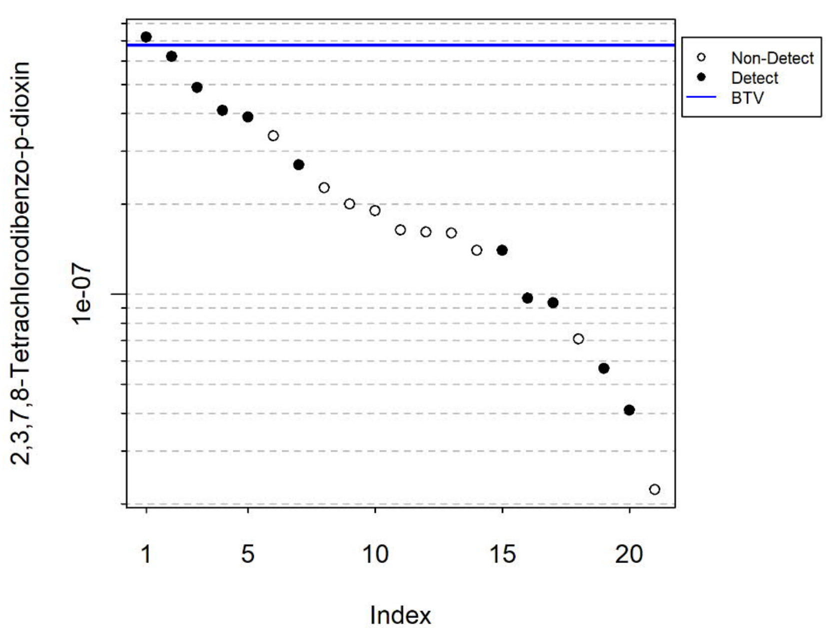
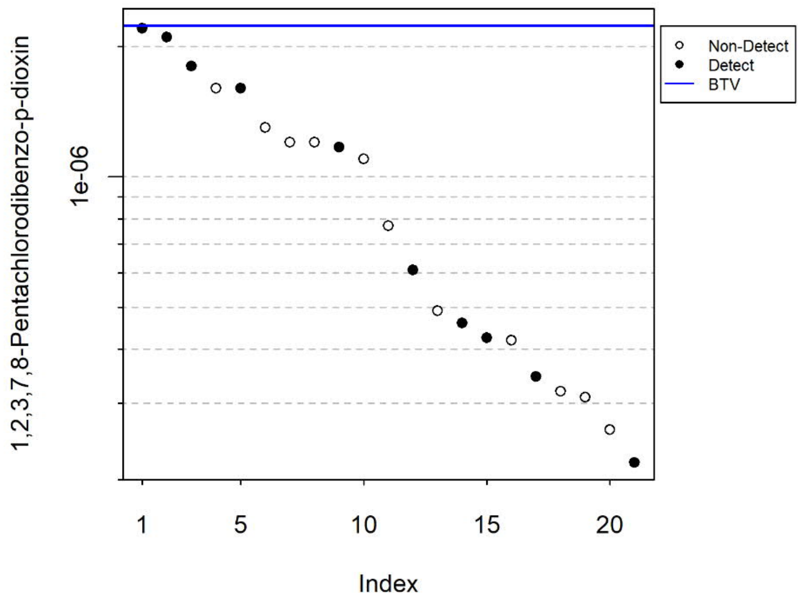
Index Plots of Background Sediment

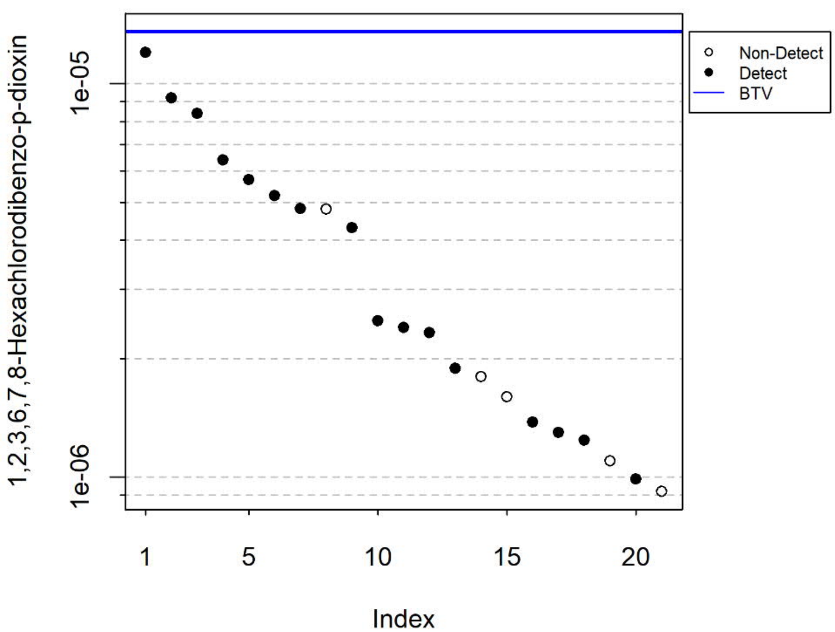



The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

Index Plots of Background Sediment

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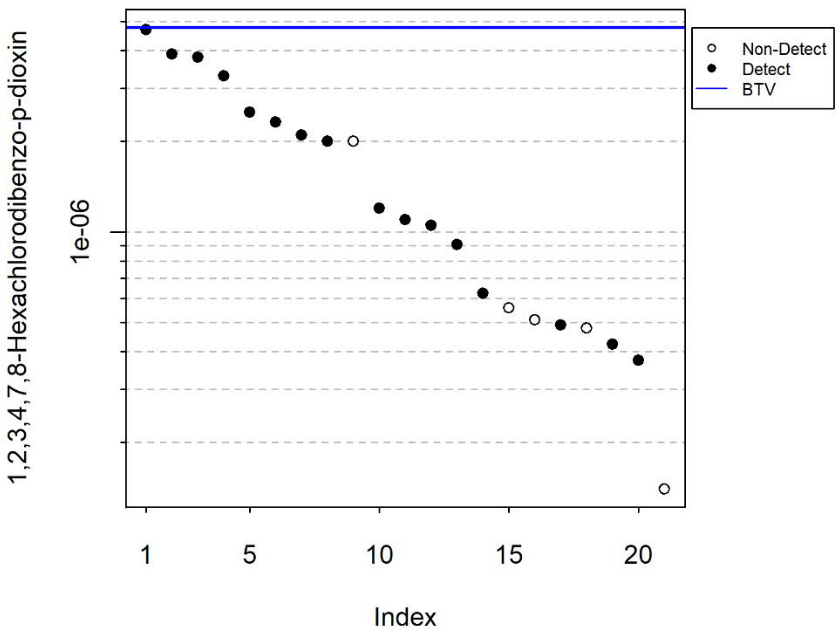


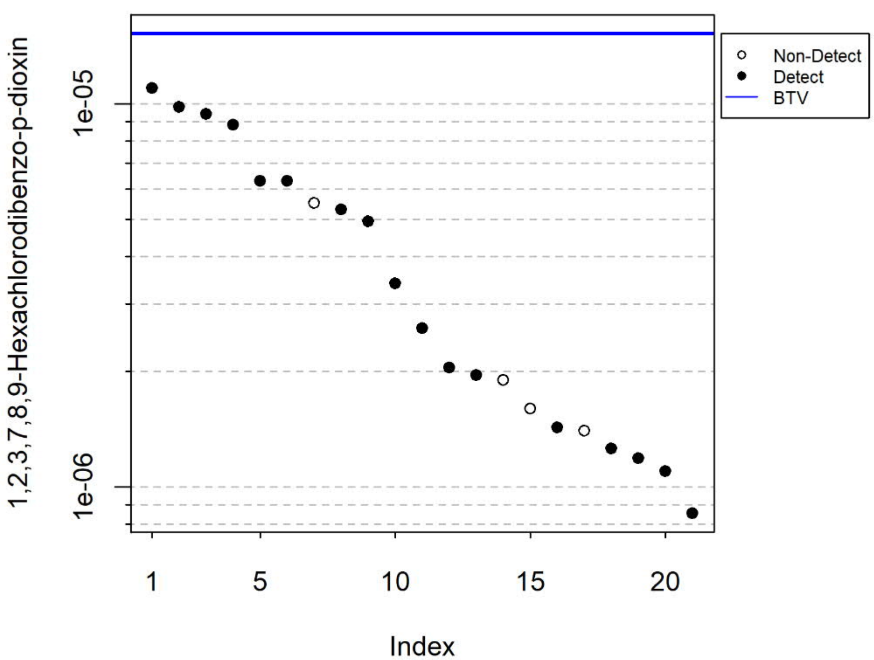


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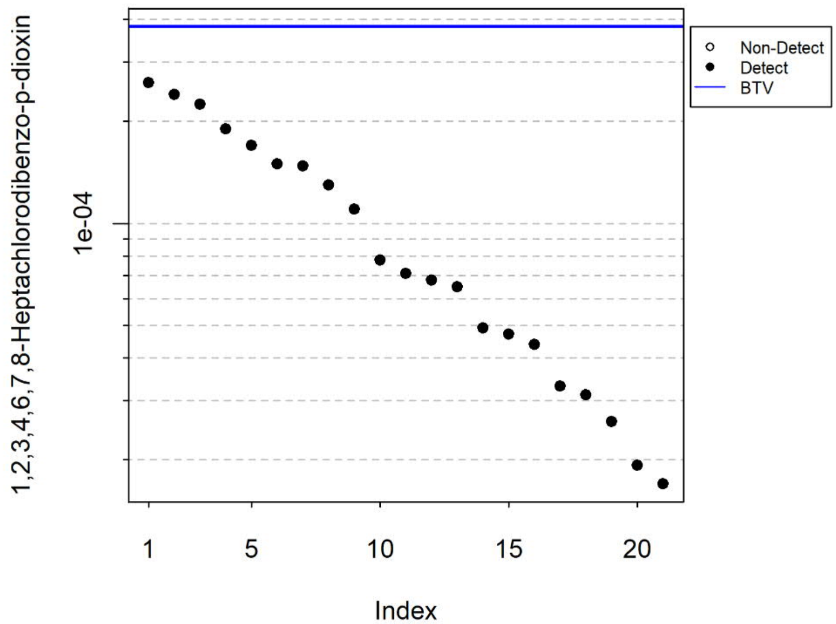
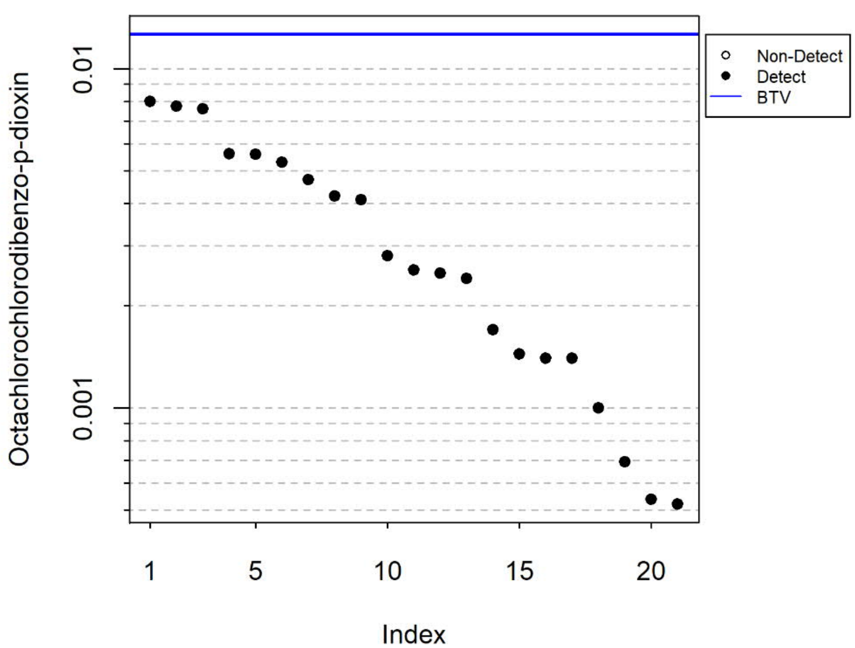
Index Plots of Background Sediment

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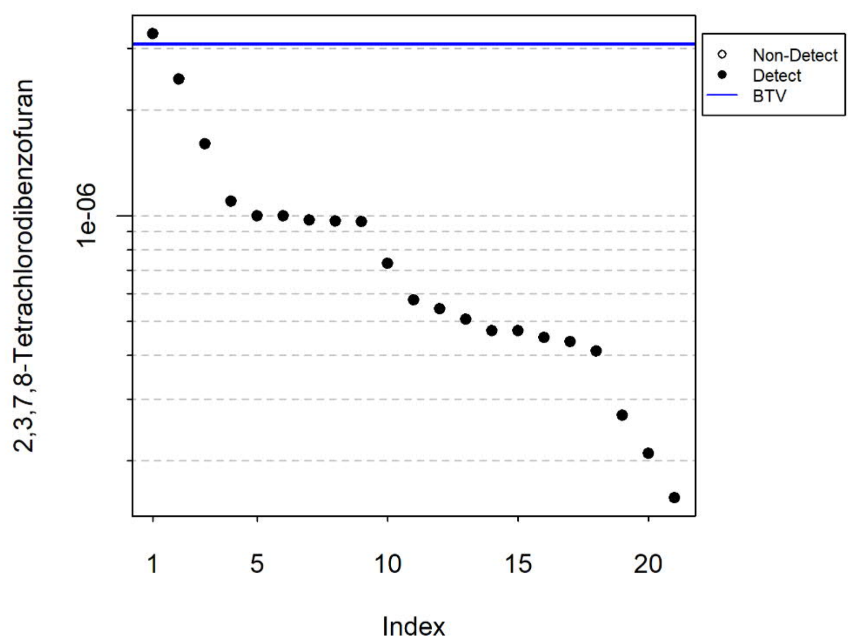
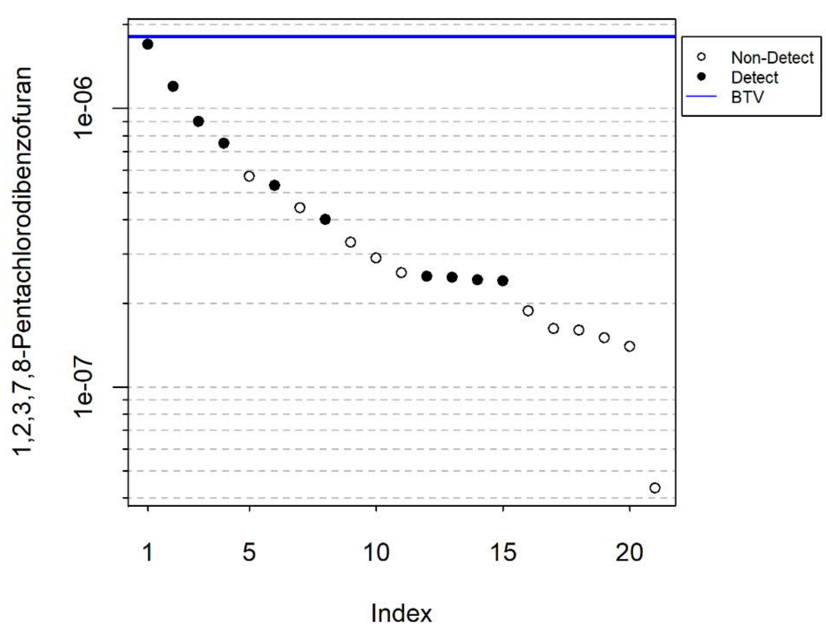
Index Plots of Background Sediment

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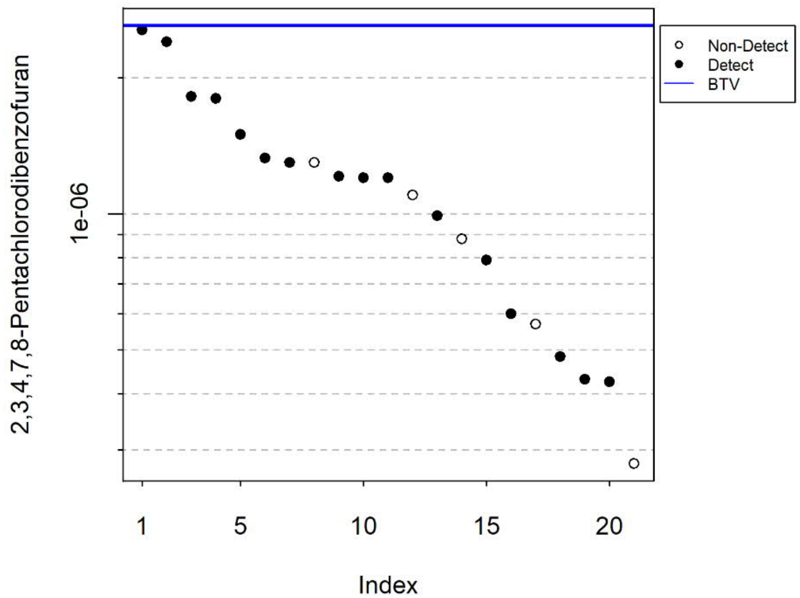
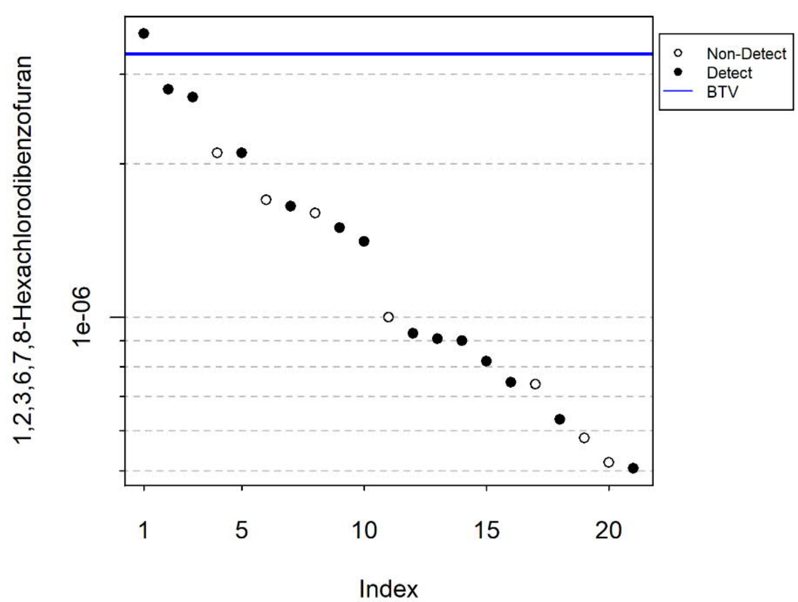
Index Plots of Background Sediment

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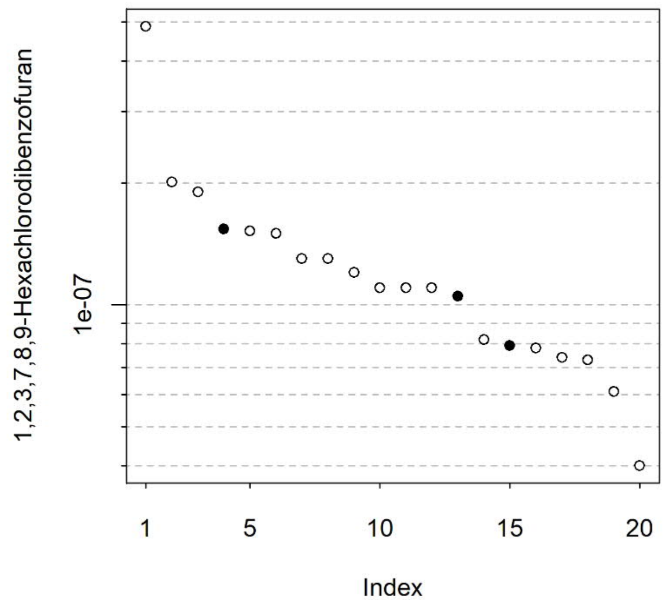


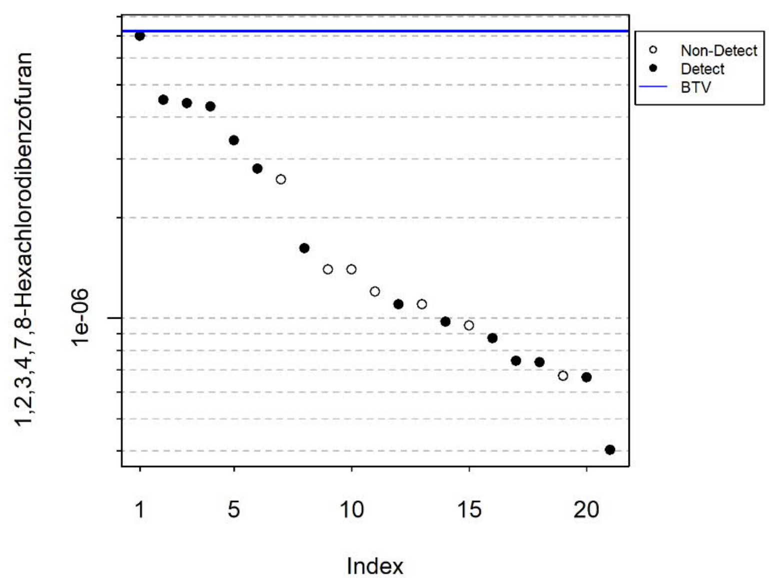


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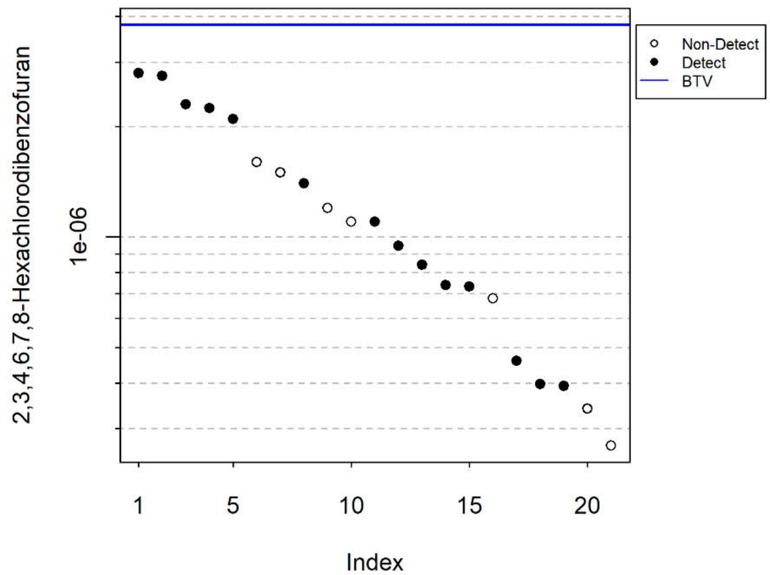
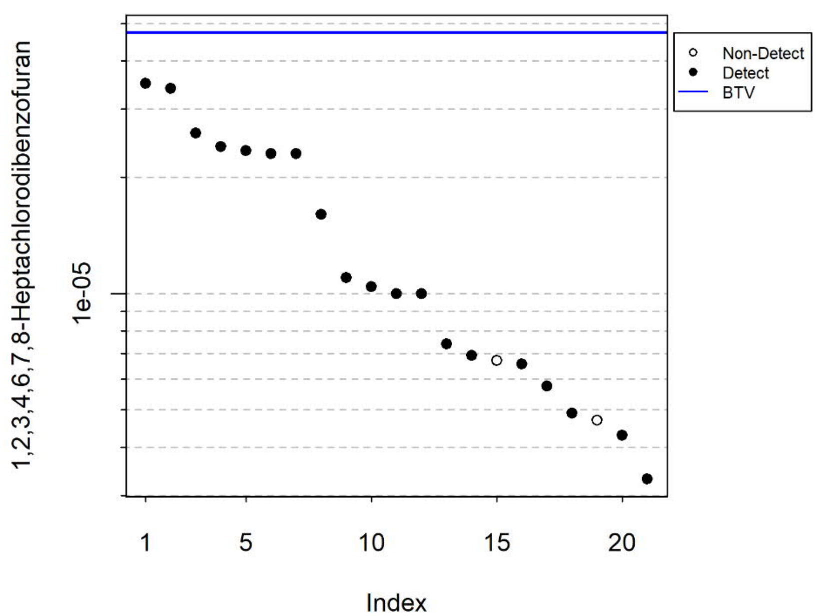
Index Plots of Background Sediment

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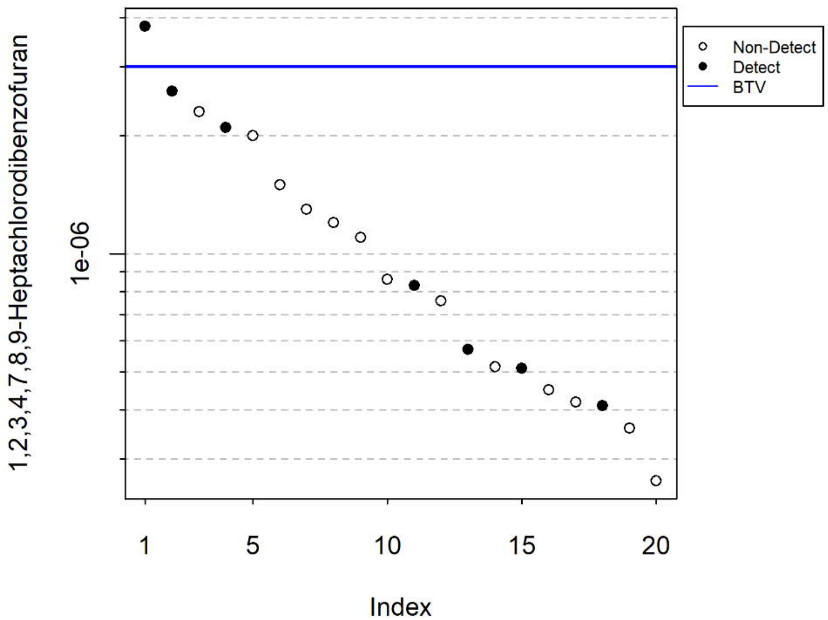
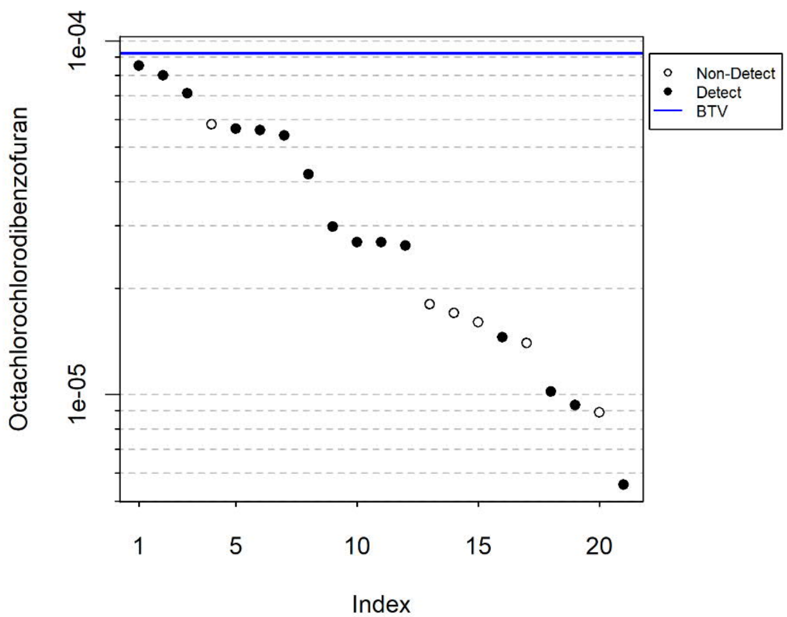
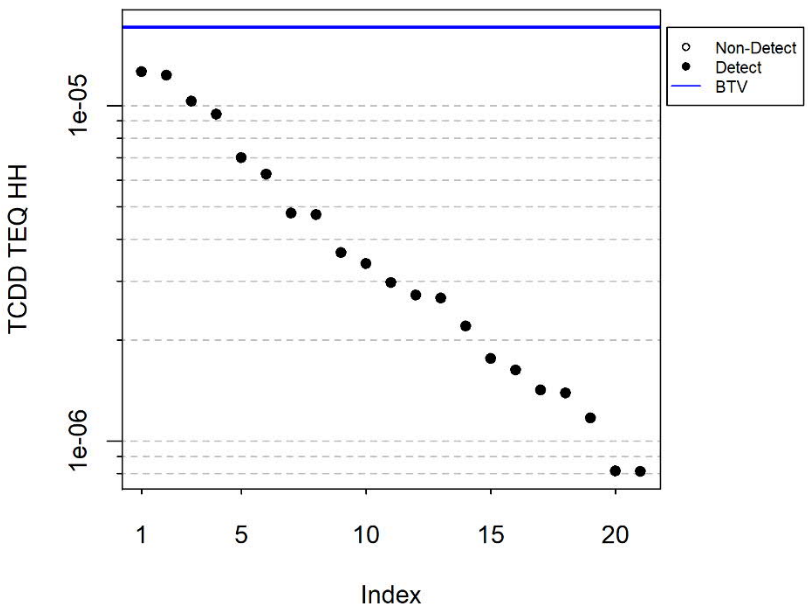
Index Plots of Background Sediment




The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

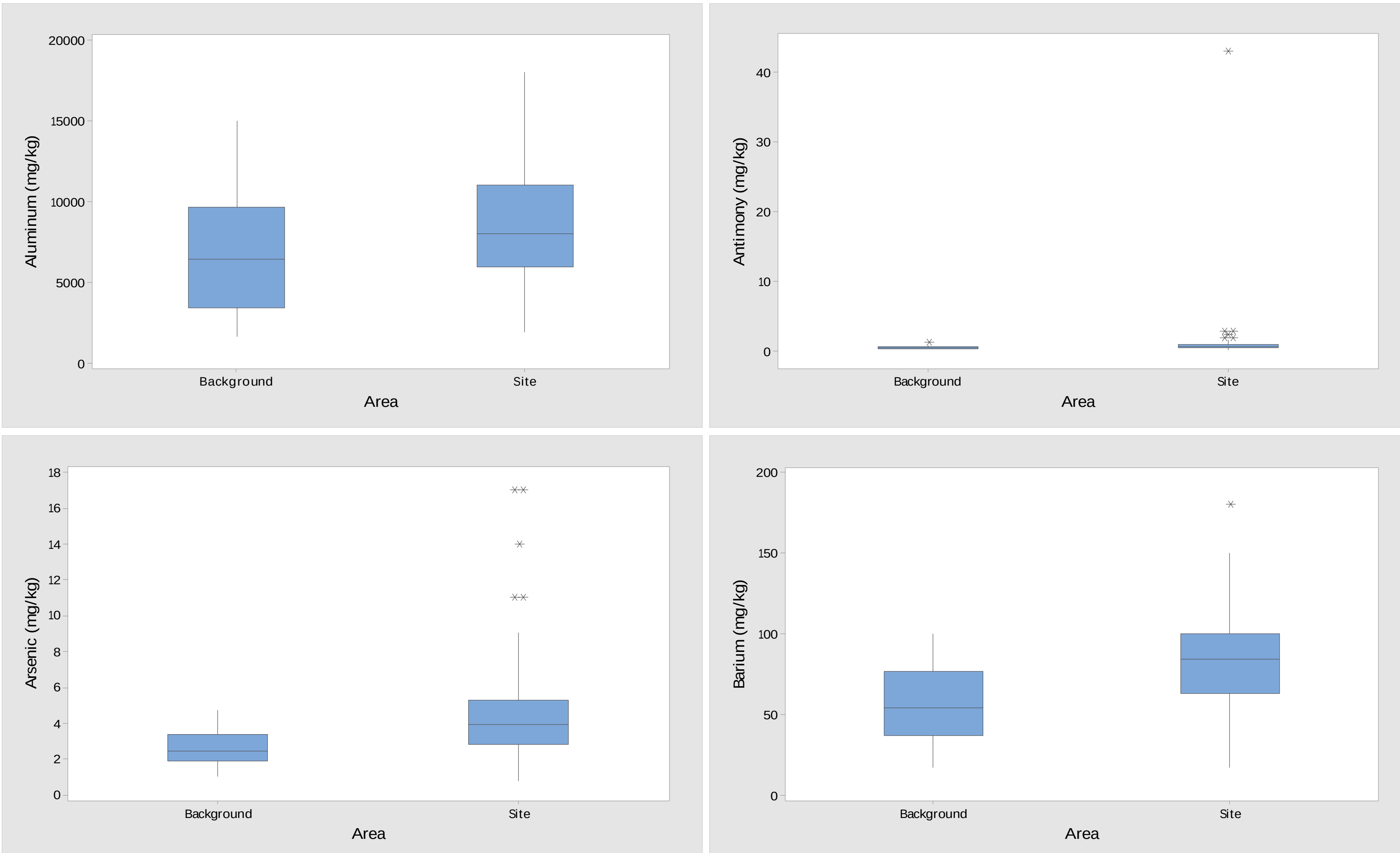
Index Plots of Background Sediment



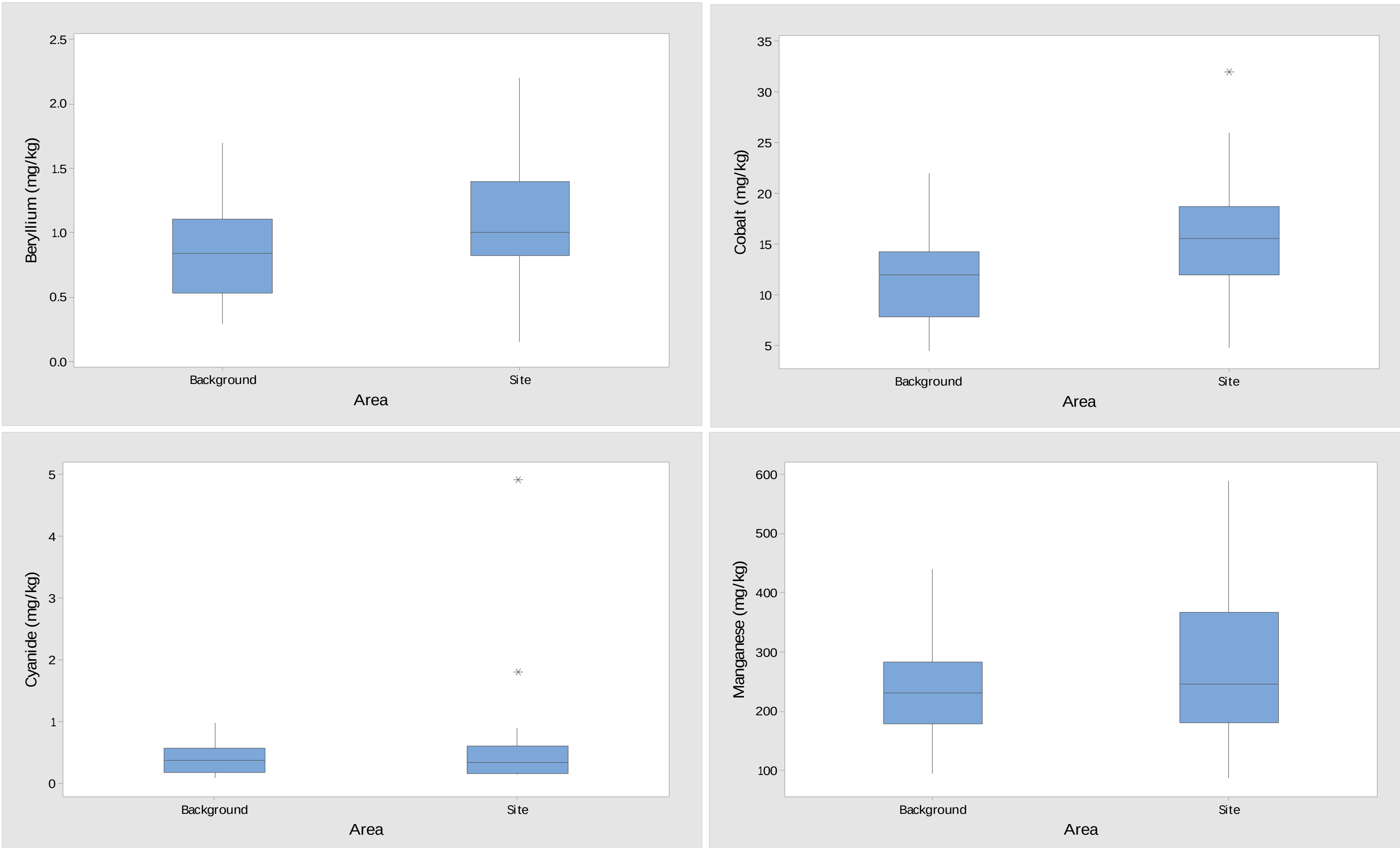

The units for the chemical concentrations and background threshold value (BTV) concentrations are milligrams per kilogram (mg/kg).

# Boxplot Comparisons of Site and Background Sediment Datasets

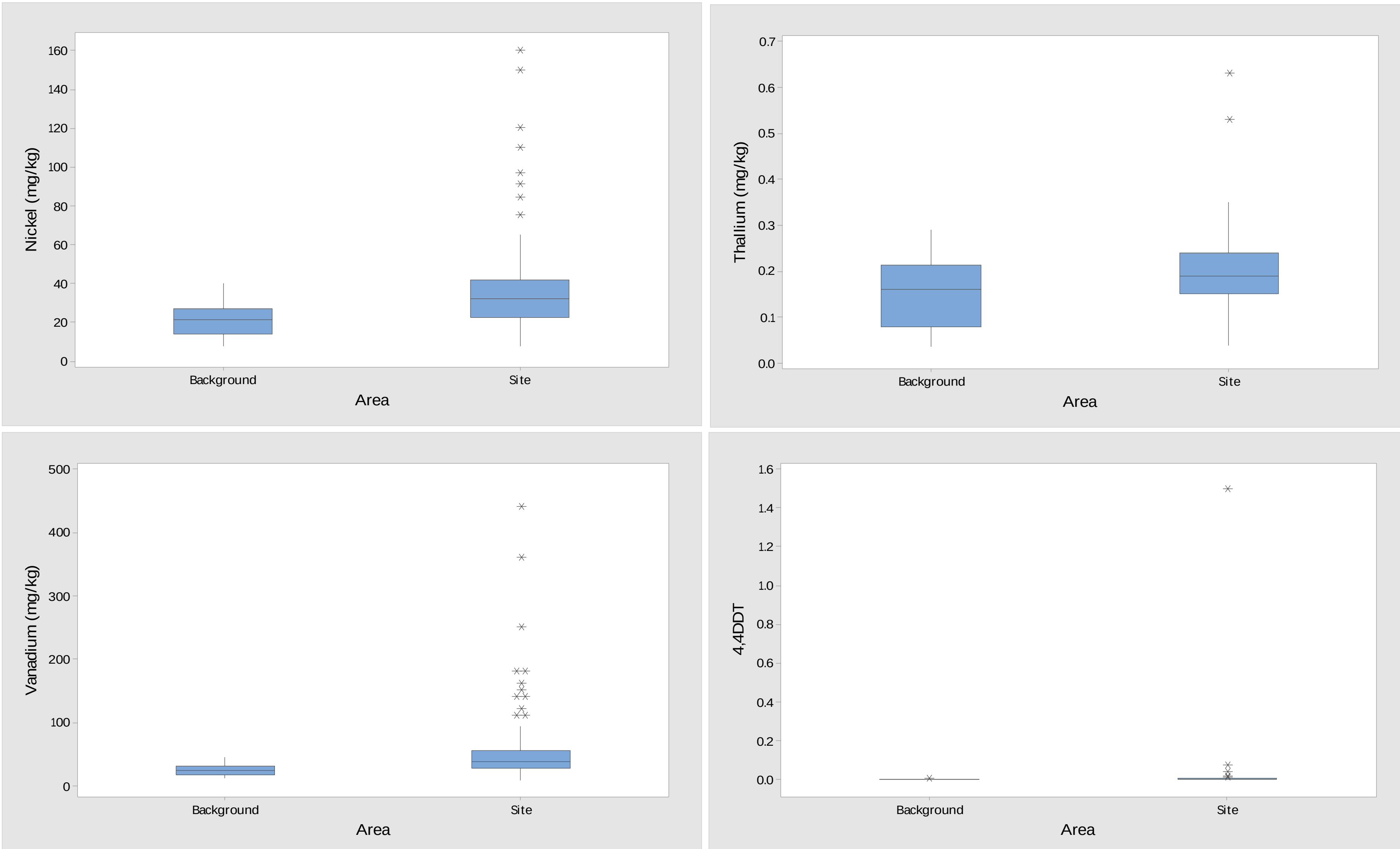
Boxplots Comparing Site and Background Sediment



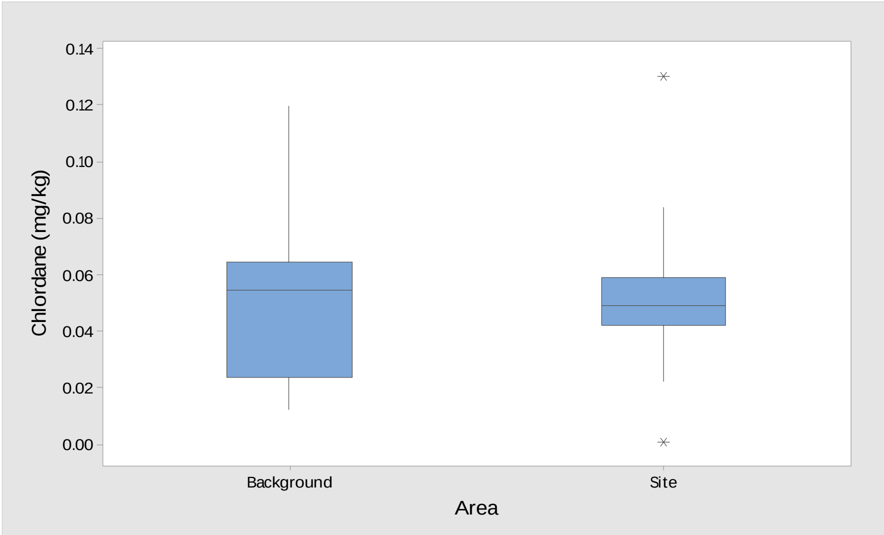
Boxplots Comparing Site and Background Sediment

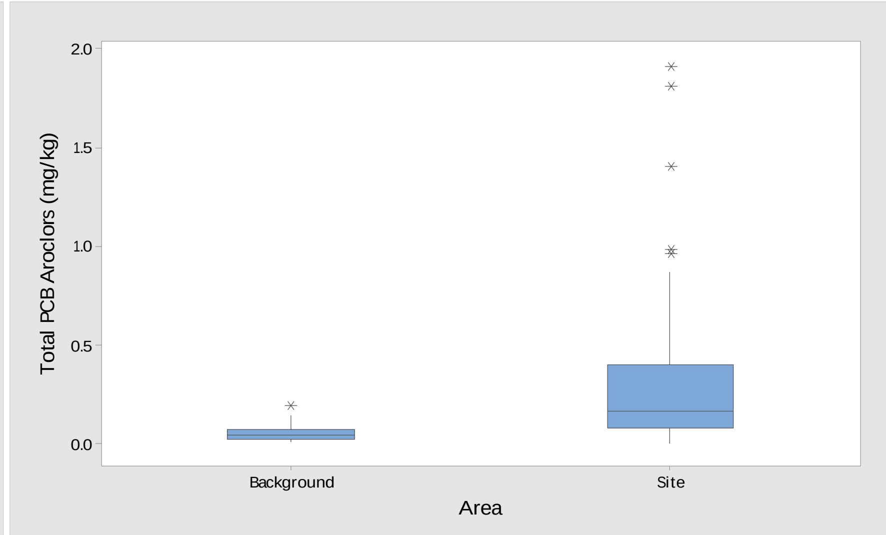


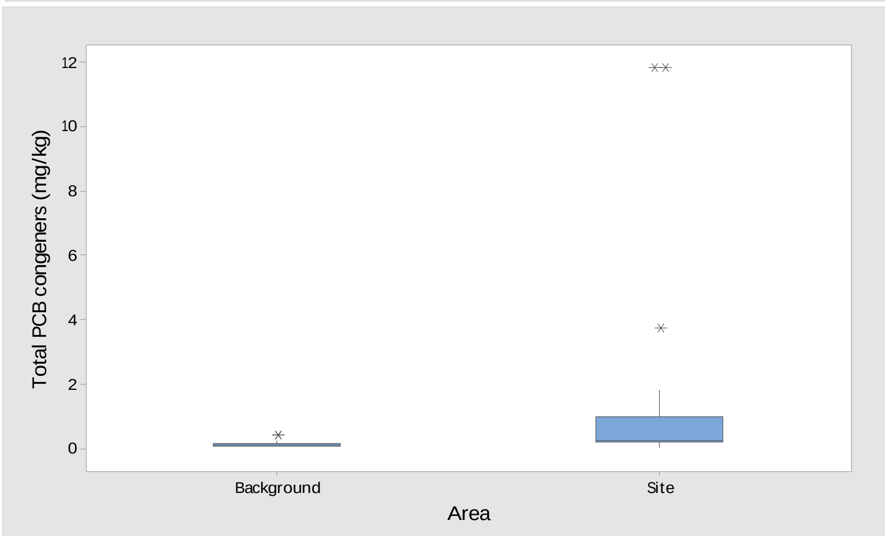
Boxplots Comparing Site and Background Sediment

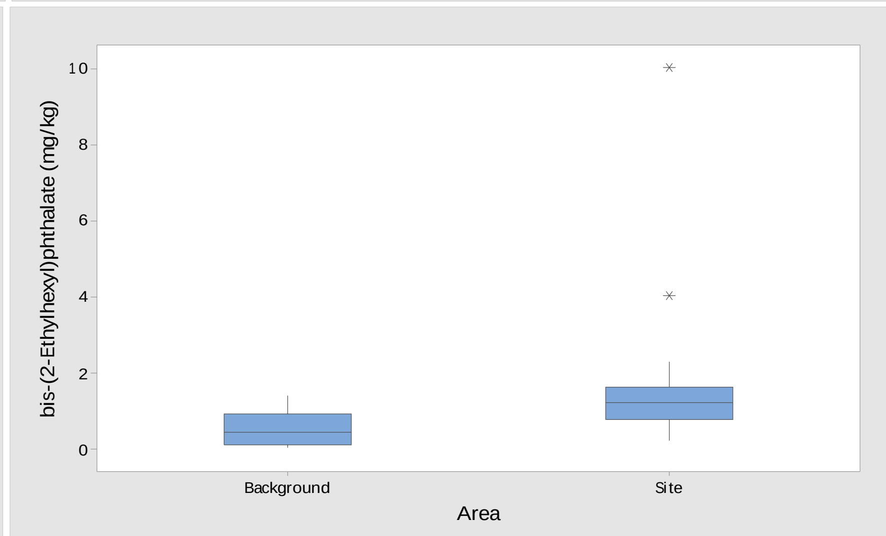


Boxplots Comparing Site and Background Sediment

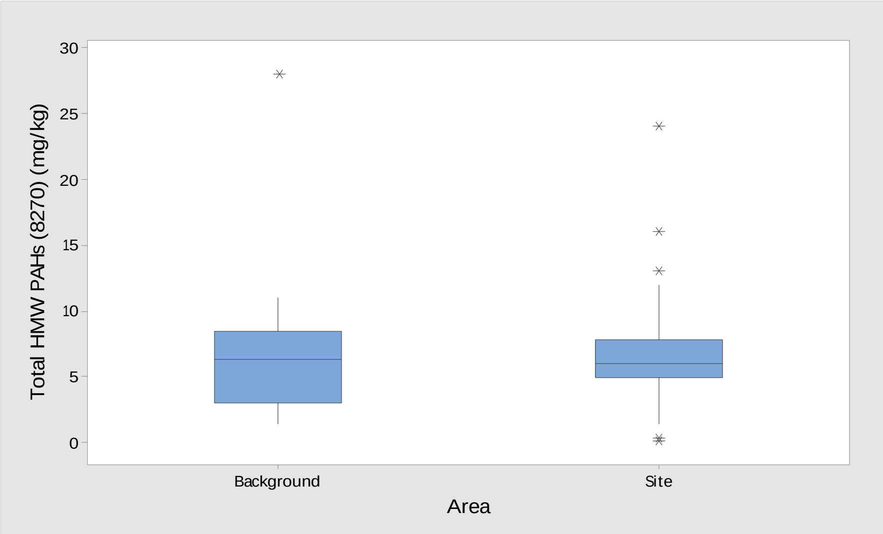


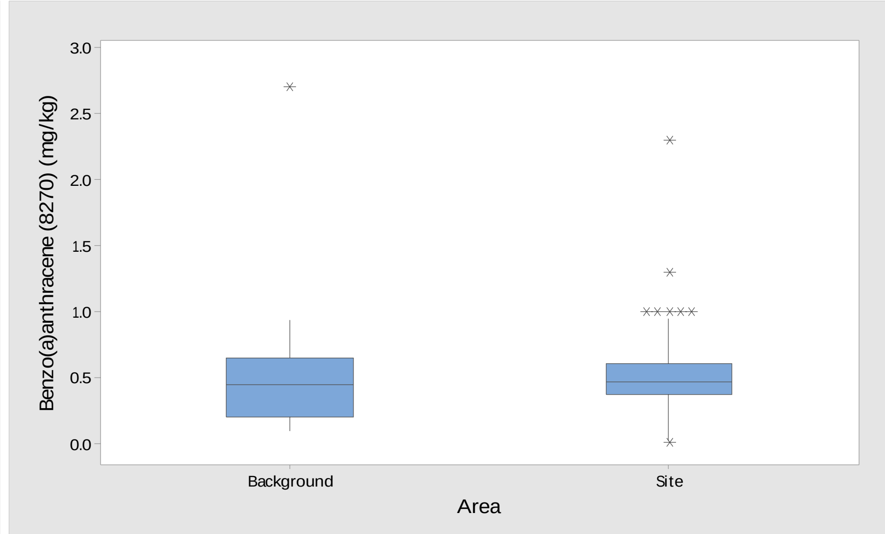



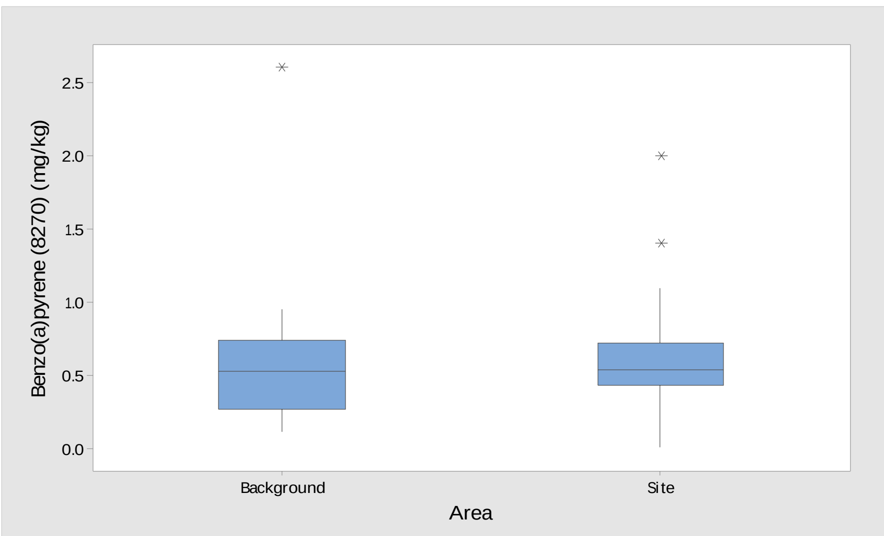



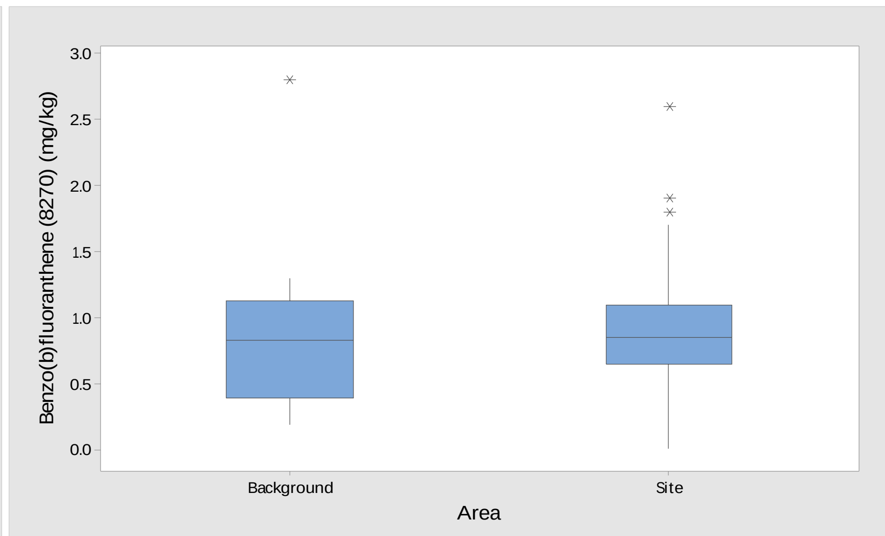



Boxplots Comparing Site and Background Sediment

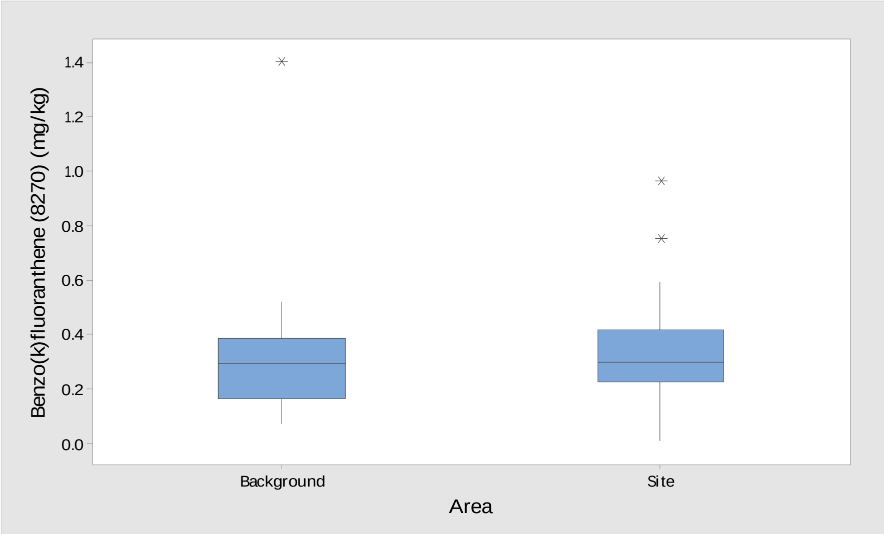


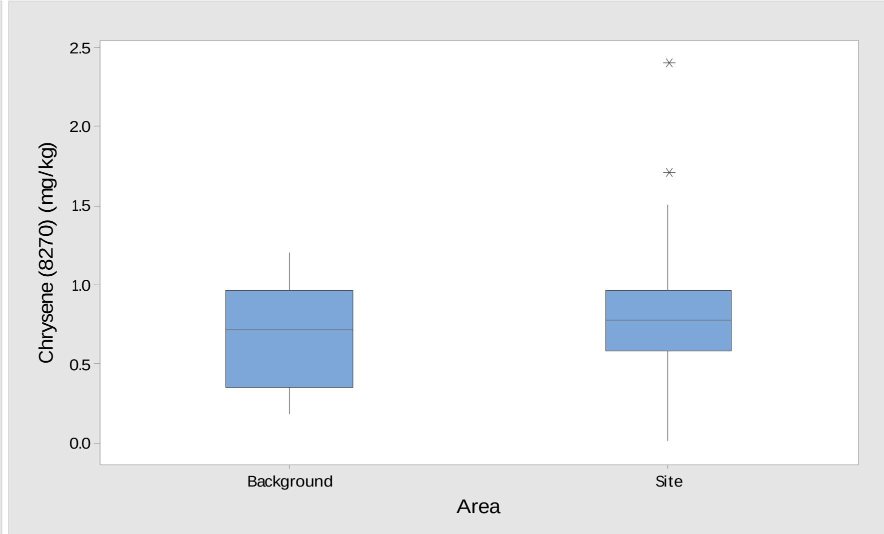



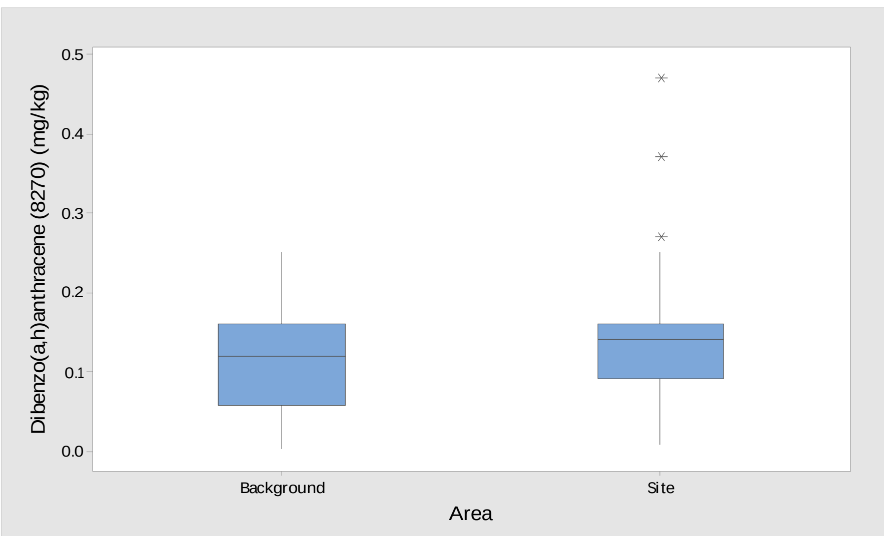



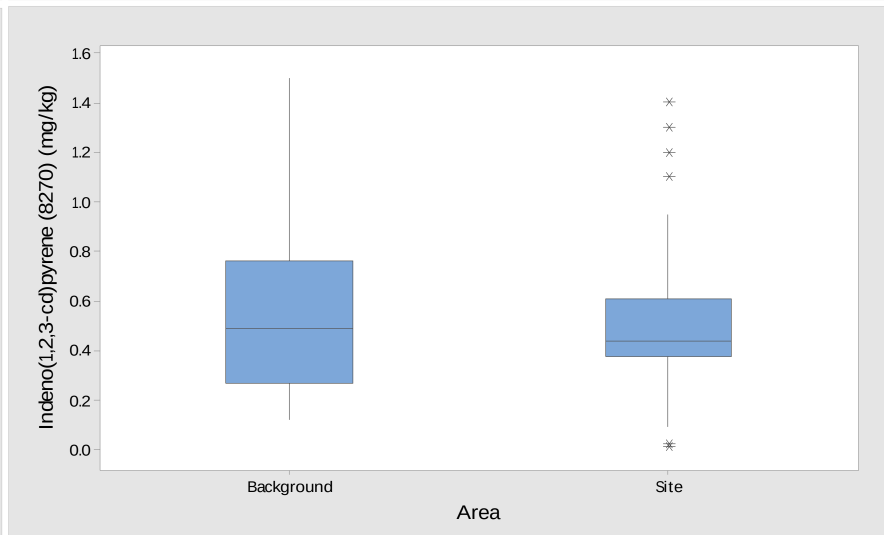



Boxplots Comparing Site and Background Sediment

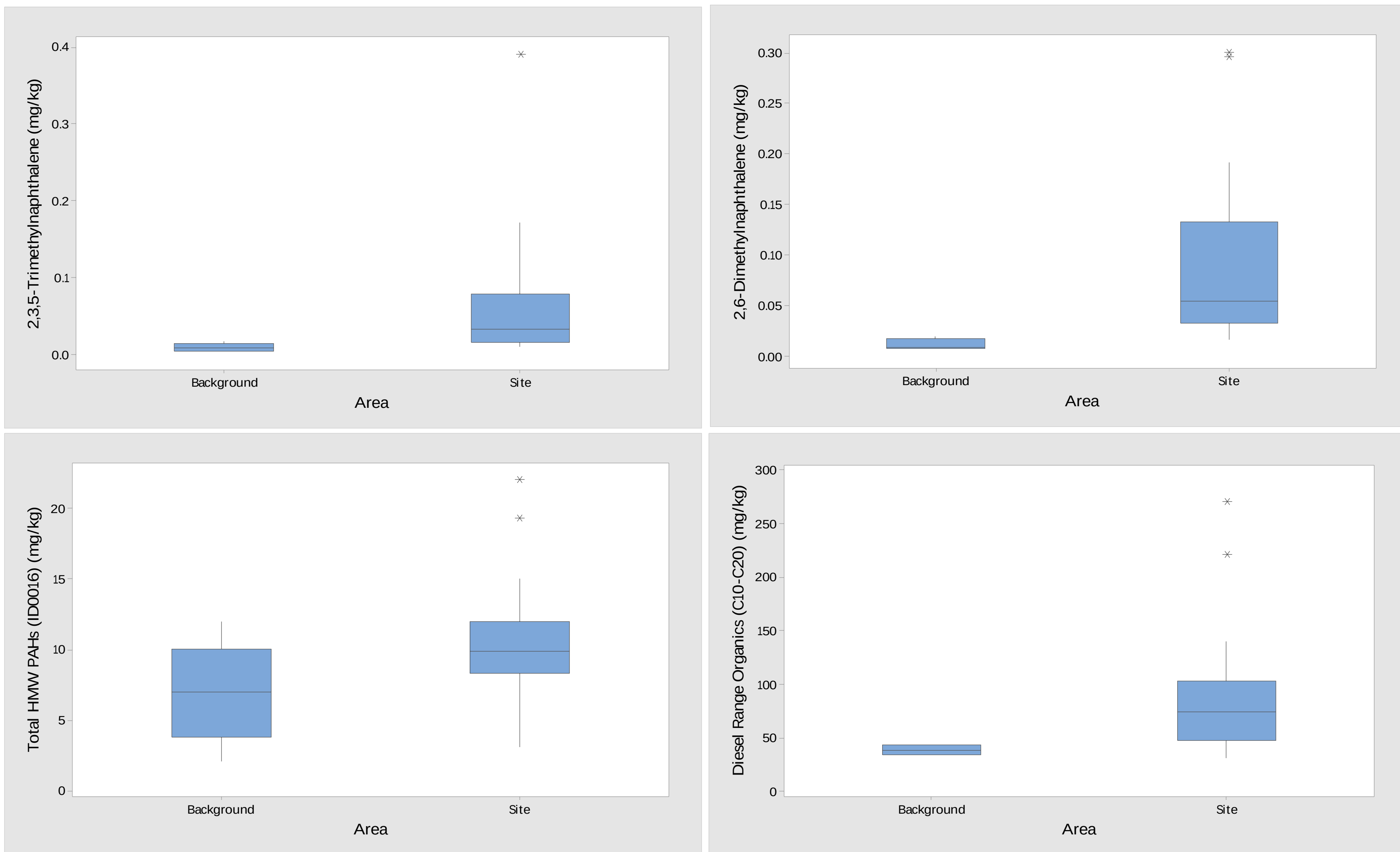


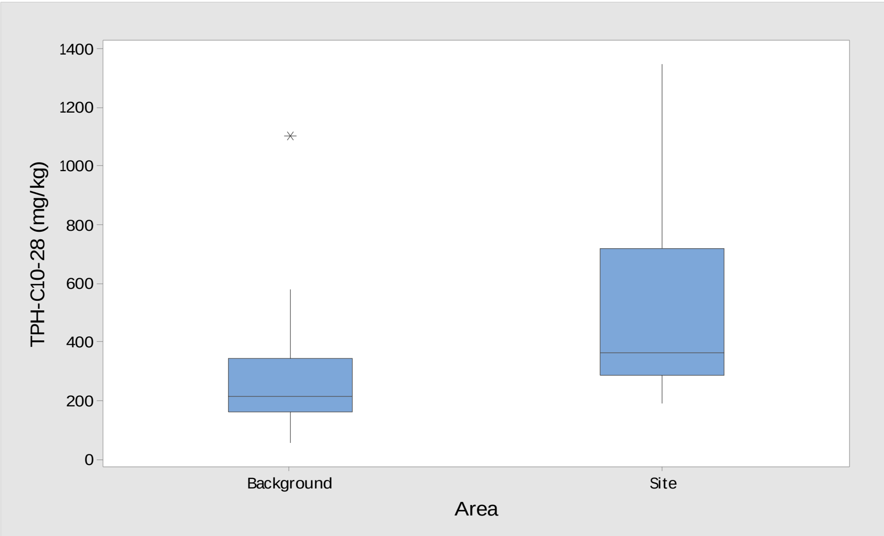



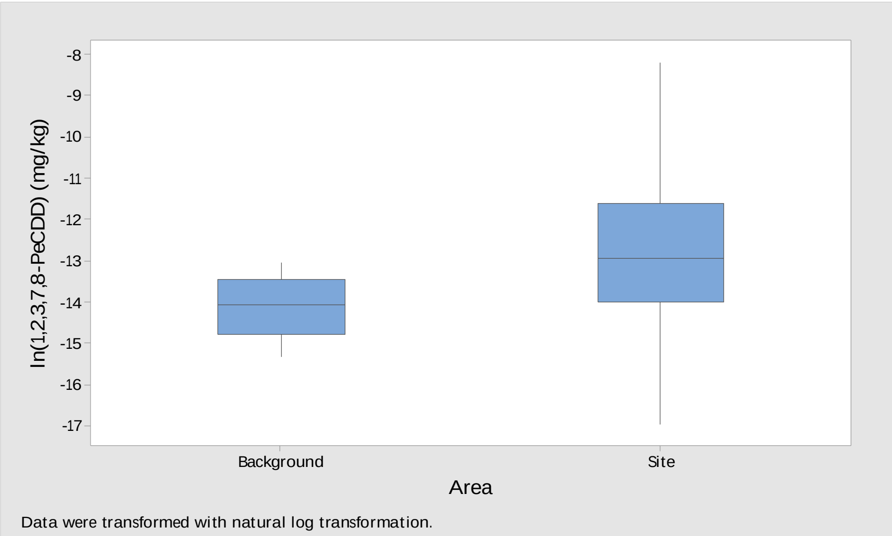



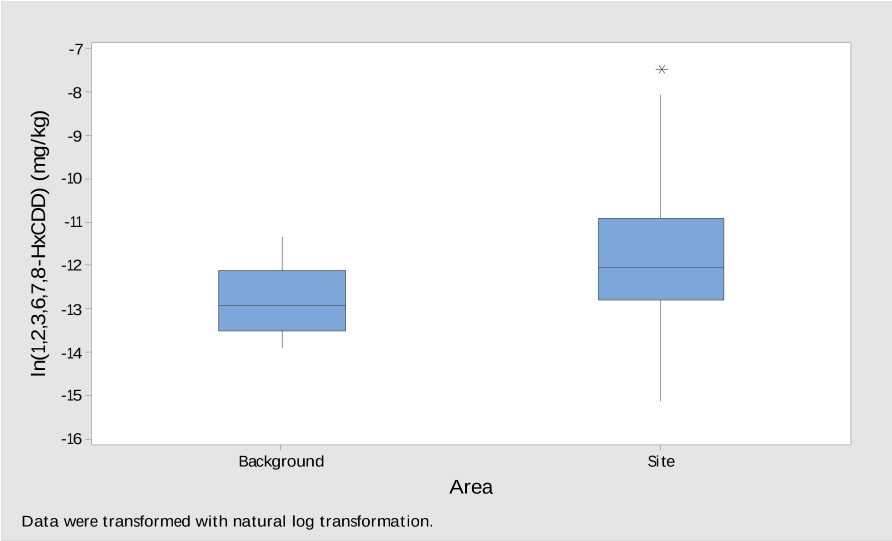
Boxplots Comparing Site and Background Sediment

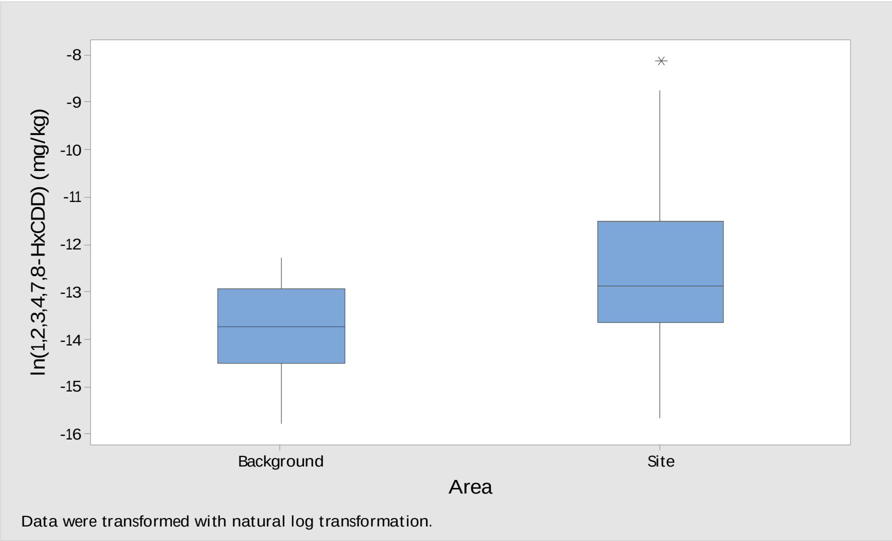


Boxplots Comparing Site and Background Sediment

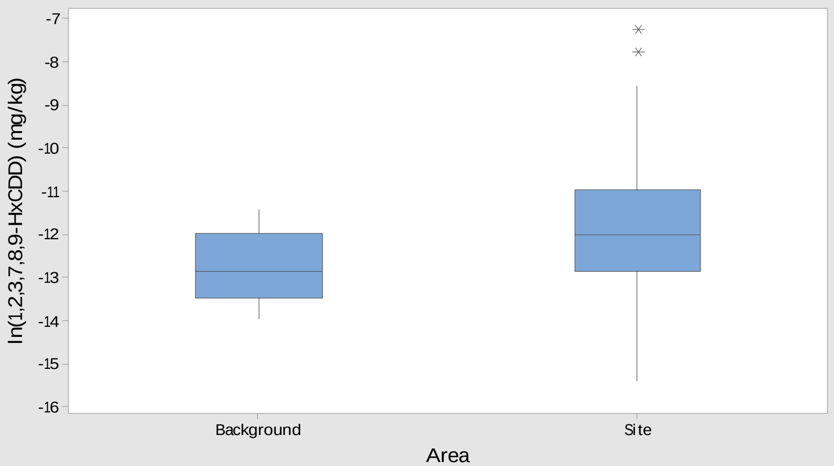


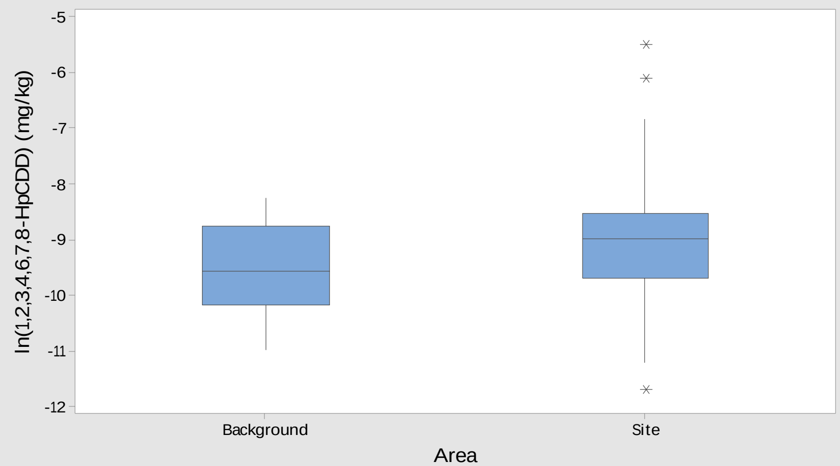



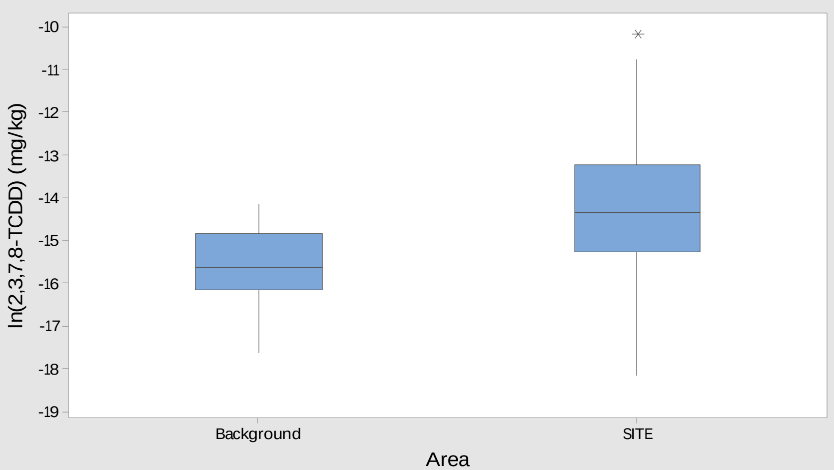
Boxplots Comparing Site and Background Sediment



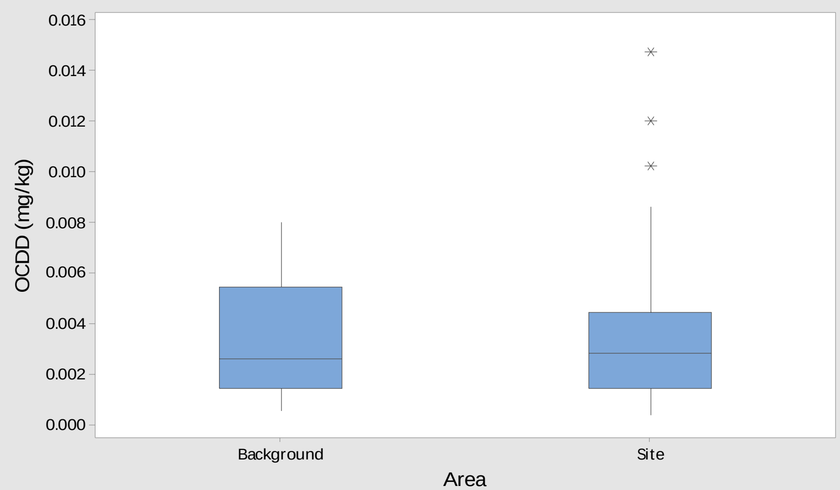

Data were transformed with natural log transformation.



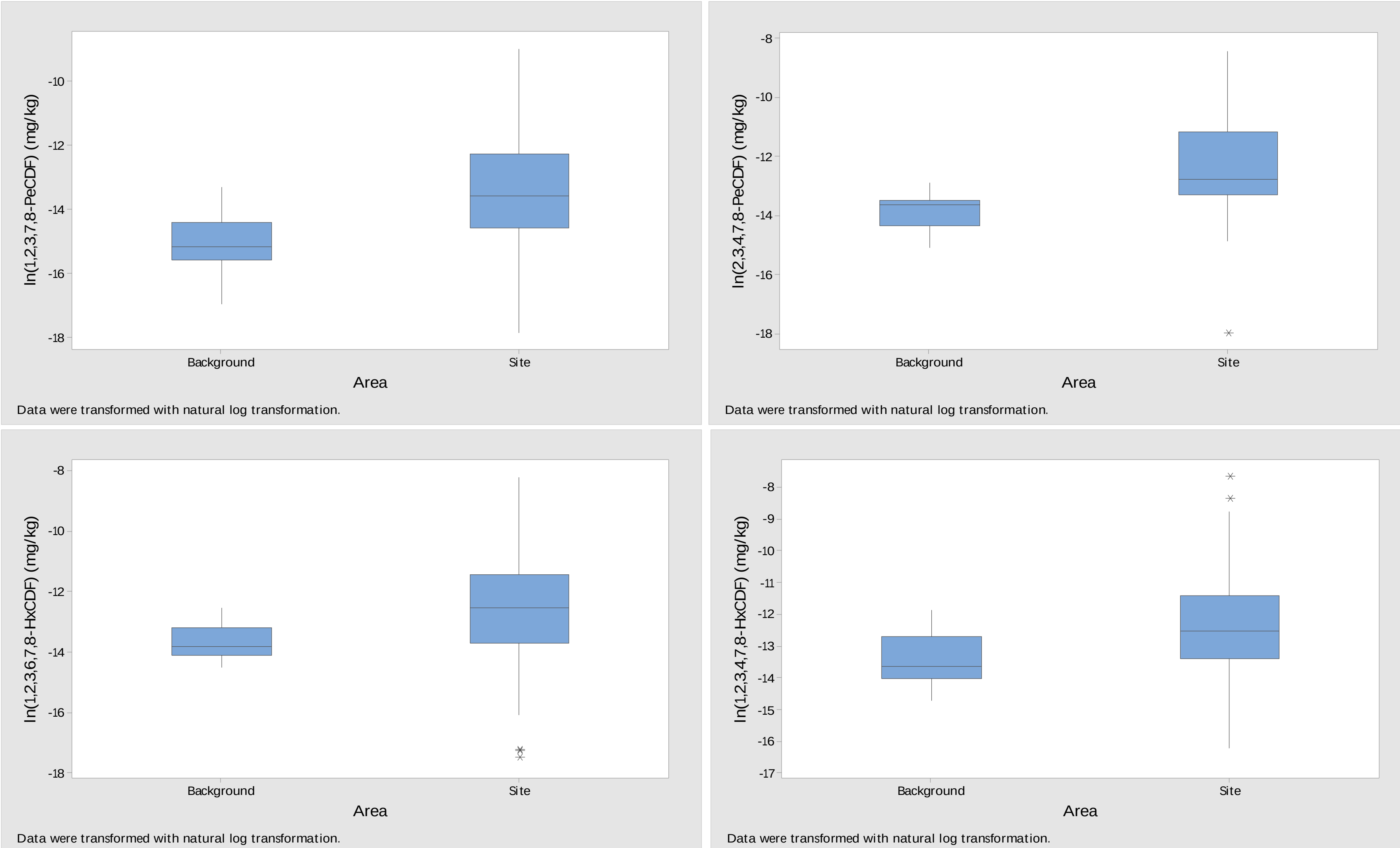

Data were transformed with natural log transformation.



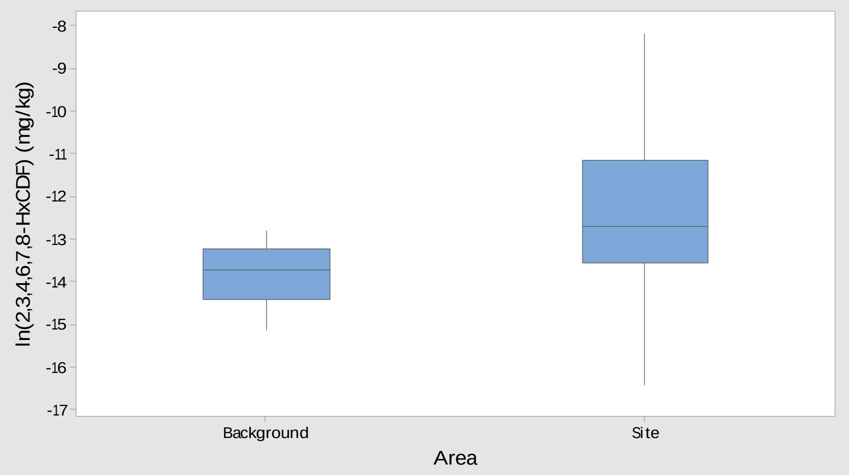

Data were transformed with natural log transformation.



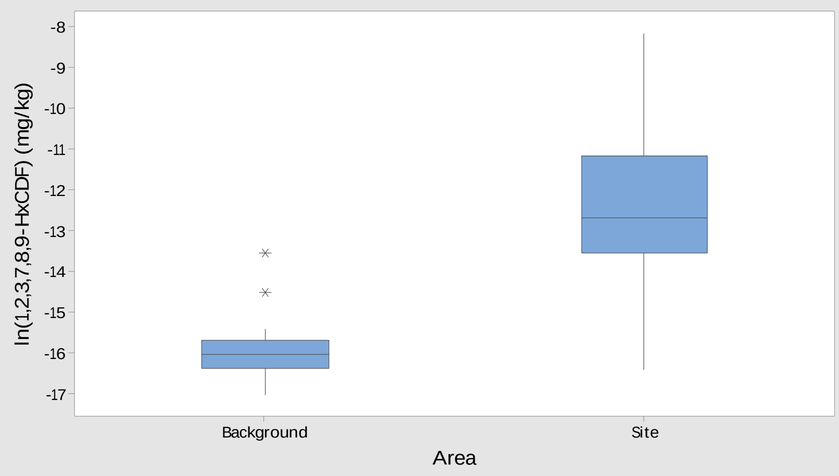
Boxplots Comparing Site and Background Sediment



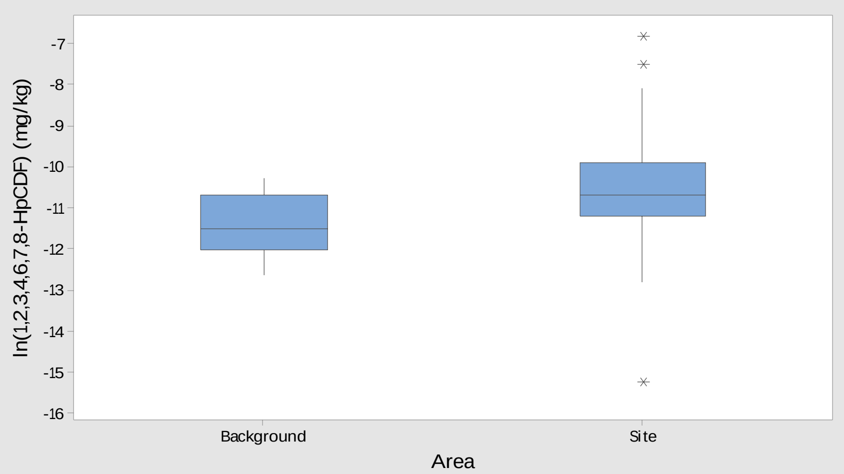
Boxplots Comparing Site and Background Sediment



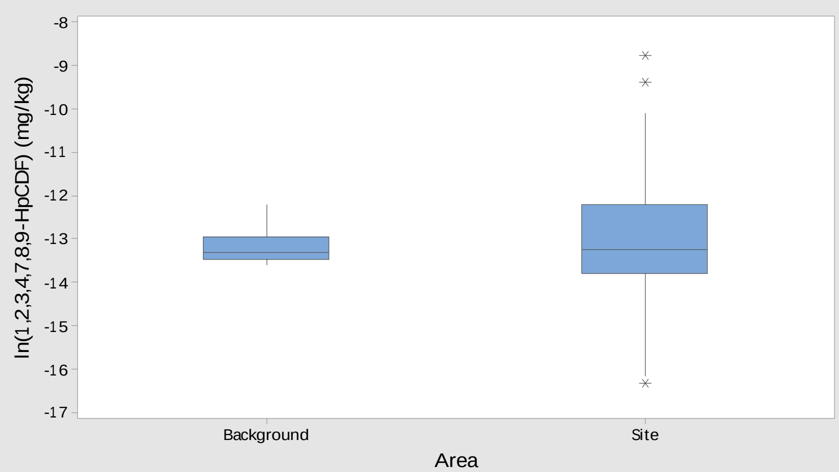

Data were transformed with natural log transformation.




Data were transformed with natural log transformation.

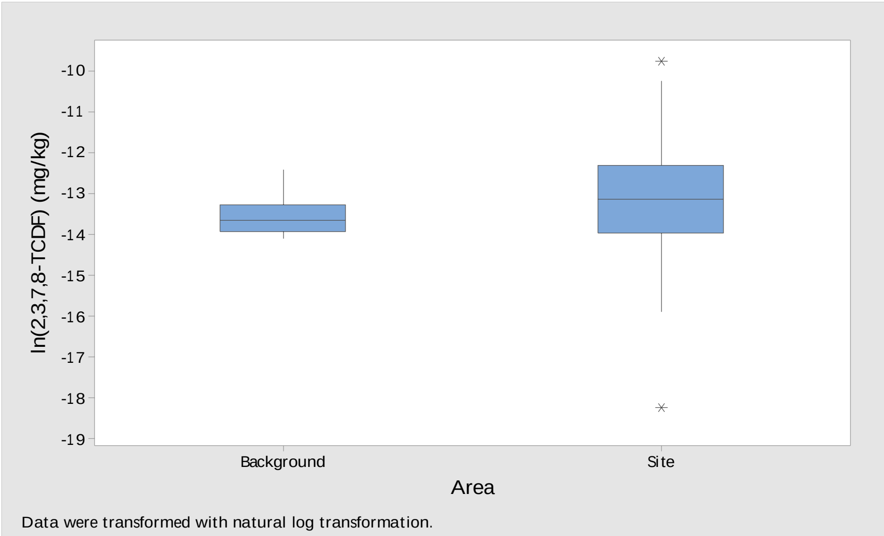


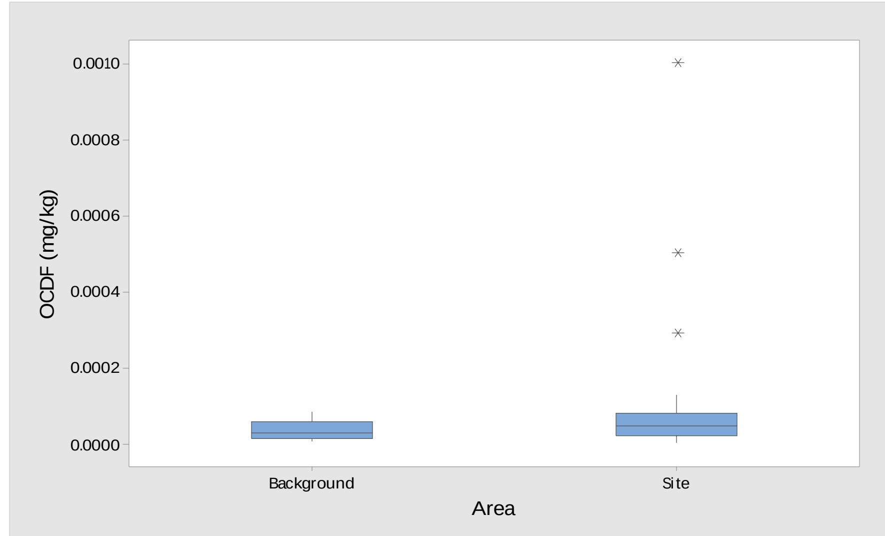

Data were transformed with natural log transformation.

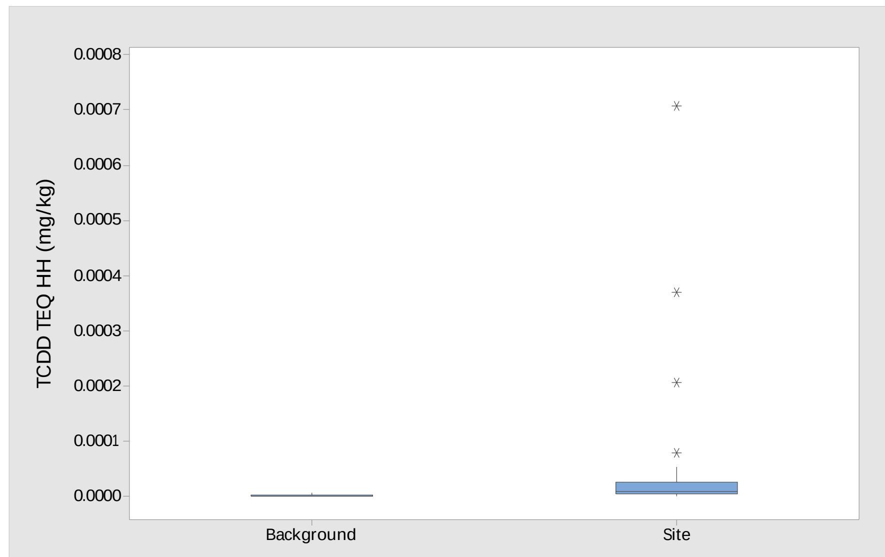



Data were transformed with natural log transformation.

Boxplots Comparing Site and Background Sediment



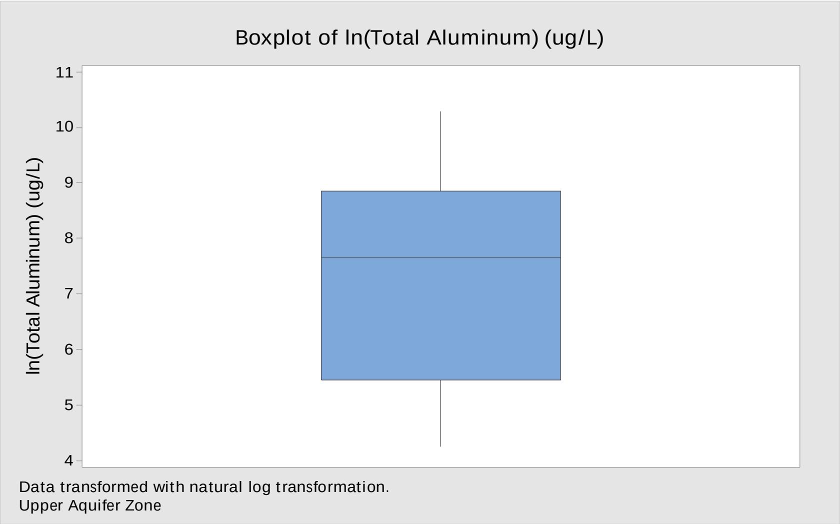



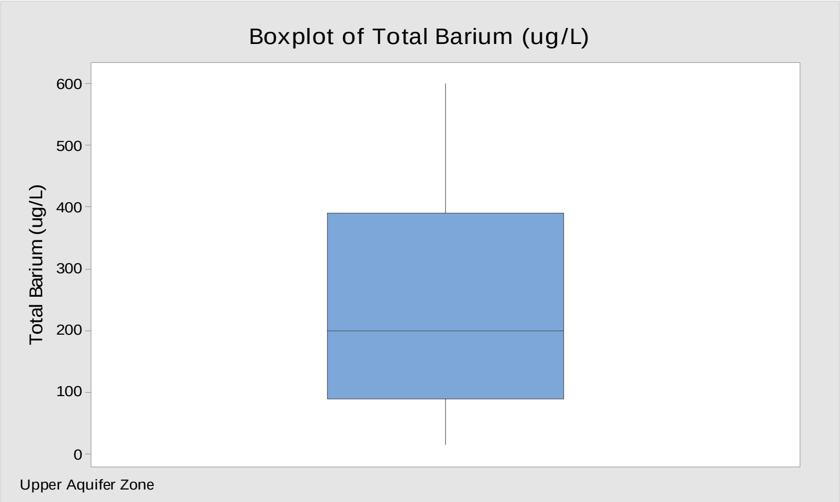
# Attachment E

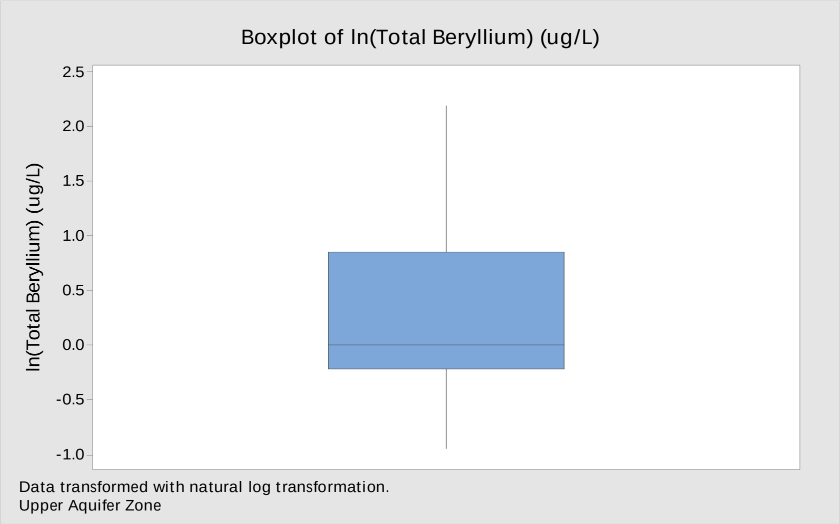
# Supporting Graphics - Groundwater

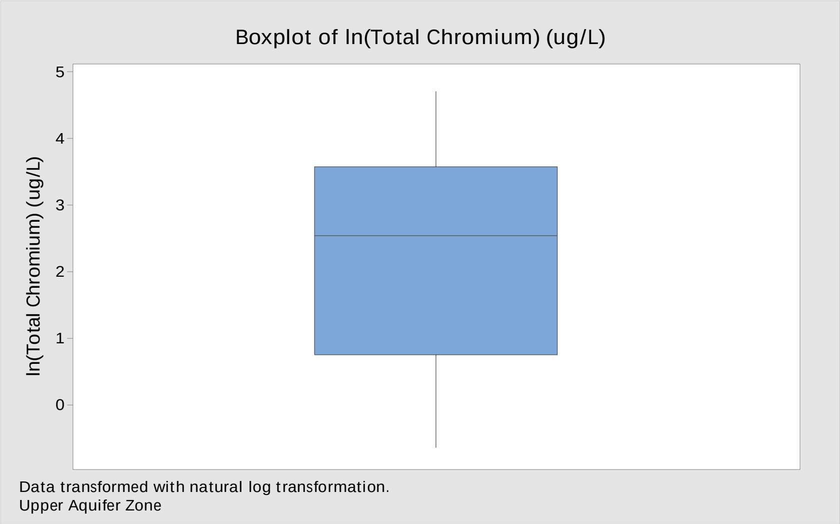
# Evaluation of Background Groundwater Dataset

Boxplots - Upper Groundwater Aquifer Zone

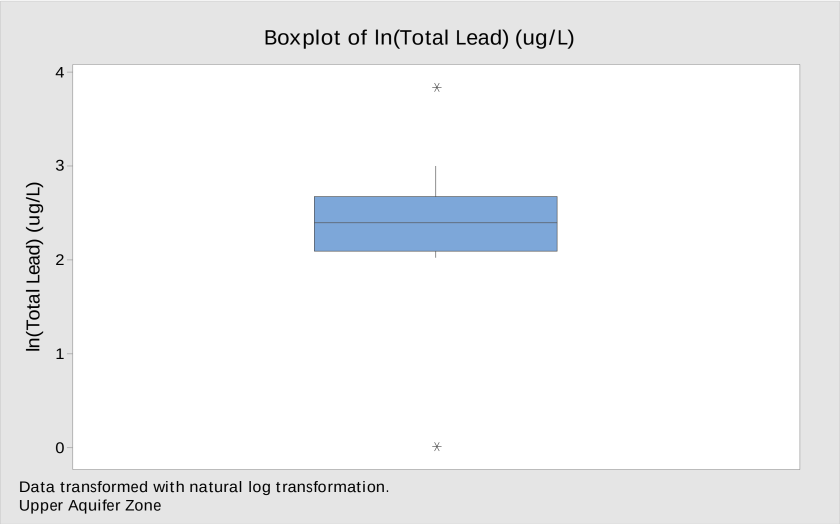


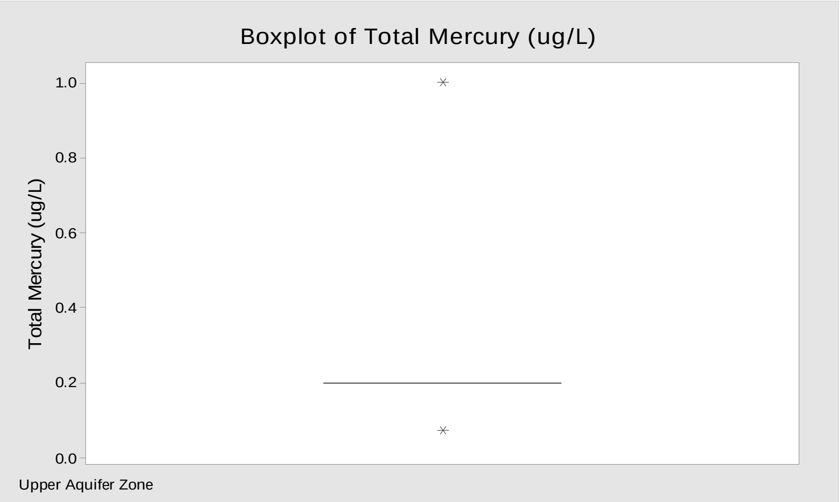



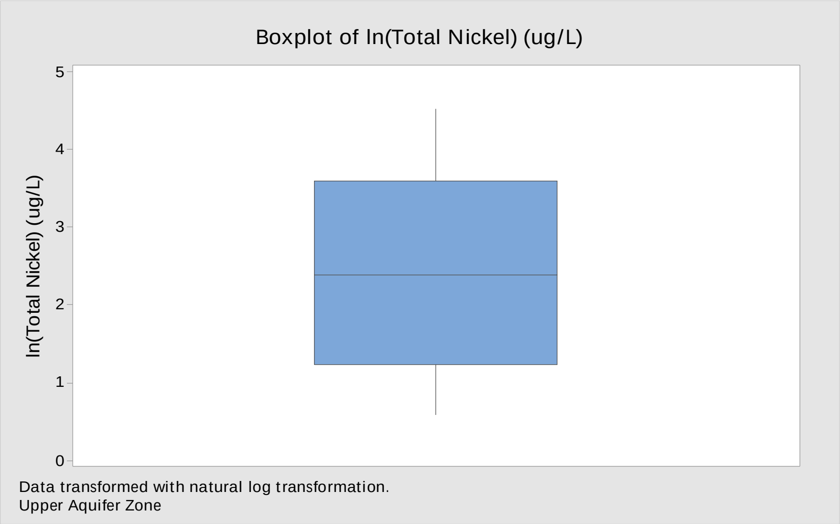



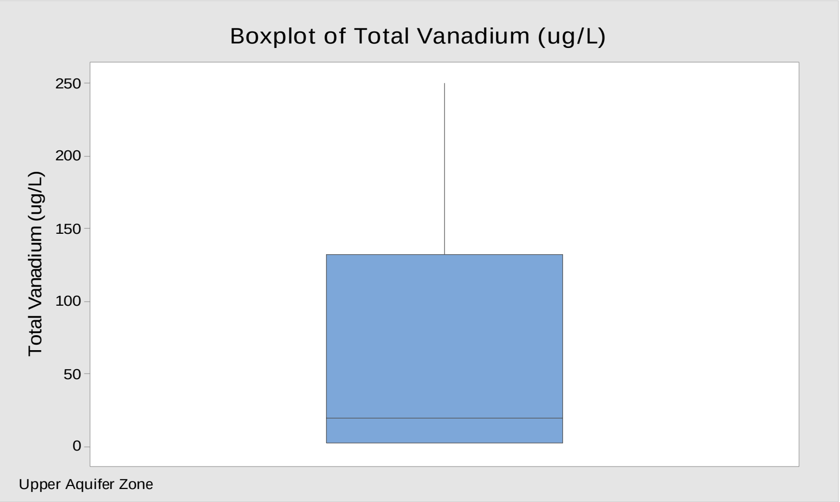



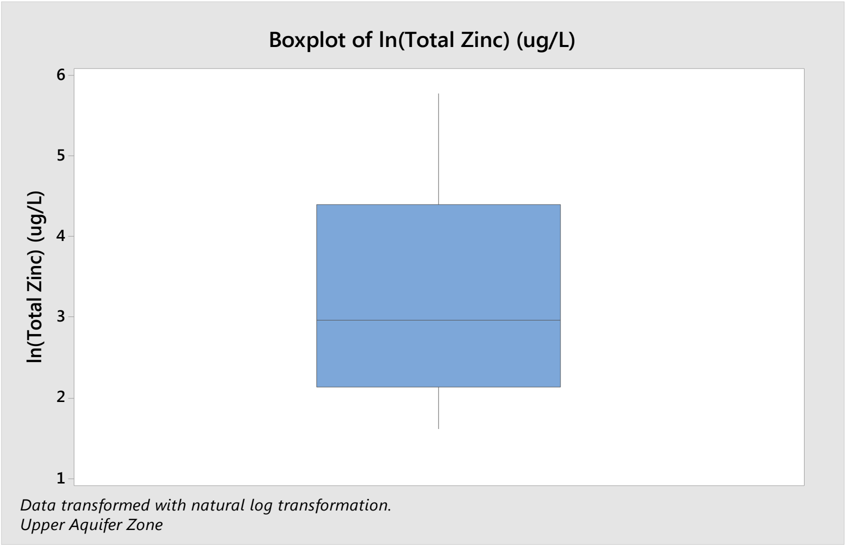
Boxplots - Upper Groundwater Aquifer Zone

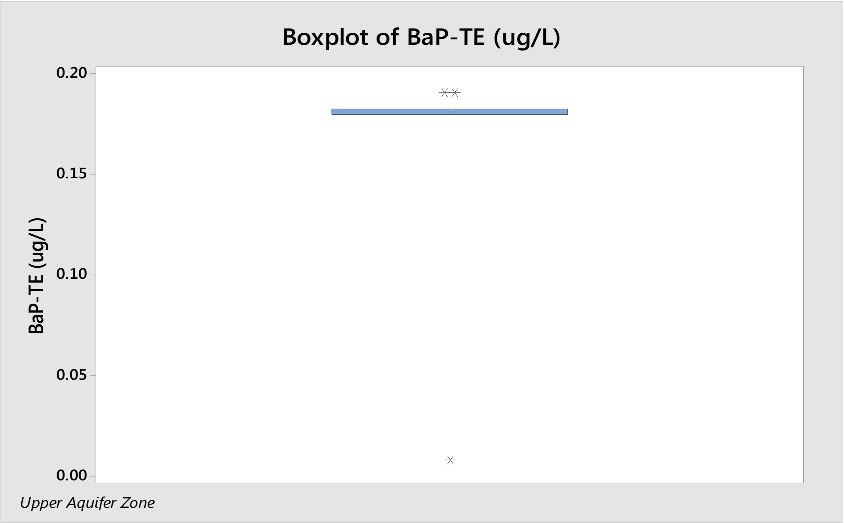


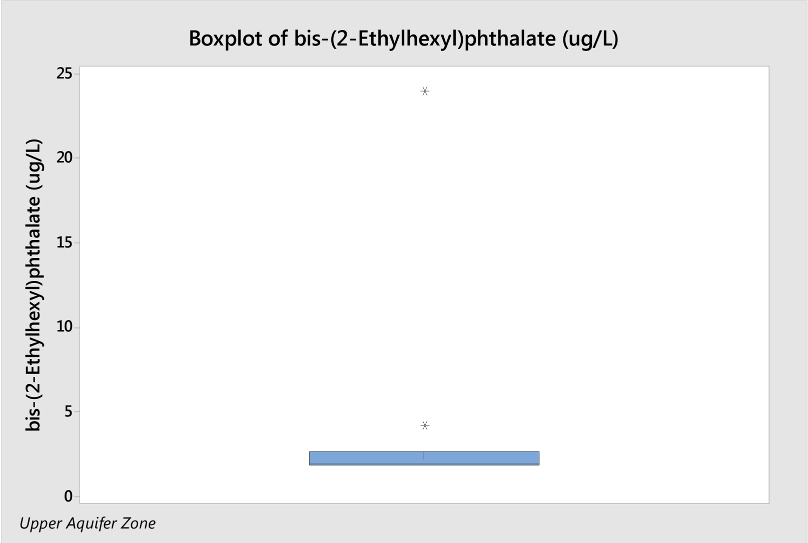



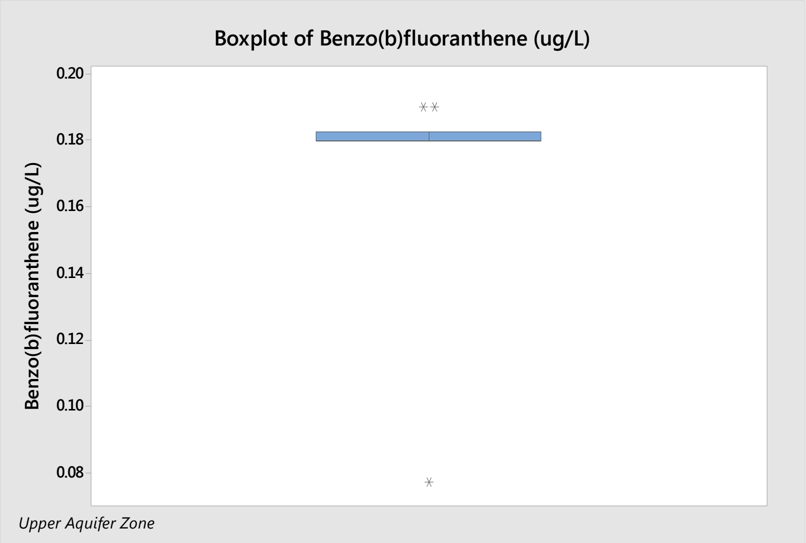



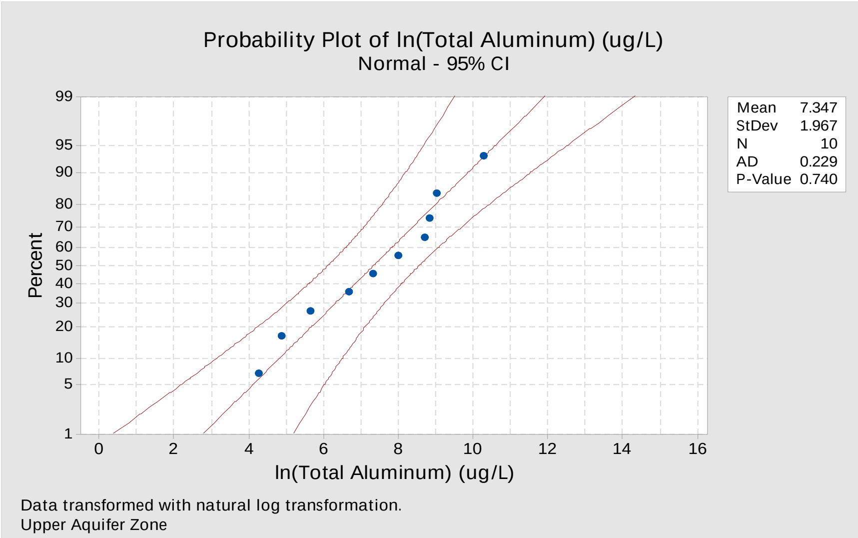

Boxplot of ln(Total Zinc) (ug/L)
ln(Total Zinc) (ug/L)
6
5
4
3
2
1
Data transformed with natural log transformation.
Upper Aquifer Zone

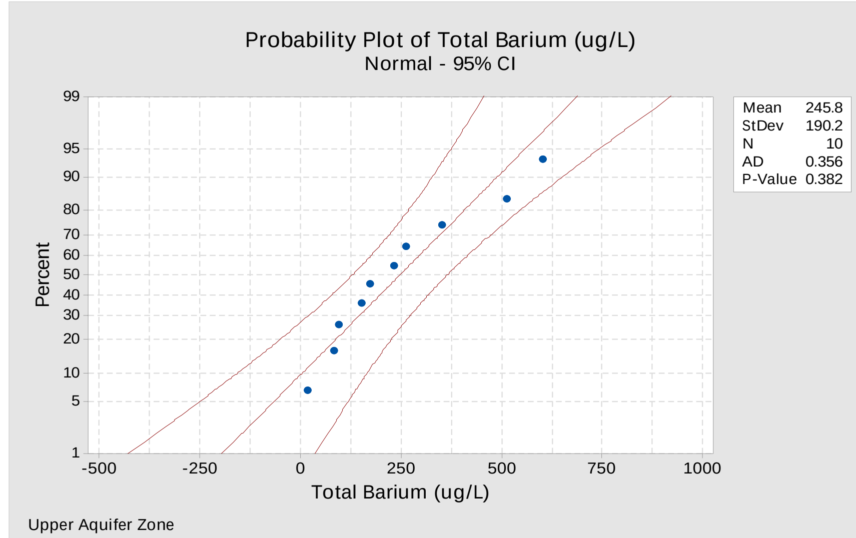

Boxplot of BaP-TE (ug/L)
BaP-TE (ug/L)
0.20
0.15
0.10
0.05
0.00
Upper Aquifer Zone

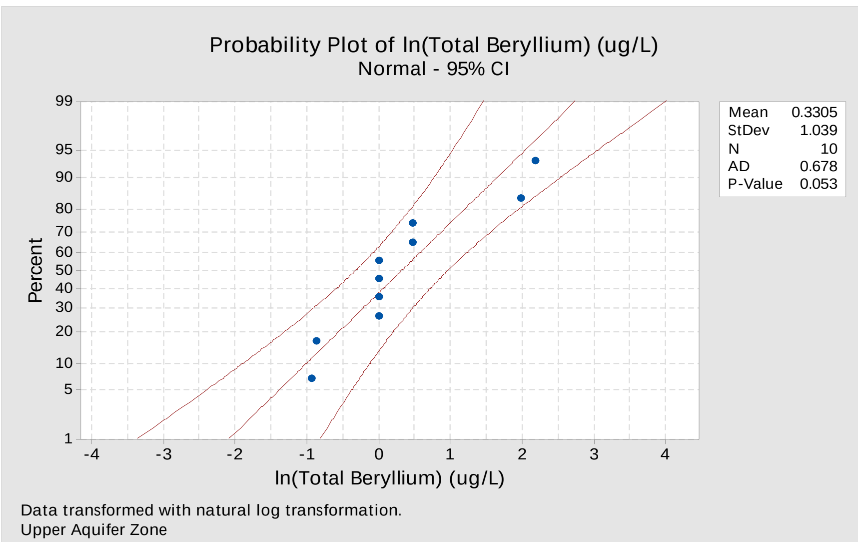

Boxplot of bis-(2-Ethylhexyl)phthalate (ug/L)
bis-(2-Ethylhexyl)phthalate (ug/L)
25
20
15
10
5
0
Upper Aquifer Zone

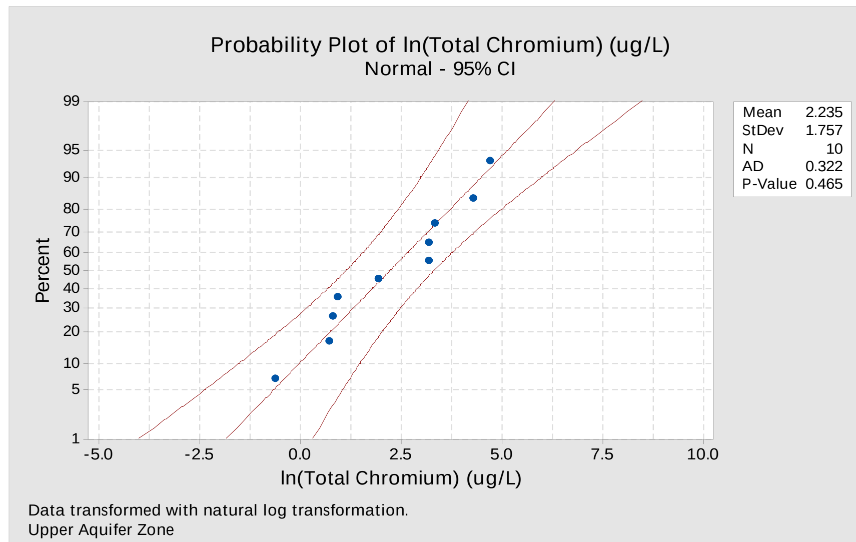

Boxplot of Benzo(b)fluoranthene (ug/L)
Benzo(b)fluoranthene (ug/L)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
Upper Aquifer Zone

Probability Plots - Upper Groundwater Aquifer Zone

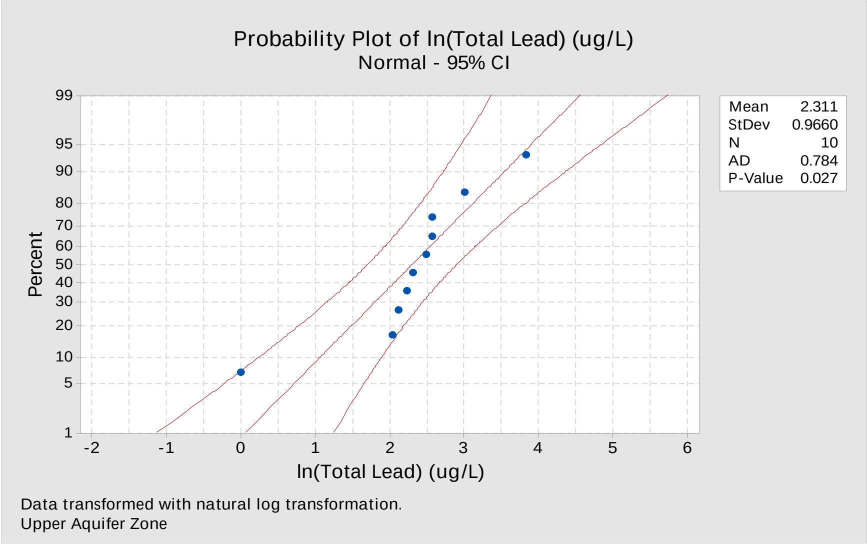


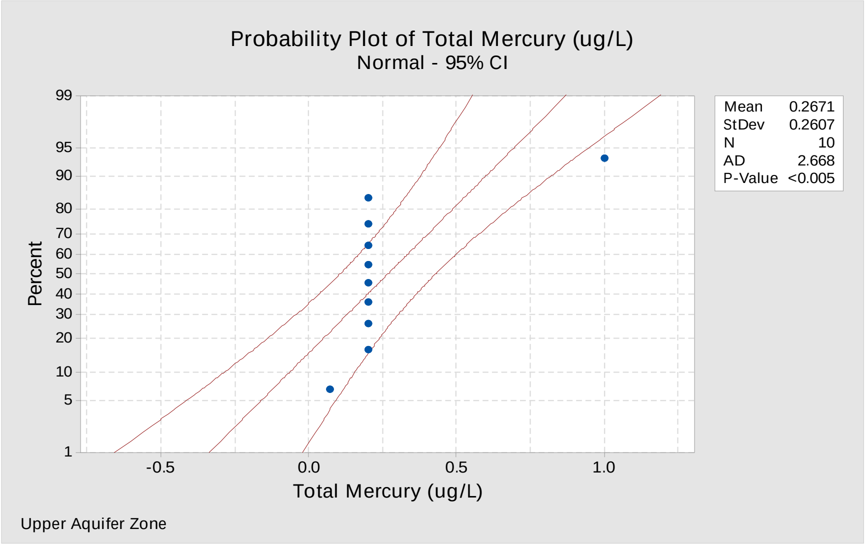



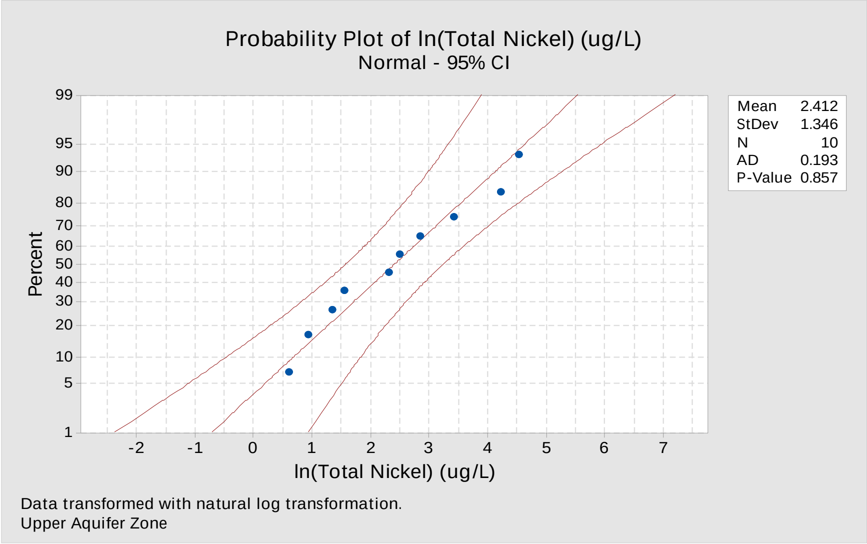



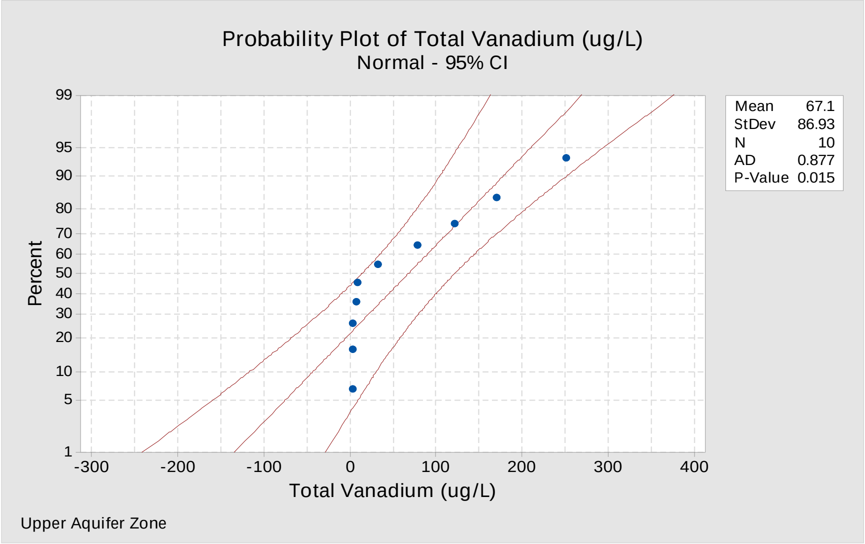



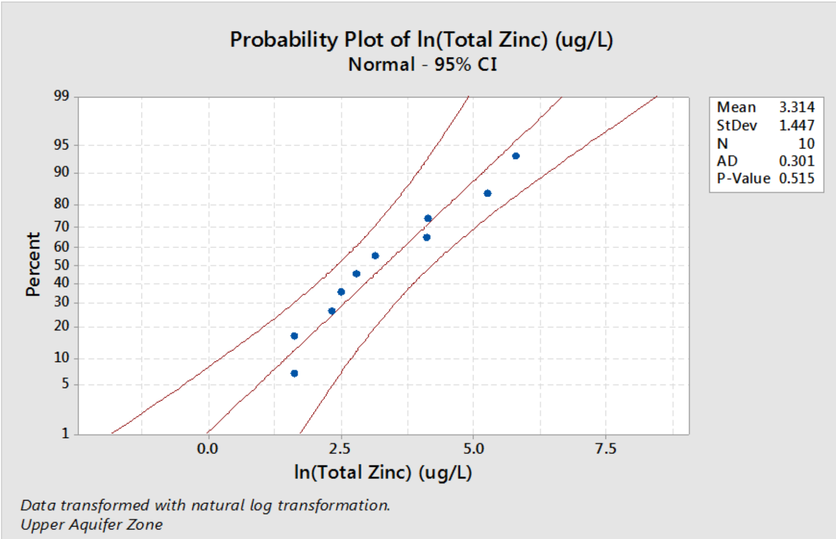
Probability Plots - Upper Groundwater Aquifer Zone

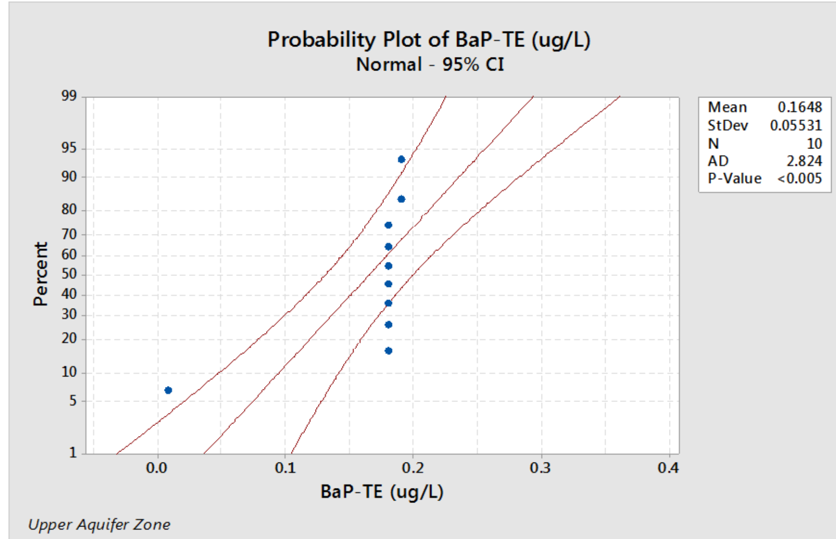


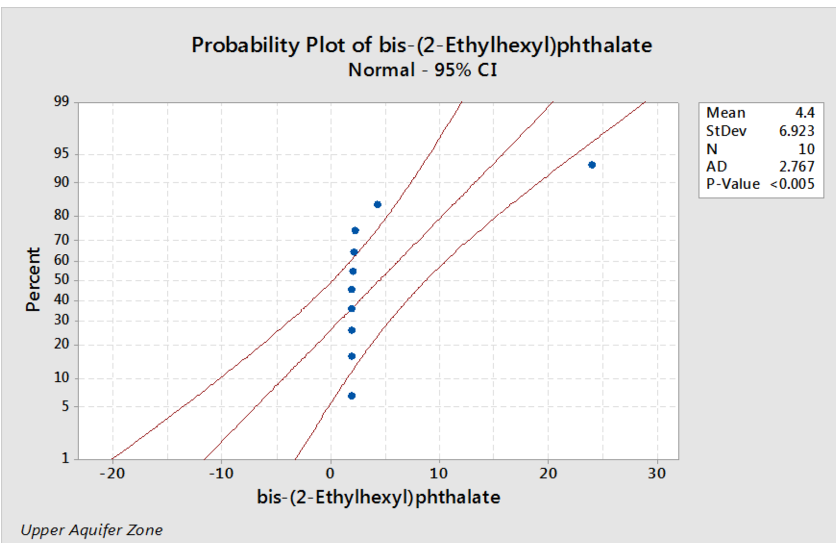



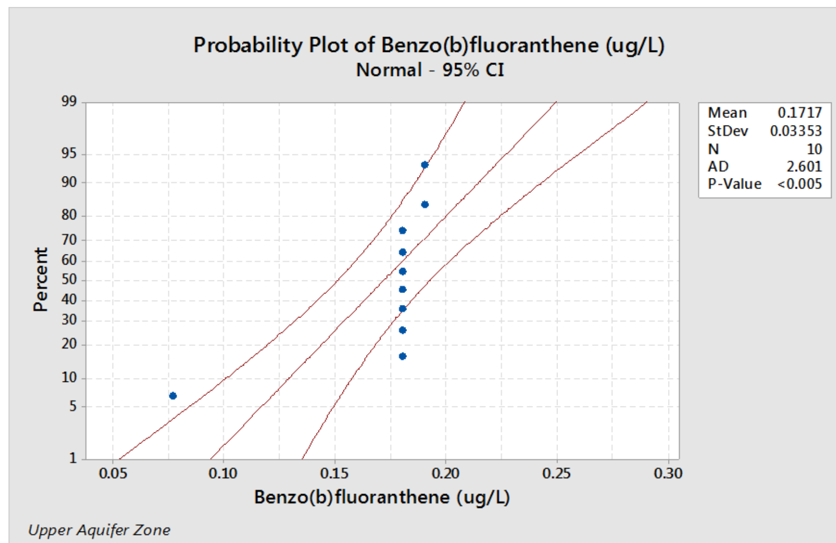



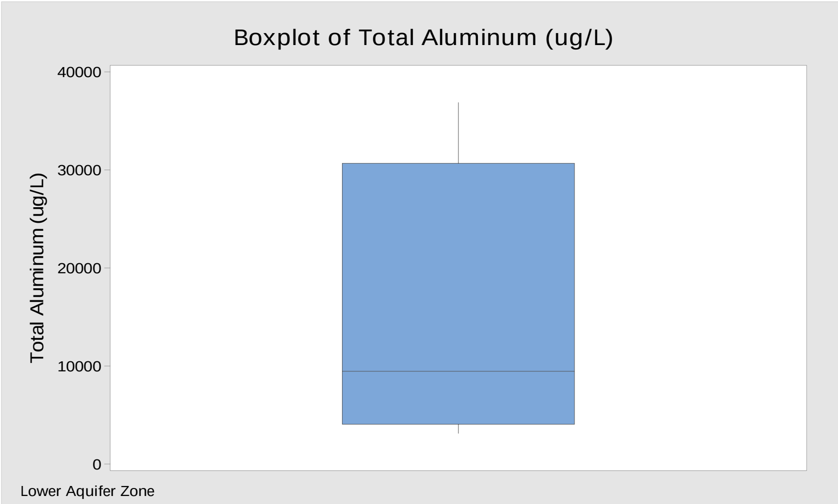

Probability Plot of ln(Total Zinc) (ug/L)
Normal - 95% CI
Mean 3.314
StDev 1.447
N 10
AD 0.301
P-Value 0.515
Percent
99 95 90 80 70 60 50 40 30 20 10 5 1
0.0 2.5 5.0 7.5
ln(Total Zinc) (ug/L)
Data transformed with natural log transformation.
Upper Aquifer Zone

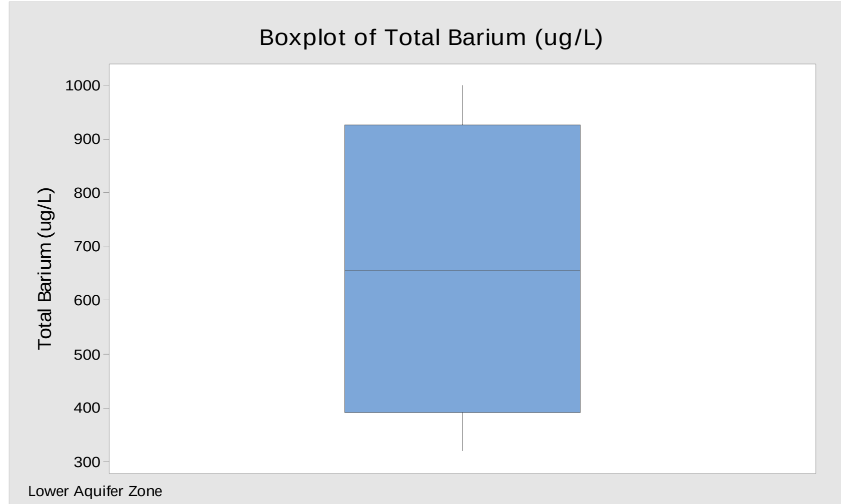

Probability Plot of BaP-TE (ug/L)
Normal - 95% CI
Mean 0.1648
StDev 0.05531
N 10
AD 2.824
P-Value <0.005
Percent
99 95 90 80 70 60 50 40 30 20 10 5 1
0.0 0.1 0.2 0.3 0.4
BaP-TE (ug/L)
Upper Aquifer Zone

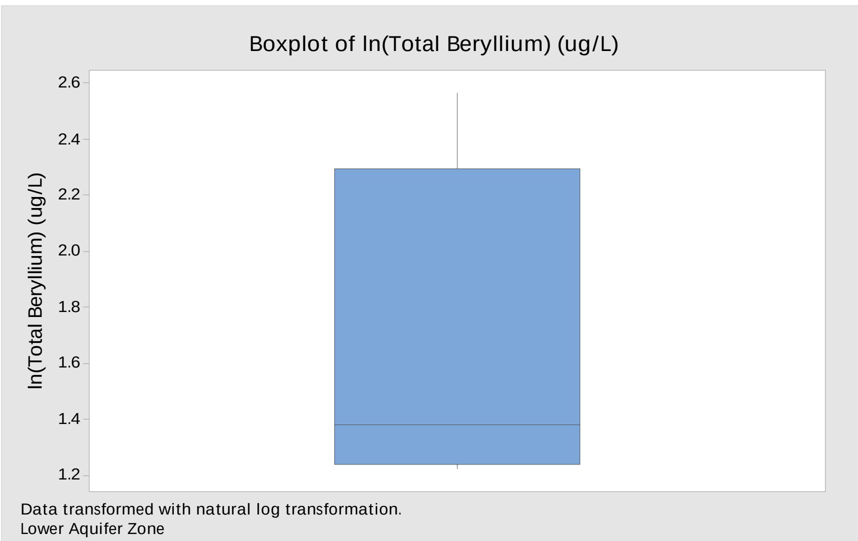

Probability Plot of bis-(2-Ethylhexyl)phthalate
Normal - 95% CI
Mean 4.4
StDev 6.923
N 10
AD 2.767
P-Value <0.005
Percent
99 95 90 80 70 60 50 40 30 20 10 5 1
-20 -10 0 10 20 30
bis-(2-Ethylhexyl)phthalate
Upper Aquifer Zone

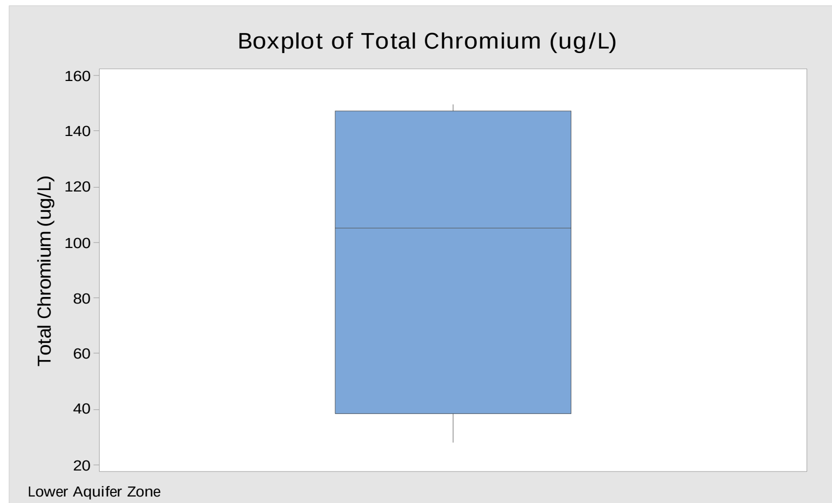

Probability Plot of Benzo(b)fluoranthene (ug/L)
Normal - 95% CI
Mean 0.1717
StDev 0.03353
N 10
AD 2.601
P-Value <0.005
Percent
99 95 90 80 70 60 50 40 30 20 10 5 1
0.05 0.10 0.15 0.20 0.25 0.30
Benzo(b)fluoranthene (ug/L)
Upper Aquifer Zone

Boxplots - Lower Groundwater Aquifer Zone

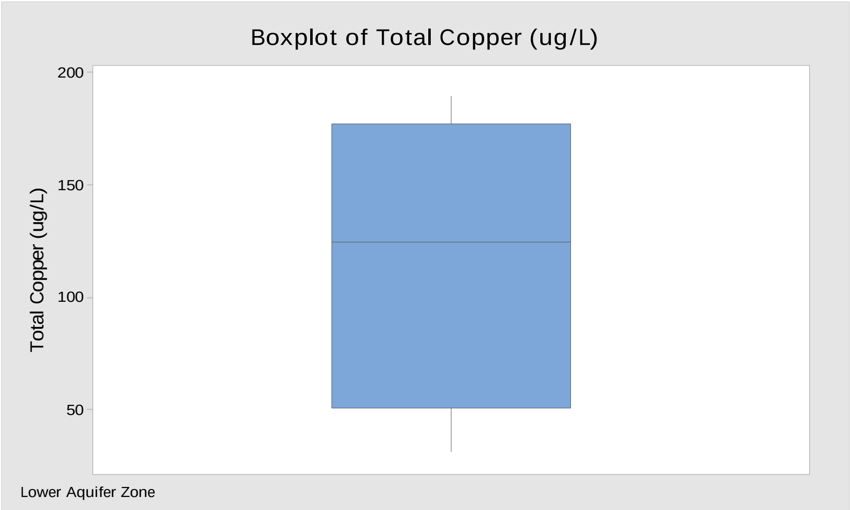


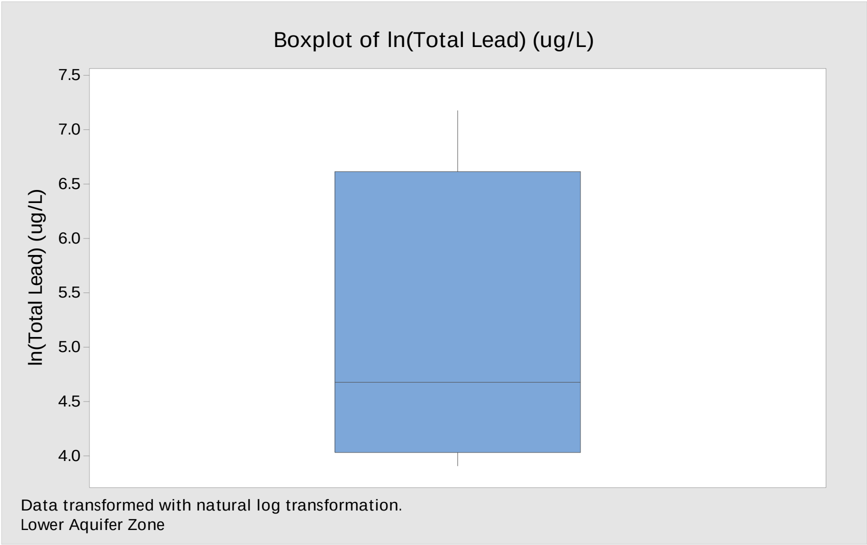



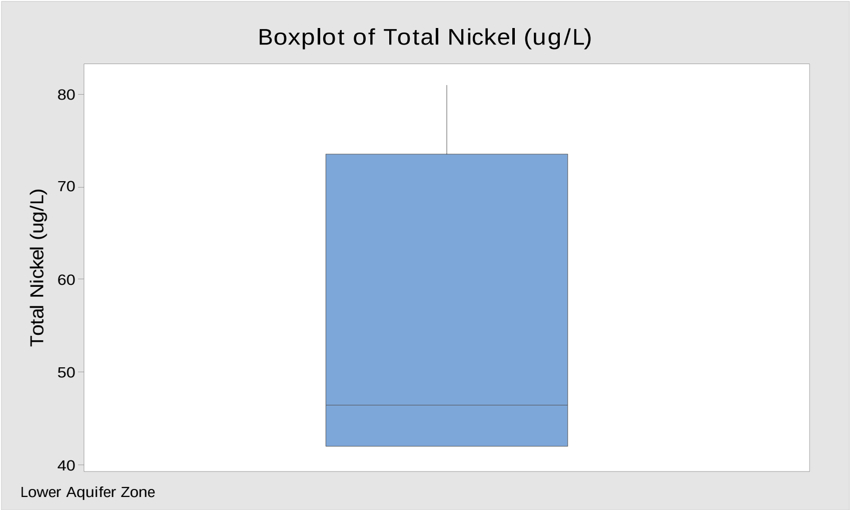



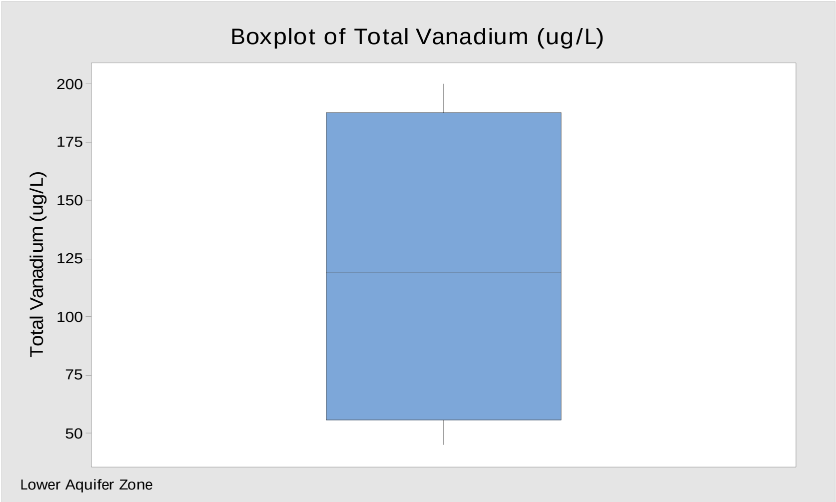



Boxplots - Lower Groundwater Aquifer Zone

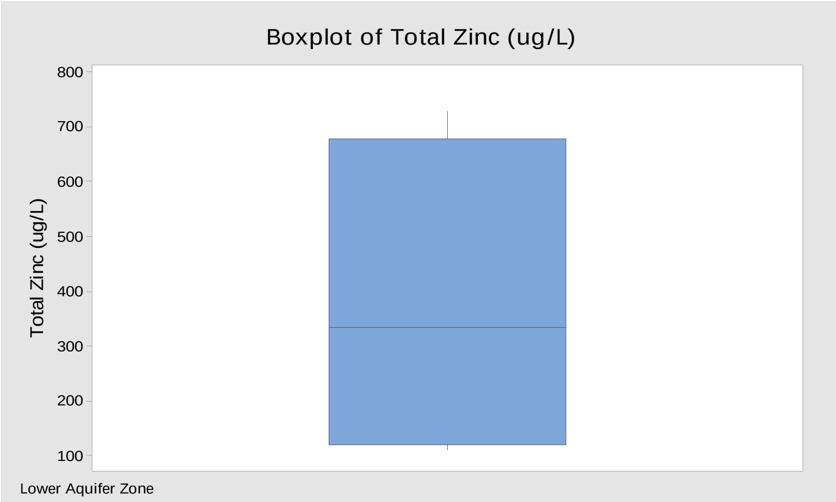


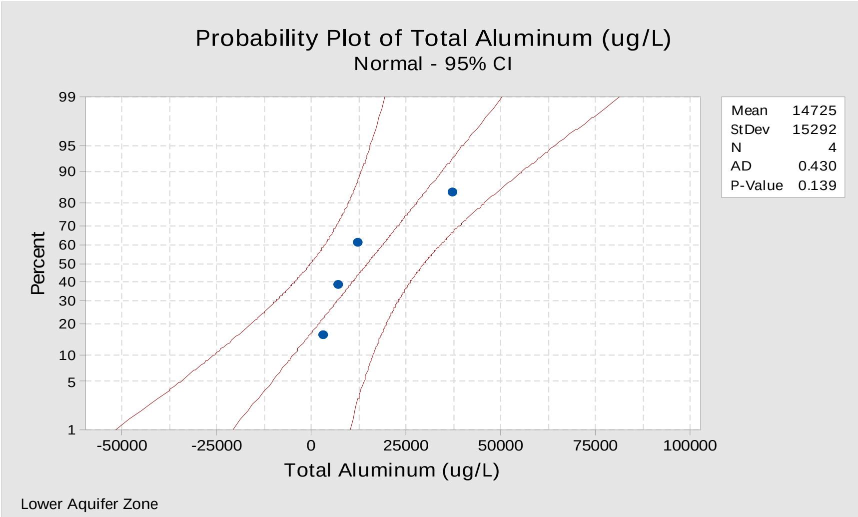



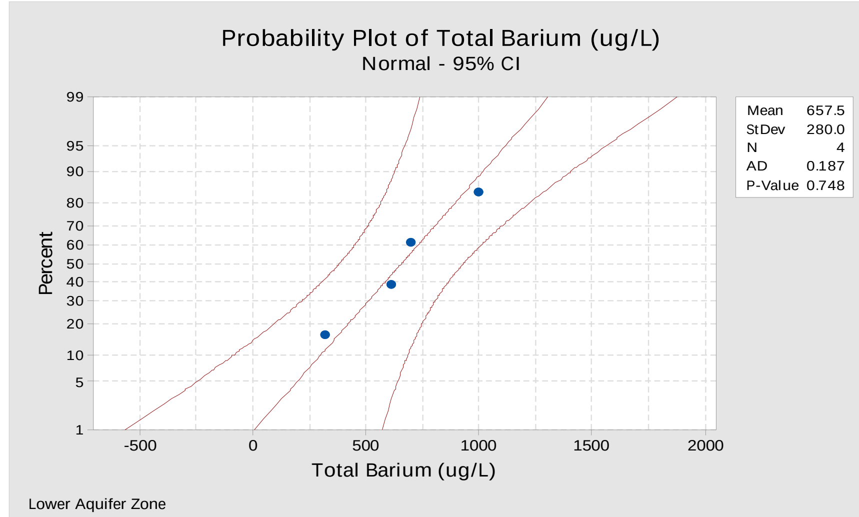



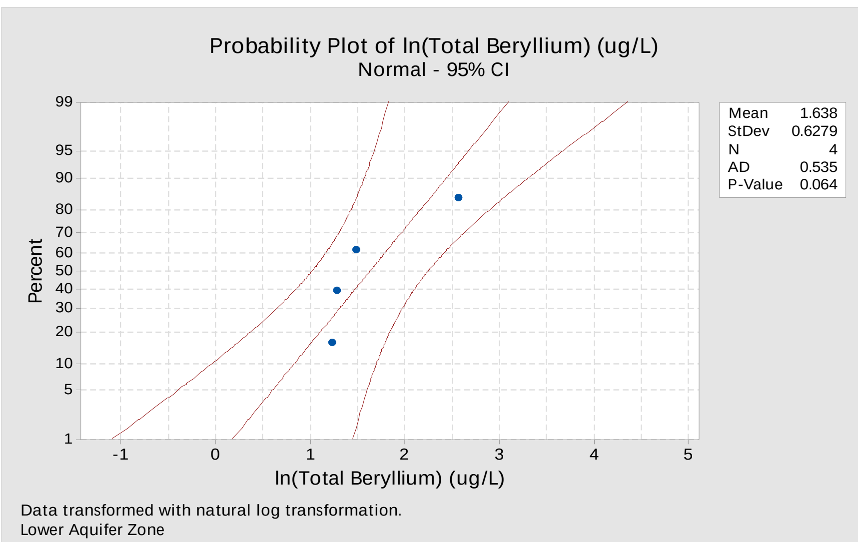
Boxplots - Lower Groundwater Aquifer Zone

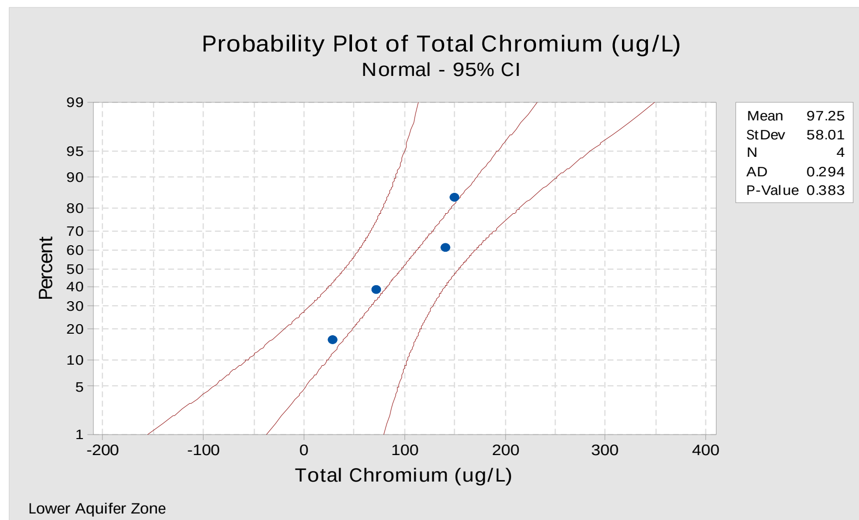


Probability Plots - Lower Groundwater Aquifer Zone

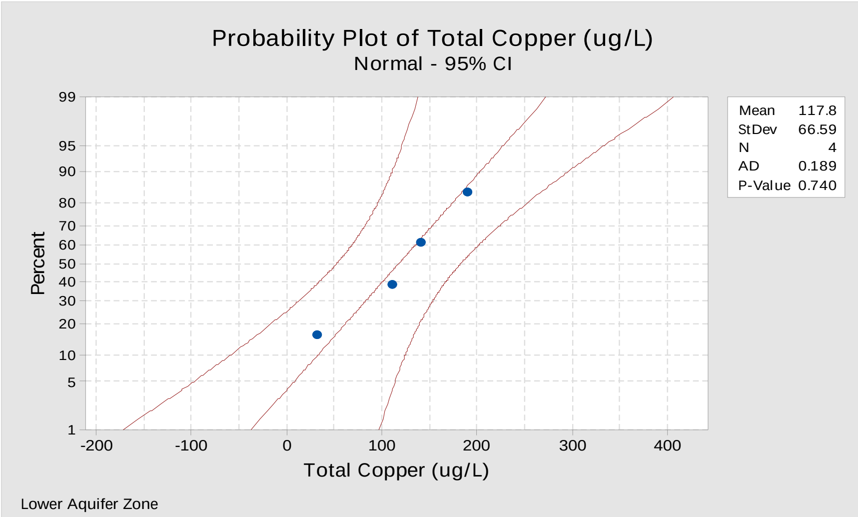


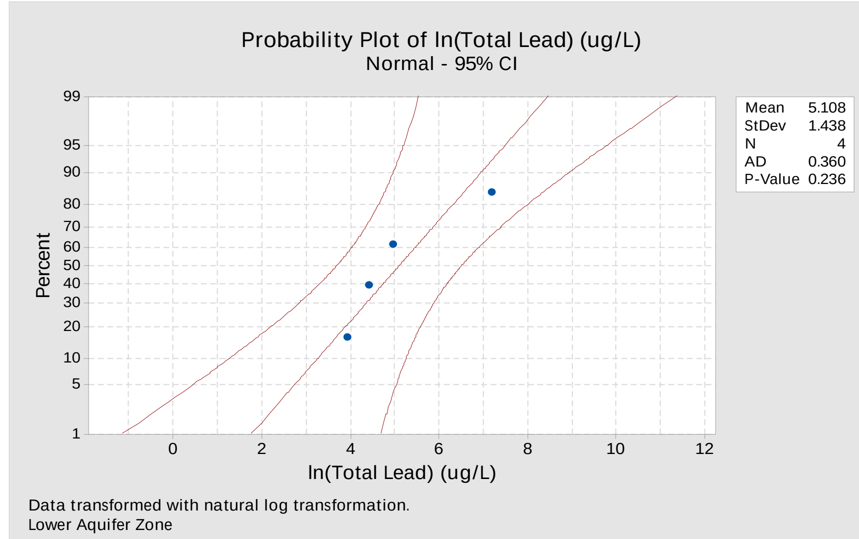



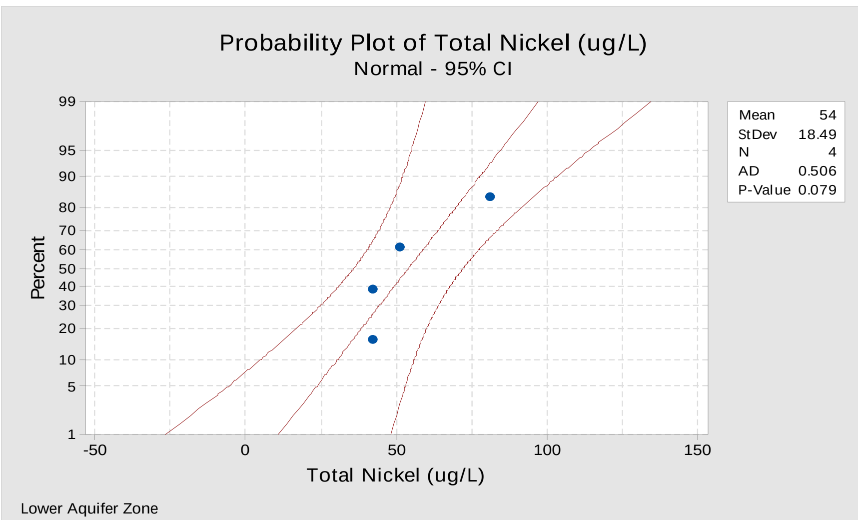



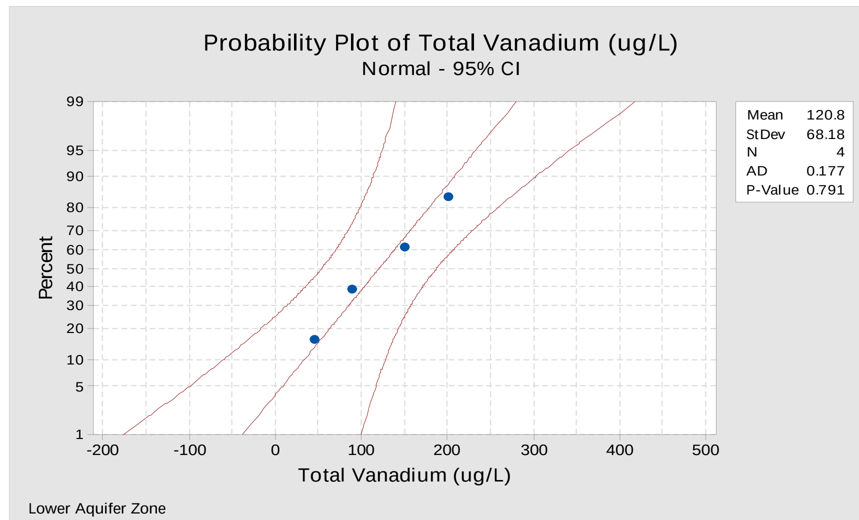



Probability Plots - Lower Groundwater Aquifer Zone

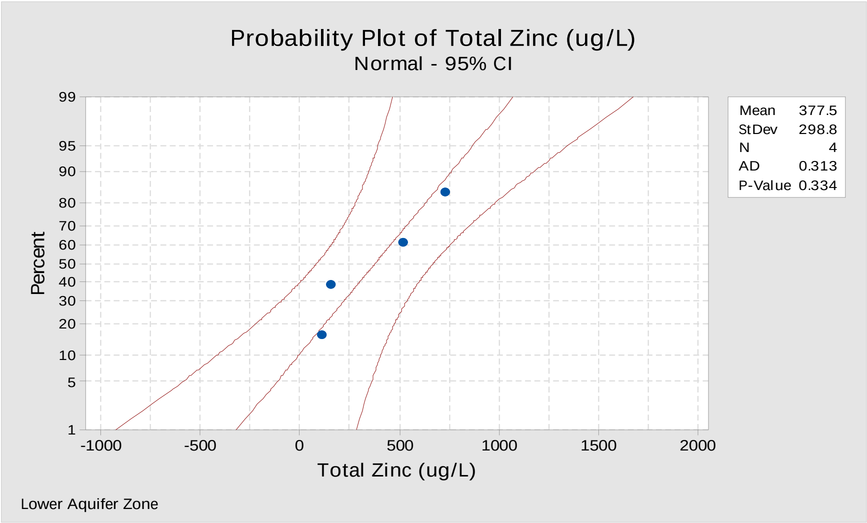


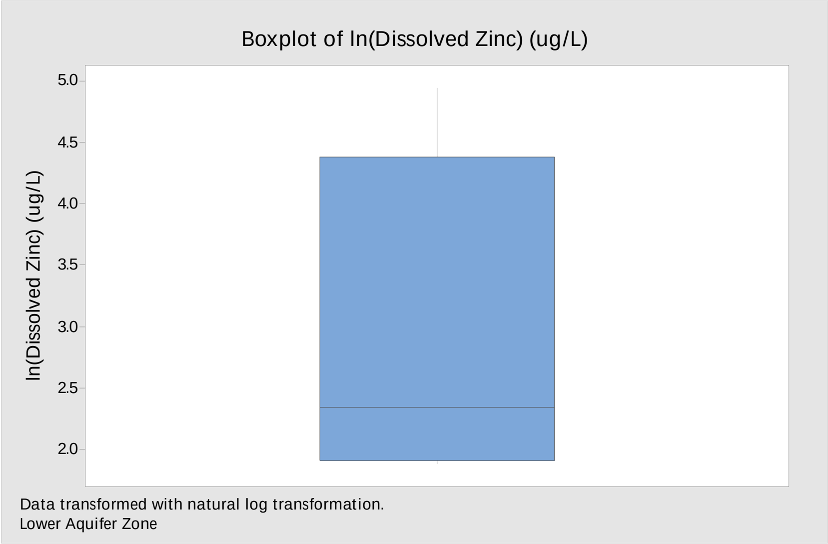



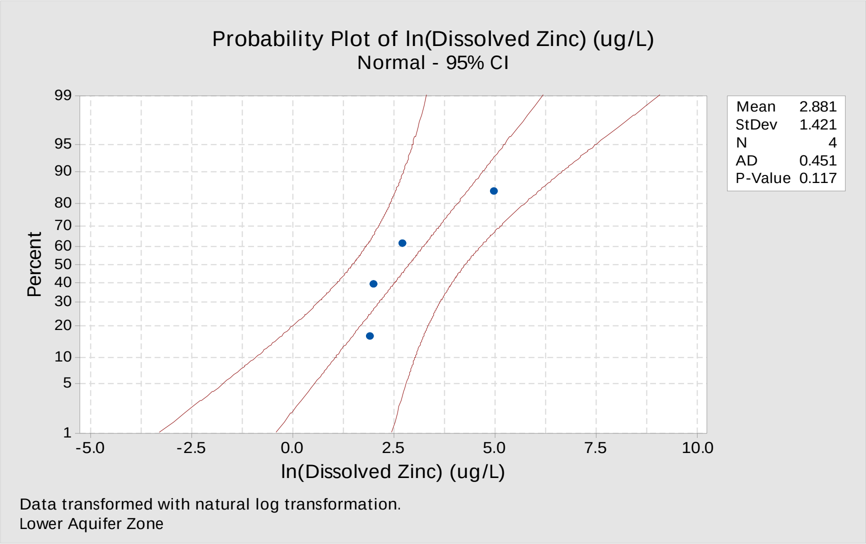
# Probability Plots - Lower Groundwater Aquifer Zone



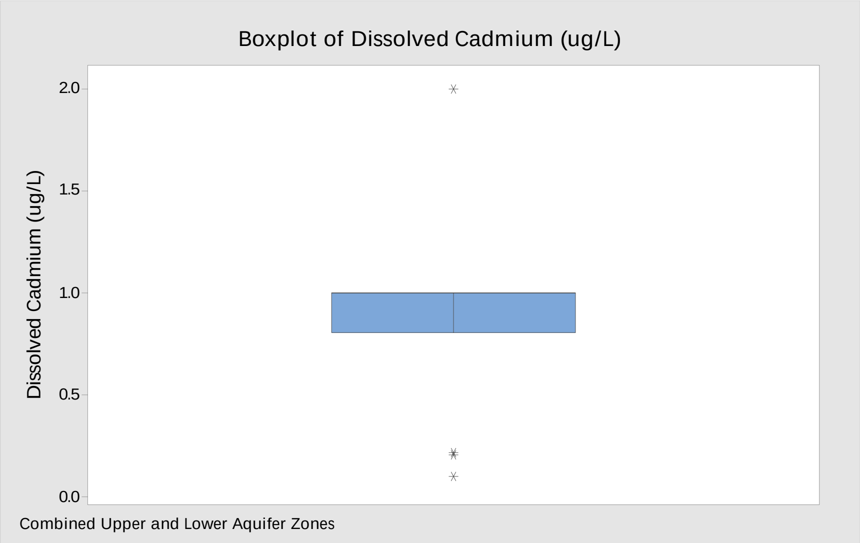
Boxplot and Probability Plot - Lower Groundwater Aquifer Zone - Dissolved Zinc

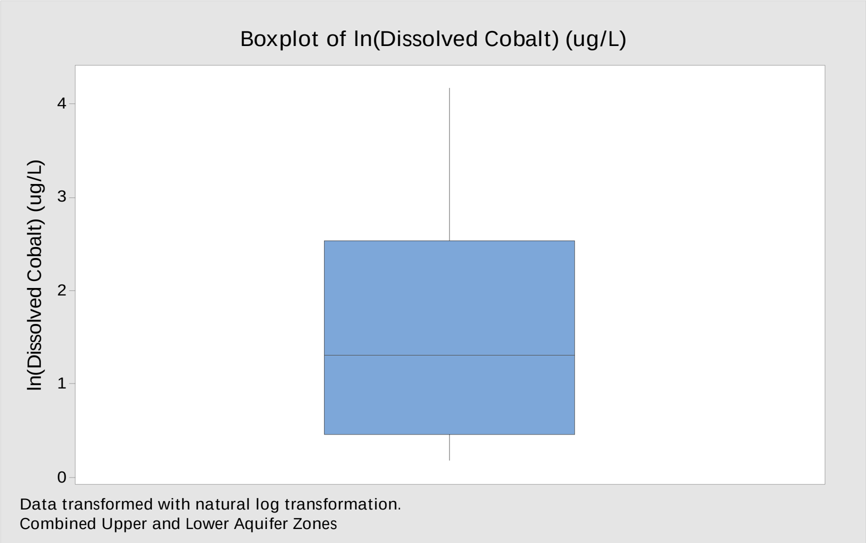


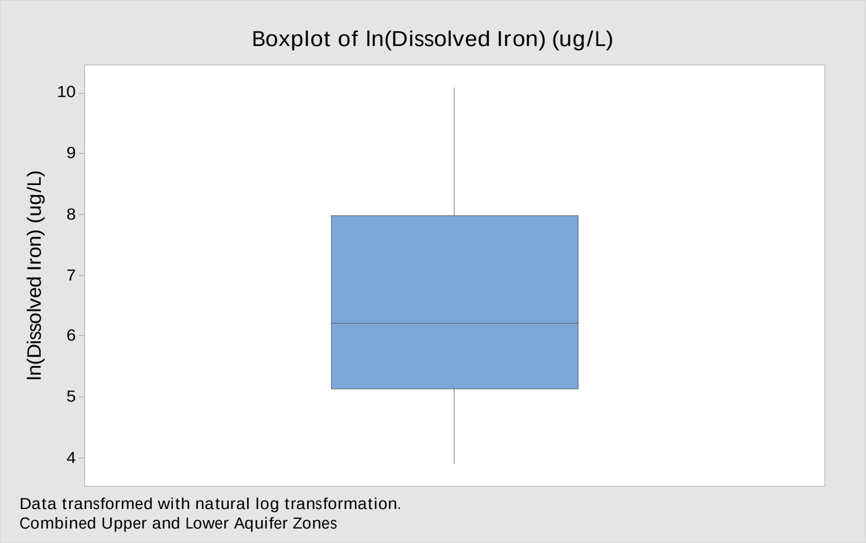
Boxplot and Probability Plot - Lower Groundwater Aquifer Zone - Dissolved Zinc

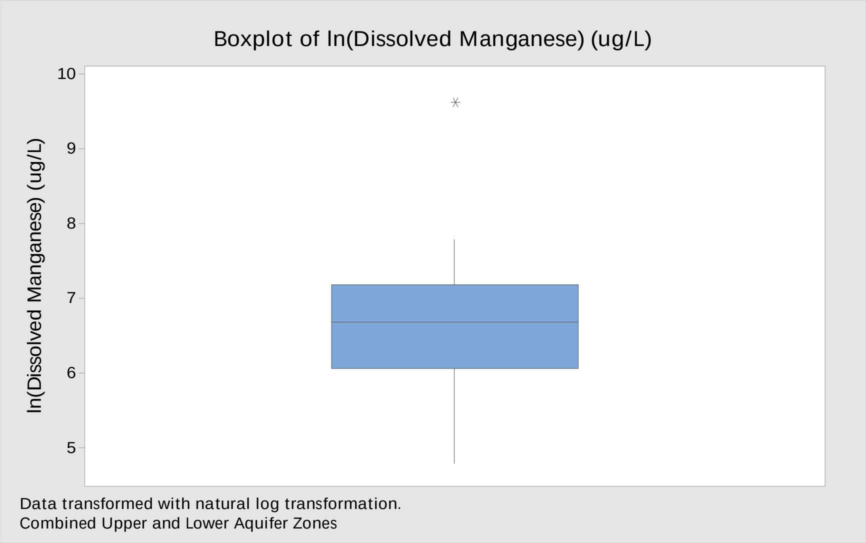


Boxplot - Combined Upper and Lower Groundwater Aquifer Zones

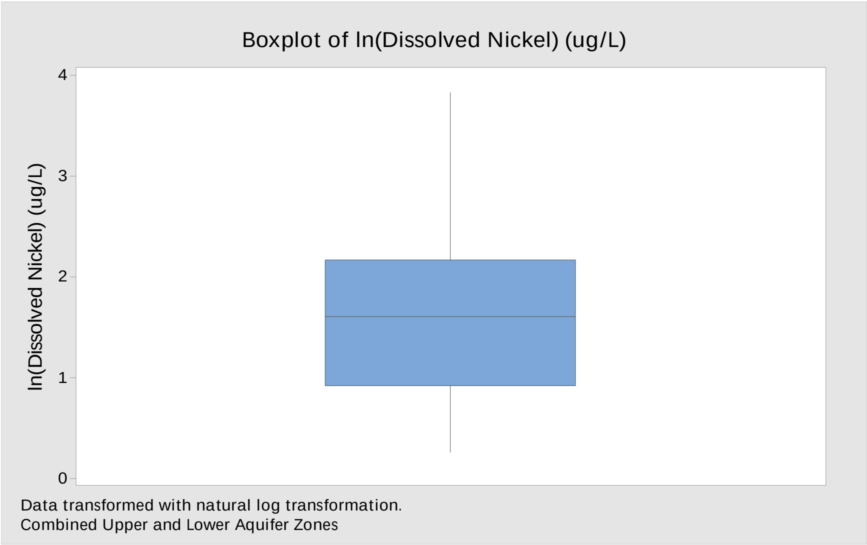


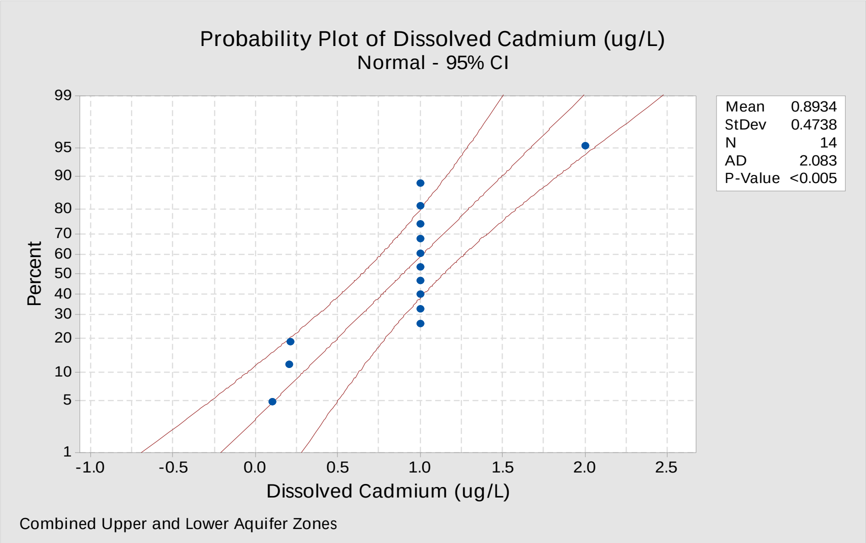



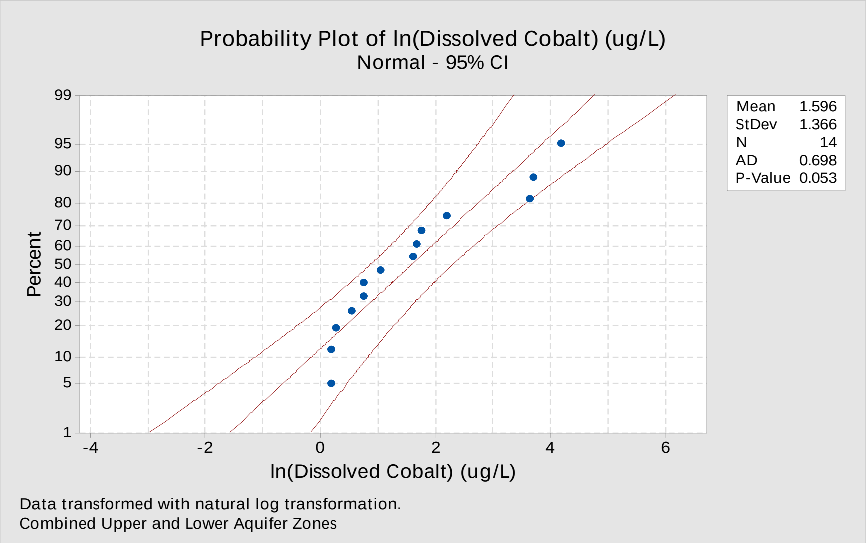



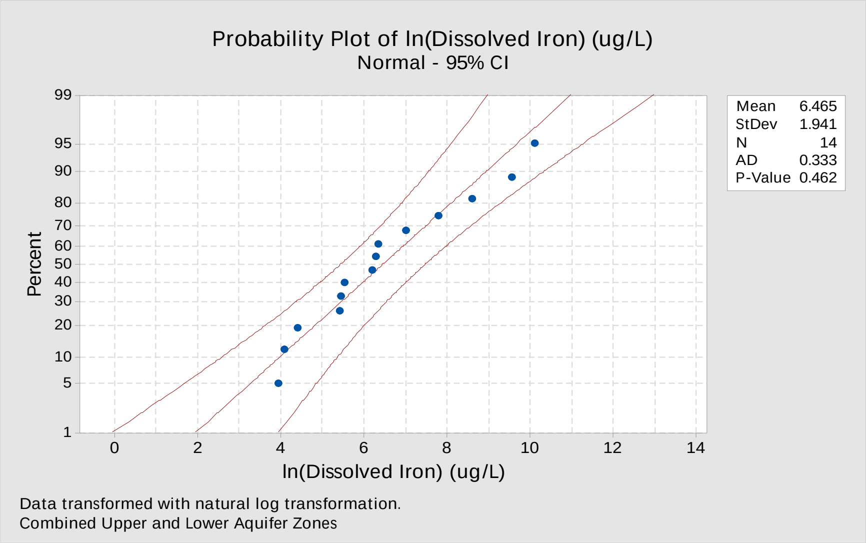
Boxplot - Combined Upper and Lower Groundwater Aquifer Zones

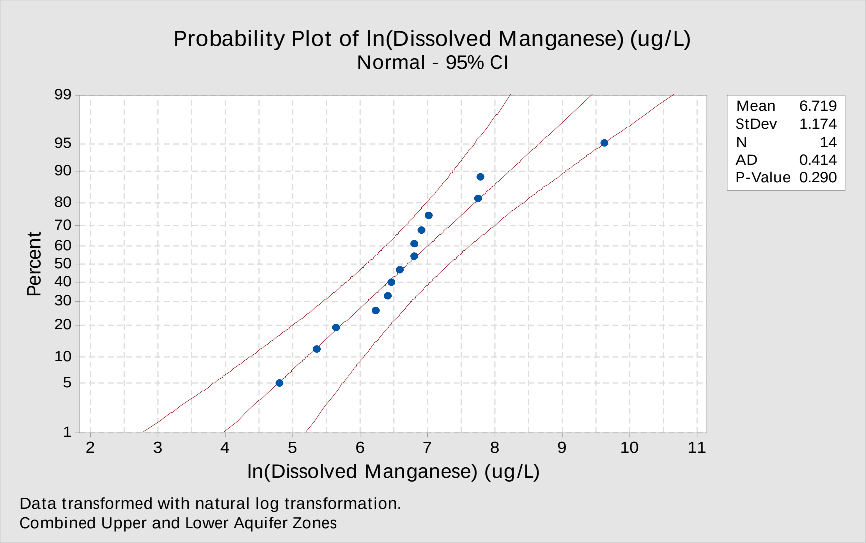


Probability Plots - Combined Upper and Lower Groundwater Aquifer Zones

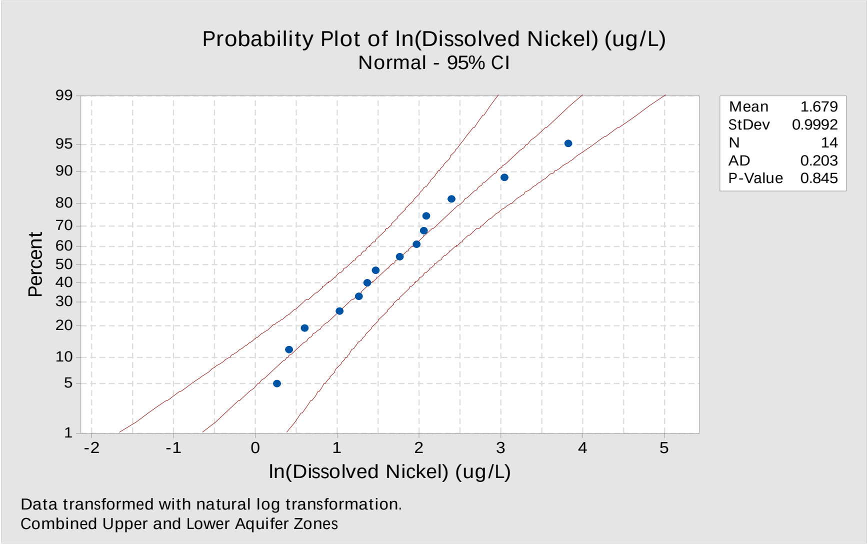


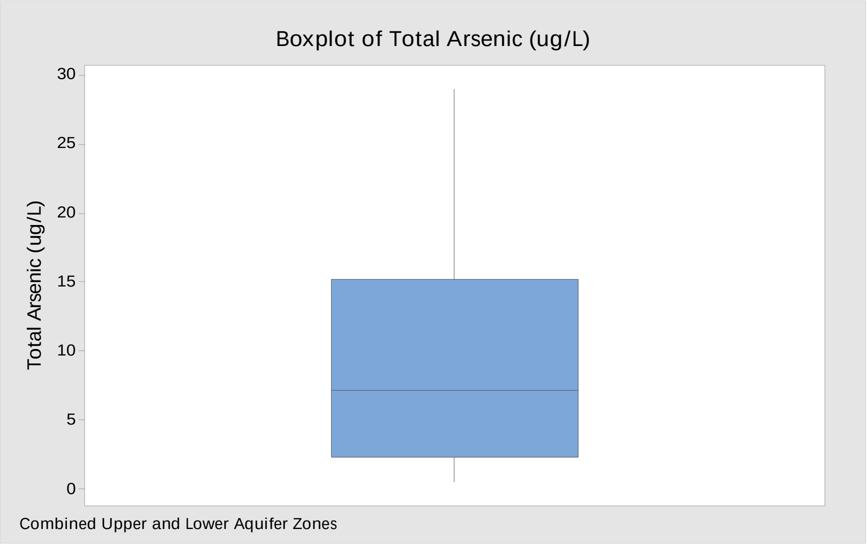



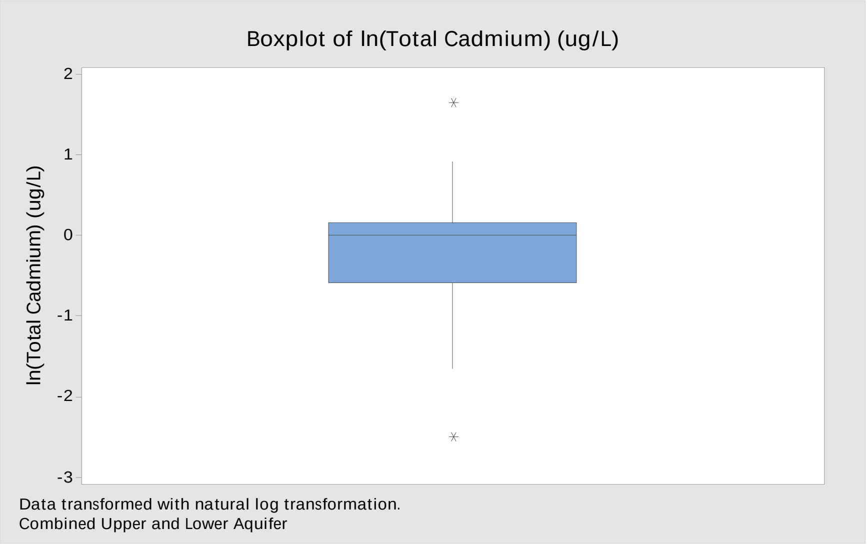



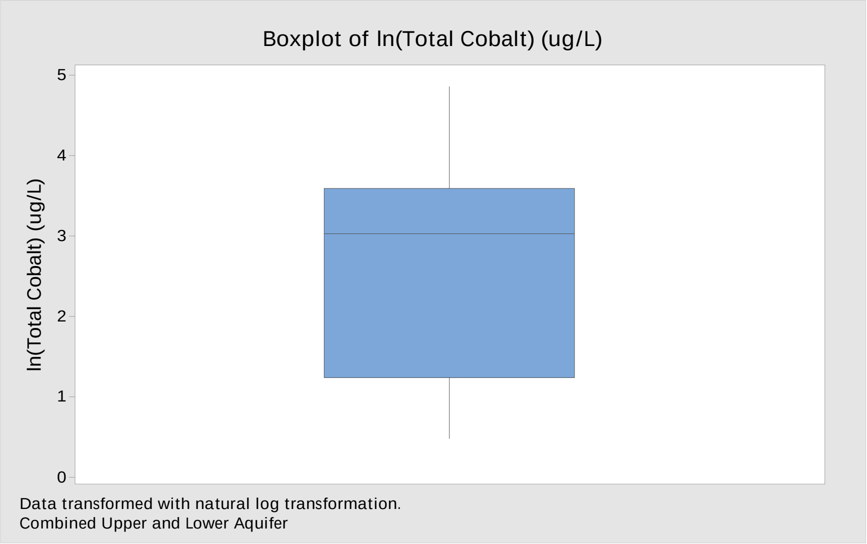
# Probability Plots - Combined Upper and Lower Groundwater Aquifer Zones

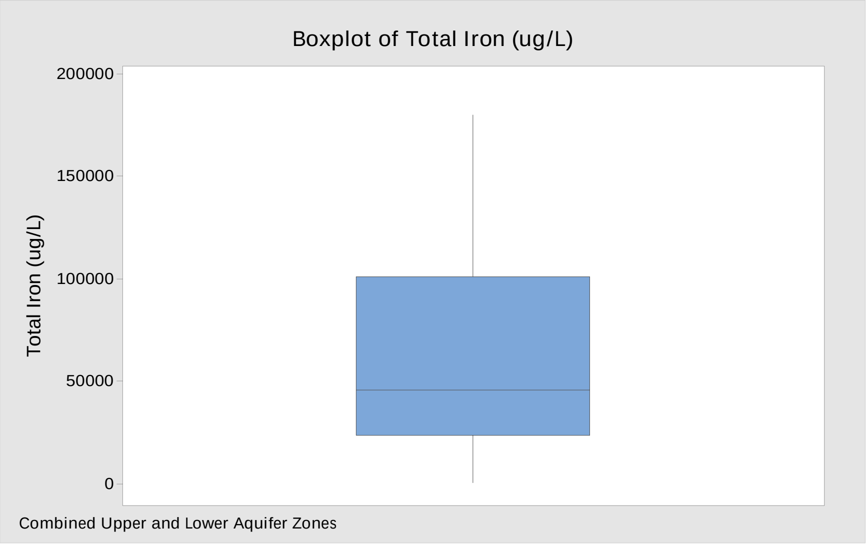


Boxplots - Combined Upper and Lower Groundwater Aquifer Zones

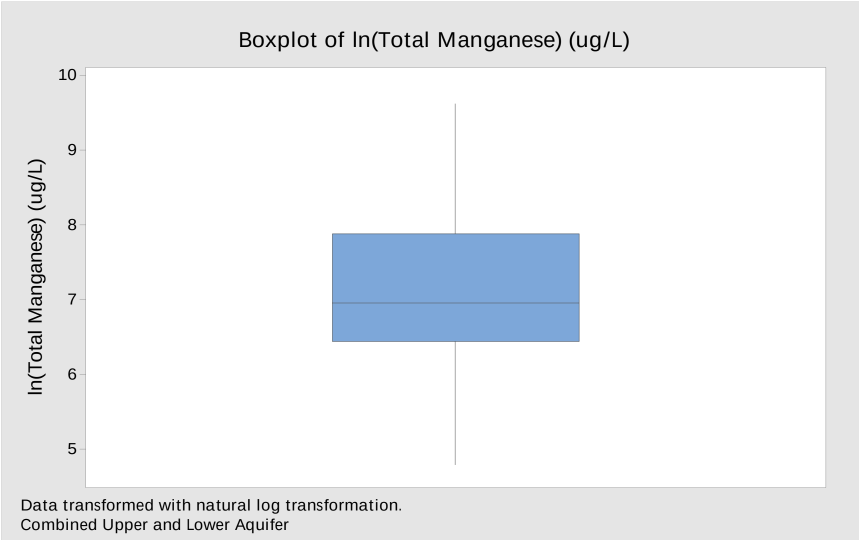


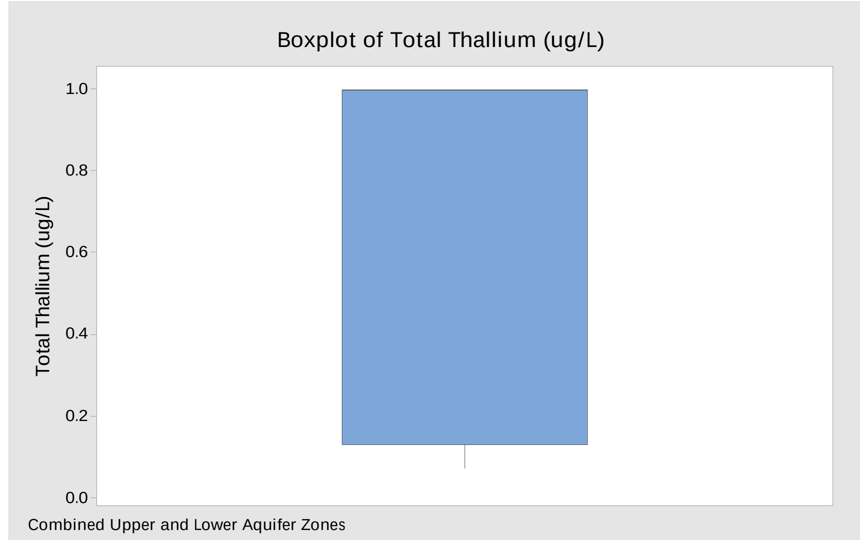



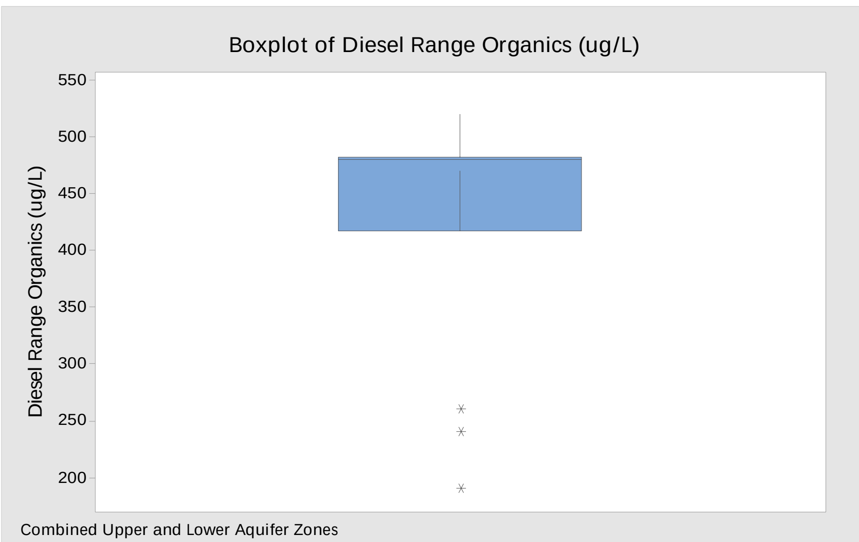



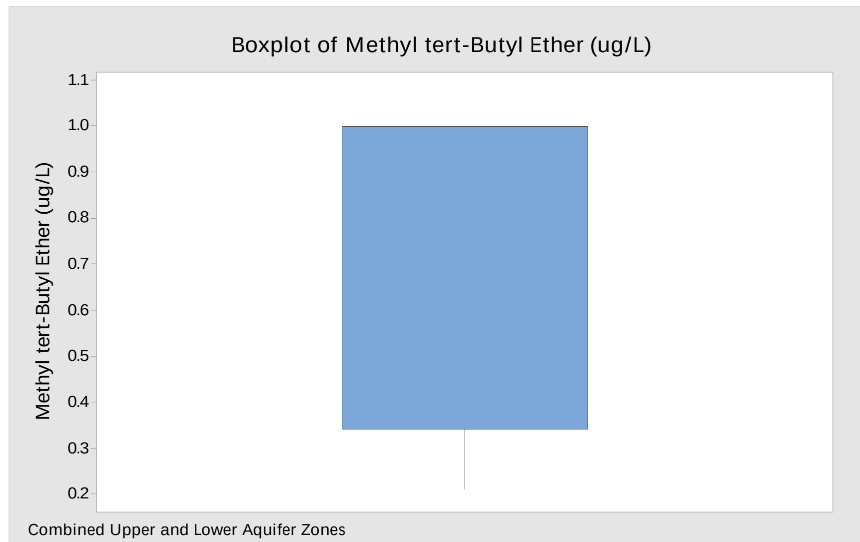



Boxplots - Combined Upper and Lower Groundwater Aquifer Zones

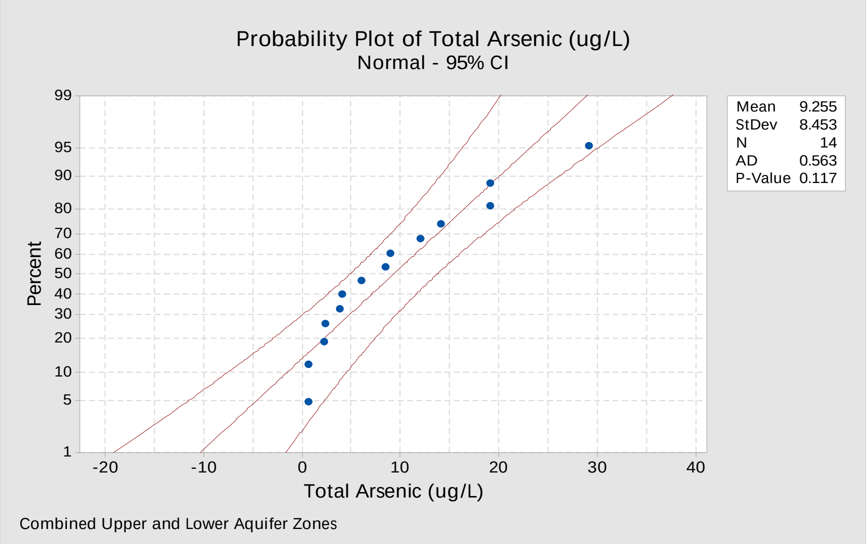


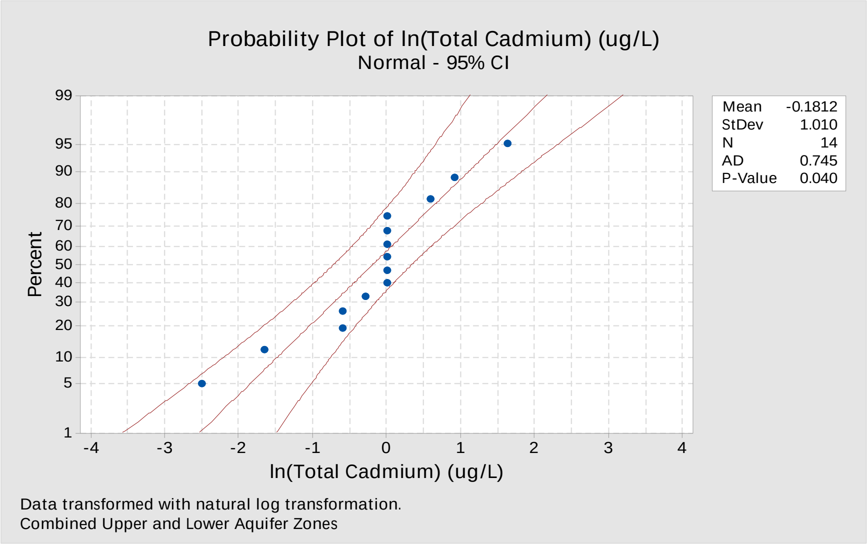



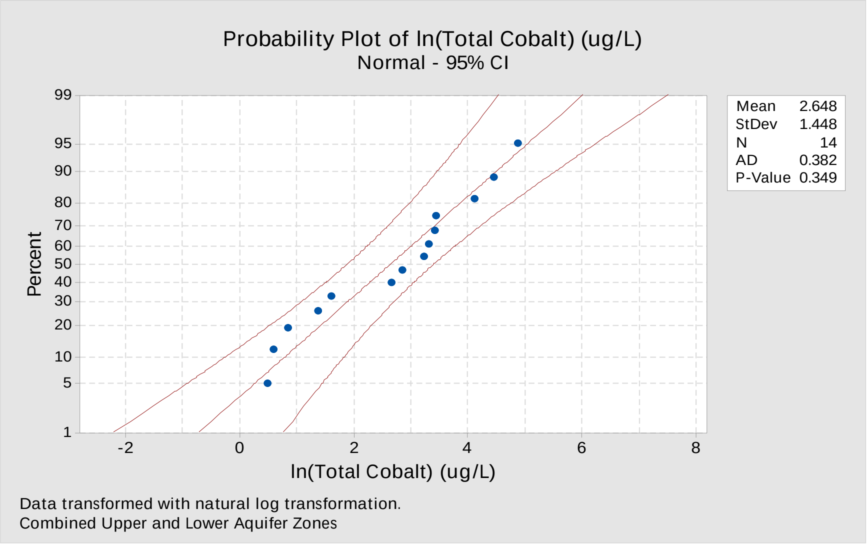



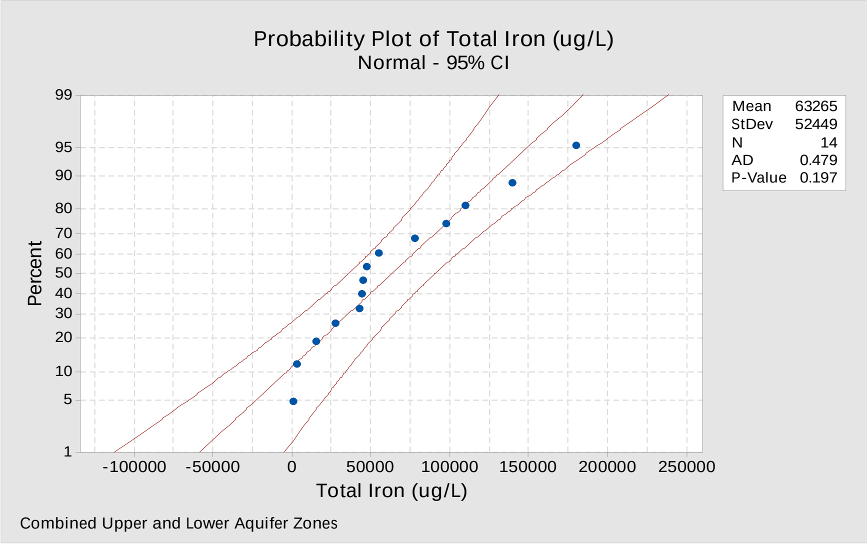



Probability Plots - Combined Upper and Lower Groundwater Aquifer Zones

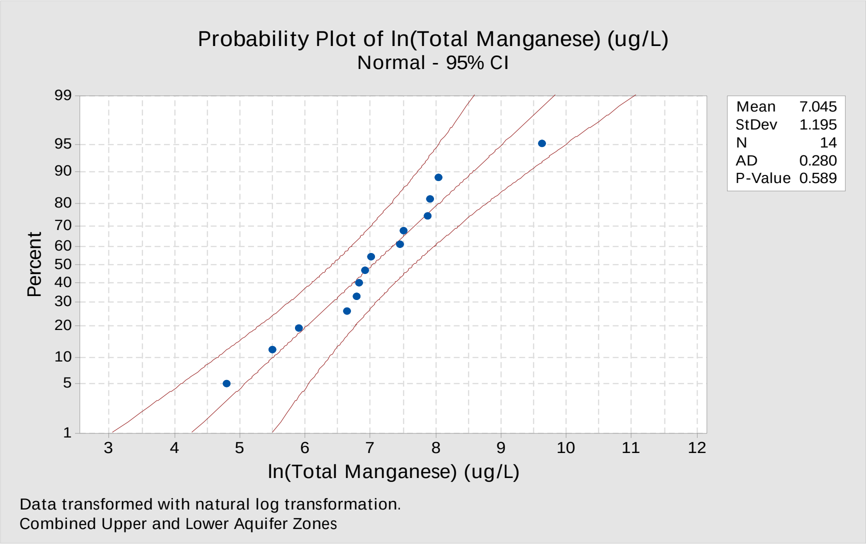


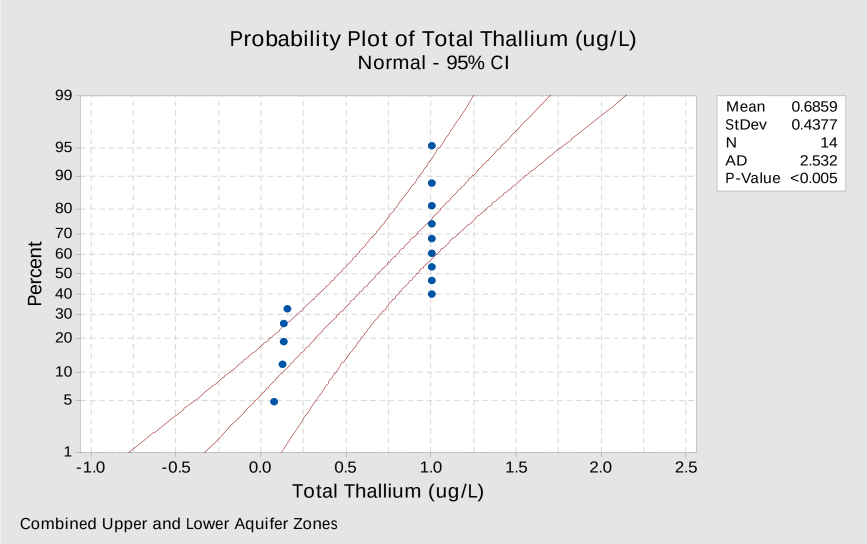



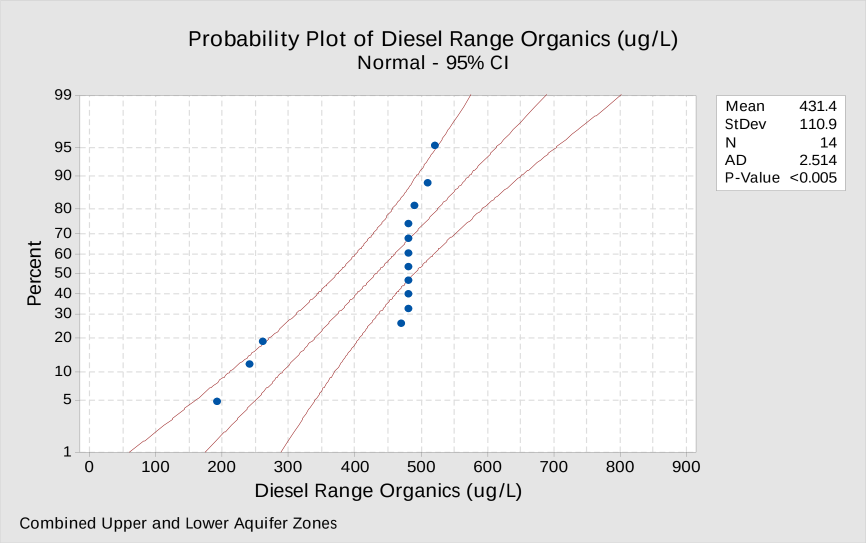



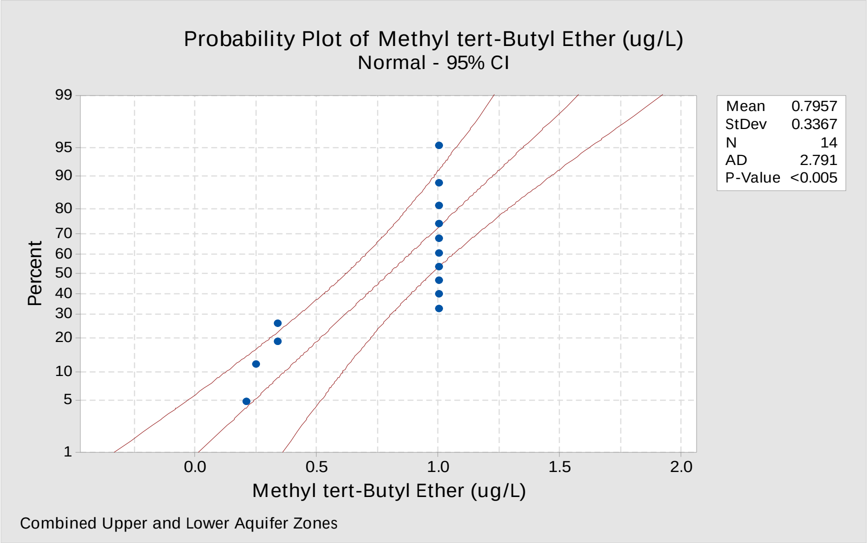



Probability Plots - Combined Upper and Lower Groundwater Aquifer Zones



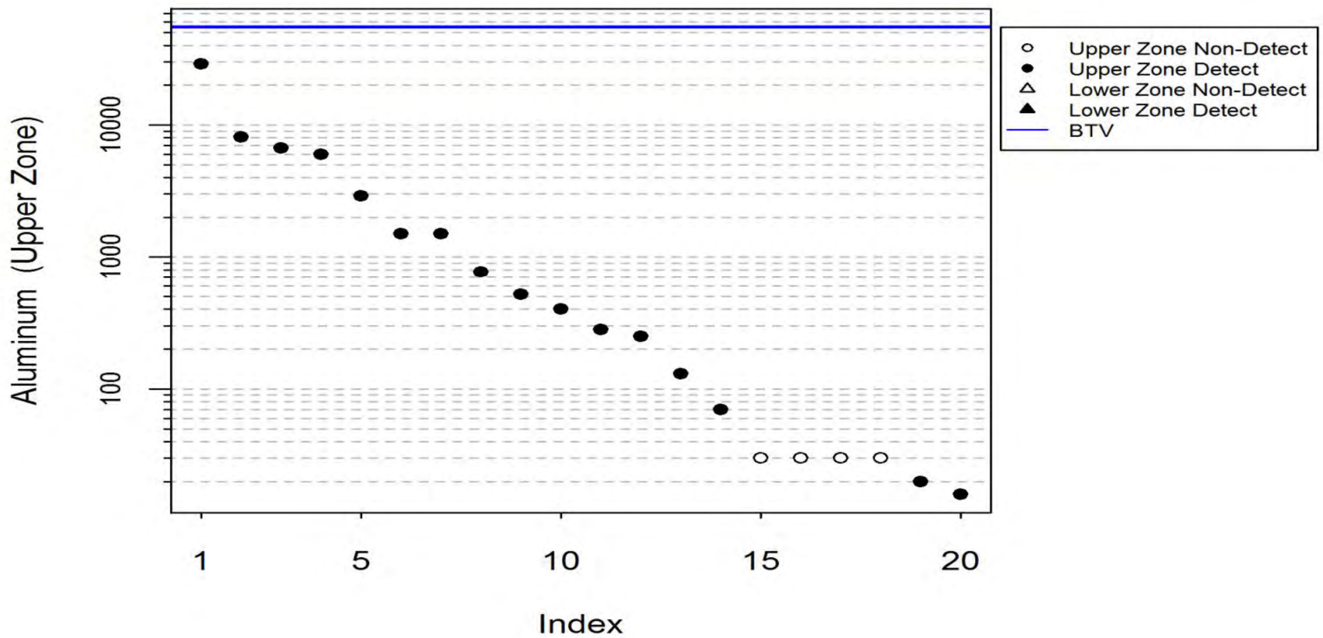



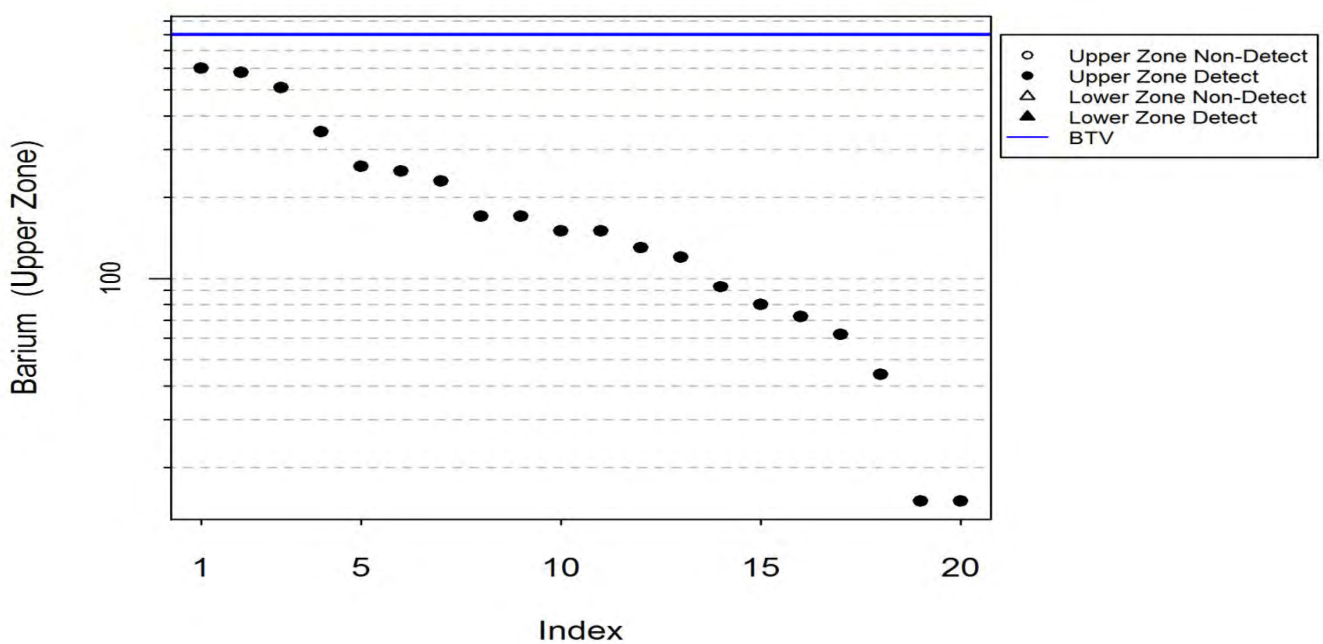



# Index Plots of BTVs and Background Groundwater Datasets

Index Plots of Constituents in Background Groundwater – Upper Aquifer

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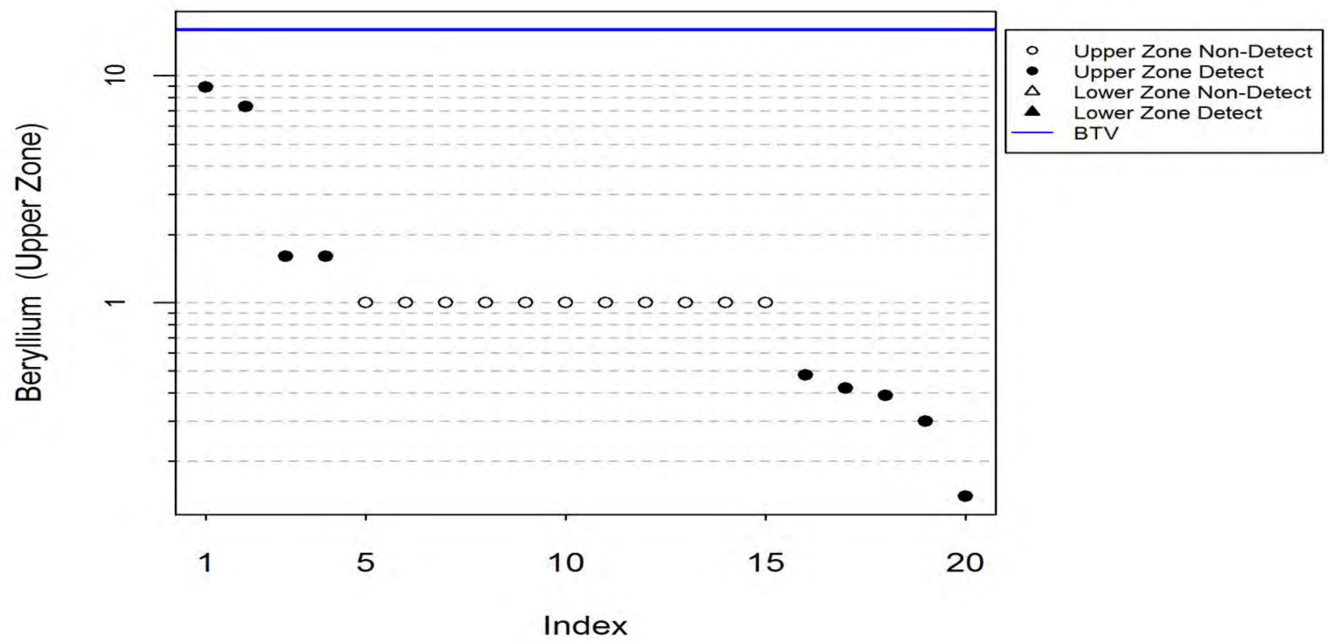
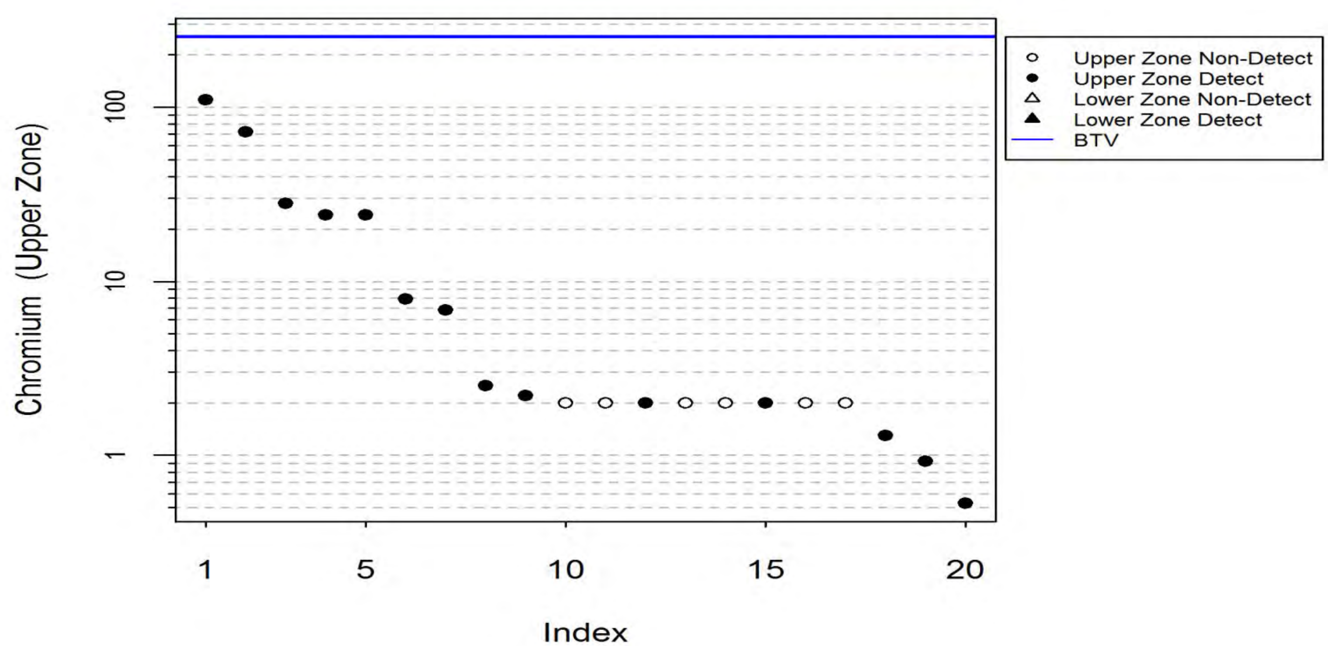
Index Plots of Constituents in Background Groundwater – Upper Aquifer

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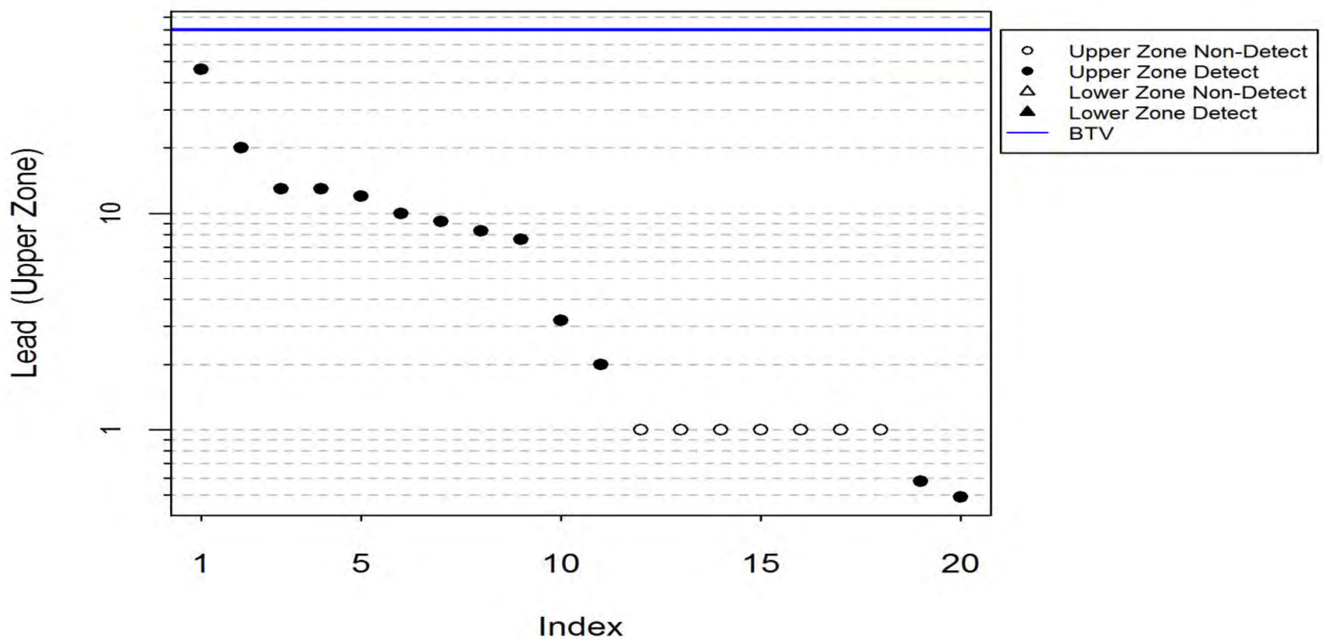
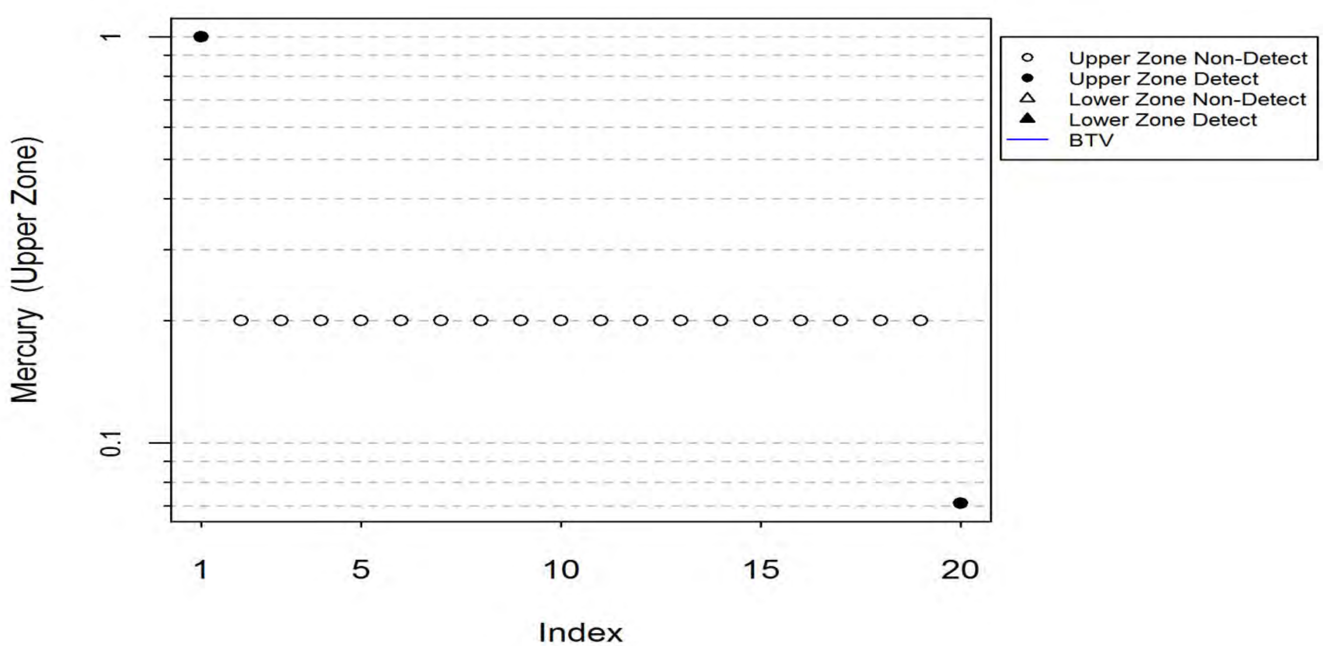
Index Plots of Constituents in Background Groundwater – Upper Aquifer

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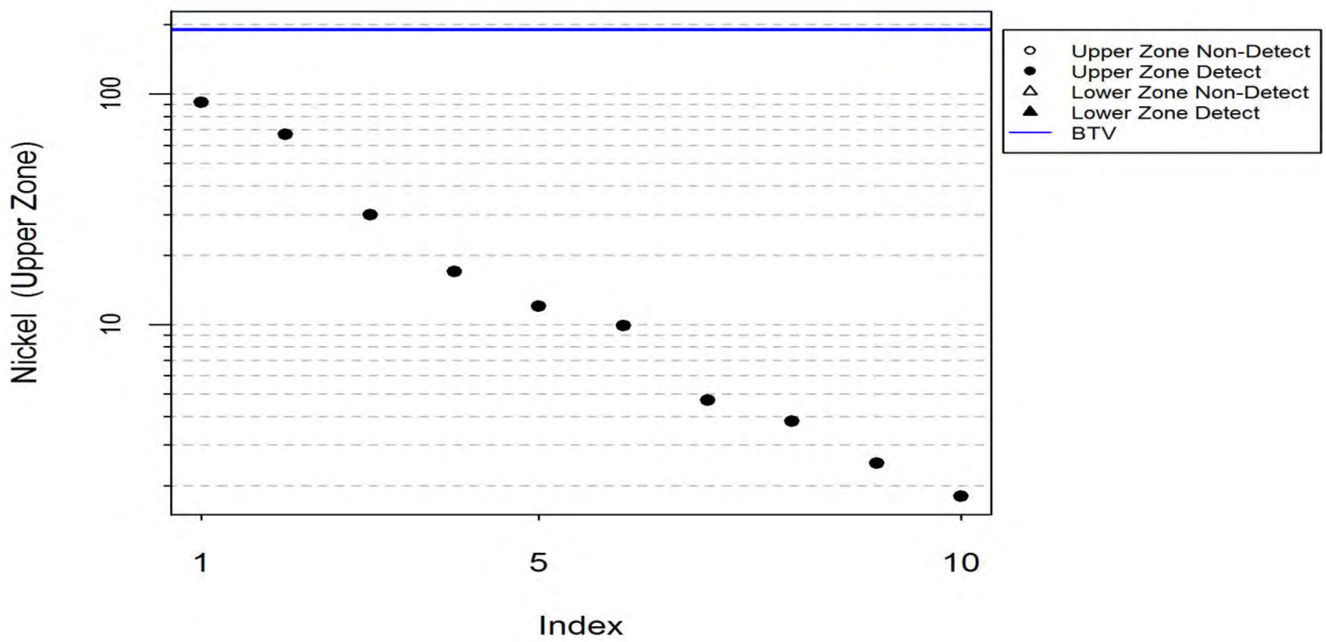
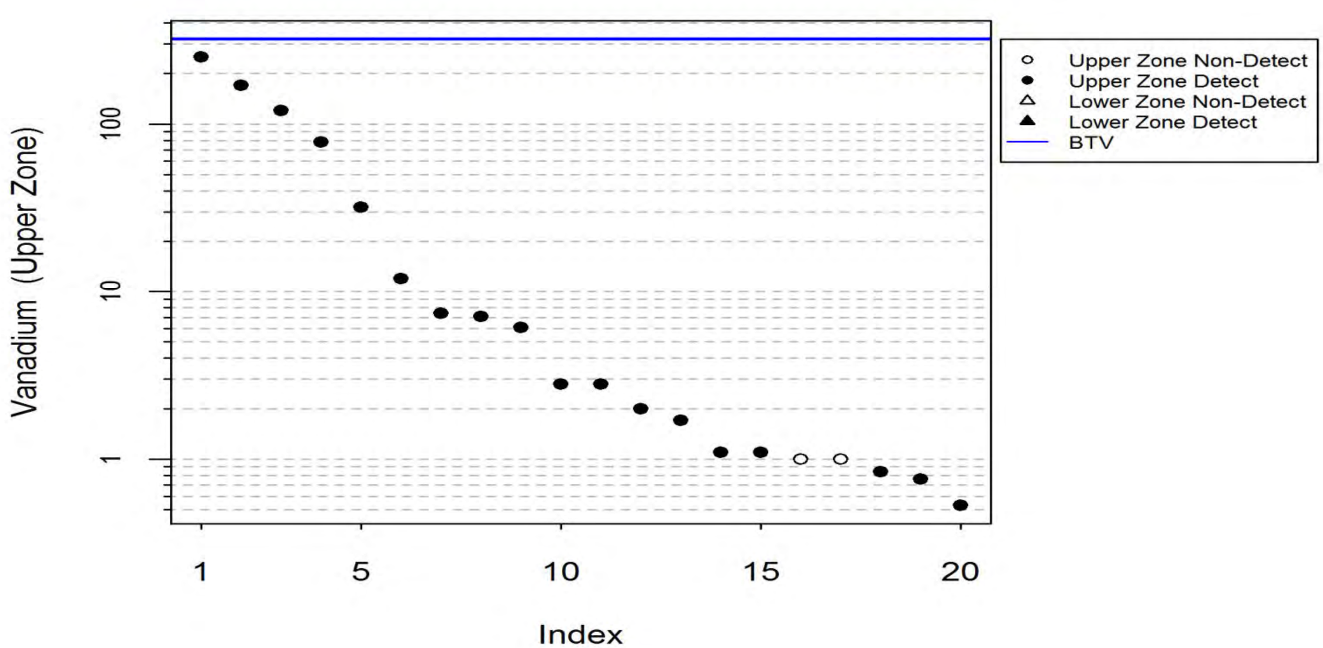
Index Plots of Constituents in Background Groundwater – Upper Aquifer

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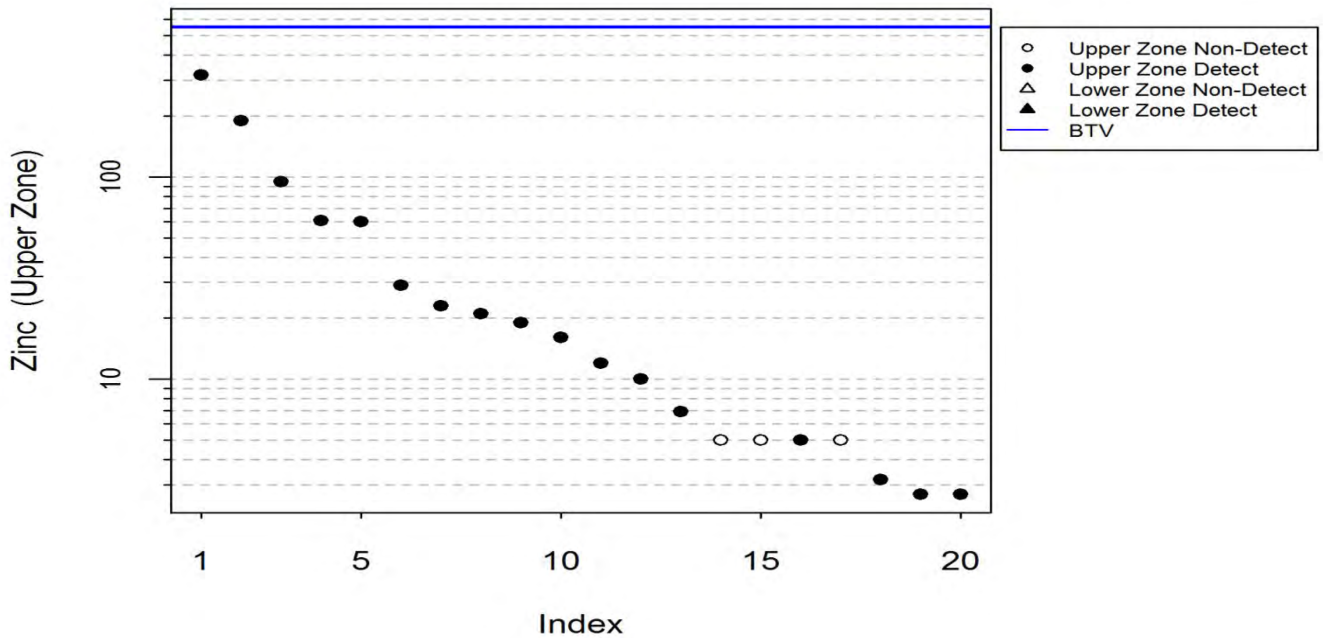


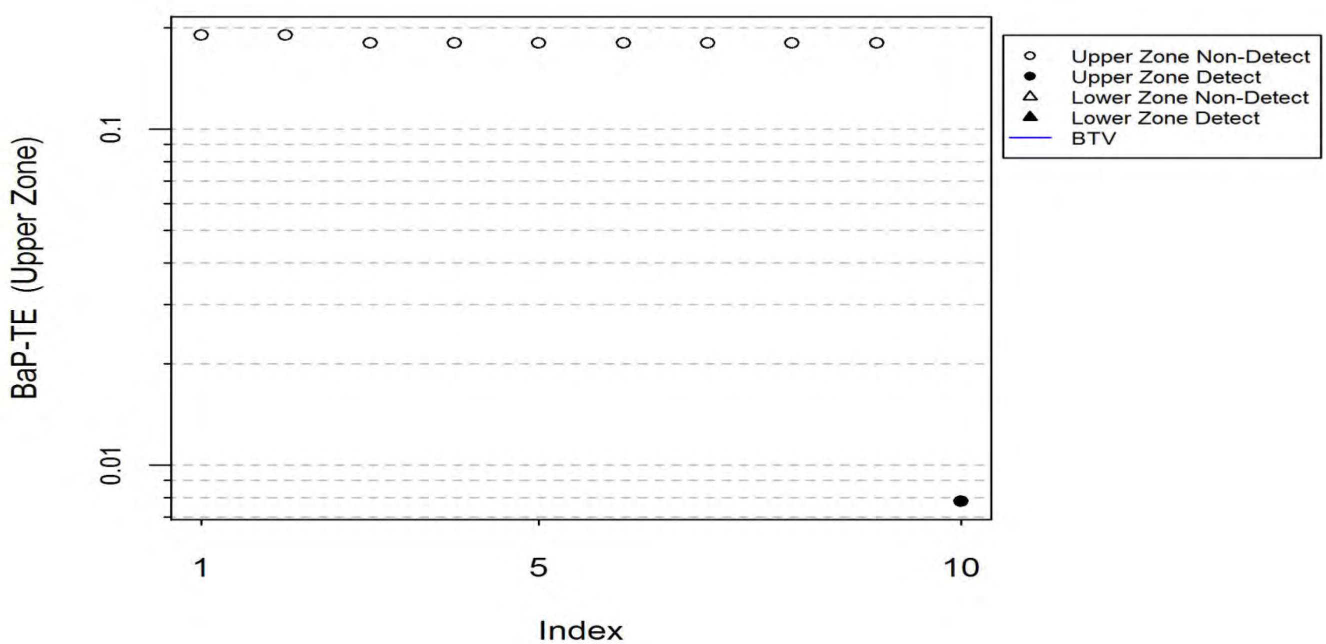


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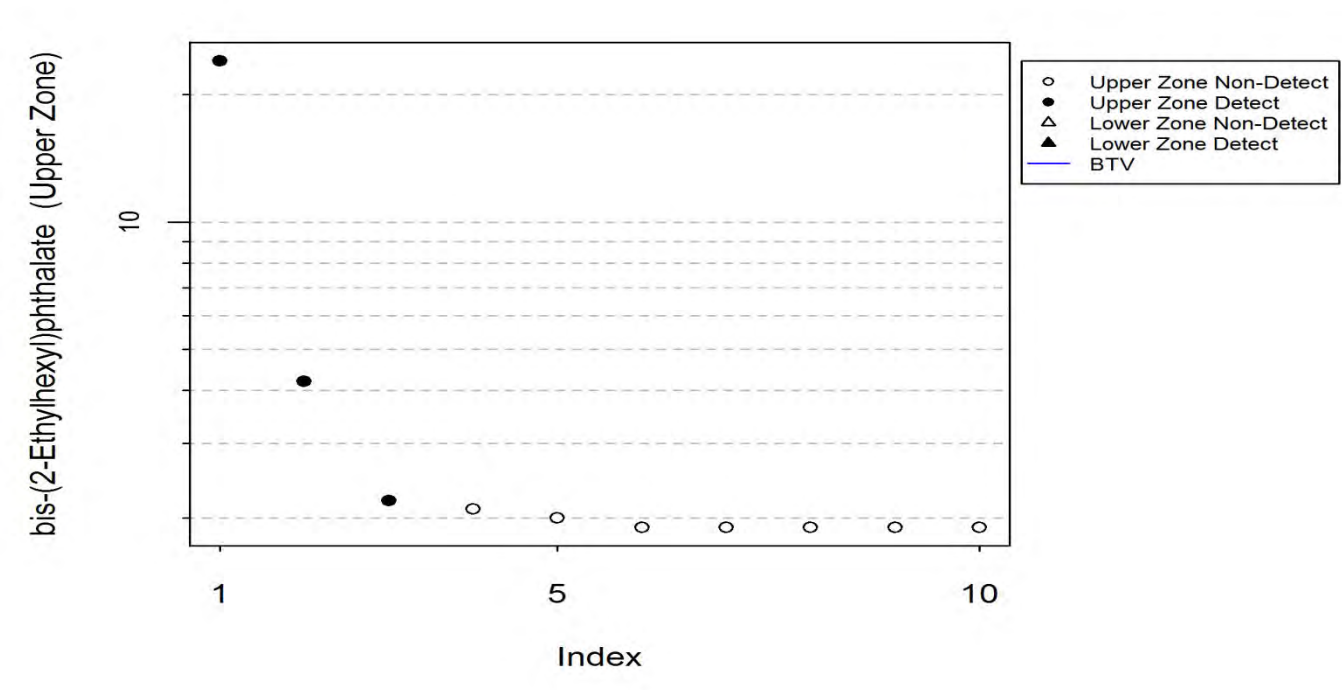


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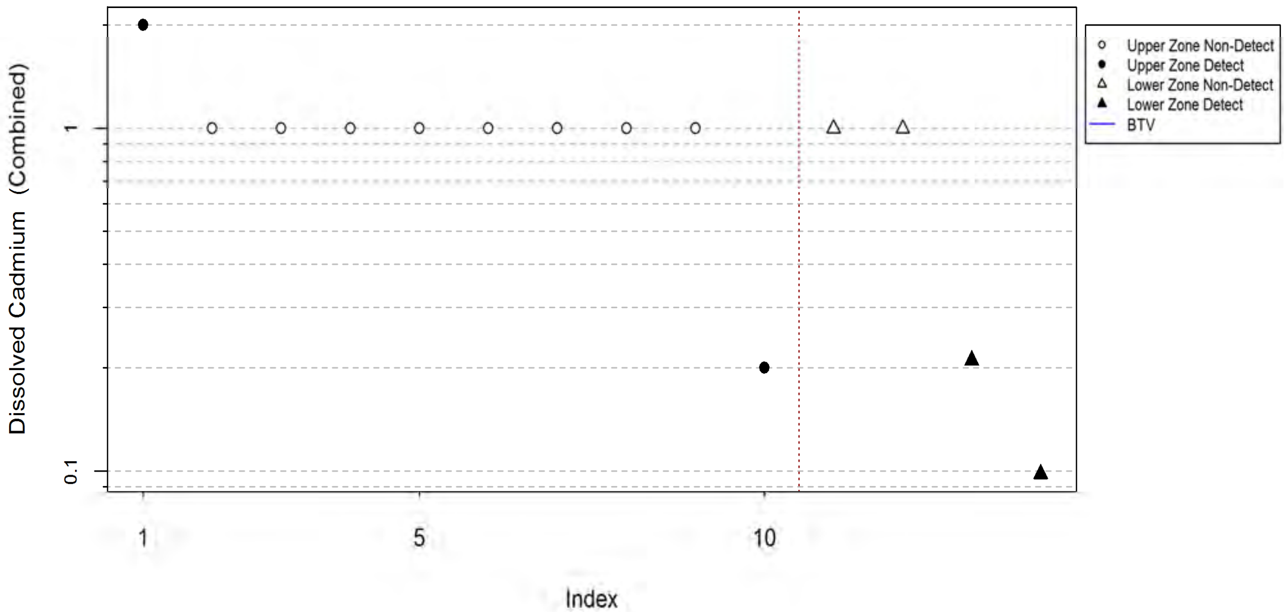


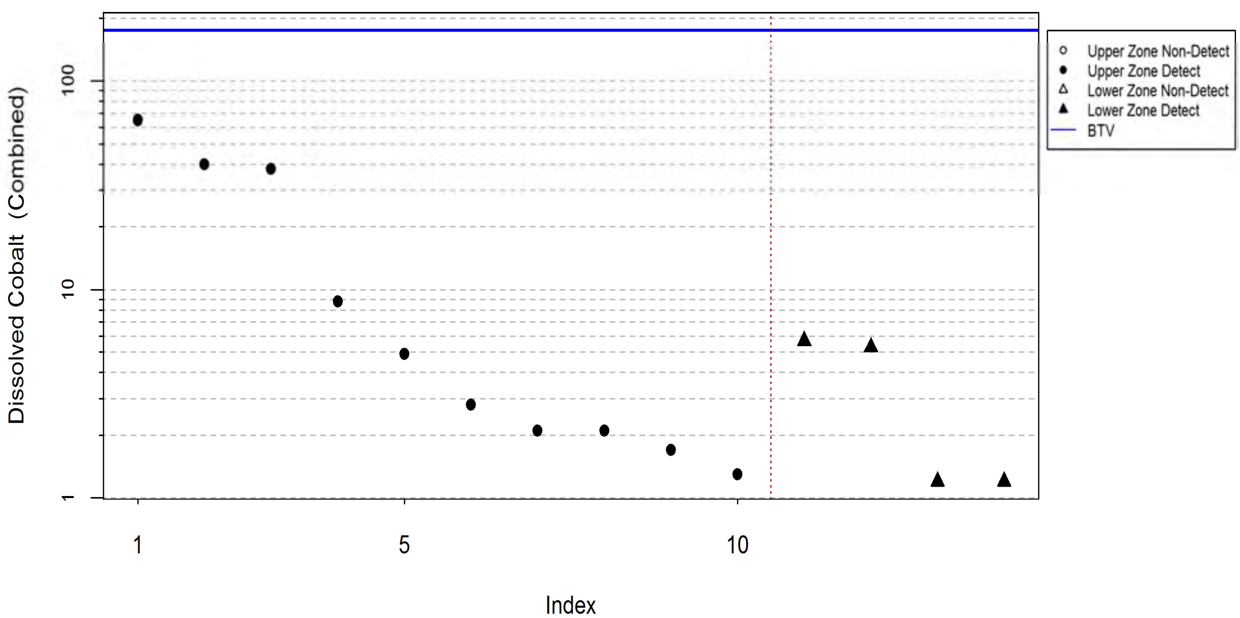


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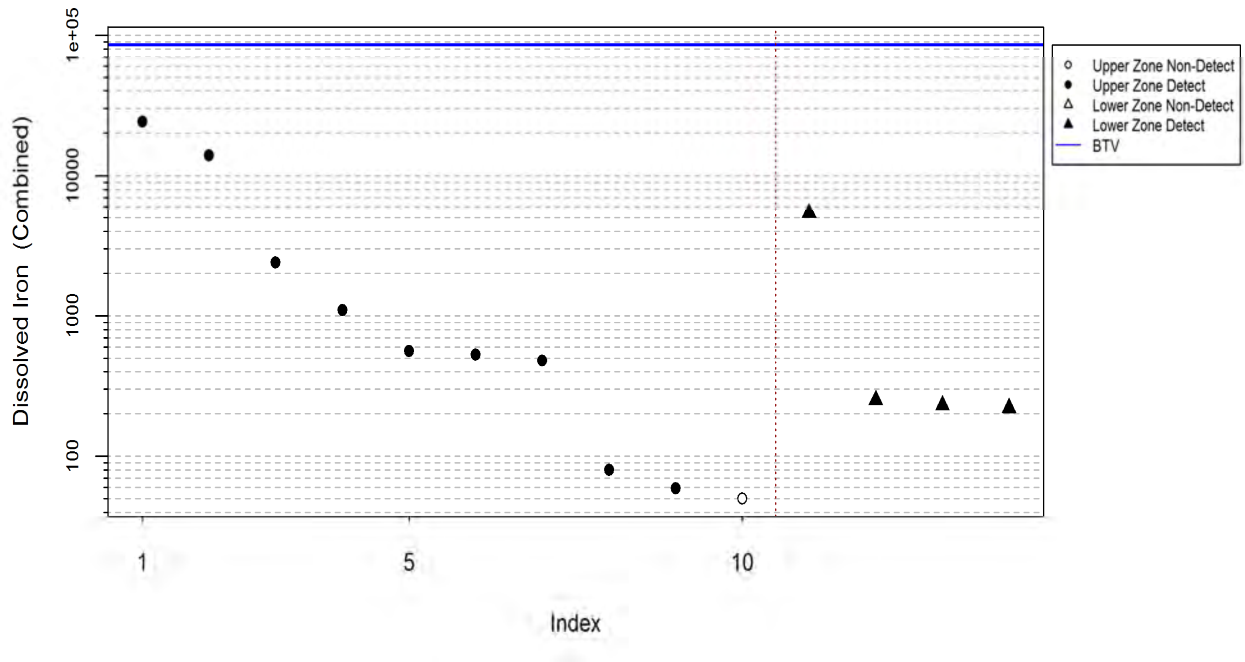
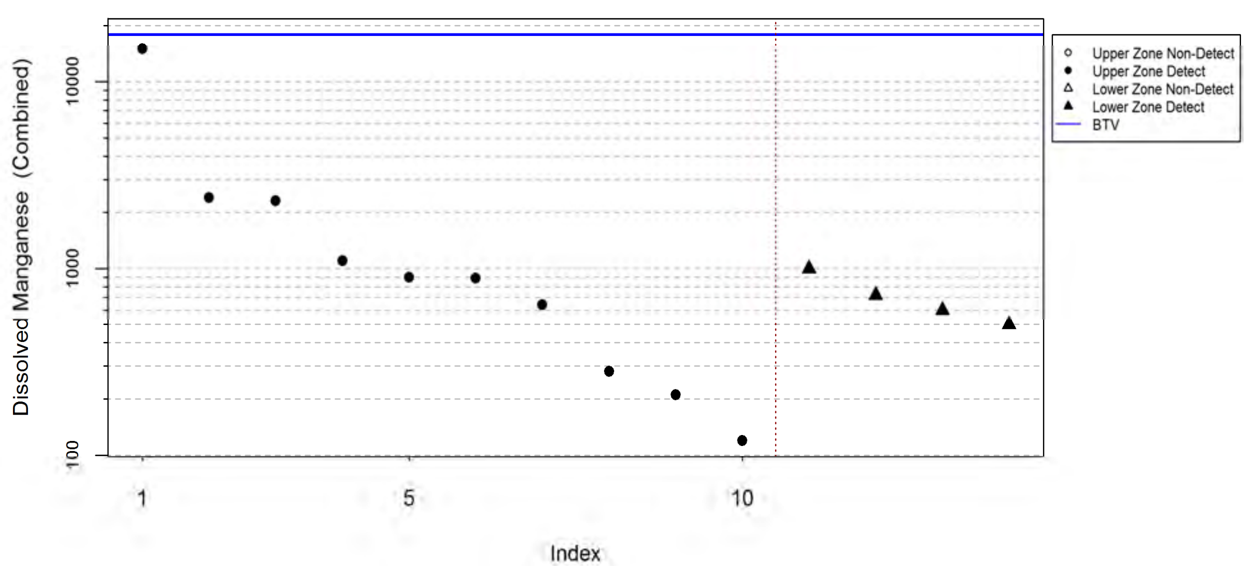
Index Plots of Constituents in Background Groundwater – Combined Upper and Lower Aquifer

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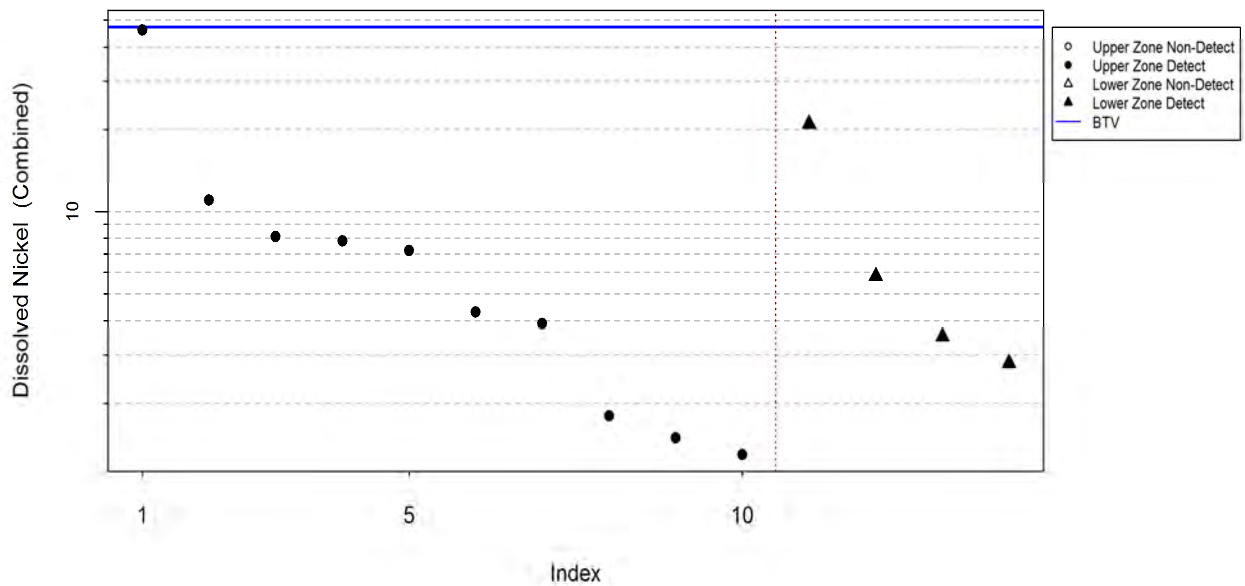
Index Plots of Constituents in Background Groundwater – Combined Upper and Lower Aquifer

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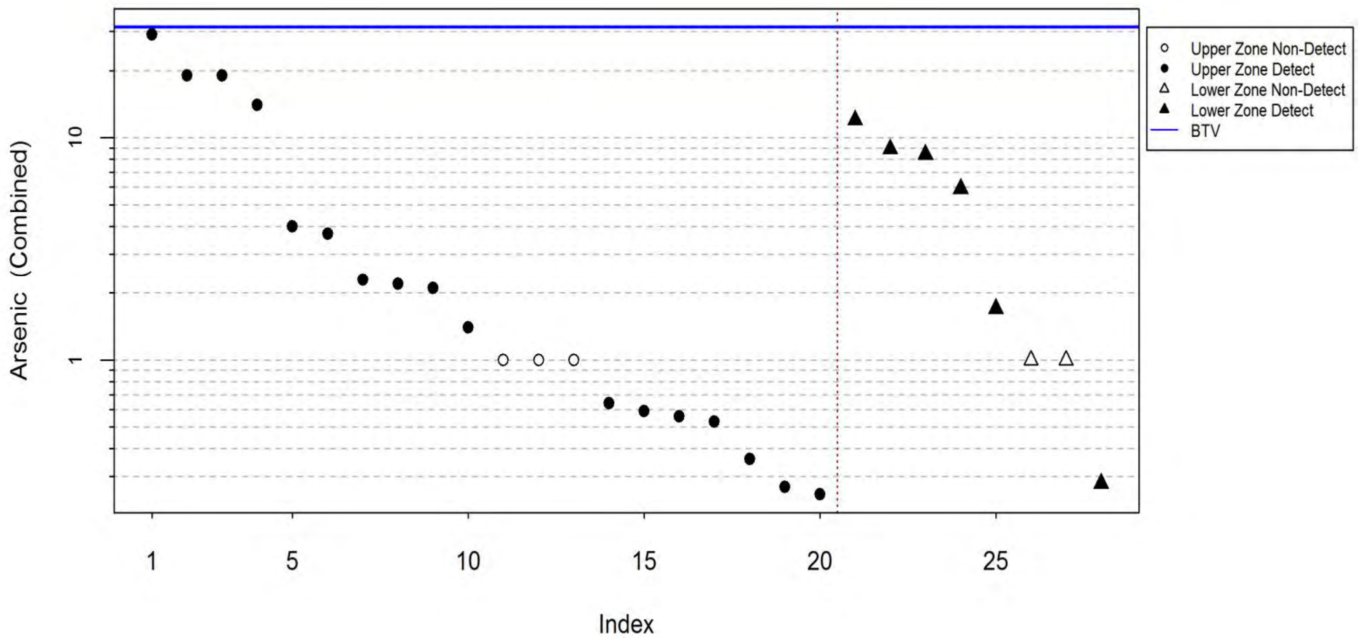
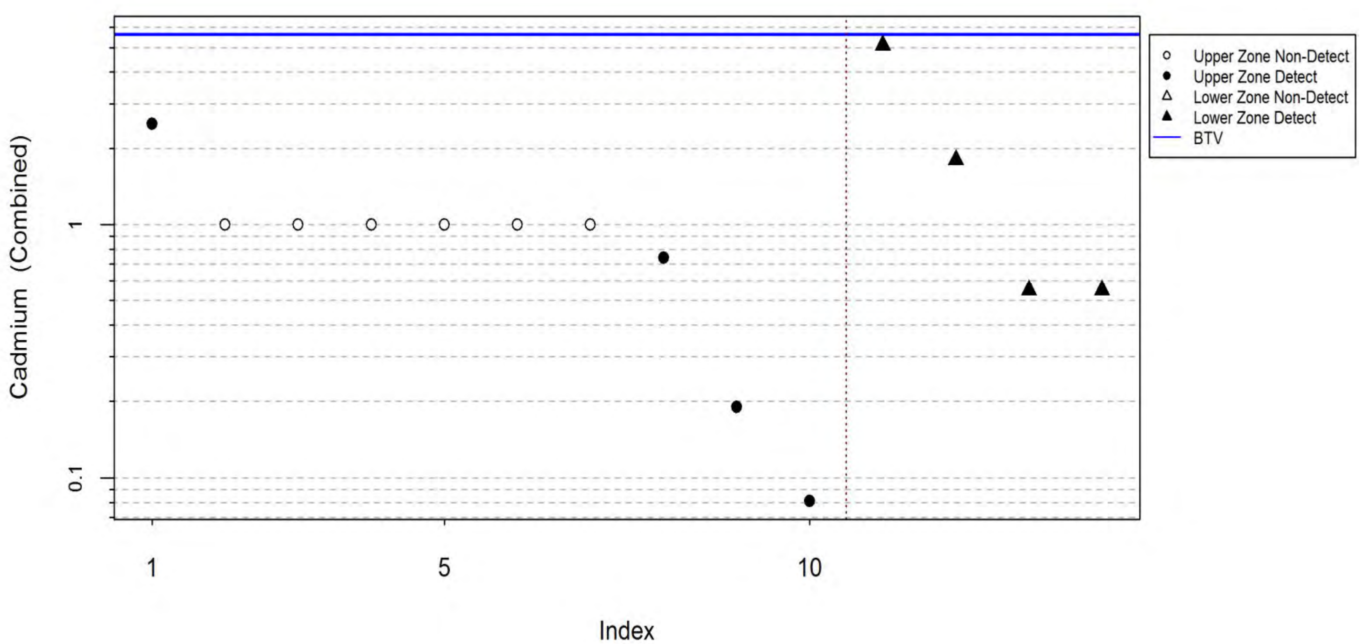
Index Plots of Constituents in Background Groundwater – Combined Upper and Lower Aquifer

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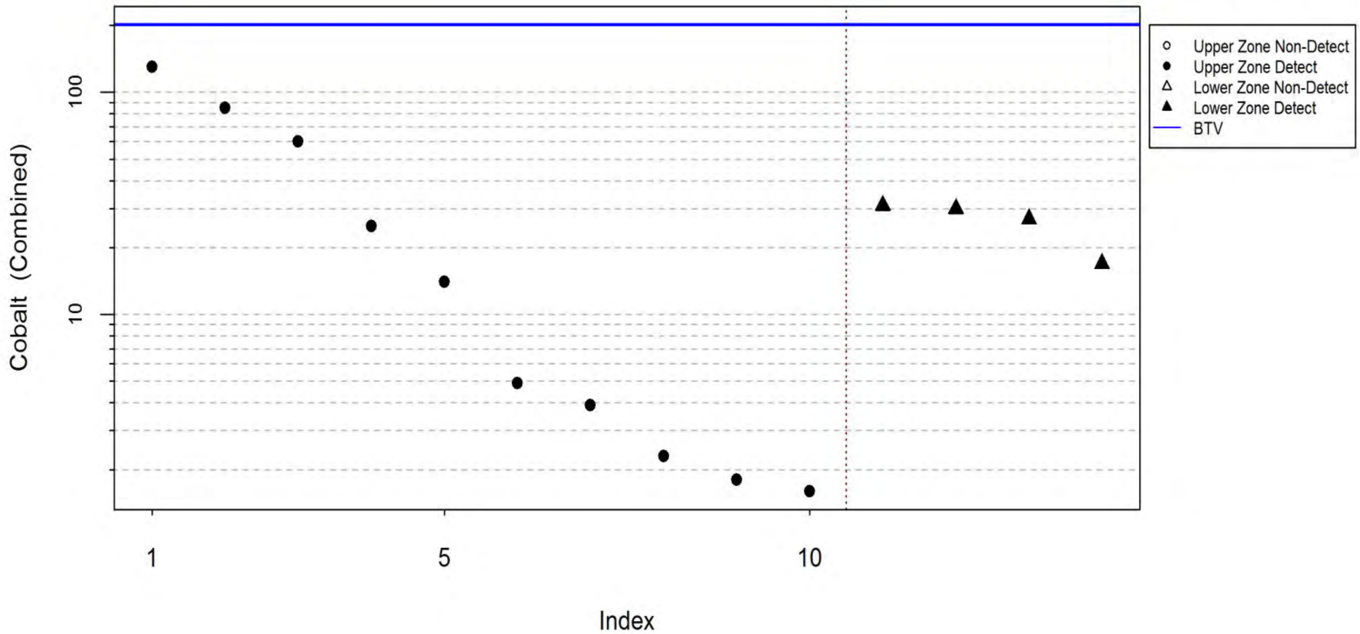
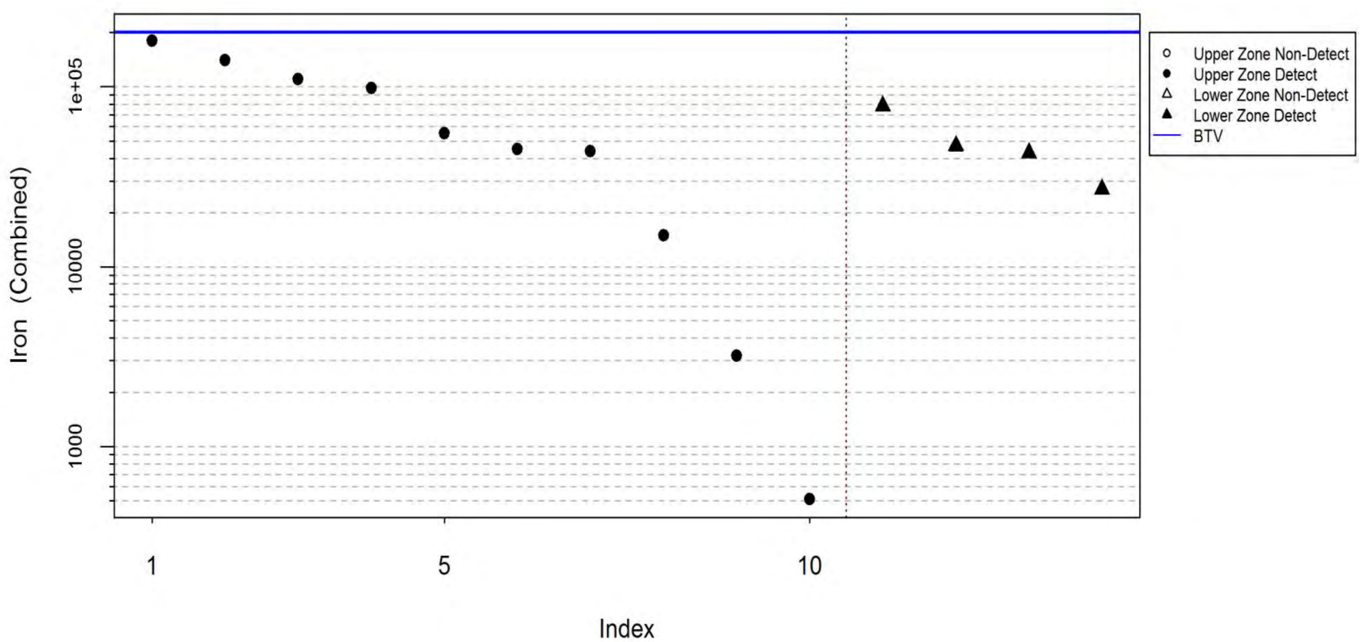
Index Plots of Constituents in Background Groundwater – Combined Upper and Lower Aquifer

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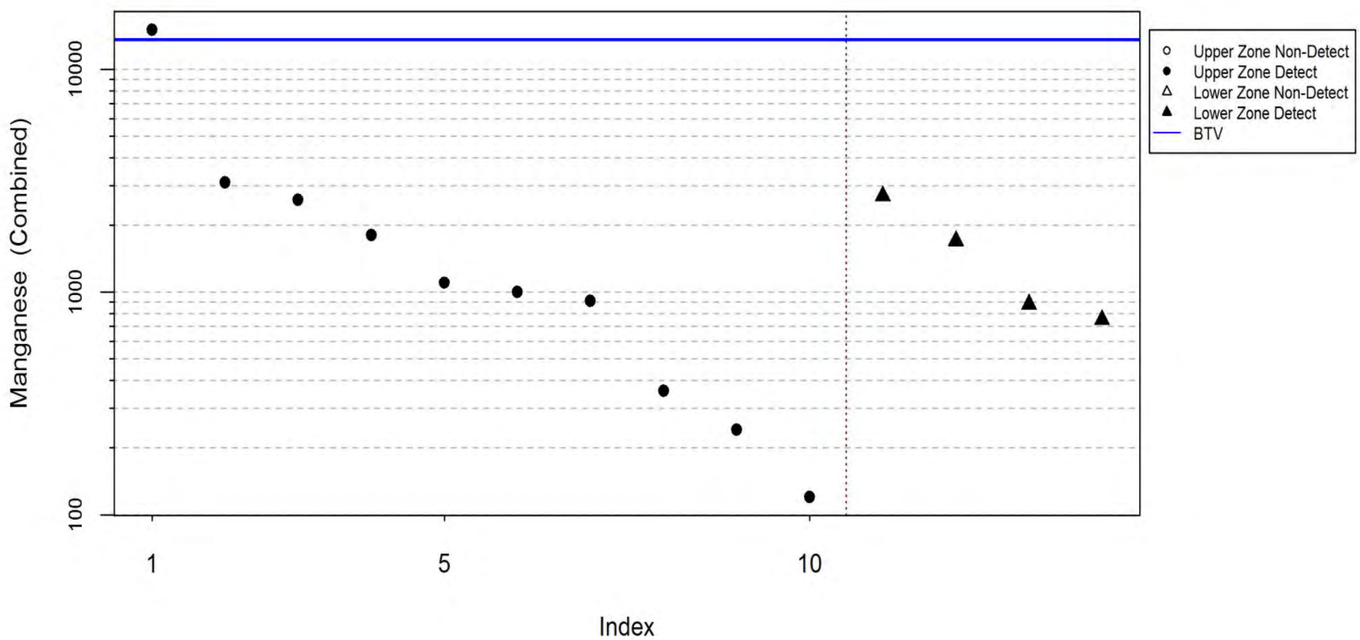
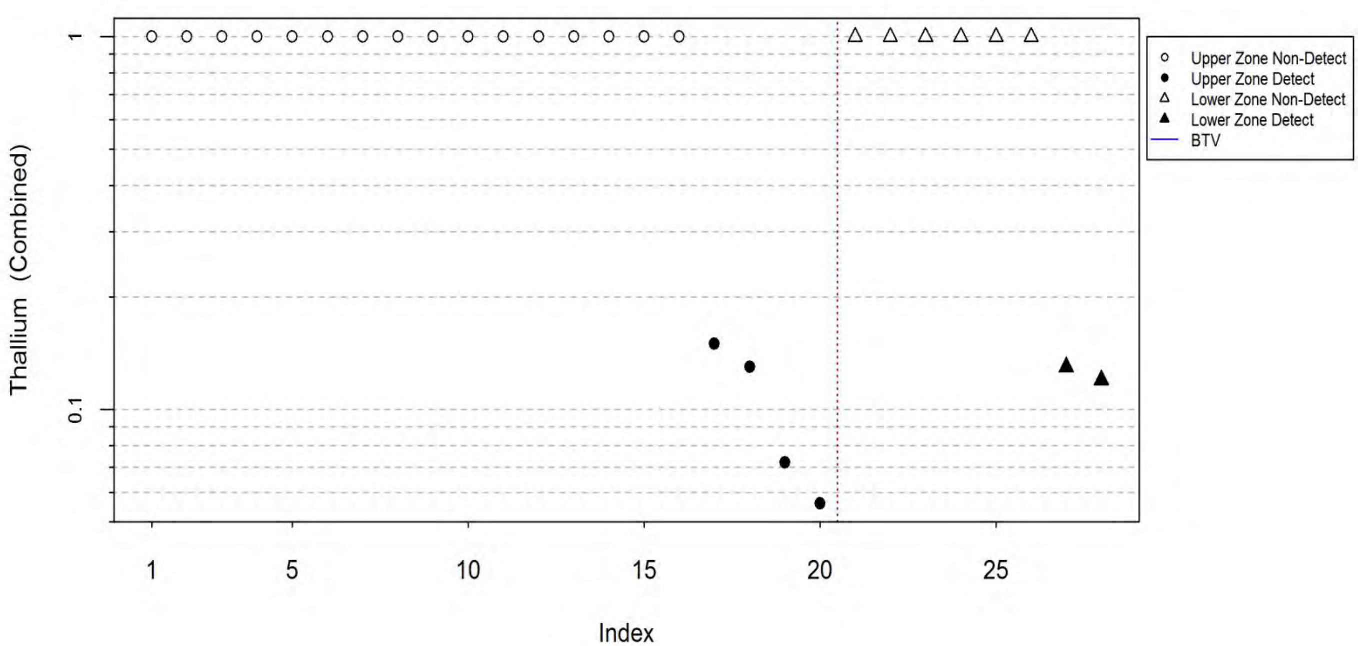
Index Plots of Constituents in Background Groundwater – Combined Upper and Lower Aquifer




Units are ug/L.

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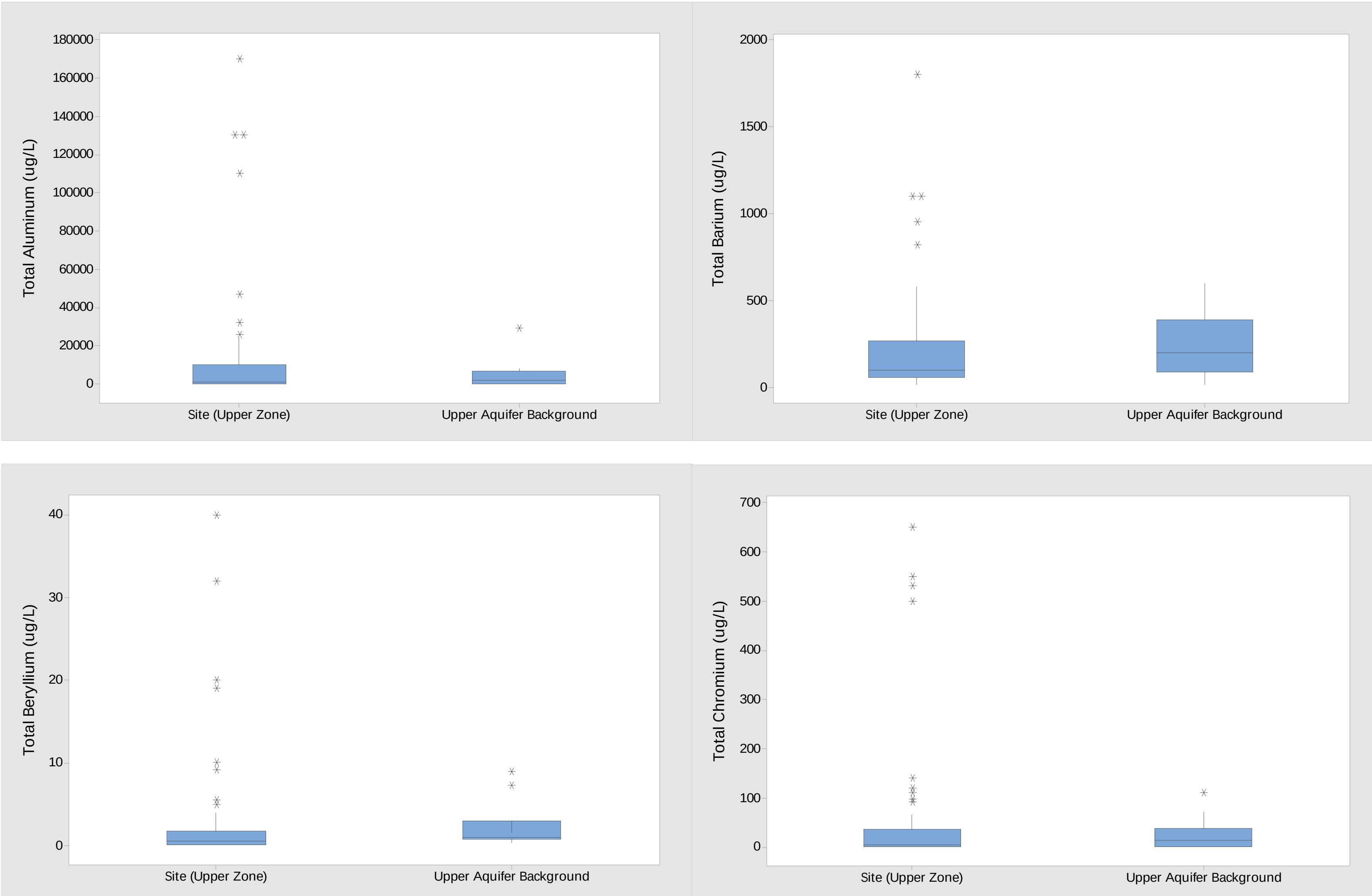
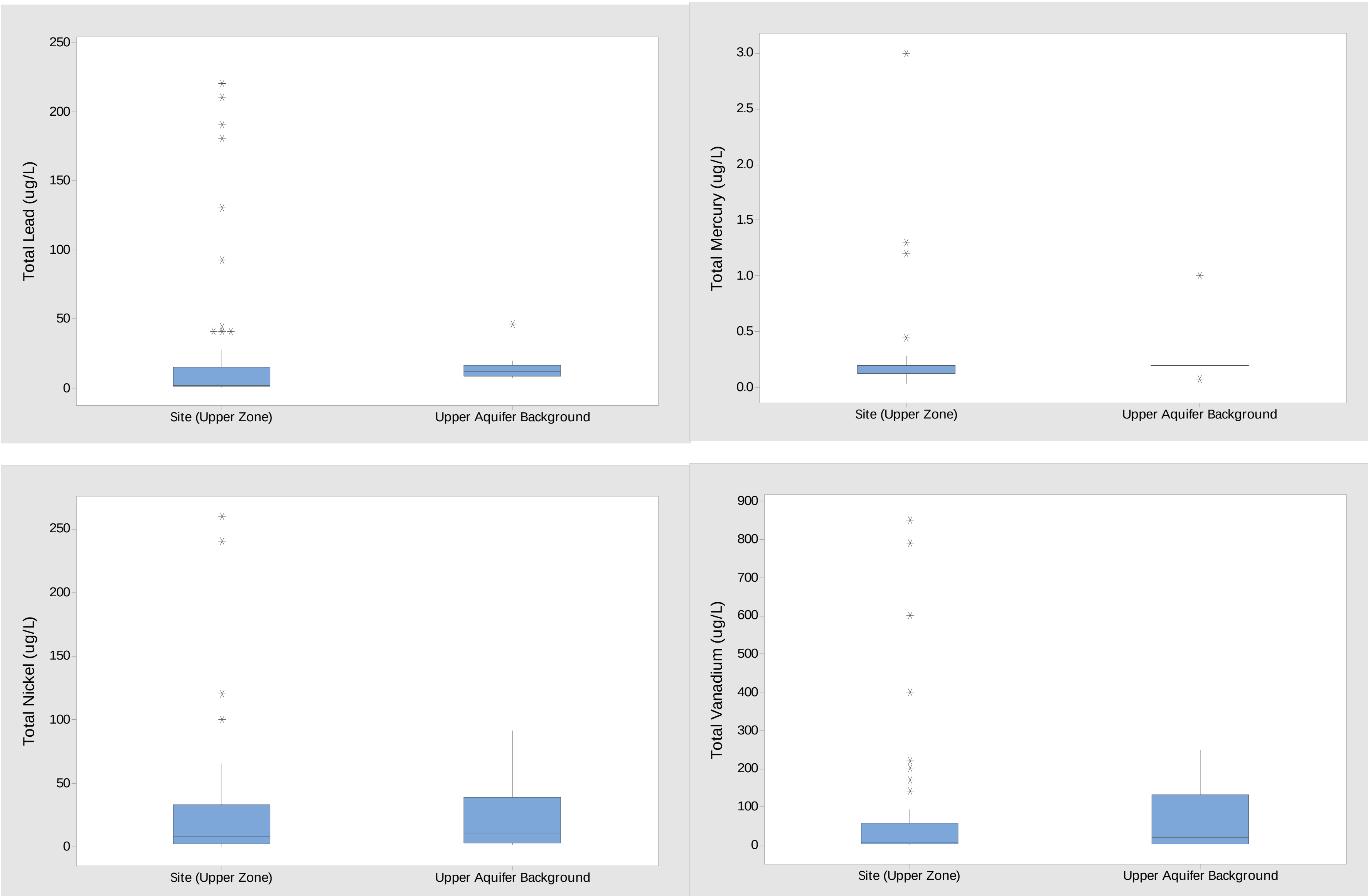
# Boxplot Comparisons of Site and Background Groundwater Datasets

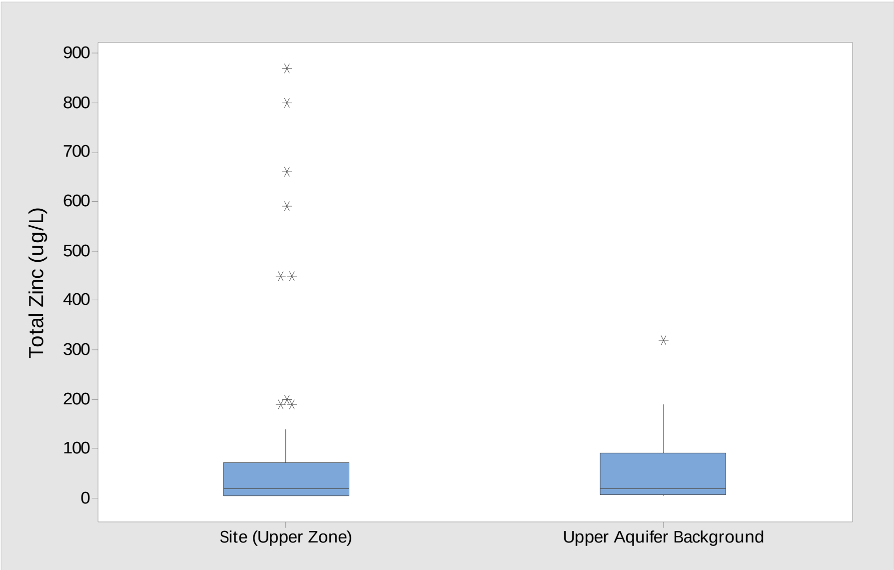
Boxplot Comparisons of Site and Background Groundwater - Upper Aquifer Zone

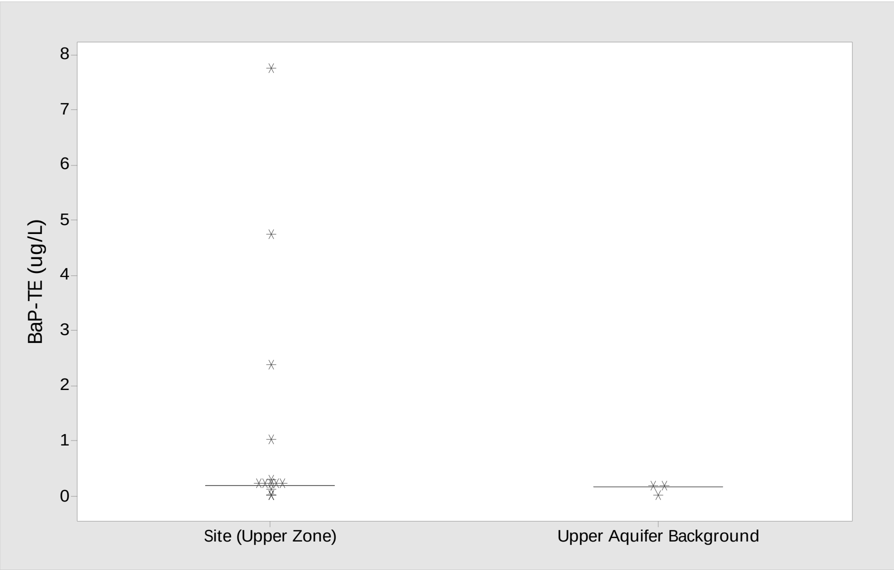


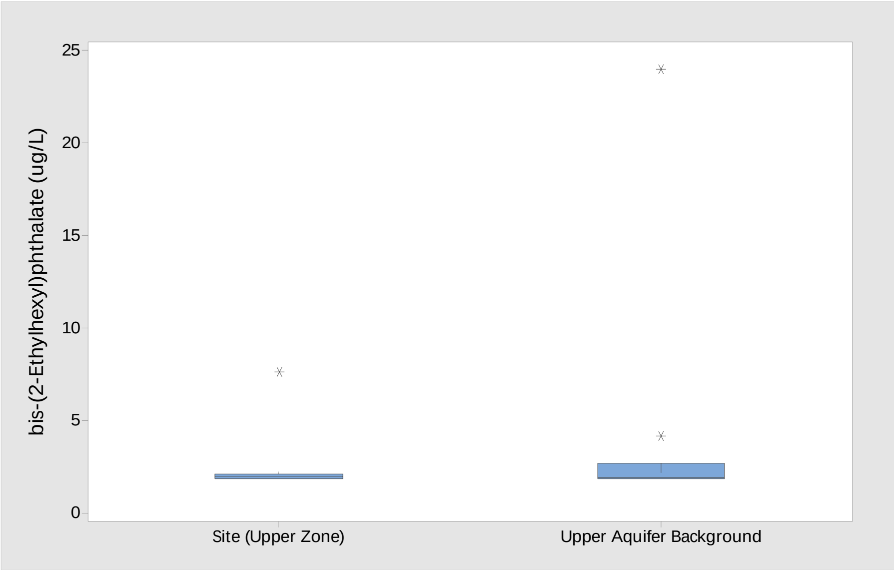
Boxplot Comparisons of Site and Background Groundwater - Upper Aquifer Zone



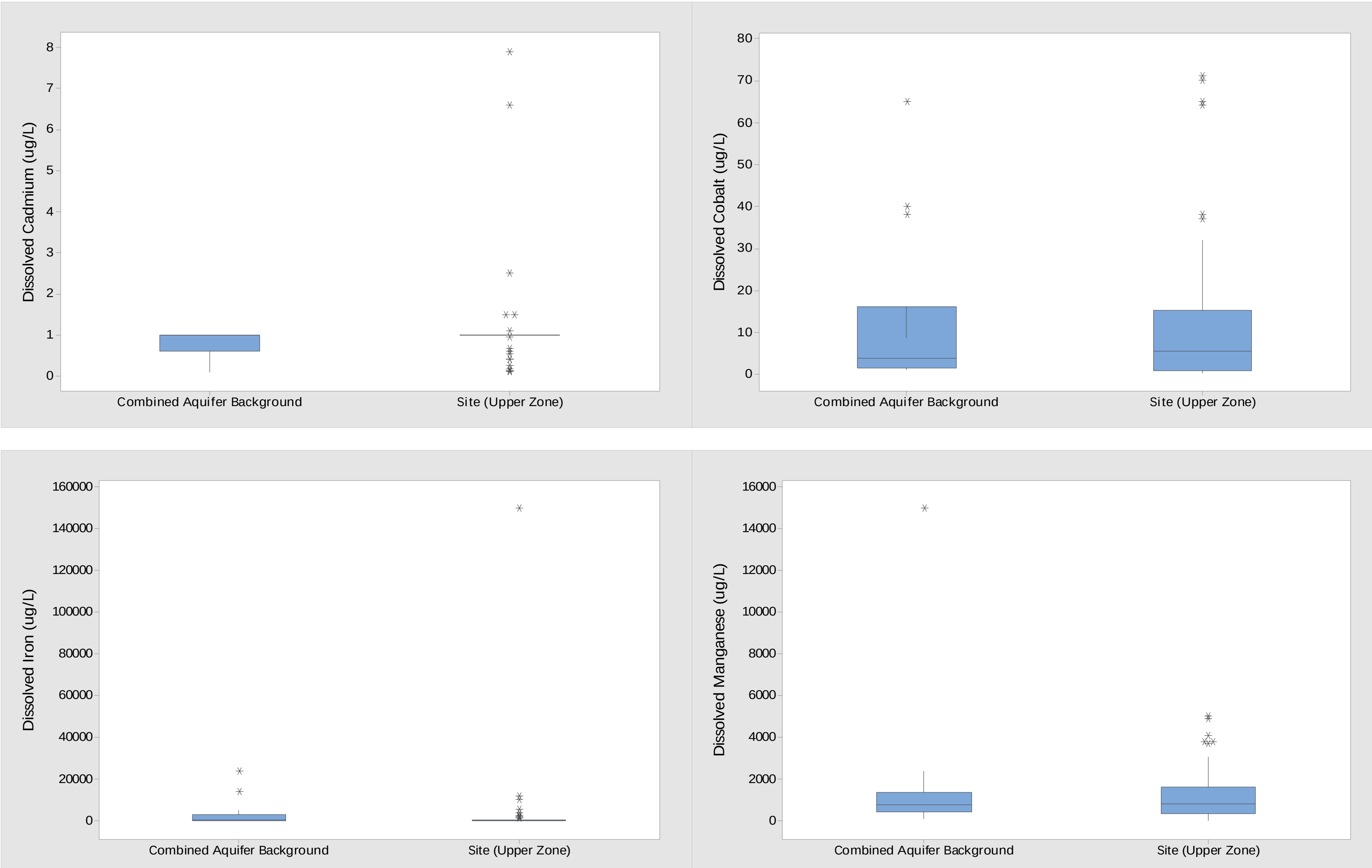
Boxplot Comparisons of Site and Background Groundwater - Upper Aquifer Zone



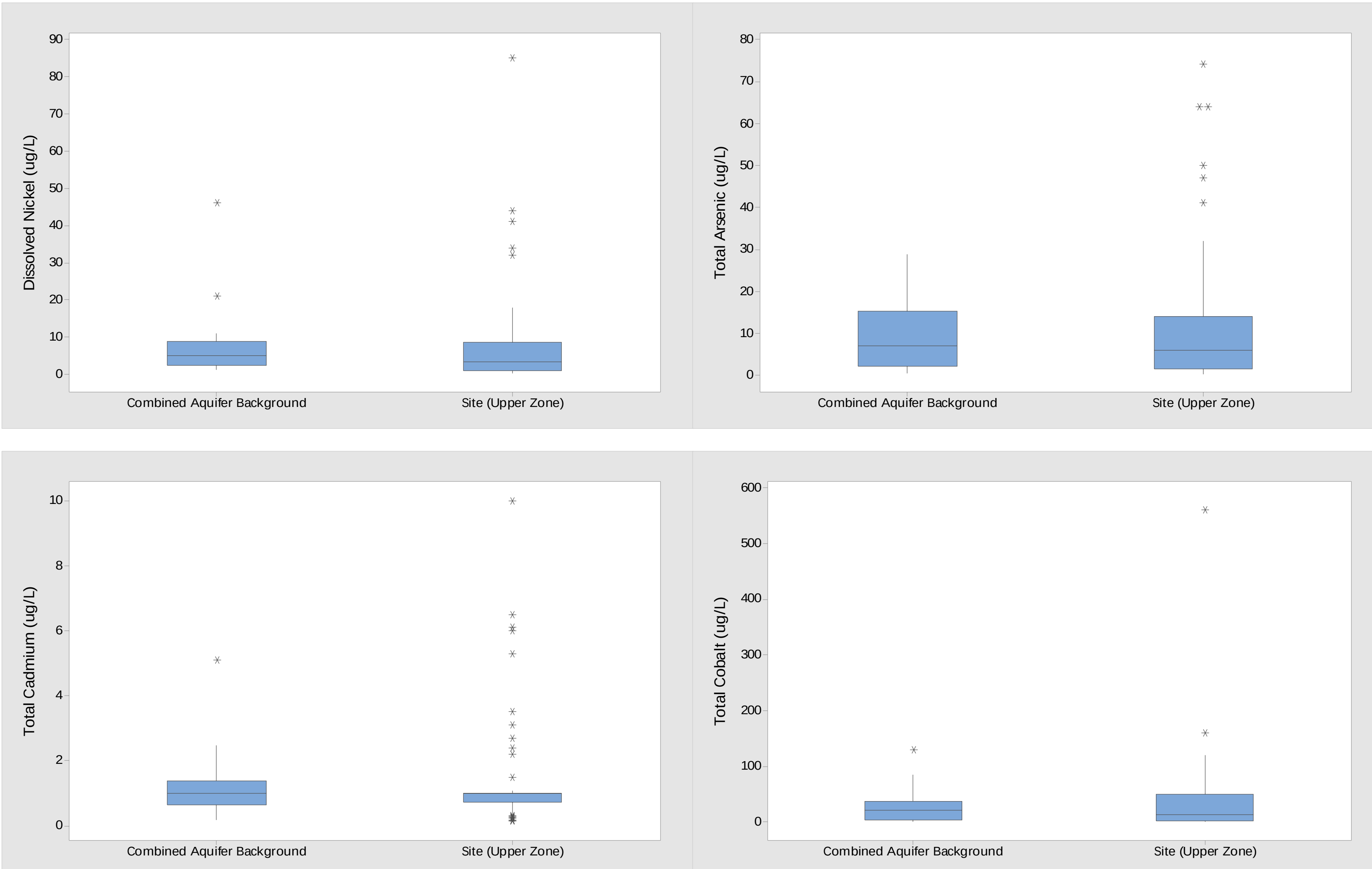



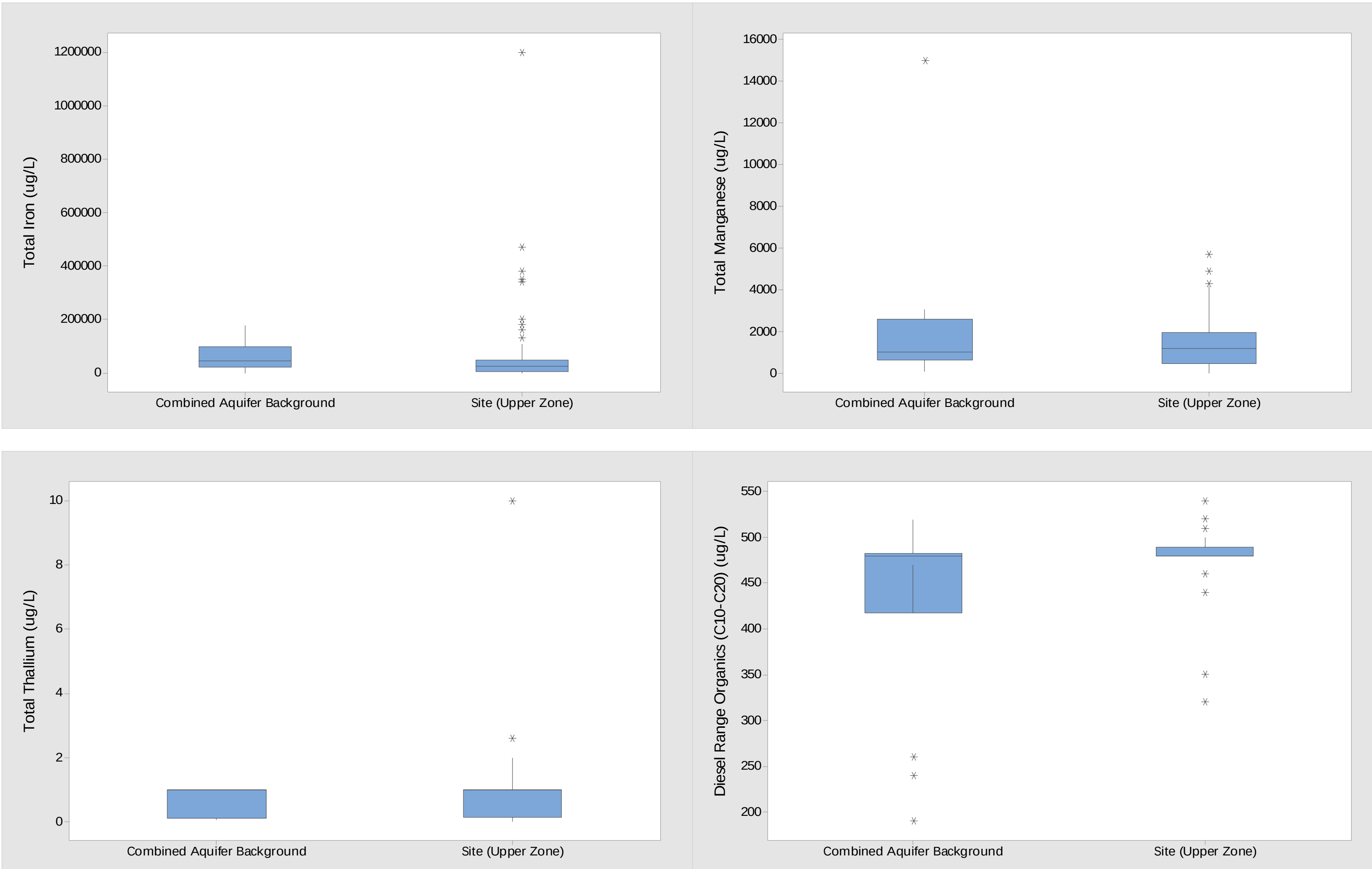
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Upper Aquifer Zone



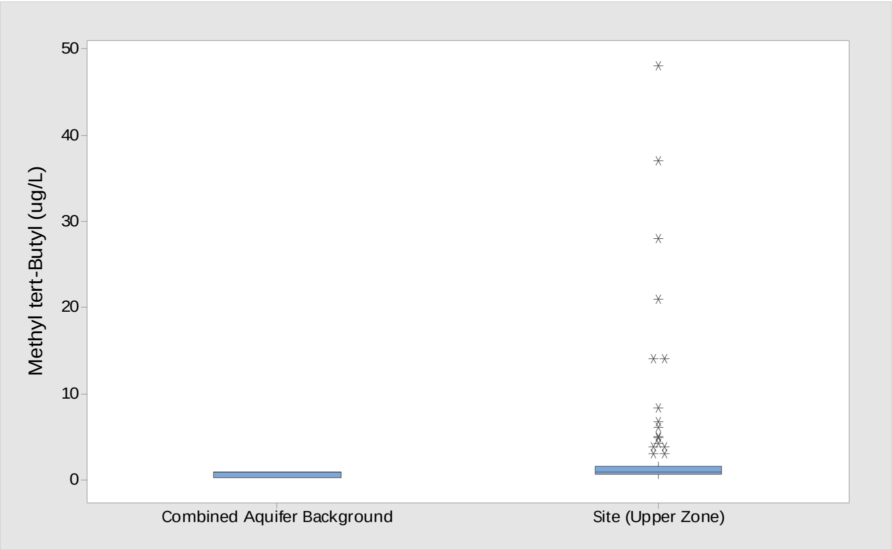
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Upper Aquifer Zone



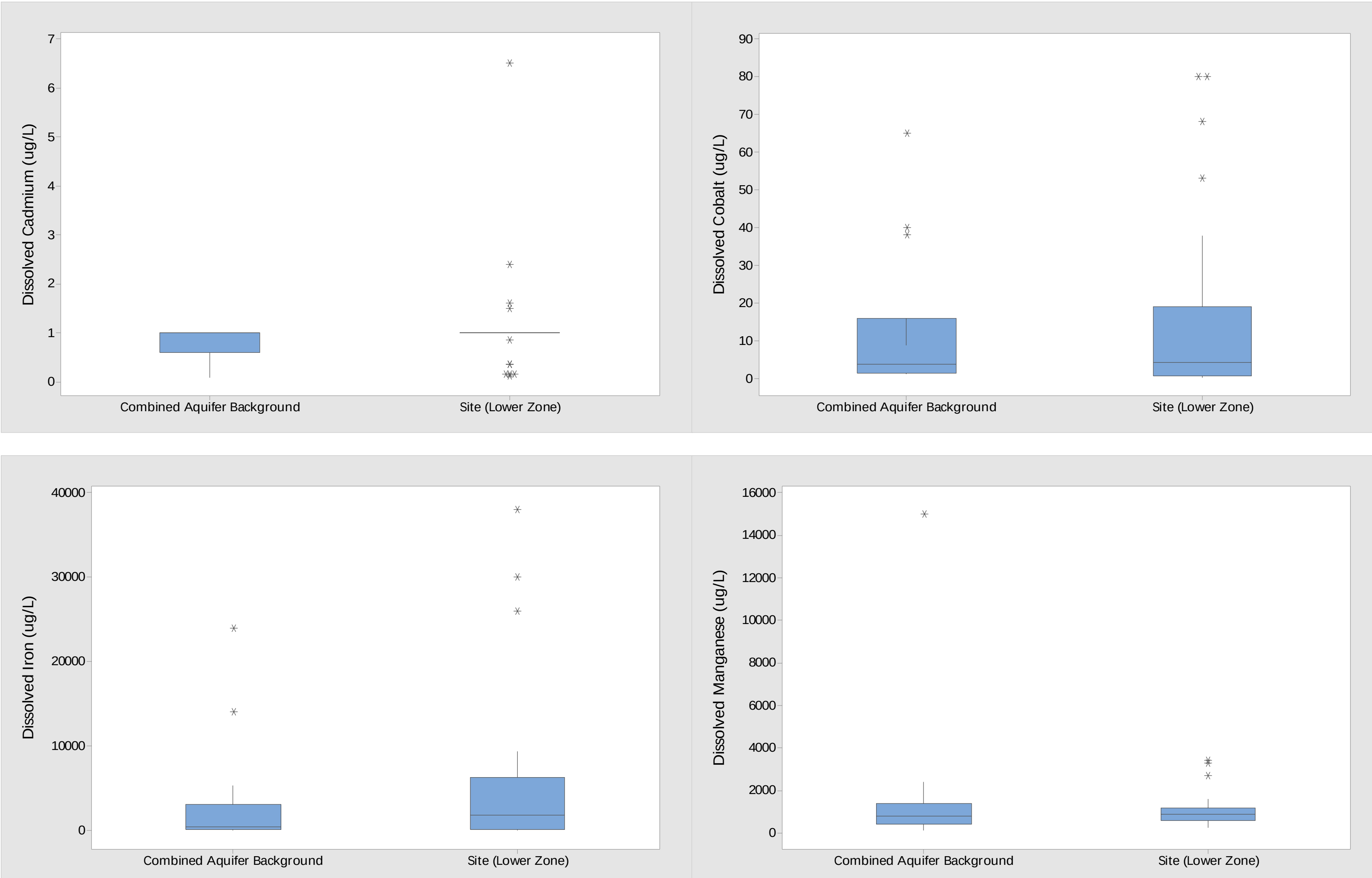
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Upper Aquifer Zone



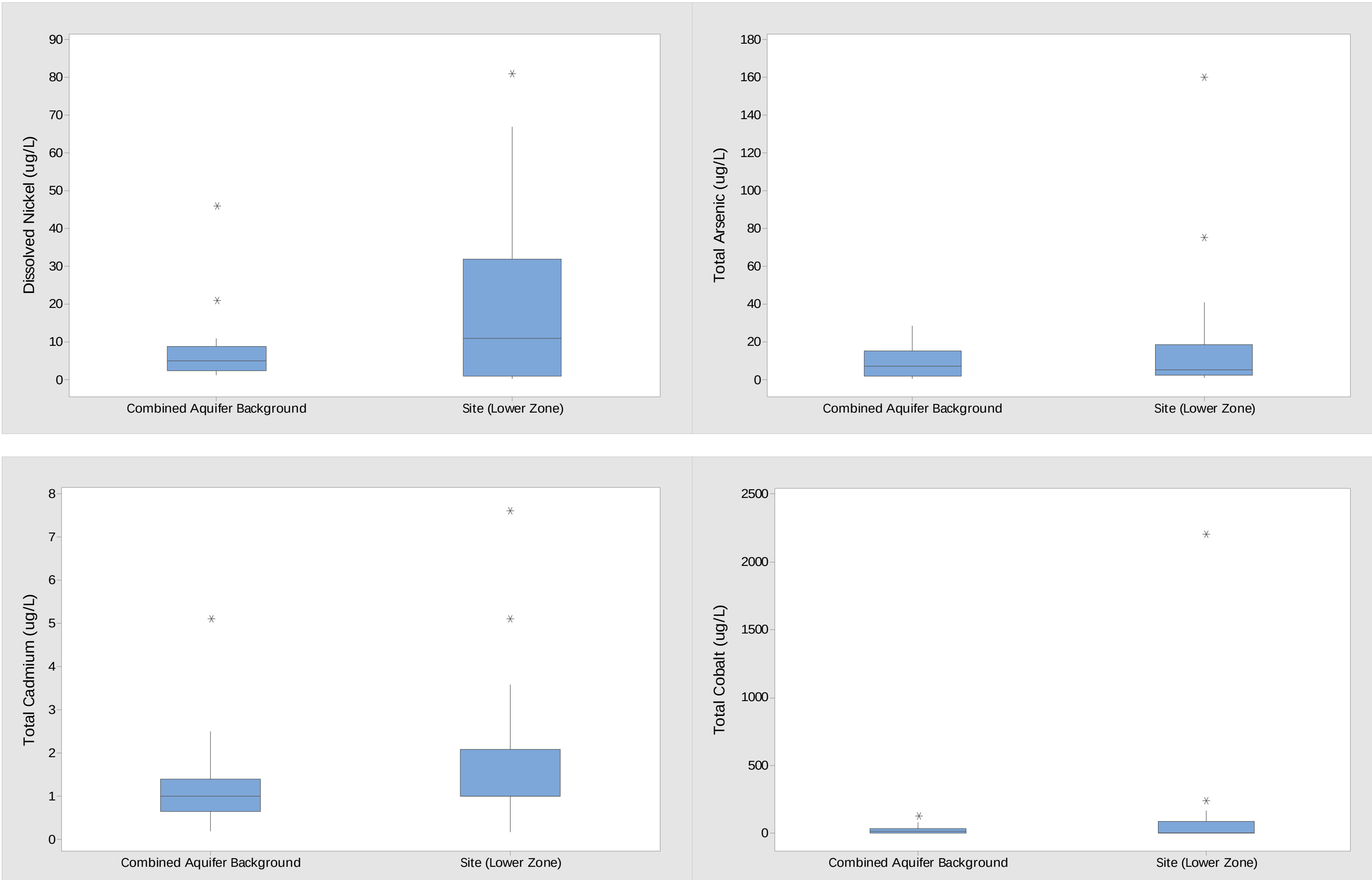
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Upper Aquifer Zone



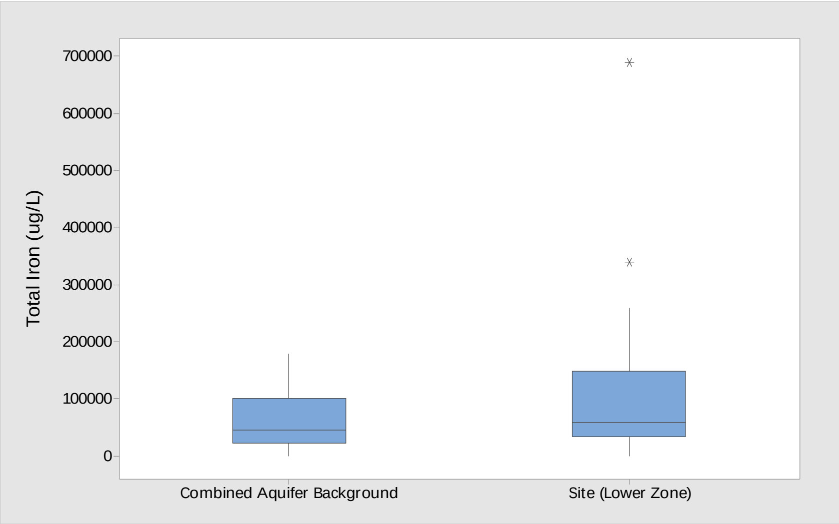
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Lower Aquifer Zone

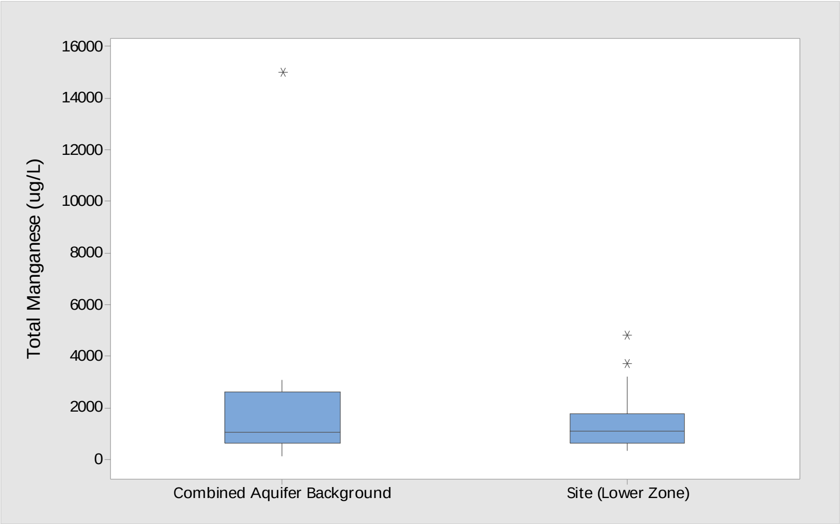


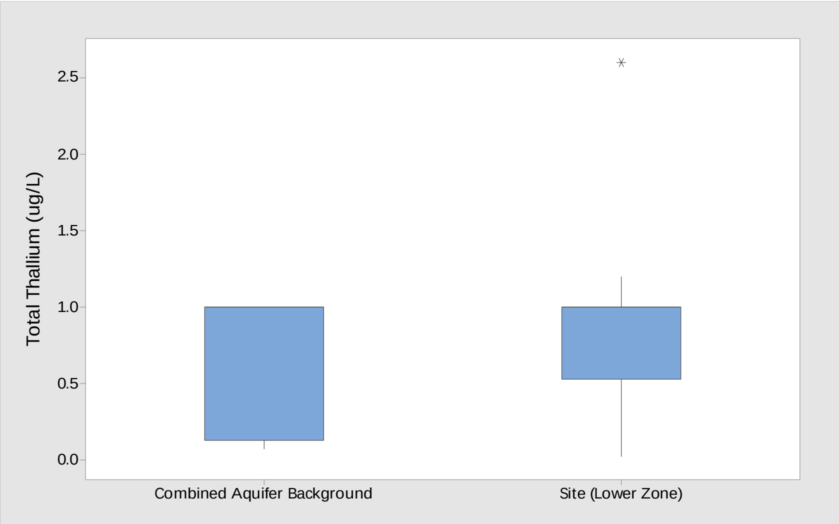
Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Lower Aquifer Zone

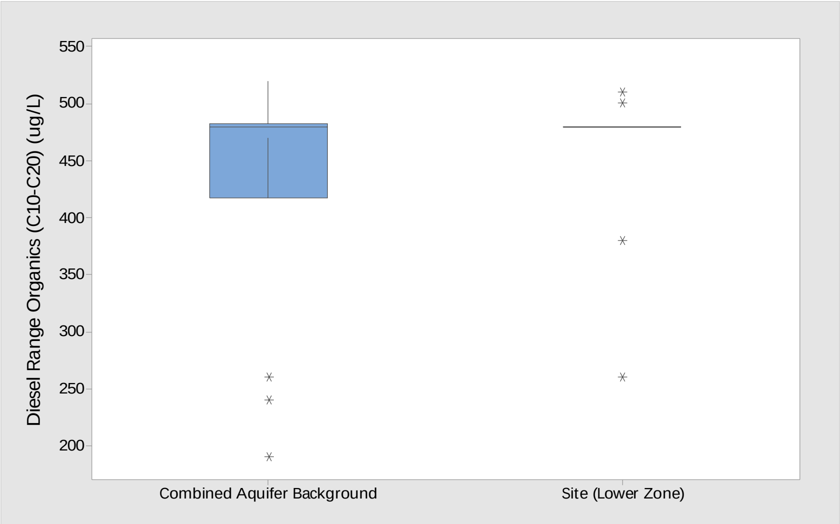


Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Lower Aquifer Zone

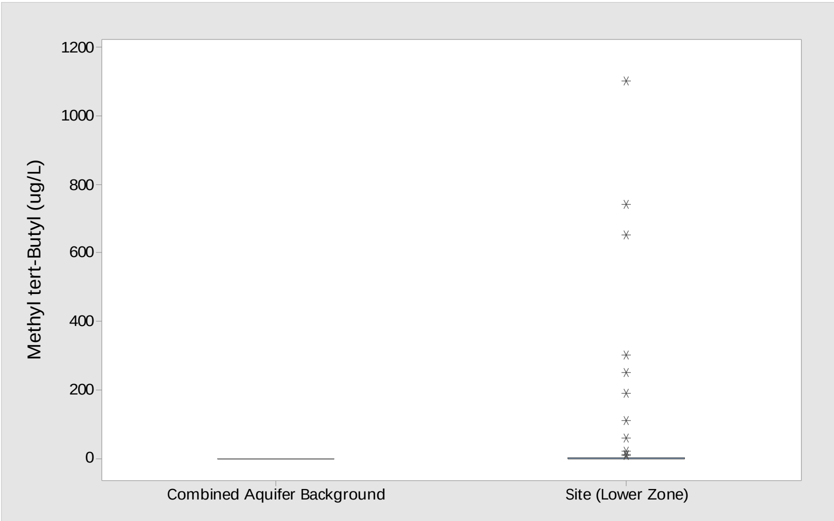


Boxplot Comparisons of Site and Background Groundwater - Combined Background versus Site Lower Aquifer Zone



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# Attachment F

# Supporting Graphics – Pore Water

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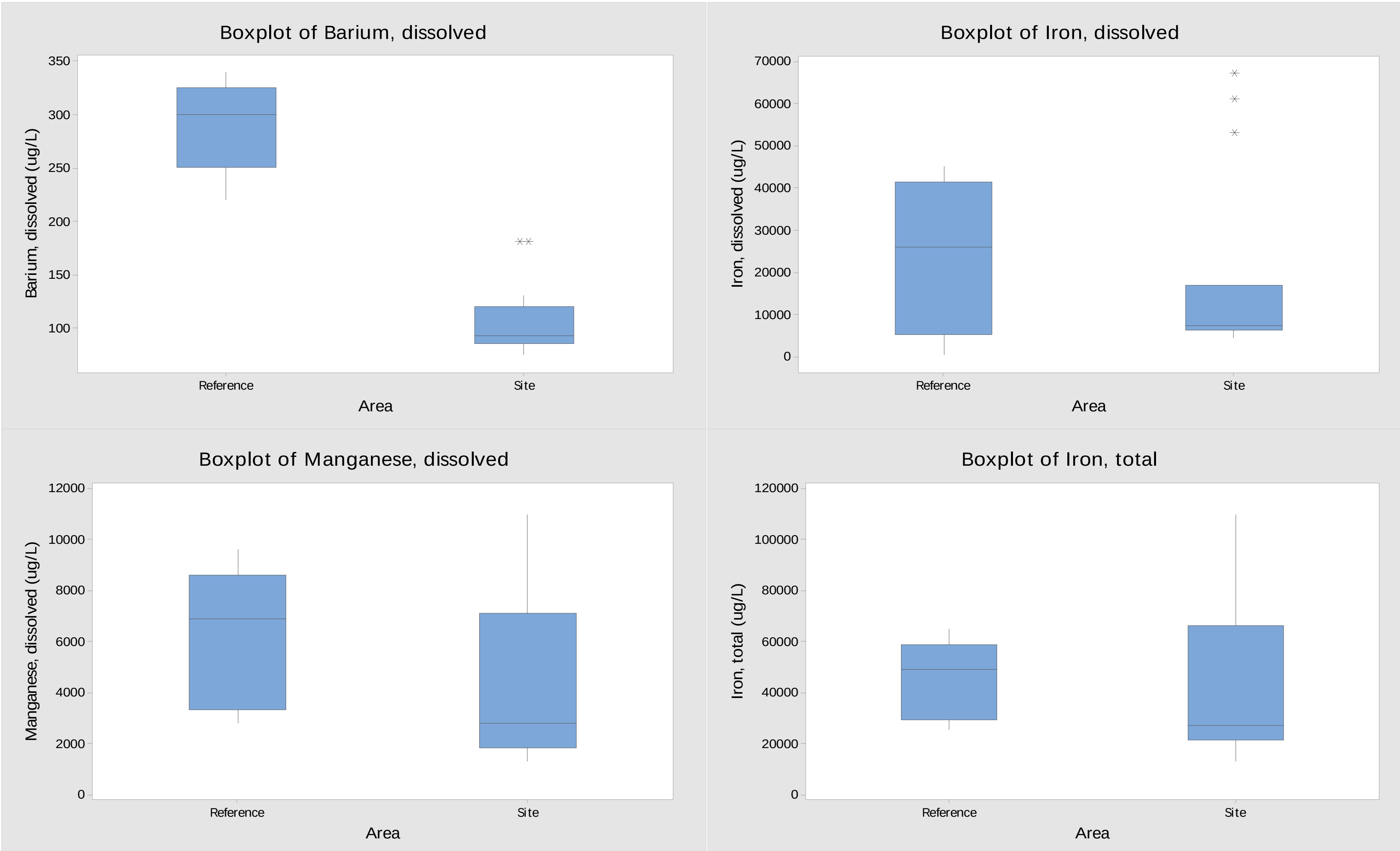
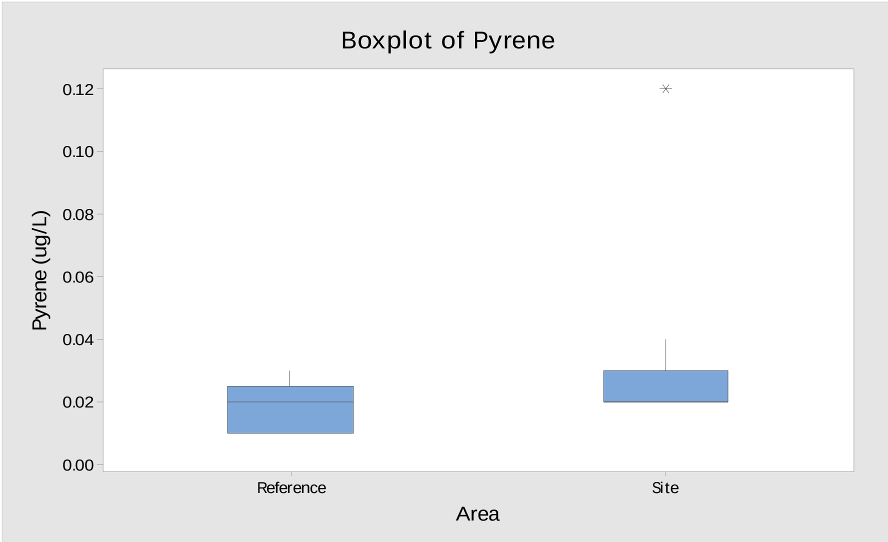
# Boxplot Comparisons of Site and Reference Pore Water Datasets

Boxplot Comparisons of Site and Reference Pore Water

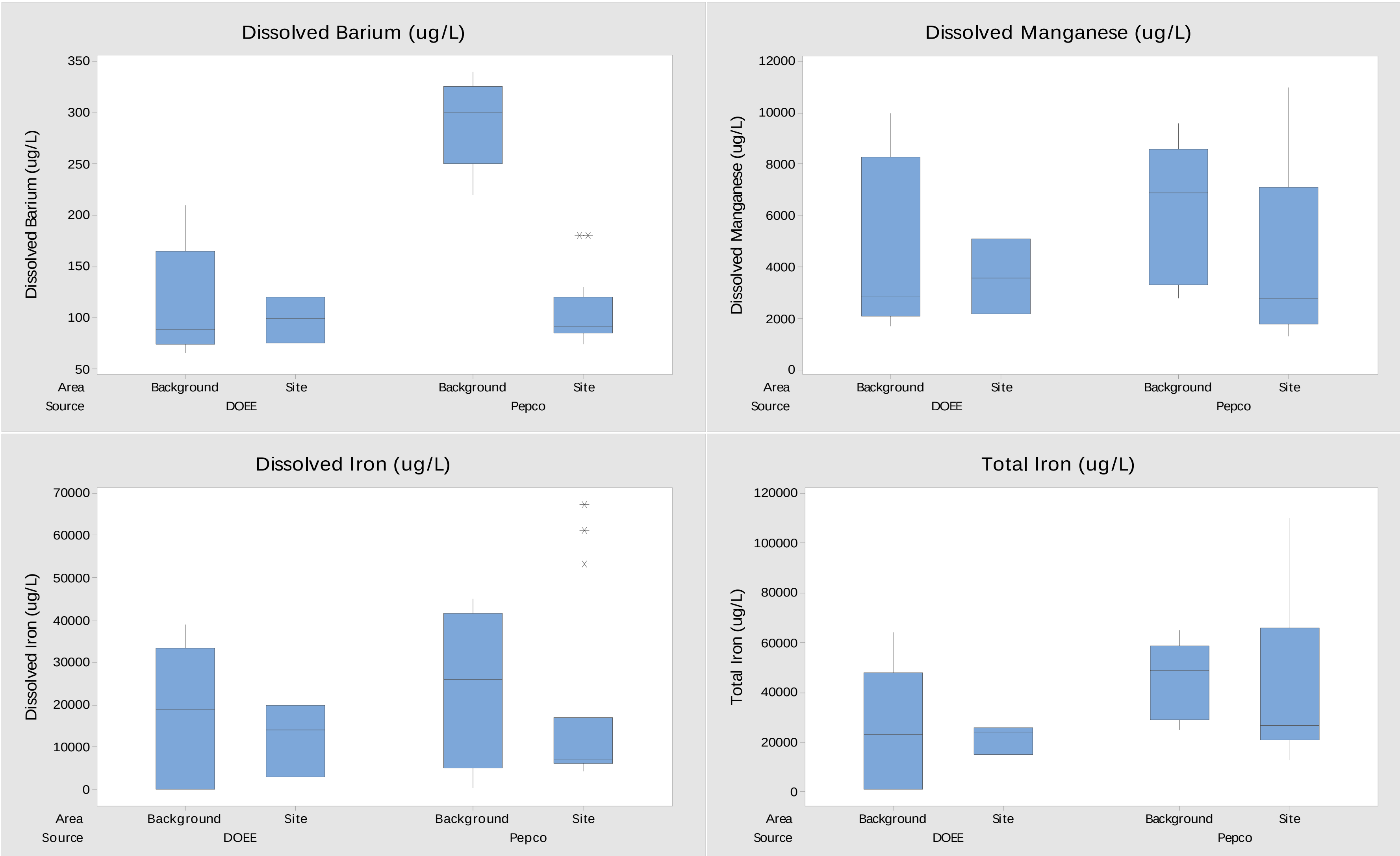


Boxplot Comparisons of Site and Reference Pore Water



# Boxplot Comparisons of Site and Background Pore Water Datasets Collected by Pepco and DOEE

Boxplot Comparisons of Metal Concentrations Detected in Pepco and DOEE Pore Water Samples
Collected in Site and Background Areas



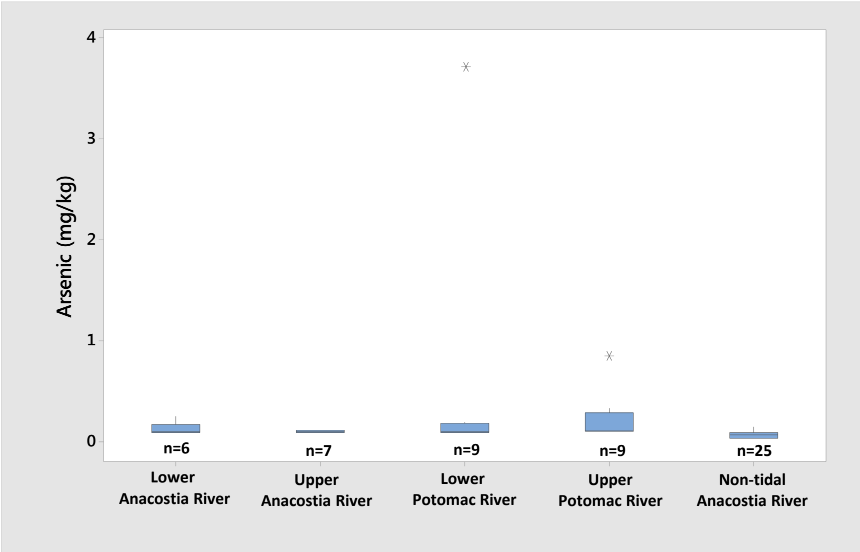

The number of samples in each area are as follows. Five Pepco background samples were collected at the five reference sampling locations upstream of the Site. The five DOEE background pore water samples were collected at five locations upstream of the Site. Site samples include 15 pore water samples collected by Pepco and three pore water samples collected by DOEE in the Waterside Investigation Area.

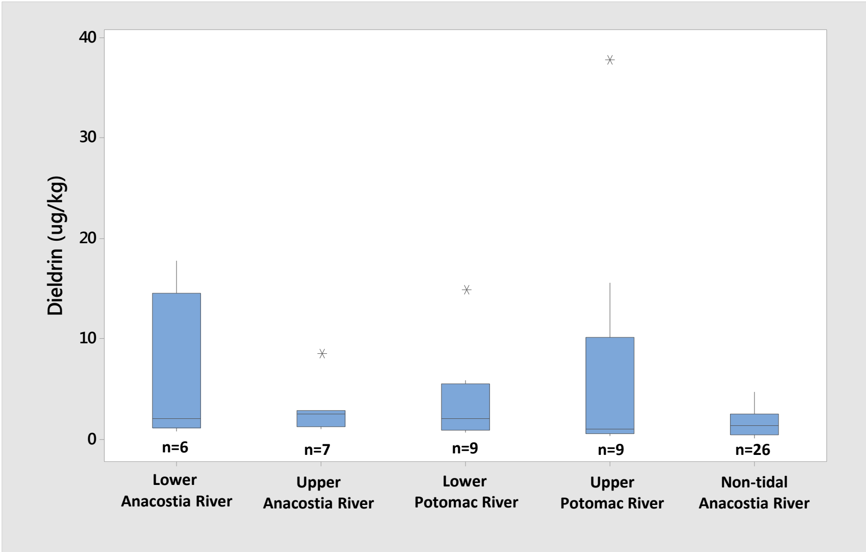
## Attachment G

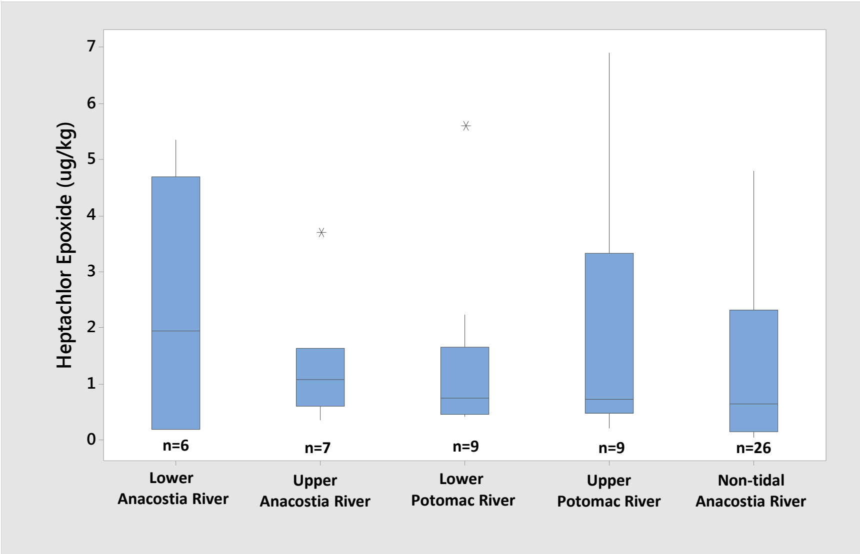
## Supporting Graphics – Fish Tissue

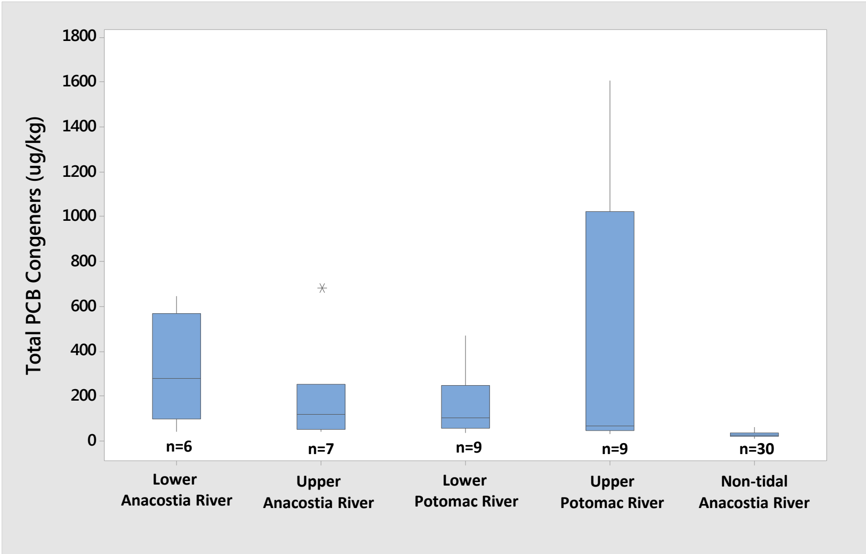
**Attachment G**

**Comparison of Fish Fillet Tissue Concentrations Between the Study Area Reaches and the Background Reaches**

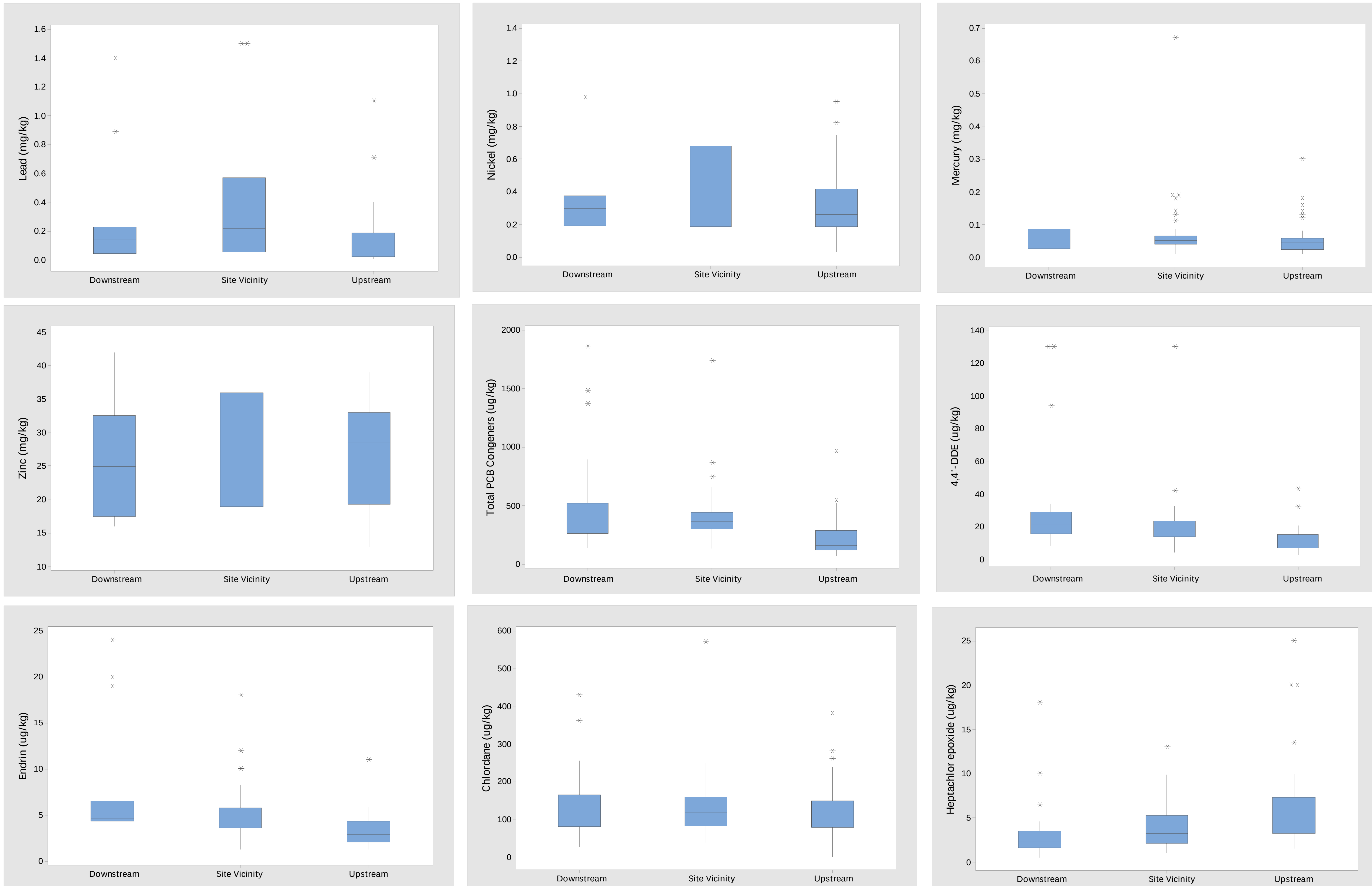


**Attachment G**
**Comparison of COPCs in Whole Body Fish Tissue Samples in Exposure Unit 3 (Site)**
**and Upstream and Downstream Reaches**




Whole body fish tissue samples were collected by Tetra Tech for the ARSP (DOEE, 2018). "Site Vicinity" samples were collected in an approximately 2-8-mile area centered on the Waterside Investigation Area from the CSX Bridge to Kenilworth Park Landfill. "Downstream" samples were collected downstream of the CSX Bridge and "Upstream" samples were collected upstream of the Kenilworth Park Landfill.

Attachment H

# Memorandum on Revision to Benning Road Background Sediment Evaluation

AECOM

# Memorandum

| | | | |
|---|---|---|---|
| To | Apurva Patil, DOEE | Page | 1 |
| CC | Tammy Sanford, Fariba Mahvi, Pepco; Ravi Damera, AECOM | | |
| Subject | Revision to Benning Road Background Sediment Evaluation | | |
| From | Maryann Welsch, AECOM | | |
| Date | May 29, 2019 | | |

This memo addresses the comments presented in DOEE's email correspondence on May 8, 2019 regarding the background sediment dataset and Background Threshold Value (BTV) calculation for total polychlorinated biphenyl congeners (PCBc). DOEE noted that Pepco's up-gradient surface sediment dataset is bimodal in that it incorporates two separate and distinct sediment size classes: coarse-grained sandy sediment from Anacostia River Sediment Project (ARSP) Reach 7 and finer-grained silt and clay from Reach 67. DOEE further noted that its more detailed scrutiny of Pepco's total PCBc analysis presented in Appendix W of the Remedial Investigation (RI) Report (submitted for DOEE review on April 8, 2019) indicates that Reach 67 sediments are the more relevant background sediment for Pepco's Benning Road Waterside Investigation Area.

DOEE presented an analysis of total PCBc and grain size data for 35 ARSP samples included in the background sediment dataset, which consists of 13 samples in Reach 7 and 22 samples in Reach 67. DOEE noted that grain size data were not available for the Pepco background samples so the Pepco background samples were not included in this analysis. DOEE calculated a background threshold value (BTV) of 0.25 mg/kg for total PCBc based on the dataset for Reach 67 (22 samples) (in contrast to the BTV of 0.33 mg/kg calculated by Pepco based on the entire background sediment data set).

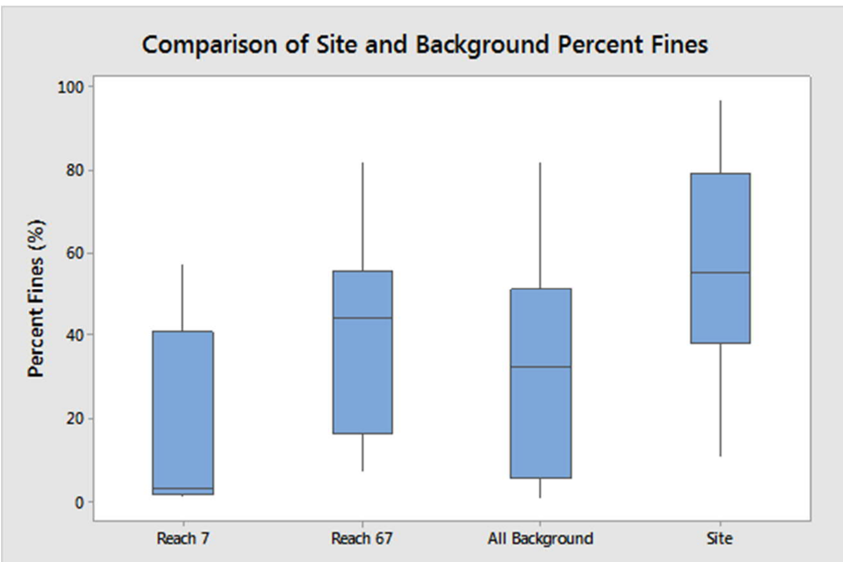
AECOM confirmed DOEE's calculation of the percentage fines for the 35 ARSP samples included in DOEE's analysis showing that the samples in Reach 67 have higher percentages of fines (clay and silt) in comparison to samples located upstream in Reach 7.

DOEE's analysis excluded all samples for which it did not have data regarding grain size. However, based on DOEE's assessment that Reach 7 sediment consists predominantly of coarse sandy materials and Reach 67 consists predominantly of silt and clay-sized material, it is reasonable to assume that all samples within each of these river reaches will consist of the same the grain size that generally characterizes each reach, and thus there is no reason to exclude samples simply due to lack of grain size data. AECOM repeated the analysis conducted by DOEE (described above) for total PCBc and grain size for all available background samples (both DOEE and Pepco samples) for which total PCBc data are available in Reach 67 and Reach 7. A summary of the data used by DOEE (as presented in the May 8th email) and the dataset used by AECOM is provided in the table below. AECOM's analysis included the 35 ARSP samples used for DOEE's analysis, plus five Pepco samples for which both congener and grain size data are available, and four samples (two Pepco and two DOEE) for which total PCBc data are available, but no grain size data. As illustrated in the table below, DOEE 35 sample dataset and the AECOM 44 sample dataset have the same mean percent fines, but the mean total PCBc concentration is lower in the DOEE dataset in comparison to the AECOM dataset.

Summary of Background Sediment Samples in DOEE and AECOM Analyses of Total PCB Congeners and Grain Size in Reach 67 and Reach 7

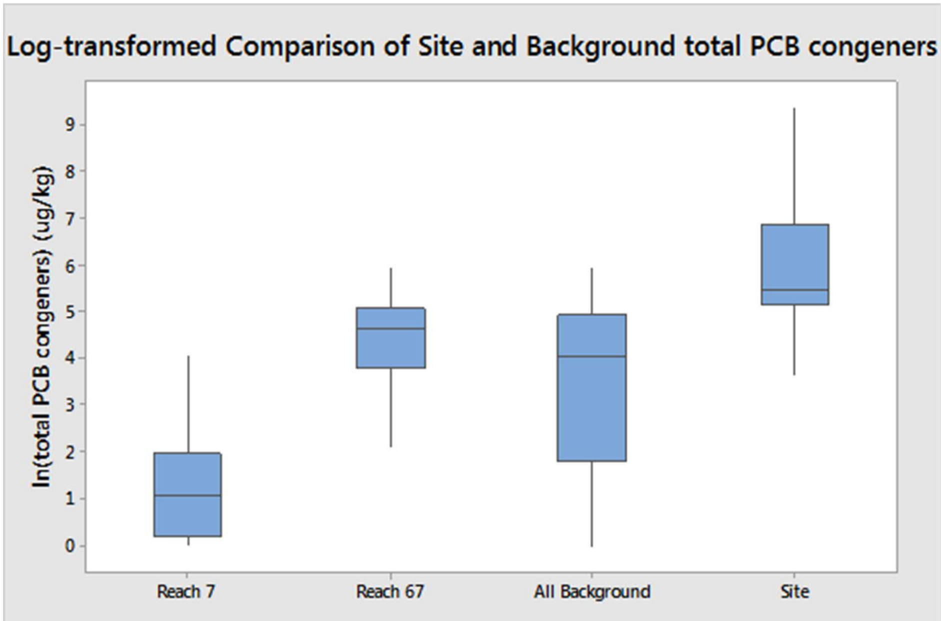
| Background Sediment Dataset for Reach 67 and Reach 7 | Number of Samples | Mean Percent Fines (%) | Mean Total PCB Congeners (mg/kg) |
|---|---|---|---|
| DOEE analysis (May 8th email) | 35 | 31 | 0.072 |
| AECOM analysis (this memo) | 44 | 31 | 0.082 |

AECOM compared the percent fines for samples collected in Reach 7, Reach 67, all background (Reach 7 + Reach 67 combined), and the Waterside Investigation Area (Site). The boxplot below illustrates that the percent fines in Site is higher than all background samples and likely most similar to samples collected in Reach 67.




The boxplot comparison below presents the total PCB congener concentrations in Reach 7, Reach 67, all background (Reach 7+Reach 67), and Site samples. Consistent with percent fines, Site concentrations are most similar to Reach 67 samples.

AECOM




AECOM removed the Reach 7 sediment data from the background sediment dataset (consistent with DOEE's evaluation of relevant grain size discussed above) and performed the background evaluation statistics (described in Appendix W of the RI Report) on the revised dataset for a subset of constituents including total PCBc. A total of 18 samples from Reach 7 were removed from the dataset including four Pepco-collected samples: SEDBACK1, SEDBACK2, SEDBACK3, and SEDBACK16. **Figure 1** illustrates the location of the remaining background sediment samples (31 sample locations) in Reach 67.

**Table 1** presents a comparison of the background evaluation statistics presented in the most recent iteration of the Background Evaluation submitted to DOEE in April 2019 and the revised statistics based on the exclusion of Reach 7 sediment samples (i.e., "Revised Background Evaluation – May 2019") for a subset of constituents. Following the removal of the Reach 7 sediment data, the following changes were noted:

- Fewer outliers were identified and removed.
- The BTVs increase in value (with the exception of nickel).
- Most population test outcomes remain the same.

Changes to the revised statistics for the remaining constituents included in the background sediment evaluation (Appendix W of the RI Report) are not expected to differ significantly from the changes noted here. In general, higher concentrations were measured in samples collected in Reach 67 versus Reach 7. Therefore, it is expected that BTVs will be similar or higher than the BTVs presented in April and most of the population test outcomes will likely remain the same.

The BTV for total PCBc was calculated on a dataset of 29 samples that fall within the Reach 67 area and includes 22 ARSP samples, six Pepco background sediment samples, and one additional DOEE sample (R7-38) for which total PCBc data are available but grain size data are not available (presented in **Table 2**). No outliers were identified for this total PCBc dataset. The BTV for total PCBc, 0.42 mg/kg, was calculated as the 95% UTL with 95% coverage based on the gamma distribution.

In summary, AECOM agrees with the analysis of total PCBc and percent fines for the ARSP samples in the background sediment dataset provided by DOEE in their May 8$^{th}$ email. The background statistics results for total PCBc presented in **Table 1**, including the outlier test and BTV outcomes, differed from DOEE's results due to the inclusion of all Reach 67 background sediment samples for which total PCBc data are available. However, this BTV (0.42 mg/kg) is the appropriate statistic to use in the RI Report based on the analysis presented in this memo.

**Table 1. Comparison of background evaluation statistics presented in the Appendix W Background Evaluation submitted in April 2019 and the revised statistics presented in this memo (i.e., "May 2019") which excludes samples in the ARSP Reach 7.**

| | Background Evaluation - April 2019 | | | | | Revised Background Evaluation - May 2019 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Outlier Test [a] | | | | | Outlier Test [a] | | | |
| **COPC** | **FOD** | Outlier Value (mg/kg) | Sample Identification of Outlier Value | **BTV Statistic (mg/kg) [b]** | **Population Test Outcome [c]** | **FOD** | Outlier Value (mg/kg) | Sample Identification of Outlier Value | **BTV Statistic (mg/kg) [b]** | **Population Test Outcome [c]** |
| **Inorganics** | | | | | | | | | | |
| Cyanide | 22 : 41 | -- | -- | 0.8 | Site < Background | 19 : 27 | -- | -- | 0.87 | Site>=Background |
| Nickel | 47 : 47 | -- | -- | 47 | Site>=Background | 30 : 30 | -- | -- | 40 | Site>=Background |
| **Pesticides** | | | | | | | | | | |
| 4,4'-DDT | 32 : 40 | 0.0056<br>0.005<br>0.0039<br>0.0032<br>0.0025<br>0.0024 | SEDBACK6<br>SEDBACK4<br>SEDBACK16<br>SEDBACK5<br>R7-13<br>R7-28 | 0.0022 | Site>=Background | 24 : 28 | 0.0056;<br>0.005 | SEDBACK6;<br>SEDBACK4 | 0.0028 | Site>=Background |
| **Polychlorinated Biphenyl Compounds** | | | | | | | | | | |
| Total PCBs (Aroclors) | 36 : 46 | 0.19 | R7-01 | 0.18 | Site>=Background | 30 : 30 | -- | -- | 0.18 | Site>=Background |
| Total PCB Congeners | 42 : 42 | 0.38<br>0.37 | SEDBACK17<br>R7-01 | 0.33 | Site>=Background | 29 : 29 | -- | -- | 0.42 | Site>=Background |
| **Semi-Volatile Organic Compounds** | | | | | | | | | | |
| Total HMW PAHs | 46 : 46 | 28 | SEDBACK4 | 11 | Site < Background | 30 : 30 | -- | -- | 19 | Site < Background |
| **Semi-Volatile Organic Compounds (Method ID-0016)** | | | | | | | | | | |

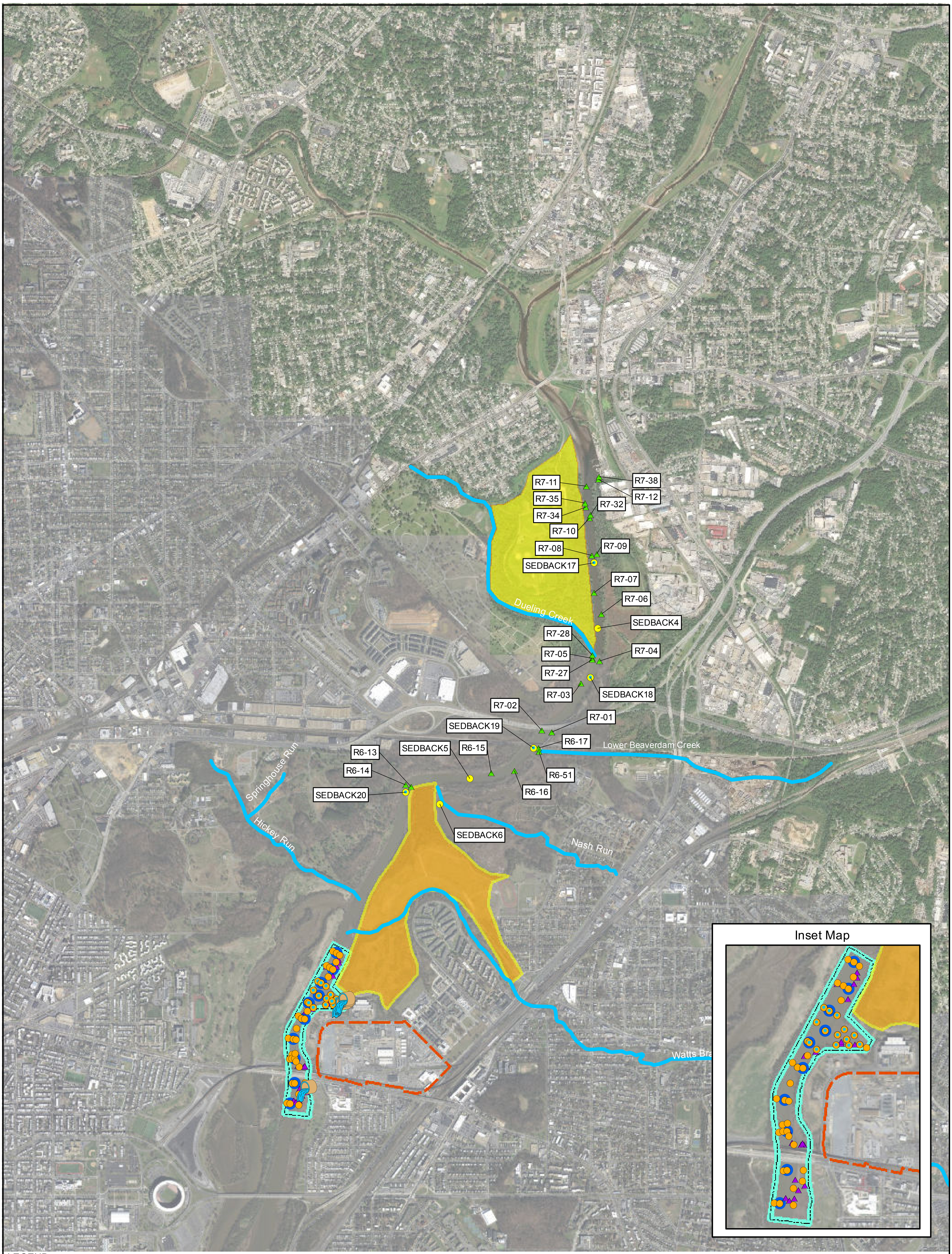
| COPC | Background Evaluation - April 2019 | | | | | Revised Background Evaluation - May 2019 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | FOD | Outlier Test [a] | | BTV Statistic (mg/kg) [b] | Population Test Outcome [c] | FOD | Outlier Test [a] | | BTV Statistic (mg/kg) [b] | Population Test Outcome [c] |
| | | Outlier Value (mg/kg) | Sample Identification of Outlier Value | | | | Outlier Value (mg/kg) | Sample Identification of Outlier Value | | |
| Total HMW PAHs | 41 : 41 | -- | -- | 15 | Site>=Background | 27 : 27 | -- | -- | 17 | Site>=Background |
| **Dioxin/Furan Compounds** | | | | | | | | | | |
| 1,2,3,7,8-PeCDD | 11 : 32 | -- | -- | 1.8E-06 | Site>=Background | 10 : 21 | -- | -- | 2.2E-06 | Site>=Background |
| OCDD | 31 : 32 | -- | -- | 1.2E-02 | Site < Background | 21 : 21 | -- | -- | 1.3E-02 | Site < Background |
| 2,3,4,7,8-PeCDF | 18 : 32 | -- | -- | 2.3E-06 | Site>=Background | 16 : 21 | -- | -- | 2.6E-06 | Site>=Background |
| OCDF | 18 : 32 | -- | -- | 7.7E-05 | Site>=Background | 15 : 21 | -- | -- | 9.2E-05 | Site>=Background |

Notes:
The April 2019 Background Evaluation (Appendix W of the RI Report) was submitted to DOEE on April 8 and the sediment dataset was revised from the dataset presented in the November 2018 submittal by the exclusion of all samples downstream of SEDBACK20.
The revised background evaluation prepared in May 2019 reflects the exclusion of samples in the ARSP Reach 7 (upgradient and including SEDBACK16) per DOEE's comment in their May 8, 2019 email.
Values highlighted in grey is the maximum of April and May 2019 BTVs.
BTV - Background Threshold Value.
COPC - Chemical of Potential Concern.
NC - Not calculated.
USEPA - United States Environmental Protection Agency.
[a] The default outlier test in ProUCL (version 5.1; USEPA, 2016) was conducted (Rosner's test for over 25 samples, Dixon's test for under 25 samples).
If the dataset includes non-detects, the non-detects were included at the full value of the detection imit.
Identified outlier values were removed from the dataset prior to the calculation of the BTV statistics.
[b] BTVs were calculated in ProUCL (version 5.1; USEPA, 2016). The 95UTL was selected based on the distribution of the raw dataset.
If the dataset includes non-detects, the BTV was selected from the Kaplan-Meier statistics.
[c] Populations tests (two-sample hypothesis tests) were conducted to compare the mean or median concentration of Site and background datasets.

AECOM

**Table 2. Total PCB congener concentrations and percentage fines data for background sediment samples in Reach 67**

| Background Sediment Sample | Total PCB congeners (µg/kg) | Percent Fines (%) |
|---|---|---|
| SEDBACK17 | 380 | 49.7 |
| SEDBACK18 | 37 | 36.8 |
| SEDBACK19 | 140 | 7.4 |
| SEDBACK20 | 60 | 17.3 |
| SEDBACK5 | 127 | No data |
| SEDBACK6 | 219 | No data |
| R6-13 | 200 | 14 |
| R6-14 | 71 | 11.5 |
| R6-15 | 99 | 46 |
| R6-16 | 240 | 42.9 |
| R6-17 | 140 | 59.5 |
| R6-51 | 160 | 12 |
| R7-01 | 370 | 81.4 |
| R7-02 | 99 | 48.4 |
| R7-03 | 67 | 47.6 |
| R7-04 | 50 | 51.4 |
| R7-05 | 130 | 45.2 |
| R7-06 | 16 | 54.4 |
| R7-07 | 160 | 60.8 |
| R7-08 | 8.1 | 9.3 |
| R7-09 | 145 | 72.2 |
| R7-10 | 37 | 21.7 |
| R7-11 | 57 | 37.3 |
| R7-12 | 28 | 8.2 |
| R7-27 | 75 | 60.8 |
| R7-28 | 190 | 70.9 |
| R7-32 | 33 | 21 |
| R7-34 | 21 | 27.8 |
| R7-38 | 75 | No data |




LEGEND

- Pepco Sediment and Pore Water Background Location (2017)*
- Pepco Background Location - Co-located Sediment/Surface Water (2013)
- DOEE Background Location - Sediment
- Pepco Sediment and Pore Water Location (2017)*
- Pepco Sediment Sample Location (2013)
- DOEE Sediment Sample Location
- Pepco Co-Located Sediment / Surface Water Location (2013)
- Benning Road Facility Property Boundary
- Outfalls
- Selected Tributaries
- Colmar Manner Landfill
- Kenilworth Landfill
- Waterside Investigation Area

*Co-located with sediment bioassays and benthic macroinvertebrate community survey samples.

0 1,500 Feet

AECOM

| BENNING ROAD FACILITY RI/FS PROJECT<br>3400 BENNING RD., NE<br>WASHINGTON, DC 20019 | BACKGROUND AND SITE SEDIMENT, SURFACE WATER, AND PORE WATER SAMPLE LOCATIONS |
|---|---|
| Date: 5/22/2019 Drawn By: KNS Checked By: SED | FIGURE 1 |

Path: P:\Jobs\Water\QA_Group\Pepco\GIS\MXD\2019Revisions\ Fig2_3_PepcoDOEE_SurfSdBkg_03252019

# Attachment I

# ProUCL Output

# ProUCL Output - Soil

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 11:02:47 AM |
| From File | ProUCL_INPUT.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

RA17_SO_Metals|Arsenic

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 29 |
| Minimum | 0.59 |
| Maximum | 30 |
| Mean of Raw Data | 4.653 |
| Standard Deviation of Raw Data | 4.747 |
| Khat | 1.888 |
| Theta hat | 2.465 |
| Kstar | 1.763 |
| Theta star | 2.64 |
| Mean of Log Transformed Data | 1.25 |
| Standard Deviation of Log Transformed Data | 0.747 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.751 |
| Shapiro Wilk Test Statistic | 0.603 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 4.19E-12 |
| Lilliefors Test Statistic | 0.271 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.872 |
| A-D Test Statistic | 0.748 |
| A-D Critical (0.05) Value | 0.761 |
| K-S Test Statistic | 0.156 |
| K-S Critical(0.05) Value | 0.141 |

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.981 |
| Shapiro Wilk Test Statistic | 0.975 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.619 |
| Lilliefors Test Statistic | 0.116 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Chromium

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 24 |
| Minimum | 3.7 |
| Maximum | 110 |
| Mean of Raw Data | 17.93 |
| Standard Deviation of Raw Data | 18.04 |
| Khat | 2.182 |
| Theta hat | 8.217 |
| Kstar | 2.035 |

| | |
|---|---|
| Theta star | 8.811 |
| Mean of Log Transformed Data | 2.64 |
| Standard Deviation of Log Transformed Data | 0.643 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.736 |
| Shapiro Wilk Test Statistic | 0.576 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 9.99E-13 |
| Lilliefors Test Statistic | 0.282 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.869 |
| A-D Test Statistic | 1.801 |
| A-D Critical (0.05) Value | 0.758 |
| K-S Test Statistic | 0.183 |
| K-S Critical(0.05) Value | 0.141 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.966 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0882 |
| Lilliefors Test Statistic | 0.123 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Cobalt

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 34 |
| Minimum | 0.47 |
| Maximum | 16 |
| Mean of Raw Data | 6.297 |
| Standard Deviation of Raw Data | 4.278 |
| Khat | 1.862 |
| Theta hat | 3.382 |
| Kstar | 1.739 |
| Theta star | 3.622 |
| Mean of Log Transformed Data | 1.548 |
| Standard Deviation of Log Transformed Data | 0.873 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.968 |
| Shapiro Wilk Test Statistic | 0.921 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.00923 |
| Lilliefors Test Statistic | 0.165 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.981 |
| A-D Test Statistic | 0.286 |
| A-D Critical (0.05) Value | 0.761 |
| K-S Test Statistic | 0.0796 |

| | |
|---|---|
| K-S Critical(0.05) Value | 0.141 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.926 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0146 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_Metals|Nickel

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 34 |
| Minimum | 0.99 |
| Maximum | 88 |
| Mean of Raw Data | 12.16 |
| Standard Deviation of Raw Data | 16.53 |
| Khat | 1.204 |
| Theta hat | 10.1 |
| Kstar | 1.131 |
| Theta star | 10.76 |
| Mean of Log Transformed Data | 2.029 |
| Standard Deviation of Log Transformed Data | 0.922 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.729 |
| Shapiro Wilk Test Statistic | 0.557 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 3.69E-13 |
| Lilliefors Test Statistic | 0.332 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.902 |
| A-D Test Statistic | 1.807 |
| A-D Critical (0.05) Value | 0.773 |
| K-S Test Statistic | 0.194 |
| K-S Critical(0.05) Value | 0.143 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.207 |
| Lilliefors Test Statistic | 0.131 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Thallium

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 28 |
| Minimum | 0.016 |
| Maximum | 0.64 |

| | |
|---|---|
| Mean of Raw Data | 0.113 |
| Standard Deviation of Raw Data | 0.0951 |
| Khat | 2.884 |
| Theta hat | 0.0391 |
| Kstar | 2.684 |
| Theta star | 0.042 |
| Mean of Log Transformed Data | -2.367 |
| Standard Deviation of Log Transformed Data | 0.585 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.722 |
| Shapiro Wilk Test Statistic | 0.565 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 5.73E-13 |
| Lilliefors Test Statistic | 0.253 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.819 |
| A-D Test Statistic | 1.155 |
| A-D Critical (0.05) Value | 0.755 |
| K-S Test Statistic | 0.153 |
| K-S Critical(0.05) Value | 0.141 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.955 |
| Shapiro Wilk Test Statistic | 0.946 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0766 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Vanadium

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 25 |
| Minimum | 3.4 |
| Maximum | 80 |
| Mean of Raw Data | 25.76 |
| Standard Deviation of Raw Data | 14.21 |
| Khat | 3.917 |
| Theta hat | 6.575 |
| Kstar | 3.64 |
| Theta star | 7.075 |
| Mean of Log Transformed Data | 3.116 |
| Standard Deviation of Log Transformed Data | 0.544 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.9 |
| Shapiro Wilk Test Statistic | 0.83 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 6.56E-06 |
| Lilliefors Test Statistic | 0.193 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.959 |
| A-D Test Statistic | 1.015 |
| A-D Critical (0.05) Value | 0.753 |
| K-S Test Statistic | 0.135 |
| K-S Critical(0.05) Value | 0.14 |

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.949 |
| Shapiro Wilk Test Statistic | 0.926 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0138 |
| Lilliefors Test Statistic | 0.152 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

RA17_SO_PestPCBs|PCB, Total Aroclors (AECOM Calc)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 24 |
| Minimum | 8.40E-04 |
| Maximum | 0.39 |
| Mean of Raw Data | 0.0148 |
| Standard Deviation of Raw Data | 0.0611 |
| Khat | 0.504 |
| Theta hat | 0.0295 |
| Kstar | 0.483 |
| Theta star | 0.0307 |
| Mean of Log Transformed Data | -5.47 |
| Standard Deviation of Log Transformed Data | 1.111 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.411 |
| Shapiro Wilk Test Statistic | 0.205 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0 |
| Lilliefors Test Statistic | 0.458 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.694 |
| A-D Test Statistic | 7.544 |
| A-D Critical (0.05) Value | 0.813 |
| K-S Test Statistic | 0.406 |
| K-S Critical(0.05) Value | 0.148 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.857 |
| Shapiro Wilk Test Statistic | 0.759 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 4.66E-08 |
| Lilliefors Test Statistic | 0.283 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 17 |
| Minimum | 6.7 |
| Maximum | 230 |
| Mean of Raw Data | 26.72 |
| Standard Deviation of Raw Data | 39.36 |
| Khat | 1.726 |
| Theta hat | 15.48 |
| Kstar | 1.614 |
| Theta star | 16.56 |
| Mean of Log Transformed Data | 2.969 |
| Standard Deviation of Log Transformed Data | 0.616 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.558 |
| Shapiro Wilk Test Statistic | 0.345 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0 |
| Lilliefors Test Statistic | 0.458 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.727 |
| A-D Test Statistic | 7.399 |
| A-D Critical (0.05) Value | 0.763 |
| K-S Test Statistic | 0.417 |
| K-S Critical(0.05) Value | 0.142 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.801 |
| Shapiro Wilk Test Statistic | 0.672 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 2.04E-10 |
| Lilliefors Test Statistic | 0.351 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_Petroleum|Oil Range Organics (C20-C36)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 29 |
| Minimum | 7.4 |
| Maximum | 860 |
| Mean of Raw Data | 72.98 |
| Standard Deviation of Raw Data | 143.1 |
| Khat | 0.774 |
| Theta hat | 94.34 |
| Kstar | 0.732 |
| Theta star | 99.67 |
| Mean of Log Transformed Data | 3.52 |

| | |
|---|---|
| Standard Deviation of Log Transformed Data | 1.105 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.651 |
| Shapiro Wilk Test Statistic | 0.461 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 3.22E-15 |
| Lilliefors Test Statistic | 0.323 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.882 |
| A-D Test Statistic | 2.83 |
| A-D Critical (0.05) Value | 0.788 |
| K-S Test Statistic | 0.242 |
| K-S Critical(0.05) Value | 0.145 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.955 |
| Shapiro Wilk Test Statistic | 0.909 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.00336 |
| Lilliefors Test Statistic | 0.216 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Dibenzo(a,h)anthracene

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 31 |
| Minimum | 0.002 |
| Maximum | 1.8 |
| Mean of Raw Data | 0.0686 |
| Standard Deviation of Raw Data | 0.291 |
| Khat | 0.356 |
| Theta hat | 0.192 |
| Kstar | 0.346 |
| Theta star | 0.198 |
| Mean of Log Transformed Data | -4.561 |
| Standard Deviation of Log Transformed Data | 1.286 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.452 |
| Shapiro Wilk Test Statistic | 0.241 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0 |
| Lilliefors Test Statistic | 0.46 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.794 |
| A-D Test Statistic | 8.937 |

| | |
|---|---|
| A-D Critical (0.05) Value | 0.845 |
| K-S Test Statistic | 0.389 |
| K-S Critical(0.05) Value | 0.15 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.834 |
| Shapiro Wilk Test Statistic | 0.718 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 3.28E-09 |
| Lilliefors Test Statistic | 0.325 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Naphthalene

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 27 |
| Minimum | 0.0011 |
| Maximum | 2.8 |
| Mean of Raw Data | 0.0811 |
| Standard Deviation of Raw Data | 0.441 |
| Khat | 0.301 |
| Theta hat | 0.27 |
| Kstar | 0.295 |
| Theta star | 0.275 |
| Mean of Log Transformed Data | -4.806 |
| Standard Deviation of Log Transformed Data | 1.249 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.38 |
| Shapiro Wilk Test Statistic | 0.179 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0 |
| Lilliefors Test Statistic | 0.486 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.723 |
| A-D Test Statistic | 10.57 |
| A-D Critical (0.05) Value | 0.858 |
| K-S Test Statistic | 0.463 |
| K-S Critical(0.05) Value | 0.151 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.815 |
| Shapiro Wilk Test Statistic | 0.702 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 1.24E-09 |
| Lilliefors Test Statistic | 0.349 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 38 |
| Minimum | 7.74E-08 |
| Maximum | 2.29E-06 |
| Mean of Raw Data | 3.93E-07 |
| Standard Deviation of Raw Data | 3.84E-07 |
| Khat | 1.857 |
| Theta hat | 2.11E-07 |
| Kstar | 1.734 |
| Theta star | 2.26E-07 |
| Mean of Log Transformed Data | -15.04 |
| Standard Deviation of Log Transformed Data | 0.744 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.801 |
| Shapiro Wilk Test Statistic | 0.673 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 2.18E-10 |
| Lilliefors Test Statistic | 0.214 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.923 |
| A-D Test Statistic | 0.669 |
| A-D Critical (0.05) Value | 0.761 |
| K-S Test Statistic | 0.14 |
| K-S Critical(0.05) Value | 0.141 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.99 |
| Shapiro Wilk Test Statistic | 0.978 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.72 |
| Lilliefors Test Statistic | 0.0848 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

| | Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 11:06:09 AM |
| From File | ProUCL_INPUT.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

RA17_SO_Metals|Lead (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | 6.4 |
| Maximum | 320 |
| Mean of Raw Data | 65.92 |

| | |
|---|---|
| Standard Deviation of Raw Data | 88.37 |
| Khat | 0.874 |
| Theta hat | 75.4 |
| Kstar | 0.776 |
| Theta star | 84.9 |
| Mean of Log Transformed Data | 3.517 |
| Standard Deviation of Log Transformed Data | 1.161 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.815 |
| Shapiro Wilk Test Statistic | 0.67 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.12E-06 |
| Lilliefors Test Statistic | 0.273 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.965 |
| A-D Test Statistic | 0.889 |
| A-D Critical (0.05) Value | 0.774 |
| K-S Test Statistic | 0.19 |
| K-S Critical(0.05) Value | 0.2 |

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.366 |
| Lilliefors Test Statistic | 0.118 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Lead (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | 1.7 |
| Maximum | 5100 |
| Mean of Raw Data | 276.5 |
| Standard Deviation of Raw Data | 1136 |
| Khat | 0.242 |
| Theta hat | 1143 |
| Kstar | 0.239 |
| Theta star | 1157 |
| Mean of Log Transformed Data | 2.669 |
| Standard Deviation of Log Transformed Data | 1.747 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.476 |
| Shapiro Wilk Test Statistic | 0.255 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.73E-11 |
| Lilliefors Test Statistic | 0.487 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.84 |
| A-D Test Statistic | 4.51 |
| A-D Critical (0.05) Value | 0.873 |
| K-S Test Statistic | 0.392 |
| K-S Critical(0.05) Value | 0.213 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.862 |
| Shapiro Wilk Test Statistic | 0.765 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.25E-04 |
| Lilliefors Test Statistic | 0.257 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_Metals|Manganese (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | 17 |
| Maximum | 1000 |
| Mean of Raw Data | 243.6 |
| Standard Deviation of Raw Data | 248 |
| Khat | 1.159 |
| Theta hat | 210.1 |
| Kstar | 1.019 |
| Theta star | 239.1 |
| Mean of Log Transformed Data | 5.006 |
| Standard Deviation of Log Transformed Data | 1.082 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.895 |
| Shapiro Wilk Test Statistic | 0.809 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 7.75E-04 |
| Lilliefors Test Statistic | 0.19 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.996 |
| A-D Test Statistic | 0.146 |
| A-D Critical (0.05) Value | 0.765 |
| K-S Test Statistic | 0.0878 |
| K-S Critical(0.05) Value | 0.199 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.996 |
| Shapiro Wilk Test Statistic | 0.987 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.989 |
| Lilliefors Test Statistic | 0.0738 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Manganese (3 - 4 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 18 |
| Minimum | 2 |
| Maximum | 1000 |
| Mean of Raw Data | 134.4 |
| Standard Deviation of Raw Data | 221.4 |
| Khat | 0.713 |
| Theta hat | 188.6 |
| Kstar | 0.639 |
| Theta star | 210.4 |
| Mean of Log Transformed Data | 4.055 |
| Standard Deviation of Log Transformed Data | 1.414 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.729 |
| Shapiro Wilk Test Statistic | 0.558 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 9.98E-08 |
| Lilliefors Test Statistic | 0.304 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.929 |
| A-D Test Statistic | 0.449 |
| A-D Critical (0.05) Value | 0.783 |
| K-S Test Statistic | 0.142 |
| K-S Critical(0.05) Value | 0.202 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.981 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.924 |
| Lilliefors Test Statistic | 0.108 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)anthracene (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 18 |
| Minimum | 0.0039 |
| Maximum | 0.67 |
| Mean of Raw Data | 0.0927 |
| Standard Deviation of Raw Data | 0.167 |
| Khat | 0.597 |
| Theta hat | 0.155 |
| Kstar | 0.541 |
| Theta star | 0.171 |
| Mean of Log Transformed Data | -3.415 |
| Standard Deviation of Log Transformed Data | 1.401 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.74 |

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.566 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.31E-07 |
| Lilliefors Test Statistic | 0.318 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.962 |
| A-D Test Statistic | 1.292 |
| A-D Critical (0.05) Value | 0.794 |
| K-S Test Statistic | 0.261 |
| K-S Critical(0.05) Value | 0.204 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.945 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.321 |
| Lilliefors Test Statistic | 0.201 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)anthracene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | 0.0016 |
| Maximum | 11 |
| Mean of Raw Data | 0.565 |
| Standard Deviation of Raw Data | 2.456 |
| Khat | 0.195 |
| Theta hat | 2.903 |
| Kstar | 0.199 |
| Theta star | 2.843 |
| Mean of Log Transformed Data | -4.366 |
| Standard Deviation of Log Transformed Data | 1.859 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.462 |
| Shapiro Wilk Test Statistic | 0.241 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.98E-11 |
| Lilliefors Test Statistic | 0.526 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.847 |
| A-D Test Statistic | 5.431 |
| A-D Critical (0.05) Value | 0.897 |
| K-S Test Statistic | 0.41 |
| K-S Critical(0.05) Value | 0.215 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.803 |
| Shapiro Wilk Test Statistic | 0.673 |

| | |
|---|---|
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.21E-06 |
| Lilliefors Test Statistic | 0.343 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Benzo(a)pyrene (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | 0.0039 |
| Maximum | 1.5 |
| Mean of Raw Data | 0.131 |
| Standard Deviation of Raw Data | 0.335 |
| Khat | 0.454 |
| Theta hat | 0.288 |
| Kstar | 0.42 |
| Theta star | 0.312 |
| Mean of Log Transformed Data | -3.452 |
| Standard Deviation of Log Transformed Data | 1.521 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.615 |
| Shapiro Wilk Test Statistic | 0.406 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.27E-09 |
| Lilliefors Test Statistic | 0.356 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.9 |
| A-D Test Statistic | 1.839 |
| A-D Critical (0.05) Value | 0.812 |
| K-S Test Statistic | 0.288 |
| K-S Critical(0.05) Value | 0.206 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.963 |
| Shapiro Wilk Test Statistic | 0.928 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.149 |
| Lilliefors Test Statistic | 0.212 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)pyrene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | 0.0037 |
| Maximum | 8.7 |
| Mean of Raw Data | 0.45 |
| Standard Deviation of Raw Data | 1.942 |
| Khat | 0.211 |

| | |
|---|---|
| Theta hat | 2.133 |
| Kstar | 0.213 |
| Theta star | 2.116 |
| Mean of Log Transformed Data | -4.254 |
| Standard Deviation of Log Transformed Data | 1.702 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.463 |
| Shapiro Wilk Test Statistic | 0.242 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.02E-11 |
| Lilliefors Test Statistic | 0.523 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.84 |
| A-D Test Statistic | 5.884 |
| A-D Critical (0.05) Value | 0.887 |
| K-S Test Statistic | 0.447 |
| K-S Critical(0.05) Value | 0.214 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.735 |
| Shapiro Wilk Test Statistic | 0.567 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.32E-07 |
| Lilliefors Test Statistic | 0.327 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Benzo(b)fluoranthene (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | 0.0039 |
| Maximum | 1.3 |
| Mean of Raw Data | 0.136 |
| Standard Deviation of Raw Data | 0.294 |
| Khat | 0.519 |
| Theta hat | 0.263 |
| Kstar | 0.474 |
| Theta star | 0.287 |
| Mean of Log Transformed Data | -3.211 |
| Standard Deviation of Log Transformed Data | 1.498 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.672 |
| Shapiro Wilk Test Statistic | 0.478 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 9.34E-09 |
| Lilliefors Test Statistic | 0.326 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.93 |
| A-D Test Statistic | 1.342 |
| A-D Critical (0.05) Value | 0.801 |
| K-S Test Statistic | 0.271 |
| K-S Critical(0.05) Value | 0.205 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| Shapiro Wilk Test Statistic | 0.954 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.441 |
| Lilliefors Test Statistic | 0.188 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(b)fluoranthene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | 0.0037 |
| Maximum | 11 |
| Mean of Raw Data | 0.57 |
| Standard Deviation of Raw Data | 2.455 |
| Khat | 0.205 |
| Theta hat | 2.788 |
| Kstar | 0.207 |
| Theta star | 2.752 |
| Mean of Log Transformed Data | -4.147 |
| Standard Deviation of Log Transformed Data | 1.803 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.464 |
| Shapiro Wilk Test Statistic | 0.243 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.08E-11 |
| Lilliefors Test Statistic | 0.523 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.844 |
| A-D Test Statistic | 5.564 |
| A-D Critical (0.05) Value | 0.89 |
| K-S Test Statistic | 0.412 |
| K-S Critical(0.05) Value | 0.215 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.764 |
| Shapiro Wilk Test Statistic | 0.608 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.80E-07 |
| Lilliefors Test Statistic | 0.342 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | 0.0039 |
| Maximum | 1.6 |
| Mean of Raw Data | 0.123 |
| Standard Deviation of Raw Data | 0.355 |
| Khat | 0.421 |
| Theta hat | 0.293 |
| Kstar | 0.391 |
| Theta star | 0.315 |
| Mean of Log Transformed Data | -3.643 |
| Standard Deviation of Log Transformed Data | 1.511 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.574 |
| Shapiro Wilk Test Statistic | 0.358 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 3.60E-10 |
| Lilliefors Test Statistic | 0.393 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.872 |
| A-D Test Statistic | 2.324 |
| A-D Critical (0.05) Value | 0.819 |
| K-S Test Statistic | 0.3 |
| K-S Critical(0.05) Value | 0.207 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.944 |
| Shapiro Wilk Test Statistic | 0.895 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.0333 |
| Lilliefors Test Statistic | 0.234 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (3 - 4 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | 0.0037 |
| Maximum | 5.1 |
| Mean of Raw Data | 0.268 |
| Standard Deviation of Raw Data | 1.138 |
| Khat | 0.237 |
| Theta hat | 1.129 |
| Kstar | 0.235 |
| Theta star | 1.14 |

| | |
|---|---|
| Mean of Log Transformed Data | -4.34 |
| Standard Deviation of Log Transformed Data | 1.561 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.464 |
| Shapiro Wilk Test Statistic | 0.243 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.08E-11 |
| Lilliefors Test Statistic | 0.521 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.831 |
| A-D Test Statistic | 5.952 |
| A-D Critical (0.05) Value | 0.875 |
| K-S Test Statistic | 0.462 |
| K-S Critical(0.05) Value | 0.213 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.722 |
| Shapiro Wilk Test Statistic | 0.55 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 7.74E-08 |
| Lilliefors Test Statistic | 0.332 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|BaP-TE (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | 0.00131 |
| Maximum | 2.34 |
| Mean of Raw Data | 0.203 |
| Standard Deviation of Raw Data | 0.524 |
| Khat | 0.407 |
| Theta hat | 0.499 |
| Kstar | 0.379 |
| Theta star | 0.536 |
| Mean of Log Transformed Data | -3.209 |
| Standard Deviation of Log Transformed Data | 1.788 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.618 |
| Shapiro Wilk Test Statistic | 0.41 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.41E-09 |
| Lilliefors Test Statistic | 0.355 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.909 |

| | |
|---|---|
| A-D Test Statistic | 1.318 |
| A-D Critical (0.05) Value | 0.822 |
| K-S Test Statistic | 0.257 |
| K-S Critical(0.05) Value | 0.207 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.987 |
| Shapiro Wilk Test Statistic | 0.98 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.914 |
| Lilliefors Test Statistic | 0.156 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|BaP-TE (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | 1.61E-04 |
| Maximum | 13.3 |
| Mean of Raw Data | 0.685 |
| Standard Deviation of Raw Data | 2.97 |
| Khat | 0.177 |
| Theta hat | 3.876 |
| Kstar | 0.184 |
| Theta star | 3.732 |
| Mean of Log Transformed Data | -4.624 |
| Standard Deviation of Log Transformed Data | 2.363 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.464 |
| Shapiro Wilk Test Statistic | 0.243 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.06E-11 |
| Lilliefors Test Statistic | 0.522 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.857 |
| A-D Test Statistic | 4.325 |
| A-D Critical (0.05) Value | 0.914 |
| K-S Test Statistic | 0.397 |
| K-S Critical(0.05) Value | 0.217 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.906 |
| Shapiro Wilk Test Statistic | 0.844 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.00306 |
| Lilliefors Test Statistic | 0.23 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_DioxinFurans|TCDD TEQ HH (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | 8.82E-07 |
| Maximum | 2.10E-05 |
| Mean of Raw Data | 6.17E-06 |
| Standard Deviation of Raw Data | 4.85E-06 |
| Khat | 2.227 |
| Theta hat | 2.77E-06 |
| Kstar | 1.927 |
| Theta star | 3.20E-06 |
| Mean of Log Transformed Data | -12.24 |
| Standard Deviation of Log Transformed Data | 0.717 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.875 |
| Shapiro Wilk Test Statistic | 0.779 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 2.23E-04 |
| Lilliefors Test Statistic | 0.286 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.961 |
| A-D Test Statistic | 0.487 |
| A-D Critical (0.05) Value | 0.751 |
| K-S Test Statistic | 0.193 |
| K-S Critical(0.05) Value | 0.196 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.969 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.702 |
| Lilliefors Test Statistic | 0.158 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_DioxinFurans|TCDD TEQ HH (3 - 4 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | 1.30E-07 |
| Maximum | 2.71E-05 |
| Mean of Raw Data | 4.25E-06 |
| Standard Deviation of Raw Data | 7.44E-06 |
| Khat | 0.671 |
| Theta hat | 6.34E-06 |
| Kstar | 0.603 |
| Theta star | 7.04E-06 |
| Mean of Log Transformed Data | -13.27 |
| Standard Deviation of Log Transformed Data | 1.339 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.72 |
| Shapiro Wilk Test Statistic | 0.531 |

| | |
|---|---|
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.55E-08 |
| Lilliefors Test Statistic | 0.344 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.919 |
| A-D Test Statistic | 1.197 |
| A-D Critical (0.05) Value | 0.787 |
| K-S Test Statistic | 0.202 |
| K-S Critical(0.05) Value | 0.202 |

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.978 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.52 |
| Lilliefors Test Statistic | 0.104 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 11:12:45 AM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

RA17_SO_Metals|Arsenic

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 29 |
| Minimum | -0.229 |
| Maximum | 1.477 |
| Mean of Raw Data | 0.543 |
| Standard Deviation of Raw Data | 0.324 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.981 |
| Shapiro Wilk Test Statistic | 0.975 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.619 |
| Lilliefors Test Statistic | 0.116 |
| Lilliefors Critical (0.05) Value | 0.139 |
| Data appear Normal at (0.05) Significance Level | |

RA17_SO_Metals|Chromium

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 24 |
| Minimum | 0.568 |
| Maximum | 2.041 |
| Mean of Raw Data | 1.147 |
| Standard Deviation of Raw Data | 0.279 |
| Khat | 17.66 |
| Theta hat | 0.0649 |
| Kstar | 16.35 |
| Theta star | 0.0701 |
| Mean of Log Transformed Data | 0.108 |
| Standard Deviation of Log Transformed Data | 0.244 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.966 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0882 |
| Lilliefors Test Statistic | 0.123 |
| Lilliefors Critical (0.05) Value | 0.139 |
| Data appear Normal at (0.05) Significance Level | |

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.978 |
| A-D Test Statistic | 0.613 |
| A-D Critical (0.05) Value | 0.747 |
| K-S Test Statistic | 0.109 |
| K-S Critical(0.05) Value | 0.139 |
| Data appear Gamma Distributed at (0.05) Significance Level | |

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.978 |
| Shapiro Wilk Test Statistic | 0.968 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.403 |
| Lilliefors Test Statistic | 0.125 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Cobalt

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 34 |
| Minimum | -0.328 |
| Maximum | 1.204 |
| Mean of Raw Data | 0.672 |
| Standard Deviation of Raw Data | 0.379 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.926 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0146 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Approximate Normal at (0.05) Significance Level

RA17_SO_Metals|Nickel

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 34 |
| Minimum | -0.00436 |
| Maximum | 1.944 |
| Mean of Raw Data | 0.881 |
| Standard Deviation of Raw Data | 0.401 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.207 |
| Lilliefors Test Statistic | 0.131 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Normal at (0.05) Significance Level

RA17_SO_Metals|Thallium

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 28 |
| Minimum | -1.796 |
| Maximum | -0.194 |
| Mean of Raw Data | -1.028 |
| Standard Deviation of Raw Data | 0.254 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.955 |
| Shapiro Wilk Test Statistic | 0.946 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0766 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Normal at (0.05) Significance Level

RA17_SO_Metals|Vanadium

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 25 |
| Minimum | 0.531 |
| Maximum | 1.903 |
| Mean of Raw Data | 1.353 |
| Standard Deviation of Raw Data | 0.236 |
| Khat | 27.43 |
| Theta hat | 0.0493 |
| Kstar | 25.39 |
| Theta star | 0.0533 |
| Mean of Log Transformed Data | 0.284 |
| Standard Deviation of Log Transformed Data | 0.208 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.949 |
| Shapiro Wilk Test Statistic | 0.926 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.0138 |
| Lilliefors Test Statistic | 0.152 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.941 |
| A-D Test Statistic | 1.579 |
| A-D Critical (0.05) Value | 0.747 |
| K-S Test Statistic | 0.182 |
| K-S Critical(0.05) Value | 0.139 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.879 |
| Shapiro Wilk Test Statistic | 0.807 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 1.21E-06 |
| Lilliefors Test Statistic | 0.204 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_PestPCBs|PCB, Total Aroclors (AECOM Calc)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 24 |

| | |
|---|---|
| Minimum | -3.076 |
| Maximum | -0.409 |
| Mean of Raw Data | -2.376 |
| Standard Deviation of Raw Data | 0.482 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.857 |
| Shapiro Wilk Test Statistic | 0.759 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 4.66E-08 |
| Lilliefors Test Statistic | 0.283 |
| Lilliefors Critical (0.05) Value | 0.139 |
| Data not Normal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 17 |
| Minimum | 0.826 |
| Maximum | 2.362 |
| Mean of Raw Data | 1.289 |
| Standard Deviation of Raw Data | 0.267 |
| Khat | 28.83 |
| Theta hat | 0.0447 |
| Kstar | 26.69 |
| Theta star | 0.0483 |
| Mean of Log Transformed Data | 0.237 |
| Standard Deviation of Log Transformed Data | 0.183 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.801 |
| Shapiro Wilk Test Statistic | 0.672 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 2.04E-10 |
| Lilliefors Test Statistic | 0.351 |
| Lilliefors Critical (0.05) Value | 0.139 |
| Data not Normal at (0.05) Significance Level | |

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.824 |
| A-D Test Statistic | 4.523 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.322 |
| K-S Critical(0.05) Value | 0.139 |
| Data not Gamma Distributed at (0.05) Significance Level | |

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.858 |
| Shapiro Wilk Test Statistic | 0.765 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 6.75E-08 |
| Lilliefors Test Statistic | 0.308 |
| Lilliefors Critical (0.05) Value | 0.139 |
| Data not Lognormal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_Petroleum|Oil Range Organics (C20-C36)

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 29 |
| Minimum | 0.869 |
| Maximum | 2.934 |
| Mean of Raw Data | 1.529 |
| Standard Deviation of Raw Data | 0.48 |
| Khat | 11.43 |
| Theta hat | 0.134 |
| Kstar | 10.59 |
| Theta star | 0.144 |
| Mean of Log Transformed Data | 0.38 |
| Standard Deviation of Log Transformed Data | 0.298 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.955 |
| Shapiro Wilk Test Statistic | 0.909 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.00336 |
| Lilliefors Test Statistic | 0.216 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.98 |
| A-D Test Statistic | 0.99 |
| A-D Critical (0.05) Value | 0.748 |
| K-S Test Statistic | 0.198 |
| K-S Critical(0.05) Value | 0.139 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.98 |
| Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.124 |
| Lilliefors Test Statistic | 0.182 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Dibenzo(a,h)anthracene

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 31 |
| Minimum | -2.699 |
| Maximum | 0.255 |
| Mean of Raw Data | -1.981 |
| Standard Deviation of Raw Data | 0.559 |

Data contains values <= 0

Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.834 |

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.718 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 3.28E-09 |
| Lilliefors Test Statistic | 0.325 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Naphthalene

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 27 |
| Minimum | -2.959 |
| Maximum | 0.447 |
| Mean of Raw Data | -2.087 |
| Standard Deviation of Raw Data | 0.542 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.815 |
| Shapiro Wilk Test Statistic | 0.702 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 1.24E-09 |
| Lilliefors Test Statistic | 0.349 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data not Normal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 40 |
| Number of Distinct Observations | 38 |
| Minimum | -7.111 |
| Maximum | -5.64 |
| Mean of Raw Data | -6.533 |
| Standard Deviation of Raw Data | 0.323 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.99 |
| Shapiro Wilk Test Statistic | 0.978 |
| Shapiro Wilk Critical (0.05) Value | 0.94 |
| Approximate Shapiro Wilk P Value | 0.72 |
| Lilliefors Test Statistic | 0.0848 |
| Lilliefors Critical (0.05) Value | 0.139 |

Data appear Normal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 11:15:48 AM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

RA17_SO_Metals|Lead (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | 0.806 |
| Maximum | 2.505 |
| Mean of Raw Data | 1.528 |
| Standard Deviation of Raw Data | 0.504 |
| Khat | 9.567 |
| Theta hat | 0.16 |
| Kstar | 8.165 |
| Theta star | 0.187 |
| Mean of Log Transformed Data | 0.371 |
| Standard Deviation of Log Transformed Data | 0.339 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.366 |
| Lilliefors Test Statistic | 0.118 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.274 |
| A-D Critical (0.05) Value | 0.742 |
| K-S Test Statistic | 0.117 |
| K-S Critical(0.05) Value | 0.194 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.955 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.49 |
| Lilliefors Test Statistic | 0.118 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Lead (3 - 4 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 19 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 18 |
| Minimum | 0.23 |
| Maximum | 2.23 |
| Mean of Raw Data | 1.025 |
| Standard Deviation of Raw Data | 0.477 |
| Khat | 4.889 |
| Theta hat | 0.21 |
| Kstar | 4.152 |
| Theta star | 0.247 |
| Mean of Log Transformed Data | -0.081 |
| Standard Deviation of Log Transformed Data | 0.496 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.94 |
| Shapiro Wilk Test Statistic | 0.895 |
| Shapiro Wilk Critical (0.05) Value | 0.901 |
| Approximate Shapiro Wilk P Value | 0.0354 |
| Lilliefors Test Statistic | 0.209 |
| Lilliefors Critical (0.05) Value | 0.197 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.972 |
| A-D Test Statistic | 0.58 |
| A-D Critical (0.05) Value | 0.743 |
| K-S Test Statistic | 0.17 |
| K-S Critical(0.05) Value | 0.199 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.947 |
| Shapiro Wilk Test Statistic | 0.916 |
| Shapiro Wilk Critical (0.05) Value | 0.901 |
| Approximate Shapiro Wilk P Value | 0.0846 |
| Lilliefors Test Statistic | 0.201 |
| Lilliefors Critical (0.05) Value | 0.197 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_Metals|Manganese (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | 1.23 |
| Maximum | 3 |
| Mean of Raw Data | 2.174 |
| Standard Deviation of Raw Data | 0.47 |
| Khat | 20.71 |
| Theta hat | 0.105 |
| Kstar | 17.64 |
| Theta star | 0.123 |
| Mean of Log Transformed Data | 0.752 |
| Standard Deviation of Log Transformed Data | 0.233 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.996 |
| Shapiro Wilk Test Statistic | 0.987 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.989 |
| Lilliefors Test Statistic | 0.0738 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.221 |
| A-D Critical (0.05) Value | 0.741 |
| K-S Test Statistic | 0.0967 |
| K-S Critical(0.05) Value | 0.193 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.98 |
| Shapiro Wilk Test Statistic | 0.958 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.514 |
| Lilliefors Test Statistic | 0.104 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Lognormal at (0.05) Significance Level

RA17_SO_Metals|Manganese (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 18 |
| Minimum | 0.301 |
| Maximum | 3 |
| Mean of Raw Data | 1.761 |
| Standard Deviation of Raw Data | 0.614 |
| Khat | 5.987 |
| Theta hat | 0.294 |
| Kstar | 5.122 |
| Theta star | 0.344 |
| Mean of Log Transformed Data | 0.48 |
| Standard Deviation of Log Transformed Data | 0.489 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.981 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.924 |
| Lilliefors Test Statistic | 0.108 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.961 |
| A-D Test Statistic | 0.656 |
| A-D Critical (0.05) Value | 0.745 |
| K-S Test Statistic | 0.165 |
| K-S Critical(0.05) Value | 0.194 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.882 |
| Shapiro Wilk Test Statistic | 0.801 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 5.23E-04 |
| Lilliefors Test Statistic | 0.186 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate_Lognormal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)anthracene (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 18 |
| Minimum | -2.409 |
| Maximum | -0.174 |
| Mean of Raw Data | -1.483 |
| Standard Deviation of Raw Data | 0.608 |

Data contains values <= 0

Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.945 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.321 |
| Lilliefors Test Statistic | 0.201 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate Normal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)anthracene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | -2.796 |
| Maximum | 1.041 |
| Mean of Raw Data | -1.896 |
| Standard Deviation of Raw Data | 0.807 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.803 |
| Shapiro Wilk Test Statistic | 0.673 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.21E-06 |
| Lilliefors Test Statistic | 0.343 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Benzo(a)pyrene (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | -2.409 |
| Maximum | 0.176 |
| Mean of Raw Data | -1.499 |
| Standard Deviation of Raw Data | 0.661 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.963 |
| Shapiro Wilk Test Statistic | 0.928 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.149 |
| Lilliefors Test Statistic | 0.212 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Approximate Normal at (0.05) Significance Level

RA17_SO_SVOCs|Benzo(a)pyrene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | -2.432 |
| Maximum | 0.94 |

| | |
|---|---|
| Mean of Raw Data | -1.847 |
| Standard Deviation of Raw Data | 0.739 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.735 |
| Shapiro Wilk Test Statistic | 0.567 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 1.32E-07 |
| Lilliefors Test Statistic | 0.327 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data not Normal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Benzo(b)fluoranthene (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | -2.409 |
| Maximum | 0.114 |
| Mean of Raw Data | -1.395 |
| Standard Deviation of Raw Data | 0.651 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| Shapiro Wilk Test Statistic | 0.954 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.441 |
| Lilliefors Test Statistic | 0.188 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data appear Normal at (0.05) Significance Level | |

RA17_SO_SVOCs|Benzo(b)fluoranthene (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | -2.432 |
| Maximum | 1.041 |
| Mean of Raw Data | -1.801 |
| Standard Deviation of Raw Data | 0.783 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.764 |
| Shapiro Wilk Test Statistic | 0.608 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 4.80E-07 |
| Lilliefors Test Statistic | 0.342 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data not Normal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | -2.409 |
| Maximum | 0.204 |
| Mean of Raw Data | -1.582 |
| Standard Deviation of Raw Data | 0.656 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.944 |
| Shapiro Wilk Test Statistic | 0.895 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.0333 |
| Lilliefors Test Statistic | 0.234 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data not Normal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (3 - 4 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 16 |
| Minimum | -2.432 |
| Maximum | 0.708 |
| Mean of Raw Data | -1.885 |
| Standard Deviation of Raw Data | 0.678 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.722 |
| Shapiro Wilk Test Statistic | 0.55 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 7.74E-08 |
| Lilliefors Test Statistic | 0.332 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data not Normal at (0.05) Significance Level | |

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_SVOCs|BaP-TE (0 - 1 ft)

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | -2.883 |
| Maximum | 0.369 |
| Mean of Raw Data | -1.393 |
| Standard Deviation of Raw Data | 0.777 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.987 |
| Shapiro Wilk Test Statistic | 0.98 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.914 |
| Lilliefors Test Statistic | 0.156 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Normal at (0.05) Significance Level

RA17_SO_SVOCs|BaP-TE (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 17 |
| Minimum | -3.793 |
| Maximum | 1.124 |
| Mean of Raw Data | -2.008 |
| Standard Deviation of Raw Data | 1.026 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.906 |
| Shapiro Wilk Test Statistic | 0.844 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.00306 |
| Lilliefors Test Statistic | 0.23 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data not Normal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

RA17_SO_DioxinFurans|TCDD TEQ HH (0 - 1 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 20 |
| Minimum | -6.055 |
| Maximum | -4.678 |
| Mean of Raw Data | -5.314 |
| Standard Deviation of Raw Data | 0.311 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.969 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.702 |
| Lilliefors Test Statistic | 0.158 |
| Lilliefors Critical (0.05) Value | 0.192 |

Data appear Normal at (0.05) Significance Level

RA17_SO_DioxinFurans|TCDD TEQ HH (3 - 4 ft)

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 20 |
| Number of Distinct Observations | 19 |
| Minimum | -6.886 |

| | |
|---|---|
| Maximum | -4.567 |
| Mean of Raw Data | -5.765 |
| Standard Deviation of Raw Data | 0.582 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.978 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.905 |
| Approximate Shapiro Wilk P Value | 0.52 |
| Lilliefors Test Statistic | 0.104 |
| Lilliefors Critical (0.05) Value | 0.192 |
| Data appear Normal at (0.05) Significance Level | |

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.11/17/2018 9:56:16 AM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Rosner's Outlier Test for RA17_SO_Metals|Arsenic

| | |
|---|---|
| Mean | 0.543 |
| Standard Deviation | 0.324 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.543 | 0.32 | 1.477 | 36 | 2.917 | 3.04 | 3.38 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Cobalt

| | |
|---|---|
| Mean | 0.672 |
| Standard Deviation | 0.379 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.672 | 0.374 | -0.328 | 4 | 2.672 | 3.04 | 3.38 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Nickel

| | |
|---|---|
| Mean | 0.881 |
| Standard Deviation | 0.401 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.881 | 0.396 | 1.944 | 19 | 2.688 | 3.04 | 3.38 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Thallium

| | |
|---|---|
| Mean | -1.028 |
| Standard Deviation | 0.254 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.028 | 0.251 | -0.194 | 36 | 3.325 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: -0.194

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Thallium

| | |
|---|---|
| Mean | -1.049 |

| | |
|---|---|
| Standard Deviation | 0.218 |
| Number of data | 39 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.049 | 0.215 | -1.796 | 4 | 3.473 | 3.03 | 3.37 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: -1.796

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: -1.796

Rosner's Outlier Test for RA17_SO_Metals|Thallium

| | |
|---|---|
| Mean | -1.03 |
| Standard Deviation | 0.182 |
| Number of data | 38 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.03 | 0.18 | -1.432 | 2 | 2.235 | 3.01 | 3.36 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Chromium

| | |
|---|---|
| Mean | 1.147 |
| Standard Deviation | 0.279 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 1.147 | 0.276 | 2.041 | 36 | 3.247 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 2.041

For 1% Significance Level, there is no Potential Outlier

Rosner's Outlier Test for RA17_SO_Metals|Chromium

| | |
|---|---|
| Mean | 1.124 |
| Standard Deviation | 0.242 |
| Number of data | 39 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 1.124 | 0.238 | 1.756 | 35 | 2.652 | 3.03 | 3.37 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.11/17/2018 12:58:41 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_Metals|Lead (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 2.50514997831991 is a Potential

Test Statistic: 0.114

For 10% significance level, 2.50514997831991 is not an
For 5% significance level, 2.50514997831991 is not an
For 1% significance level, 2.50514997831991 is not an

2. Observation Value 0.806179973983887 is a Potentia

Test Statistic: 0.060

For 10% significance level, 0.806179973983887 is not a
For 5% significance level, 0.806179973983887 is not an
For 1% significance level, 0.806179973983887 is not an

Dixon's Outlier Test for RA17_SO_Metals|Lead (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 3.70757017609794 is a Potential

Test Statistic: 0.574

For 10% significance level, 3.70757017609794 is an ou
For 5% significance level, 3.70757017609794 is an outl
For 1% significance level, 3.70757017609794 is an outl

2. Observation Value 0.230448921378274 is a Potentia

Test Statistic: 0.189

For 10% significance level, 0.230448921378274 is not a
For 5% significance level, 0.230448921378274 is not an
For 1% significance level, 0.230448921378274 is not an

Dixon's Outlier Test for RA17_SO_Metals|Lead (3 - 4 ft)

Number of Observations = 19
10% critical value: 0.412
5% critical value: 0.462
1% critical value: 0.547

1. Observation Value 2.23044892137827 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.315

For 10% significance level, 2.23044892137827 is not an outlier.
For 5% significance level, 2.23044892137827 is not an outlier.
For 1% significance level, 2.23044892137827 is not an outlier.

2. Observation Value 0.230448921378274 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.214

For 10% significance level, 0.230448921378274 is not an outlier.
For 5% significance level, 0.230448921378274 is not an outlier.
For 1% significance level, 0.230448921378274 is not an outlier.

Outlier Tests for Selected Uncensored Variables

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/25/2018 5:00:20 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

on's Outlier Test for RA17_SO_Metals|Manganese (0 -

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 3 is a Potential Outlier (Upper Ta

Test Statistic: 0.215

For 10% significance level, 3 is not an outlier.
For 5% significance level, 3 is not an outlier.
For 1% significance level, 3 is not an outlier.

2. Observation Value 1.23044892137827 is a Potential

Test Statistic: 0.223

For 10% significance level, 1.23044892137827 is not ar
For 5% significance level, 1.23044892137827 is not an
For 1% significance level, 1.23044892137827 is not an

on's Outlier Test for RA17_SO_Metals|Manganese (3 - 4

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 3 is a Potential Outlier (Upper Ta

Test Statistic: 0.316

For 10% significance level, 3 is not an outlier.
For 5% significance level, 3 is not an outlier.
For 1% significance level, 3 is not an outlier.

2. Observation Value 0.301029995663981 is a Potentia

Test Statistic: 0.400

For 10% significance level, 0.301029995663981 is not a
For 5% significance level, 0.301029995663981 is not ar
For 1% significance level, 0.301029995663981 is not ar

Outlier Tests for Selected Uncensored Variables

| | | |
|---|---|---|
| User Selected Options | | |
| Date/Time of Computation | ProUCL 5.19/27/2018 11:18:33 AM | |
| From File | | ProUCL_INPUT.xls |
| Full Precision | | OFF |

Rosner's Outlier Test for RA17_SO_Metals|Vanadium

| | |
|---|---|
| Mean | 25.76 |
| Standard Deviation | 14.21 |
| Number of data | 40 |
| Number of suspected outliers | 10 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 25.76 | 14.03 | 80 | 30 | 3.865 | 3.04 | 3.38 |
| 2 | 24.36 | 11.31 | 57 | 28 | 2.886 | 3.03 | 3.37 |
| 3 | 23.51 | 10.09 | 56 | 4 | 3.22 | 3.01 | 3.36 |
| 4 | 22.63 | 8.634 | 50 | 32 | 3.17 | 3 | 3.34 |
| 5 | 21.87 | 7.394 | 3.4 | 38 | 2.498 | 2.99 | 3.33 |
| 6 | 22.39 | 6.779 | 6.8 | 37 | 2.3 | 2.976 | 3.314 |
| 7 | 22.85 | 6.306 | 36 | 12 | 2.085 | 2.962 | 3.298 |
| 8 | 22.45 | 5.953 | 36 | 35 | 2.275 | 2.948 | 3.282 |
| 9 | 22.03 | 5.521 | 35 | 9 | 2.349 | 2.934 | 3.266 |
| 10 | 21.61 | 5.071 | 11 | 6 | 2.093 | 2.92 | 3.25 |

For 5% significance level, there are 4 Potential Outliers
Potential outliers are:
80, 57, 56, 50

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 80

Outlier Tests for Selected Uncensored Variables

| | | |
|---|---|---|
| User Selected Options | | |
| Date/Time of Computation | ProUCL 5.19/27/2018 9:28:23 AM | |
| From File | | ProUCL_INPUT.xls |
| Full Precision | | OFF |

Rosner's Outlier Test for RA17_SO_PestPCBs|PCB, Total Aroclors (AECOM Calc)

| | |
|---|---|
| Mean | 0.0148 |
| Standard Deviation | 0.0611 |
| Number of data | 40 |

Number of suspected outliers 1

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.0148 | 0.0603 | 0.39 | 35 | 6.221 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 0.39

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 0.39

Rosner's Outlier Test for RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

| | |
|---|---|
| Mean | 26.72 |
| Standard Deviation | 39.36 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 26.72 | 38.86 | 230 | 8 | 5.23 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 230

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 230

Rosner's Outlier Test for RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

| | |
|---|---|
| Mean | 21.51 |
| Standard Deviation | 21.79 |
| Number of data | 39 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 21.51 | 21.51 | 150 | 9 | 5.975 | 3.03 | 3.37 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 150

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 150

Rosner's Outlier Test for RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

| | |
|---|---|
| Mean | 18.13 |
| Standard Deviation | 5.437 |
| Number of data | 38 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 18.13 | 5.365 | 40 | 34 | 4.077 | 3.01 | 3.36 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 40

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 40

Rosner's Outlier Test for RA17_SO_Petroleum|Diesel Range Organics (C10-C20)

| | |
|---|---|
| Mean | 17.54 |
| Standard Deviation | 4.091 |
| Number of data | 37 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 17.54 | 4.035 | 6.7 | 34 | 2.686 | 3 | 3.34 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | | |
|---|---|---|
| User Selected Options | | |
| Date/Time of Computation | ProUCL 5.19/27/2018 9:32:17 AM | |
| From File | | ProUCL_INPUT_Log.xls |
| Full Precision | | OFF |

Rosner's Outlier Test for RA17_SO_Petroleum|Oil Range Organics (C20-C36)

| | |
|---|---|
| Mean | 1.529 |
| Standard Deviation | 0.48 |
| Number of data | 40 |
| Number of suspected outliers | 10 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 1.529 | 0.474 | 2.934 | 8 | 2.968 | 3.04 | 3.38 |
| 2 | 1.492 | 0.428 | 2.505 | 10 | 2.368 | 3.03 | 3.37 |
| 3 | 1.466 | 0.399 | 2.301 | 36 | 2.093 | 3.01 | 3.36 |
| 4 | 1.443 | 0.379 | 2.255 | 35 | 2.141 | 3 | 3.34 |
| 5 | 1.421 | 0.359 | 2.204 | 26 | 2.185 | 2.99 | 3.33 |
| 6 | 1.398 | 0.337 | 2.041 | 5 | 1.906 | 2.976 | 3.314 |
| 7 | 1.379 | 0.323 | 2.041 | 9 | 2.049 | 2.962 | 3.298 |
| 8 | 1.359 | 0.306 | 2 | 33 | 2.095 | 2.948 | 3.282 |
| 9 | 1.339 | 0.288 | 1.949 | 25 | 2.12 | 2.934 | 3.266 |
| 10 | 1.32 | 0.27 | 1.881 | 19 | 2.08 | 2.92 | 3.25 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | | |
|---|---|---|
| User Selected Options | | |
| Date/Time of Computation | ProUCL 5.19/27/2018 9:44:49 AM | |
| From File | | ProUCL_INPUT_Log.xls |
| Full Precision | | OFF |

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(a)anthracene (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value -0.173925197299174 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.267

For 10% significance level, -0.173925197299174 is not an outlier.
For 5% significance level, -0.173925197299174 is not an outlier.
For 1% significance level, -0.173925197299174 is not an outlier.

2. Observation Value -2.4089353929735 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.156

For 10% significance level, -2.4089353929735 is not an outlier.
For 5% significance level, -2.4089353929735 is not an outlier.
For 1% significance level, -2.4089353929735 is not an outlier.

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(a)anthracene (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 1.04139268515823 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.644

For 10% significance level, 1.04139268515823 is an outlier.
For 5% significance level, 1.04139268515823 is an outlier.
For 1% significance level, 1.04139268515823 is an outlier.

2. Observation Value -2.79588001734408 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.227

For 10% significance level, -2.79588001734408 is not an outlier.
For 5% significance level, -2.79588001734408 is not an outlier.
For 1% significance level, -2.79588001734408 is not an outlier.

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 9:45:34 AM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(a)pyrene (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 0.176091259055681 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.395

For 10% significance level, 0.176091259055681 is not an outlier.
For 5% significance level, 0.176091259055681 is not an outlier.
For 1% significance level, 0.176091259055681 is not an outlier.

2. Observation Value -2.4089353929735 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.153

For 10% significance level, -2.4089353929735 is not an outlier.
For 5% significance level, -2.4089353929735 is not an outlier.
For 1% significance level, -2.4089353929735 is not an outlier.

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(a)pyrene (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 0.939519252618618 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.680

For 10% significance level, 0.939519252618618 is an outlier.
For 5% significance level, 0.939519252618618 is an outlier.
For 1% significance level, 0.939519252618618 is an outlier.

2. Observation Value -2.43179827593301 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.214

For 10% significance level, -2.43179827593301 is not an outlier.
For 5% significance level, -2.43179827593301 is not an outlier.
For 1% significance level, -2.43179827593301 is not an outlier.

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 10:52:43 AM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(b)fluoranthene (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 0.113943352306837 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.318

For 10% significance level, 0.113943352306837 is not an outlier.
For 5% significance level, 0.113943352306837 is not an outlier.
For 1% significance level, 0.113943352306837 is not an outlier.

2. Observation Value -2.4089353929735 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.151

For 10% significance level, -2.4089353929735 is not an outlier.
For 5% significance level, -2.4089353929735 is not an outlier.
For 1% significance level, -2.4089353929735 is not an outlier.

Dixon's Outlier Test for RA17_SO_SVOCs|Benzo(b)fluoranthene (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 1.04139268515823 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.625

For 10% significance level, 1.04139268515823 is an outlier.
For 5% significance level, 1.04139268515823 is an outlier.
For 1% significance level, 1.04139268515823 is an outlier.

2. Observation Value -2.43179827593301 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.184

For 10% significance level, -2.43179827593301 is not an outlier.
For 5% significance level, -2.43179827593301 is not an outlier.
For 1% significance level, -2.43179827593301 is not an outlier.

Rosner's Outlier Test for RA17_SO_SVOCs|Dibenzo(a,h)anthracene

| | |
|---|---|
| Mean | 0.0686 |
| Standard Deviation | 0.291 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.0686 | 0.287 | 1.8 | 8 | 6.029 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 1.8

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 1.8

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 10:58:25 AM |
| From File | ProUCL_INPUT.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 1.6 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.922

For 10% significance level, 1.6 is an outlier.
For 5% significance level, 1.6 is an outlier.
For 1% significance level, 1.6 is an outlier.

2. Observation Value 0.0039 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.020

For 10% significance level, 0.0039 is not an outlier.
For 5% significance level, 0.0039 is not an outlier.
For 1% significance level, 0.0039 is not an outlier.

Dixon's Outlier Test for RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 5.1 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.991

For 10% significance level, 5.1 is an outlier.
For 5% significance level, 5.1 is an outlier.
For 1% significance level, 5.1 is an outlier.

2. Observation Value 0.0037 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.065

For 10% significance level, 0.0037 is not an outlier.
For 5% significance level, 0.0037 is not an outlier.
For 1% significance level, 0.0037 is not an outlier.

Rosner's Outlier Test for RA17_SO_SVOCs|Naphthalene

| | |
|---|---|
| Mean | 0.0811 |
| Standard Deviation | 0.441 |
| Number of data | 40 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.0811 | 0.436 | 2.8 | 8 | 6.238 | 3.04 | 3.38 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 2.8

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 2.8

Outlier Tests for Selected Uncensored Variables

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/27/2018 12:18:36 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_SVOCs|BaP-TE (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 0.369215857410143 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.363

For 10% significance level, 0.369215857410143 is not an outlier.
For 5% significance level, 0.369215857410143 is not an outlier.
For 1% significance level, 0.369215857410143 is not an outlier.

2. Observation Value -2.88272870434424 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.310

For 10% significance level, -2.88272870434424 is not an outlier.
For 5% significance level, -2.88272870434424 is not an outlier.
For 1% significance level, -2.88272870434424 is not an outlier.

Dixon's Outlier Test for RA17_SO_SVOCs|BaP-TE (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value 1.12385164096709 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.474

For 10% significance level, 1.12385164096709 is an outlier.
For 5% significance level, 1.12385164096709 is an outlier.
For 1% significance level, 1.12385164096709 is not an outlier.

2. Observation Value -3.79317412396815 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.185

For 10% significance level, -3.79317412396815 is not an outlier.
For 5% significance level, -3.79317412396815 is not an outlier.
For 1% significance level, -3.79317412396815 is not an outlier.

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 12:19:54 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Rosner's Outlier Test for RA17_SO_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin

| | |
|---|---|
| Mean | -6.533 |
| Standard Deviation | 0.323 |
| Number of data | 40 |
| Number of suspected outliers | 10 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -6.533 | 0.319 | -5.64 | 36 | 2.801 | 3.04 | 3.38 |
| 2 | -6.556 | 0.292 | -6 | 23 | 1.902 | 3.03 | 3.37 |
| 3 | -6.571 | 0.281 | -7.111 | 6 | 1.92 | 3.01 | 3.36 |
| 4 | -6.556 | 0.27 | -7.082 | 1 | 1.945 | 3 | 3.34 |
| 5 | -6.542 | 0.259 | -6.031 | 19 | 1.971 | 2.99 | 3.33 |
| 6 | -6.556 | 0.247 | -7.047 | 34 | 1.986 | 2.976 | 3.314 |
| 7 | -6.542 | 0.236 | -6.096 | 17 | 1.891 | 2.962 | 3.298 |
| 8 | -6.555 | 0.225 | -6.107 | 38 | 1.989 | 2.948 | 3.282 |
| 9 | -6.569 | 0.214 | -6.947 | 3 | 1.766 | 2.934 | 3.266 |
| 10 | -6.557 | 0.206 | -6.936 | 12 | 1.839 | 2.92 | 3.25 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 12:20:29 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

Dixon's Outlier Test for RA17_SO_DioxinFurans|TCDD TEQ HH (0 - 1 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45
1% critical value: 0.535

1. Observation Value -4.67778070526608 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.321

For 10% significance level, -4.67778070526608 is not an outlier.
For 5% significance level, -4.67778070526608 is not an outlier.
For 1% significance level, -4.67778070526608 is not an outlier.

2. Observation Value -6.05453141486818 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.407

For 10% significance level, -6.05453141486818 is an outlier.
For 5% significance level, -6.05453141486818 is not an outlier.
For 1% significance level, -6.05453141486818 is not an outlier.

Dixon's Outlier Test for RA17_SO_DioxinFurans|TCDD TEQ HH (3 - 4 ft)

Number of Observations = 20
10% critical value: 0.401
5% critical value: 0.45

1% critical value: 0.535

1. Observation Value -4.56703070912559 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.378

For 10% significance level, -4.56703070912559 is not an outlier.
For 5% significance level, -4.56703070912559 is not an outlier.
For 1% significance level, -4.56703070912559 is not an outlier.

2. Observation Value -6.88605664769316 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.299

For 10% significance level, -6.88605664769316 is not an outlier.
For 5% significance level, -6.88605664769316 is not an outlier.
For 1% significance level, -6.88605664769316 is not an outlier.

Classical Oneway ANOVA

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 12:11:34 PM |
| From File | ProUCL_INPUT_Log.xls |
| Full Precision | OFF |

RA17_SO_Metals|Arsenic

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 0.569 | 0.231 | 0.0533 |
| 3 - 4 ft | 20 | 0.517 | 0.402 | 0.161 |
| Grand Statistics (All data) | 40 | 0.543 | 0.324 | 0.105 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.0267 | 1 | 0.0267 | 0.249 | 0.621 |
| Within Groups | 4.078 | 38 | 0.107 | | |
| Total | 4.104 | 39 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.328 |
| R-Sq | 0.00652 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

RA17_SO_Metals|Cobalt

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 0.738 | 0.333 | 0.111 |
| 3 - 4 ft | 20 | 0.607 | 0.419 | 0.175 |
| Grand Statistics (All data) | 40 | 0.672 | 0.379 | 0.144 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.17 | 1 | 0.17 | 1.191 | 0.282 |
| Within Groups | 5.433 | 38 | 0.143 | | |
| Total | 5.603 | 39 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.378 |
| R-Sq | 0.0304 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

RA17_SO_Metals|Manganese

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 2.174 | 0.47 | 0.221 |
| 3 - 4 ft | 20 | 1.761 | 0.614 | 0.377 |
| Grand Statistics (All data) | 40 | 1.967 | 0.579 | 0.335 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 1.706 | 1 | 1.706 | 5.706 | 0.022 |

| | | | | | |
|---|---|---|---|---|---|
| Within Groups | 11.36 | 38 | 0.299 | | |
| Total | 13.06 | 39 | | | |

Pooled Standard Deviation 0.547
R-Sq 0.131

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

RA17_SO_Metals|Nickel

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 0.96 | 0.371 | 0.138 |
| 3 - 4 ft | 20 | 0.802 | 0.422 | 0.178 |
| Grand Statistics (All data) | 40 | 0.881 | 0.401 | 0.161 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.248 | 1 | 0.248 | 1.565 | 0.219 |
| Within Groups | 6.012 | 38 | 0.158 | | |
| Total | 6.26 | 39 | | | |

Pooled Standard Deviation 0.398
R-Sq 0.0396

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

RA17_SO_DioxinFurans|TCDD TEQ HH

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -5.314 | 0.311 | 0.097 |
| 3 - 4 ft | 20 | -5.765 | 0.582 | 0.338 |
| Grand Statistics (All data) | 40 | -5.54 | 0.514 | 0.264 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 2.032 | 1 | 2.032 | 9.338 | 0.00409 |
| Within Groups | 8.27 | 38 | 0.218 | | |
| Total | 10.3 | 39 | | | |

Pooled Standard Deviation 0.467
R-Sq 0.197

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

Classical Oneway ANOVA

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 12:44:17 PM |
| From File | ProUCL_INPUT_log_OUTLIER_2.xls |
| Full Precision | OFF |

RA17_SO_Metals|Chromium

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 1.155 | 0.255 | 0.0653 |
| 3 - 4 ft | 19 | 1.091 | 0.228 | 0.052 |
| Grand Statistics (All data) | 39 | 1.124 | 0.242 | 0.0583 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.0396 | 1 | 0.0396 | 0.673 | 0.417 |
| Within Groups | 2.177 | 37 | 0.0588 | | |
| Total | 2.217 | 38 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.243 |
| R-Sq | 0.0179 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

Classical Oneway ANOVA

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 12:45:11 PM |
| From File | ProUCL_INPUT_log_OUTLIER_2.xls |
| Full Precision | OFF |

RA17_SO_Metals|Lead

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 1.528 | 0.504 | 0.254 |
| 3 - 4 ft | 19 | 1.025 | 0.477 | 0.228 |
| Grand Statistics (All data) | 39 | 1.283 | 0.547 | 0.3 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 2.461 | 1 | 2.461 | 10.2 | 0.00287 |
| Within Groups | 8.928 | 37 | 0.241 | | |
| Total | 11.39 | 38 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.491 |
| R-Sq | 0.216 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in mean/median characteristics of the various groups at 0.05 or other selected level of significance

A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

## Classical Oneway ANOVA

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 11:30:15 AM |
| From File | ProUCL_INPUT_OUTLIER_NDs_3.xls |
| Full Precision | OFF |

### RA17_SO_Metals|Thallium

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -0.997 | 0.139 | 0.0194 |
| 3 - 4 ft | 18 | -1.066 | 0.219 | 0.0481 |
| Grand Statistics (All data) | 38 | -1.03 | 0.182 | 0.0333 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.0442 | 1 | 0.0442 | 1.342 | 0.254 |
| Within Groups | 1.186 | 36 | 0.033 | | |
| Total | 1.231 | 37 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.182 |
| R-Sq | 0.0359 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in mean/median characteristics of the various groups at 0.05 or other selected level of significance

A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

## Nonparametric Oneway ANOVA (Kruskal-Wallis Test)

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 12:45:54 PM |
| From File | ProUCL_INPUT_log_OUTLIER_2.xls |
| Full Precision | OFF |

### RA17_SO_Metals|Vanadium

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 1.38 | 20.35 | 0.197 |
| 3 - 4 ft | 19 | 1.322 | 19.63 | -0.197 |
| Overall | 39 | 1.362 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 0.0387 | 1 | 0.844 | |
| 0.0388 | 1 | 0.844 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparabl

Nonparametric Oneway ANOVA (Kruskal-Wallis Test)

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 10:49:34 AM |
| From File | ProUCL_INPUT_OUTLIER_NDs_2.xls |
| Full Precision | OFF |

7_SO_PestPCBs|PCB, Total Aroclors (AECOM (

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 19 | -2.301 | 23.55 | 1.897 |
| 3 - 4 ft | 20 | -2.328 | 16.63 | -1.897 |
| Overall | 39 | -2.328 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 3.597 | 1 | 0.0579 | |
| 3.613 | 1 | 0.0573 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

7_SO_Petroleum|Diesel Range Organics (C10-(

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 1.279 | 16.38 | -2.037 |
| 3 - 4 ft | 19 | 1.279 | 23.82 | 2.037 |
| Overall | 39 | 1.279 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 4.15 | 1 | 0.0416 | |
| 4.345 | 1 | 0.0371 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Naphthalene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -2.125 | 18.4 | -0.899 |
| 3 - 4 ft | 19 | -2.119 | 21.68 | 0.899 |
| Overall | 39 | -2.119 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 0.808 | 1 | 0.369 | |
| 0.813 | 1 | 0.367 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Benzo(a)anthracene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -1.648 | 25.23 | 2.936 |
| 3 - 4 ft | 19 | -2.114 | 14.5 | -2.936 |
| Overall | 39 | -1.886 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 8.621 | 1 | 0.00332 | |
| 8.629 | 1 | 0.00331 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Benzo(a)pyrene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -1.678 | 24.88 | 2.74 |
| 3 - 4 ft | 19 | -2.114 | 14.87 | -2.74 |
| Overall | 39 | -1.959 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 7.505 | 1 | 0.00615 | |
| 7.518 | 1 | 0.00611 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Benzo(b)fluoranthene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -1.53 | 24.78 | 2.683 |
| 3 - 4 ft | 19 | -2.114 | 14.97 | -2.683 |
| Overall | 39 | -1.854 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 7.2 | 1 | 0.00729 | |
| 7.21 | 1 | 0.00725 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Dibenzo(a,h)anthracene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -2.137 | 20.4 | 0.225 |
| 3 - 4 ft | 19 | -2.119 | 19.58 | -0.225 |
| Overall | 39 | -2.119 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 0.0505 | 1 | 0.822 | |
| 0.0506 | 1 | 0.822 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in mean/median characteristics of the various groups at 0.05 or other selected level of significance

A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -1.783 | 24.33 | 2.43 |
| 3 - 4 ft | 19 | -2.114 | 15.45 | -2.43 |
| Overall | 39 | -2 | 20 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 5.907 | 1 | 0.0151 | |
| 5.918 | 1 | 0.015 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in

mean/median characteristics of the various groups at 0.05 or other selected level of significance

A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

Classical Oneway ANOVA

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 11:39:17 AM |
| From File | ProUCL_INPUT_OUTLIER_NDs.xls |
| Full Precision | OFF |

RA17_SO_SVOCs|BaP-TE

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -1.393 | 0.777 | 0.603 |
| 3 - 4 ft | 20 | -2.008 | 1.026 | 1.053 |
| Grand Statistics (All data) | 40 | -1.701 | 0.951 | 0.904 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 3.779 | 1 | 3.779 | 4.563 | 0.0392 |
| Within Groups | 31.48 | 38 | 0.828 | | |
| Total | 35.25 | 39 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.91 |
| R-Sq | 0.107 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

SO_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p

| Group | Obs | Mean | SD | Variance |
|---|---|---|---|---|
| 0 - 1 ft | 20 | -6.574 | 0.31 | 0.096 |
| 3 - 4 ft | 20 | -6.493 | 0.338 | 0.115 |
| Grand Statistics (All data) | 40 | -6.533 | 0.323 | 0.104 |

Classical One-Way Analysis of Variance Table

| Source | SS | DOF | MS | V.R.(F Stat) | P-Value |
|---|---|---|---|---|---|
| Between Groups | 0.0662 | 1 | 0.0662 | 0.629 | 0.433 |
| Within Groups | 4 | 38 | 0.105 | | |
| Total | 4.066 | 39 | | | |

| | |
|---|---|
| Pooled Standard Deviation | 0.324 |
| R-Sq | 0.0163 |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are comparable.

## Nonparametric Oneway ANOVA (Kruskal-Wallis Test)

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/17/2018 11:36:51 AM |
| From File | ProUCL_INPUT_OUTLIER_NDs.xls |
| Full Precision | OFF |

\17_SO_Petroleum|Oil Range Organics (C20-C3

| Group | Obs | Median | Ave Rank | Z |
|---|---|---|---|---|
| 0 - 1 ft | 20 | 1.703 | 22.55 | 1.109 |
| 3 - 4 ft | 20 | 1.29 | 18.45 | -1.109 |
| Overall | 40 | 1.301 | 20.5 | |

| K-W (H-Stat) | DOF | P-Value | (Approx. Chisquare) |
|---|---|---|---|
| 1.23 | 1 | 0.267 | |
| 1.236 | 1 | 0.266 | (Adjusted for Ties) |

Note: A p-value <= 0.05 (or some other selected level) suggests that there are significant differences in
mean/median characteristics of the various groups at 0.05 or other selected level of significance
A p-value > 0.05 (or other selected level) suggests that mean/median characteristics of the various groups are compara

**Background Statistics for Uncensored Full Data Sets**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.14/27/2018 2:52:39 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Background Soil\Soil Data Evaluatio |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_Metals|Arsenic**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Distinct Observations | 29 |
| Minimum | 0.59 | First Quartile | 2.425 |
| Second Largest | 10 | Median | 3.55 |
| Maximum | 30 | Third Quartile | 5.375 |
| Mean | 4.653 | SD | 4.747 |
| Coefficient of Variation | 1.02 | Skewness | 4.126 |
| Mean of logged Data | 1.25 | SD of logged Data | 0.747 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.117 | d2max (for USL) | 2.868 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.603 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.271 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 14.7 | 90% Percentile (z) | 10.74 |
| 95% UPL (t) | 12.75 | 95% Percentile (z) | 12.46 |
| 95% USL | 18.27 | 99% Percentile (z) | 15.7 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.748 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.761 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.156 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.141 | Data Not Gamma Distributed at 5% Significance Level |

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

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.888 | k star (bias corrected MLE) | 1.763 |
| Theta hat (MLE) | 2.465 | Theta star (bias corrected MLE) | 2.64 |
| nu hat (MLE) | 151 | nu star (bias corrected) | 141 |
| MLE Mean (bias corrected) | 4.653 | MLE Sd (bias corrected) | 3.504 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 11.45 | 90% Percentile | 9.324 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 11.54 | 95% Percentile | 11.49 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 14.18 | 99% Percentile | 16.34 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 14.53 | | |
| 95% WH USL | 20.22 | 95% HW USL | 21.44 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.975 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.116 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 16.97 | 90% Percentile (z) | 9.088 |
| 95% UPL (t) | 12.48 | 95% Percentile (z) | 11.92 |
| 95% USL | 29.72 | 99% Percentile (z) | 19.83 |

**Nonparametric Distribution Free Background Statistics**

Data appear Approximate Gamma Distribution at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 40 | 95% UTL with 95% Coverage | 30 |
| Approx, f used to compute achieved CC | 2.105 | Approximate Actual Confidence Coefficient achieved by UTL | 0.871 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 30 | 95% BCA Bootstrap UTL with 95% Coverage | 30 |
| 95% UPL | 9.995 | 90% Percentile | 8.09 |
| 90% Chebyshev UPL | 19.07 | 95% Percentile | 9.905 |
| 95% Chebyshev UPL | 25.6 | 99% Percentile | 22.2 |
| 95% USL | 30 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Chromium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 39 | Number of Distinct Observations | 23 |
| | | Number of Missing Observations | 1 |
| Minimum | 3.7 | First Quartile | 9.7 |
| Second Largest | 45 | Median | 13 |
| Maximum | 57 | Third Quartile | 17.5 |
| Mean | 15.57 | SD | 10.25 |
| Coefficient of Variation | 0.659 | Skewness | 2.433 |
| Mean of logged Data | 2.587 | SD of logged Data | 0.556 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.124 | d2max (for USL) | 2.857 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.769 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.939 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.201 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.14 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 37.35 | 90% Percentile (z) | 28.71 |
| 95% UPL (t) | 33.08 | 95% Percentile (z) | 32.43 |
| 95% USL | 44.87 | 99% Percentile (z) | 39.42 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.748 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.754 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.125 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.142 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 3.322 | k star (bias corrected MLE) | 3.084 |
| Theta hat (MLE) | 4.686 | Theta star (bias corrected MLE) | 5.048 |
| nu hat (MLE) | 259.1 | nu star (bias corrected) | 240.5 |
| MLE Mean (bias corrected) | 15.57 | MLE Sd (bias corrected) | 8.864 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 32.64 | 90% Percentile | 27.45 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 32.89 | 95% Percentile | 32.41 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 38.89 | 99% Percentile | 43.15 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 39.62 | | |
| 95% WH USL | 51.71 | 95% HW USL | 53.88 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.976 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.939 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0995 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.14 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 43.32 | 90% Percentile (z) | 27.11 |
| 95% UPL (t) | 34.35 | 95% Percentile (z) | 33.18 |
| 95% USL | 65.11 | 99% Percentile (z) | 48.47 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 39 | 95% UTL with 95% Coverage | 57 |
| Approx, f used to compute achieved CC | 2.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.865 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 57 | 95% BCA Bootstrap UTL with 95% Coverage | 57 |
| 95% UPL | 45 | 90% Percentile | 24 |
| 90% Chebyshev UPL | 46.72 | 95% Percentile | 31.5 |
| 95% Chebyshev UPL | 60.84 | 99% Percentile | 52.44 |
| 95% USL | 57 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Distinct Observations | 34 |
| Minimum | 0.47 | First Quartile | 2.975 |
| Second Largest | 16 | Median | 5.1 |
| Maximum | 16 | Third Quartile | 9.1 |
| Mean | 6.297 | SD | 4.278 |
| Coefficient of Variation | 0.679 | Skewness | 0.749 |

| | | | |
|---|---|---|---|
| Mean of logged Data | 1.548 | SD of logged Data | 0.873 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.117 | d2max (for USL) | 2.868 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.921 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.165 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 15.36 | 90% Percentile (z) | 11.78 |
| 95% UPL (t) | 13.59 | 95% Percentile (z) | 13.33 |
| 95% USL | 18.57 | 99% Percentile (z) | 16.25 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.286 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.761 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0796 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.141 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.862 | k star (bias corrected MLE) | 1.739 |
| Theta hat (MLE) | 3.382 | Theta star (bias corrected MLE) | 3.622 |
| nu hat (MLE) | 148.9 | nu star (bias corrected) | 139.1 |
| MLE Mean (bias corrected) | 6.297 | MLE Sd (bias corrected) | 4.775 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 15.89 | 90% Percentile | 12.66 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 16.63 | 95% Percentile | 15.62 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 19.69 | 99% Percentile | 22.25 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 21.11 | | |
| 95% WH USL | 28.12 | 95% HW USL | 31.54 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.926 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.113 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data appear Lognormal at 5% Significance Level |

Data appear Approximate Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 29.84 | 90% Percentile (z) | 14.39 |
| 95% UPL (t) | 20.84 | 95% Percentile (z) | 19.76 |
| 95% USL | 57.44 | 99% Percentile (z) | 35.82 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 40 | 95% UTL with 95% Coverage | 16 |
| Approx, f used to compute achieved CC | 2.105 | Approximate Actual Confidence Coefficient achieved by UTL | 0.871 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 16 | 95% BCA Bootstrap UTL with 95% Coverage | 16 |
| 95% UPL | 15.95 | 90% Percentile | 12.1 |
| 90% Chebyshev UPL | 19.29 | 95% Percentile | 15.05 |
| 95% Chebyshev UPL | 25.18 | 99% Percentile | 16 |
| 95% USL | 16 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Nickel**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Distinct Observations | 34 |
| Minimum | 0.99 | First Quartile | 5.2 |
| Second Largest | 61 | Median | 7.65 |
| Maximum | 88 | Third Quartile | 11.5 |
| Mean | 12.16 | SD | 16.53 |
| Coefficient of Variation | 1.359 | Skewness | 3.431 |
| Mean of logged Data | 2.029 | SD of logged Data | 0.922 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.117 | d2max (for USL) | 2.868 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.557 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.332 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 47.16 | 90% Percentile (z) | 33.35 |
| 95% UPL (t) | 40.36 | 95% Percentile (z) | 39.35 |
| 95% USL | 59.56 | 99% Percentile (z) | 50.62 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.807 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.773 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.194 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.143 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.204 | k star (bias corrected MLE) | 1.131 |
| Theta hat (MLE) | 10.1 | Theta star (bias corrected MLE) | 10.76 |
| nu hat (MLE) | 96.34 | nu star (bias corrected) | 90.45 |
| MLE Mean (bias corrected) | 12.16 | MLE Sd (bias corrected) | 11.44 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 34.13 | 90% Percentile | 27.17 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 34.1 | 95% Percentile | 34.9 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 43.93 | 99% Percentile | 52.69 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 44.87 | | |
| 95% WH USL | 66.32 | 95% HW USL | 70.82 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.959 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.94 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.131 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.139 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 53.62 | 90% Percentile (z) | 24.8 |
| 95% UPL (t) | 36.69 | 95% Percentile (z) | 34.68 |
| 95% USL | 107.1 | 99% Percentile (z) | 65.03 |

**Nonparametric Distribution Free Background Statistics**

Data appear Lognormal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 40 | 95% UTL with 95% Coverage | 88 |
| Approx, f used to compute achieved CC | 2.105 | Approximate Actual Confidence Coefficient achieved by UTL | 0.871 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 88 | 95% BCA Bootstrap UTL with 95% Coverage | 88 |
| 95% UPL | 60.1 | 90% Percentile | 16.2 |
| 90% Chebyshev UPL | 62.37 | 95% Percentile | 43.9 |
| 95% Chebyshev UPL | 85.11 | 99% Percentile | 77.47 |
| 95% USL | 88 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.14/27/2018 3:03:21 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Background Soil\Soil Data Evaluatio |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_Metals|Lead (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Distinct Observations | 19 |
| Minimum | 6.4 | First Quartile | 18 |
| Second Largest | 250 | Median | 30.5 |
| Maximum | 320 | Third Quartile | 64.5 |
| Mean | 65.92 | SD | 88.37 |
| Coefficient of Variation | 1.341 | Skewness | 2.05 |
| Mean of logged Data | 3.517 | SD of logged Data | 1.161 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.67 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.273 | **Lilliefors GOF Test** |

| | | | |
|---|---|---|---|
| 5% Lilliefors Critical Value | 0.192 | Data Not Normal at 5% Significance Level | |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 277.7 | 90% Percentile (z) | 179.2 |
| 95% UPL (t) | 222.5 | 95% Percentile (z) | 211.3 |
| 95% USL | 291.8 | 99% Percentile (z) | 271.5 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.889 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.774 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.19 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.2 | Detected data appear Gamma Distributed at 5% Significance Level |

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

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.874 | k star (bias corrected MLE) | 0.776 |
| Theta hat (MLE) | 75.4 | Theta star (bias corrected MLE) | 84.9 |
| nu hat (MLE) | 34.97 | nu star (bias corrected) | 31.06 |
| MLE Mean (bias corrected) | 65.92 | MLE Sd (bias corrected) | 74.81 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 221.4 | 90% Percentile | 161.4 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 226.2 | 95% Percentile | 216.1 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 336.5 | 99% Percentile | 345.6 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 361.3 | | |
| 95% WH USL | 371.4 | 95% HW USL | 404.2 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.948 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.118 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 543.8 | 90% Percentile (z) | 149.1 |
| 95% UPL (t) | 263.5 | 95% Percentile (z) | 227.4 |
| 95% USL | 655.2 | 99% Percentile (z) | 501.5 |

**Nonparametric Distribution Free Background Statistics**

Data appear Approximate Gamma Distribution at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with 95% Coverage | 320 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 320 | 95% BCA Bootstrap UTL with 95% Coverage | 320 |
| 95% UPL | 316.5 | 90% Percentile | 214 |
| 90% Chebyshev UPL | 337.6 | 95% Percentile | 253.5 |
| 95% Chebyshev UPL | 460.6 | 99% Percentile | 306.7 |
| 95% USL | 320 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Lead (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Distinct Observations | 18 |
| | | Number of Missing Observations | 1 |
| Minimum | 1.7 | First Quartile | 6.35 |
| Second Largest | 78 | Median | 8 |
| Maximum | 170 | Third Quartile | 13 |
| Mean | 22.6 | SD | 40.23 |
| Coefficient of Variation | 1.78 | Skewness | 3.18 |
| Mean of logged Data | 2.36 | SD of logged Data | 1.099 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.512 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.901 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.378 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.197 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 120.1 | 90% Percentile (z) | 74.16 |
| 95% UPL (t) | 94.17 | 95% Percentile (z) | 88.77 |
| 95% USL | 124.4 | 99% Percentile (z) | 116.2 |

**Gamma GOF Test**

| | | | |
|---|---|---|---|
| A-D Test Statistic | 1.973 | **Anderson-Darling Gamma GOF Test** | |
| 5% A-D Critical Value | 0.777 | Data Not Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.29 | **Kolmogorov-Smirnov Gamma GOF Test** | |
| 5% K-S Critical Value | 0.206 | Data Not Gamma Distributed at 5% Significance Level | |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.785 | k star (bias corrected MLE) | 0.696 |
| Theta hat (MLE) | 28.78 | Theta star (bias corrected MLE) | 32.46 |
| nu hat (MLE) | 29.84 | nu star (bias corrected) | 26.46 |
| MLE Mean (bias corrected) | 22.6 | MLE Sd (bias corrected) | 27.08 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 76.05 | 90% Percentile | 56.8 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 74.69 | 95% Percentile | 77.07 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 118.8 | 99% Percentile | 125.5 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 122.2 | | |
| 95% WH USL | 127.3 | 95% HW USL | 132 |

**Lognormal GOF Test**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.895 | **Shapiro Wilk Lognormal GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.901 | Data Not Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.209 | **Lilliefors Lognormal GOF Test** | |
| 5% Lilliefors Critical Value | 0.197 | Data Not Lognormal at 5% Significance Level | |

**Data Not Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 151.8 | 90% Percentile (z) | 43.31 |
| 95% UPL (t) | 74.83 | 95% Percentile (z) | 64.56 |
| 95% USL | 171 | 99% Percentile (z) | 136.5 |

**Nonparametric Distribution Free Background Statistics**

**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with 95% Coverage | 170 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 170 | 95% BCA Bootstrap UTL with 95% Coverage | 170 |
| 95% UPL | 170 | 90% Percentile | 55.6 |
| 90% Chebyshev UPL | 146.4 | 95% Percentile | 87.2 |
| 95% Chebyshev UPL | 202.5 | 99% Percentile | 153.4 |
| 95% USL | 170 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Manganese (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Distinct Observations | 20 |
| Minimum | 17 | First Quartile | 75.25 |
| Second Largest | 670 | Median | 160 |
| Maximum | 1000 | Third Quartile | 310 |
| Mean | 243.6 | SD | 248 |
| Coefficient of Variation | 1.018 | Skewness | 1.827 |
| Mean of logged Data | 5.006 | SD of logged Data | 1.082 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.809 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.19 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.192 | Data appear Normal at 5% Significance Level | |

**Data appear Approximate Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 837.9 | 90% Percentile (z) | 561.5 |
| 95% UPL (t) | 683.1 | 95% Percentile (z) | 651.6 |
| 95% USL | 877.7 | 99% Percentile (z) | 820.6 |

**Gamma GOF Test**

| | | | |
|---|---|---|---|
| A-D Test Statistic | 0.146 | **Anderson-Darling Gamma GOF Test** | |
| 5% A-D Critical Value | 0.765 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.0878 | **Kolmogorov-Smirnov Gamma GOF Test** | |
| 5% K-S Critical Value | 0.199 | Detected data appear Gamma Distributed at 5% Significance Level | |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.159 | k star (bias corrected MLE) | 1.019 |
| Theta hat (MLE) | 210.1 | Theta star (bias corrected MLE) | 239.1 |
| nu hat (MLE) | 46.37 | nu star (bias corrected) | 40.75 |

| | | | |
|---|---|---|---|
| MLE Mean (bias corrected) | 243.6 | MLE Sd (bias corrected) | 241.4 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 756.1 | 90% Percentile | 558.4 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 790.9 | 95% Percentile | 725 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1104 | 99% Percentile | 1111 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1210 | | |
| 95% WH USL | 1208 | 95% HW USL | 1340 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.987 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0738 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1995 | 90% Percentile (z) | 597.3 |
| 95% UPL (t) | 1015 | 95% Percentile (z) | 884.9 |
| 95% USL | 2373 | 99% Percentile (z) | 1850 |

**Nonparametric Distribution Free Background Statistics**

**Data appear Approximate Normal at 5% Significance Level**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with 95% Coverage | 1000 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1000 | 95% BCA Bootstrap UTL with 95% Coverage | 1000 |
| 95% UPL | 983.5 | 90% Percentile | 508 |
| 90% Chebyshev UPL | 1006 | 95% Percentile | 686.5 |
| 95% Chebyshev UPL | 1351 | 99% Percentile | 937.3 |
| 95% USL | 1000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Metals|Manganese (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Distinct Observations | 18 |
| Minimum | 2 | First Quartile | 22.25 |
| Second Largest | 330 | Median | 72 |
| Maximum | 1000 | Third Quartile | 137.5 |
| Mean | 134.4 | SD | 221.4 |
| Coefficient of Variation | 1.647 | Skewness | 3.472 |
| Mean of logged Data | 4.055 | SD of logged Data | 1.414 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.558 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.304 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 664.8 | 90% Percentile (z) | 418.1 |
| 95% UPL (t) | 526.7 | 95% Percentile (z) | 498.5 |
| 95% USL | 700.4 | 99% Percentile (z) | 649.4 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.449 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.783 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.142 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.202 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.713 | k star (bias corrected MLE) | 0.639 |
| Theta hat (MLE) | 188.6 | Theta star (bias corrected MLE) | 210.4 |
| nu hat (MLE) | 28.5 | nu star (bias corrected) | 25.56 |
| MLE Mean (bias corrected) | 134.4 | MLE Sd (bias corrected) | 168.2 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 474.8 | 90% Percentile | 344.6 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 493 | 95% Percentile | 472.8 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 739.7 | 99% Percentile | 781.2 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 815.4 | | |
| 95% WH USL | 820.9 | 95% HW USL | 919.3 |

**Lognormal GOF Test**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.981 | **Shapiro Wilk Lognormal GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.108 | **Lilliefors Lognormal GOF Test** | |
| 5% Lilliefors Critical Value | 0.192 | Data appear Lognormal at 5% Significance Level | |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1707 | 90% Percentile (z) | 353.1 |
| 95% UPL (t) | 706.3 | 95% Percentile (z) | 590.2 |
| 95% USL | 2142 | 99% Percentile (z) | 1547 |

**Nonparametric Distribution Free Background Statistics**

**Data appear Gamma Distributed at 5% Significance Level**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with 95% Coverage | 1000 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1000 | 95% BCA Bootstrap UTL with 95% Coverage | 1000 |
| 95% UPL | 966.5 | 90% Percentile | 267 |
| 90% Chebyshev UPL | 814.9 | 95% Percentile | 363.5 |
| 95% Chebyshev UPL | 1123 | 99% Percentile | 872.7 |
| 95% USL | 1000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.14/27/2018 2:55:44 PM |
| From File | BenningRoad_BackgroundSoil_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| Different or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_Metals|Thallium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 38 | Number of Missing Observations | 2 |
| Number of Distinct Observations | 26 | | |
| Number of Detects | 31 | Number of Non-Detects | 7 |
| Number of Distinct Detects | 24 | Number of Distinct Non-Detects | 4 |
| Minimum Detect | 0.037 | Minimum Non-Detect | 0.093 |
| Maximum Detect | 0.21 | Maximum Non-Detect | 0.12 |
| Variance Detected | 0.00198 | Percent Non-Detects | 18.42% |
| Mean Detected | 0.0999 | SD Detected | 0.0445 |
| Mean of Detected Logged Data | -2.402 | SD of Detected Logged Data | 0.459 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.132 | d2max (for USL) | 2.846 |

**Normal GOF Test on Detects Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.947 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.929 | Detected Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.104 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.156 | Detected Data appear Normal at 5% Significance Level | |

**Detected Data appear Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0941 | KM SD | 0.0422 |
| 95% UTL95% Coverage | 0.184 | 95% KM UPL (t) | 0.166 |
| 90% KM Percentile (z) | 0.148 | 95% KM Percentile (z) | 0.163 |
| 99% KM Percentile (z) | 0.192 | 95% KM USL | 0.214 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0914 | SD | 0.044 |
| 95% UTL95% Coverage | 0.185 | 95% UPL (t) | 0.167 |
| 90% Percentile (z) | 0.148 | 95% Percentile (z) | 0.164 |
| 99% Percentile (z) | 0.194 | 95% USL | 0.217 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | | |
|---|---|---|---|
| A-D Test Statistic | 0.214 | **Anderson-Darling GOF Test** | |
| 5% A-D Critical Value | 0.747 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.103 | **Kolmogorov-Smirnov GOF** | |
| 5% K-S Critical Value | 0.158 | Detected data appear Gamma Distributed at 5% Significance Level | |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 5.241 | k star (bias corrected MLE) | 4.756 |
| Theta hat (MLE) | 0.0191 | Theta star (bias corrected MLE) | 0.021 |
| nu hat (MLE) | 325 | nu star (bias corrected) | 294.8 |

| | | | |
|---|---|---|---|
| MLE Mean (bias corrected) | 0.0999 | | |
| MLE Sd (bias corrected) | 0.0458 | 95% Percentile of Chisquare (2kstar) | 17.63 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.037 | Mean | 0.0943 |
| Maximum | 0.21 | Median | 0.0835 |
| SD | 0.0422 | CV | 0.447 |
| k hat (MLE) | 5.553 | k star (bias corrected MLE) | 5.132 |
| Theta hat (MLE) | 0.017 | Theta star (bias corrected MLE) | 0.0184 |
| nu hat (MLE) | 422 | nu star (bias corrected) | 390 |
| MLE Mean (bias corrected) | 0.0943 | MLE Sd (bias corrected) | 0.0416 |
| 95% Percentile of Chisquare (2kstar) | 18.67 | 90% Percentile | 0.15 |
| 95% Percentile | 0.171 | 99% Percentile | 0.217 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.2 | 0.204 | 95% Approx. Gamma UPL | 0.173 | 0.175 |
| 95% Gamma USL | 0.252 | 0.261 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0941 | SD (KM) | 0.0422 |
| Variance (KM) | 0.00178 | SE of Mean (KM) | 0.00712 |
| k hat (KM) | 4.982 | k star (KM) | 4.606 |
| nu hat (KM) | 378.6 | nu star (KM) | 350.1 |
| theta hat (KM) | 0.0189 | theta star (KM) | 0.0204 |
| 80% gamma percentile (KM) | 0.128 | 90% gamma percentile (KM) | 0.153 |
| 95% gamma percentile (KM) | 0.176 | 99% gamma percentile (KM) | 0.225 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.201 | 0.205 | 95% Approx. Gamma UPL | 0.174 | 0.175 |
| 95% KM Gamma Percentile | 0.17 | 0.171 | 95% Gamma USL | 0.254 | 0.263 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.974 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.929 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.107 | **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**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0941 | Mean in Log Scale | -2.455 |
| SD in Original Scale | 0.0422 | SD in Log Scale | 0.434 |
| 95% UTL95% Coverage | 0.217 | 95% BCA UTL95% Coverage | 0.193 |
| 95% Bootstrap (%) UTL95% Coverage | 0.21 | 95% UPL (t) | 0.18 |
| 90% Percentile (z) | 0.15 | 95% Percentile (z) | 0.175 |
| 99% Percentile (z) | 0.236 | 95% USL | 0.296 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -2.461 | 95% KM UTL (Lognormal)95% Coverage | 0.22 |
| KM SD of Logged Data | 0.444 | 95% KM UPL (Lognormal) | 0.182 |
| 95% KM Percentile Lognormal (z) | 0.177 | 95% KM USL (Lognormal) | 0.302 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0914 | Mean in Log Scale | -2.498 |
| SD in Original Scale | 0.044 | SD in Log Scale | 0.463 |
| 95% UTL95% Coverage | 0.221 | 95% UPL (t) | 0.181 |
| 90% Percentile (z) | 0.149 | 95% Percentile (z) | 0.176 |
| 99% Percentile (z) | 0.241 | 95% USL | 0.307 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 38 | 95% UTL with95% Coverage | 0.21 |
| Approx, f used to compute achieved CC | 2 | Approximate Actual Confidence Coefficient achieved by UTL | 0.858 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.191 |
| 95% USL | 0.21 | 95% KM Chebyshev UPL | 0.28 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/27/2018 11:27:14 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |

| | |
|---|---|
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_Metals|Vanadium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 36 | Number of Distinct Observations | 21 |
| Minimum | 3.4 | First Quartile | 17 |
| Second Largest | 36 | Median | 22 |
| Maximum | 36 | Third Quartile | 26 |
| Mean | 21.87 | SD | 7.394 |
| Coefficient of Variation | 0.338 | Skewness | -0.16 |
| Mean of logged Data | 3.007 | SD of logged Data | 0.453 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.148 | d2max (for USL) | 2.824 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.975 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.935 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0932 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.145 | Data appear Normal at 5% Significance Level |

Data appear Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 37.75 | 90% Percentile (z) | 31.34 |
| 95% UPL (t) | 34.53 | 95% Percentile (z) | 34.03 |
| 95% USL | 42.74 | 99% Percentile (z) | 39.07 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.814 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.749 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.135 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.147 | Detected data appear Gamma Distributed at 5% Significance Level |

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

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 6.596 | k star (bias corrected MLE) | 6.065 |
| Theta hat (MLE) | 3.315 | Theta star (bias corrected MLE) | 3.605 |
| nu hat (MLE) | 474.9 | nu star (bias corrected) | 436.7 |
| MLE Mean (bias corrected) | 21.87 | MLE Sd (bias corrected) | 8.879 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 38.55 | 90% Percentile | 33.74 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 39.54 | 95% Percentile | 38.22 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 44.26 | 99% Percentile | 47.61 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 45.89 | | |
| 95% WH USL | 54.18 | 95% HW USL | 57.22 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.829 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.935 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.171 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.145 | Data Not Lognormal at 5% Significance Level |

Data Not Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 53.59 | 90% Percentile (z) | 36.17 |
| 95% UPL (t) | 43.98 | 95% Percentile (z) | 42.65 |
| 95% USL | 72.78 | 99% Percentile (z) | 58.09 |

**Nonparametric Distribution Free Background Statistics**

Data appear Normal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 36 | 95% UTL with 95% Coverage | 36 |
| Approx, f used to compute achieved CC | 1.895 | Approximate Actual Confidence Coefficient achieved by UTL | 0.842 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 36 | 95% BCA Bootstrap UTL with 95% Coverage | 36 |
| 95% UPL | 36 | 90% Percentile | 31 |
| 90% Chebyshev UPL | 44.35 | 95% Percentile | 35.25 |
| 95% Chebyshev UPL | 54.54 | 99% Percentile | 36 |
| 95% USL | 36 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.14/27/2018 4:59:44 PM |
| From File | BenningRoad_BackgroundSoil_Input.xls |
| Full Precision | OFF |

| | |
|---|---|
| Confidence Coefficient | 95% |
| Coverage | 95% |
| Different or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_PestPCBs|PCB, Total Aroclors (AECOM Calc)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 39 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 23 | | |
| Number of Detects | 5 | Number of Non-Detects | 34 |
| Number of Distinct Detects | 5 | Number of Distinct Non-Detects | 18 |
| Minimum Detect | 0.0059 | Minimum Non-Detect | 8.4000E-4 |
| Maximum Detect | 0.034 | Maximum Non-Detect | 0.0061 |
| Variance Detected | 1.3547E-4 | Percent Non-Detects | 87.18% |
| Mean Detected | 0.0144 | SD Detected | 0.0116 |
| Mean of Detected Logged Data | -4.461 | SD of Detected Logged Data | 0.719 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.124 | d2max (for USL) | 2.857 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.809 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.258 | **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) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.00259 | KM SD | 0.00588 |
| 95% UTL95% Coverage | 0.0151 | 95% KM UPL (t) | 0.0126 |
| 90% KM Percentile (z) | 0.0101 | 95% KM Percentile (z) | 0.0123 |
| 99% KM Percentile (z) | 0.0163 | 95% KM USL | 0.0194 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.00353 | SD | 0.00574 |
| 95% UTL95% Coverage | 0.0157 | 95% UPL (t) | 0.0133 |
| 90% Percentile (z) | 0.0109 | 95% Percentile (z) | 0.013 |
| 99% Percentile (z) | 0.0169 | 95% USL | 0.0199 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.379 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.684 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.238 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.36 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.392 | k star (bias corrected MLE) | 1.09 |
| Theta hat (MLE) | 0.00604 | Theta star (bias corrected MLE) | 0.0132 |
| nu hat (MLE) | 23.92 | nu star (bias corrected) | 10.9 |
| MLE Mean (bias corrected) | 0.0144 | | |
| MLE Sd (bias corrected) | 0.0138 | 95% Percentile of Chisquare (2kstar) | 6.336 |

**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 | 0.0059 | Mean | 0.0106 |
| Maximum | 0.034 | Median | 0.01 |
| SD | 0.00406 | CV | 0.385 |
| k hat (MLE) | 13.72 | k star (bias corrected MLE) | 12.68 |
| Theta hat (MLE) | 7.7057E-4 | Theta star (bias corrected MLE) | 8.3365E-4 |
| nu hat (MLE) | 1070 | nu star (bias corrected) | 988.9 |
| MLE Mean (bias corrected) | 0.0106 | MLE Sd (bias corrected) | 0.00297 |
| 95% Percentile of Chisquare (2kstar) | 38.09 | 90% Percentile | 0.0145 |
| 95% Percentile | 0.0159 | 99% Percentile | 0.0187 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0175 | 0.0173 | 95% Approx. Gamma UPL | 0.0159 | 0.0157 |
| 95% Gamma USL | 0.0206 | 0.0205 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.00259 | SD (KM) | 0.00588 |
| Variance (KM) | 3.4573E-5 | SE of Mean (KM) | 0.00105 |
| k hat (KM) | 0.194 | k star (KM) | 0.196 |
| nu hat (KM) | 15.1 | nu star (KM) | 15.28 |
| theta hat (KM) | 0.0134 | theta star (KM) | 0.0132 |
| 80% gamma percentile (KM) | 0.00337 | 90% gamma percentile (KM) | 0.00782 |
| 95% gamma percentile (KM) | 0.0134 | 99% gamma percentile (KM) | 0.0288 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0103 | 0.0097 | 95% Approx. Gamma UPL | 0.00761 | 0.00705 |
| 95% KM Gamma Percentile | 0.00725 | 0.0067 | 95% Gamma USL | 0.0163 | 0.0161 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.918 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.196 | **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**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00217 | Mean in Log Scale | -7.795 |
| SD in Original Scale | 0.00609 | SD in Log Scale | 1.565 |
| 95% UTL95% Coverage | 0.0114 | 95% BCA UTL95% Coverage | 0.034 |
| 95% Bootstrap (%) UTL95% Coverage | 0.034 | 95% UPL (t) | 0.00595 |
| 90% Percentile (z) | 0.00306 | 95% Percentile (z) | 0.0054 |
| 99% Percentile (z) | 0.0157 | 95% USL | 0.036 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -6.745 | 95% KM UTL (Lognormal)95% Coverage | 0.00809 |
| KM SD of Logged Data | 0.907 | 95% KM UPL (Lognormal) | 0.00554 |
| 95% KM Percentile Lognormal (z) | 0.00523 | 95% KM USL (Lognormal) | 0.0157 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00353 | Mean in Log Scale | -6.191 |
| SD in Original Scale | 0.00574 | SD in Log Scale | 0.986 |
| 95% UTL95% Coverage | 0.0166 | 95% UPL (t) | 0.011 |
| 90% Percentile (z) | 0.00725 | 95% Percentile (z) | 0.0104 |
| 99% Percentile (z) | 0.0203 | 95% USL | 0.0343 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 39 | 95% UTL with95% Coverage | 0.034 |
| Approx, f used to compute achieved CC | 2.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.865 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.016 |
| 95% USL | 0.034 | 95% KM Chebyshev UPL | 0.0285 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_Petroleum|Oil Range Organics (C20-C36)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 29 | | |
| Number of Detects | 27 | Number of Non-Detects | 13 |
| Number of Distinct Detects | 24 | Number of Distinct Non-Detects | 6 |
| Minimum Detect | 7.4 | Minimum Non-Detect | 17 |
| Maximum Detect | 860 | Maximum Non-Detect | 24 |
| Variance Detected | 28622 | Percent Non-Detects | 32.5% |
| Mean Detected | 98.67 | SD Detected | 169.2 |
| Mean of Detected Logged Data | 3.783 | SD of Detected Logged Data | 1.267 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.117 | d2max (for USL) | 2.868 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.535 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.923 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.295 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.167 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 70.29 | KM SD | 142.4 |
| 95% UTL95% Coverage | 371.8 | 95% KM UPL (t) | 313.2 |
| 90% KM Percentile (z) | 252.8 | 95% KM Percentile (z) | 304.5 |
| 99% KM Percentile (z) | 401.6 | 95% KM USL | 478.7 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 69.79 | SD | 144.4 |
| 95% UTL95% Coverage | 375.6 | 95% UPL (t) | 316.2 |
| 90% Percentile (z) | 254.9 | 95% Percentile (z) | 307.3 |
| 99% Percentile (z) | 405.8 | 95% USL | 483.9 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.853 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.785 | Data Not Gamma Distributed at 5% Significance Level |

| | | | |
|---|---|---|---|
| K-S Test Statistic | 0.129 | **Kolmogorov-Smirnov GOF** | |
| 5% K-S Critical Value | 0.175 | 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) | 0.741 | k star (bias corrected MLE) | 0.683 |
| Theta hat (MLE) | 133.2 | Theta star (bias corrected MLE) | 144.4 |
| nu hat (MLE) | 40.01 | nu star (bias corrected) | 36.9 |
| MLE Mean (bias corrected) | 98.67 | | |
| MLE Sd (bias corrected) | 119.4 | 95% Percentile of Chisquare (2kstar) | 4.692 |

**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 | 66.61 |
| Maximum | 860 | Median | 14 |
| SD | 145.8 | CV | 2.19 |
| k hat (MLE) | 0.229 | k star (bias corrected MLE) | 0.229 |
| Theta hat (MLE) | 290.6 | Theta star (bias corrected MLE) | 291.2 |
| nu hat (MLE) | 18.34 | nu star (bias corrected) | 18.3 |
| MLE Mean (bias corrected) | 66.61 | MLE Sd (bias corrected) | 139.3 |
| 95% Percentile of Chisquare (2kstar) | 2.272 | 90% Percentile | 200.9 |
| 95% Percentile | 330.9 | 99% Percentile | 681.2 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 410.3 | 528.5 | 95% Approx. Gamma UPL | 275.4 | 322.5 |
| 95% Gamma USL | 757.8 | 1140 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 70.29 | SD (KM) | 142.4 |
| Variance (KM) | 20281 | SE of Mean (KM) | 22.95 |
| k hat (KM) | 0.244 | k star (KM) | 0.242 |
| nu hat (KM) | 19.49 | nu star (KM) | 19.36 |
| theta hat (KM) | 288.5 | theta star (KM) | 290.5 |
| 80% gamma percentile (KM) | 100.9 | 90% gamma percentile (KM) | 211.4 |
| 95% gamma percentile (KM) | 343.5 | 99% gamma percentile (KM) | 696.7 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 307.3 | 312 | 95% Approx. Gamma UPL | 225.1 | 221.1 |
| 95% KM Gamma Percentile | 214.4 | 209.5 | 95% Gamma USL | 504.5 | 546.6 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.951 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.923 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.121 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.167 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 70.85 | Mean in Log Scale | 3.355 |
| SD in Original Scale | 144 | SD in Log Scale | 1.24 |
| 95% UTL95% Coverage | 395.4 | 95% BCA UTL95% Coverage | 860 |
| 95% Bootstrap (%) UTL95% Coverage | 860 | 95% UPL (t) | 237.4 |
| 90% Percentile (z) | 140.3 | 95% Percentile (z) | 220.1 |
| 99% Percentile (z) | 512.4 | 95% USL | 1002 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | 3.33 | 95% KM UTL (Lognormal)95% Coverage | 371.9 |
| KM SD of Logged Data | 1.223 | 95% KM UPL (Lognormal) | 224.9 |
| 95% KM Percentile Lognormal (z) | 208.7 | 95% KM USL (Lognormal) | 931 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 69.79 | Mean in Log Scale | 3.294 |
| SD in Original Scale | 144.4 | SD in Log Scale | 1.257 |
| 95% UTL95% Coverage | 386.1 | 95% UPL (t) | 230.2 |
| 90% Percentile (z) | 135 | 95% Percentile (z) | 213.2 |
| 99% Percentile (z) | 502.2 | 95% USL | 991.7 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data appear to follow a Discernible Distribution at 5% Significance Level**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 40 | 95% UTL with95% Coverage | 860 |
| Approx, f used to compute achieved CC | 2.105 | Approximate Actual Confidence Coefficient achieved by UTL | 0.871 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 314 |
| 95% USL | 860 | 95% KM Chebyshev UPL | 698.8 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.

The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Naphthalene**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 39 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 | | |
| Number of Detects | 14 | Number of Non-Detects | 25 |
| Number of Distinct Detects | 13 | Number of Distinct Non-Detects | 14 |
| Minimum Detect | 0.0011 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.13 | Maximum Non-Detect | 0.041 |
| Variance Detected | 0.00112 | Percent Non-Detects | 64.1% |
| Mean Detected | 0.0164 | SD Detected | 0.0335 |
| Mean of Detected Logged Data | -5.077 | SD of Detected Logged Data | 1.286 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.124 | d2max (for USL) | 2.857 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.474 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.327 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.00778 | KM SD | 0.0205 |
| 95% UTL95% Coverage | 0.0513 | 95% KM UPL (t) | 0.0427 |
| 90% KM Percentile (z) | 0.034 | 95% KM Percentile (z) | 0.0415 |
| 99% KM Percentile (z) | 0.0554 | 95% KM USL | 0.0663 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.00863 | SD | 0.0207 |
| 95% UTL95% Coverage | 0.0525 | 95% UPL (t) | 0.0439 |
| 90% Percentile (z) | 0.0351 | 95% Percentile (z) | 0.0426 |
| 99% Percentile (z) | 0.0567 | 95% USL | 0.0677 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.067 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.781 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.246 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.239 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.633 | k star (bias corrected MLE) | 0.545 |
| Theta hat (MLE) | 0.0259 | Theta star (bias corrected MLE) | 0.0301 |
| nu hat (MLE) | 17.73 | nu star (bias corrected) | 15.27 |
| MLE Mean (bias corrected) | 0.0164 | | |
| MLE Sd (bias corrected) | 0.0222 | 95% Percentile of Chisquare (2kstar) | 4.061 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.0011 | Mean | 0.0123 |
| Maximum | 0.13 | Median | 0.01 |
| SD | 0.0199 | CV | 1.614 |
| k hat (MLE) | 1.471 | k star (bias corrected MLE) | 1.375 |
| Theta hat (MLE) | 0.00837 | Theta star (bias corrected MLE) | 0.00895 |
| nu hat (MLE) | 114.7 | nu star (bias corrected) | 107.2 |
| MLE Mean (bias corrected) | 0.0123 | MLE Sd (bias corrected) | 0.0105 |
| 95% Percentile of Chisquare (2kstar) | 7.377 | 90% Percentile | 0.0262 |
| 95% Percentile | 0.033 | 99% Percentile | 0.0485 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.04 | 0.0399 | 95% Approx. Gamma UPL | 0.0316 | 0.0311 |
| 95% Gamma USL | 0.0581 | 0.0597 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.00778 | SD (KM) | 0.0205 |
| Variance (KM) | 4.1902E-4 | SE of Mean (KM) | 0.00342 |
| k hat (KM) | 0.145 | k star (KM) | 0.151 |
| nu hat (KM) | 11.28 | nu star (KM) | 11.75 |
| theta hat (KM) | 0.0538 | theta star (KM) | 0.0517 |
| 80% gamma percentile (KM) | 0.0085 | 90% gamma percentile (KM) | 0.0231 |
| 95% gamma percentile (KM) | 0.0428 | 99% gamma percentile (KM) | 0.1 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0305 | 0.029 | 95% Approx. Gamma UPL | 0.0226 | 0.0211 |
| 95% KM Gamma Percentile | 0.0216 | 0.0201 | 95% Gamma USL | 0.0485 | 0.0482 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.936 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.142 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00775 | Mean in Log Scale | -5.647 |
| SD in Original Scale | 0.0207 | SD in Log Scale | 0.955 |
| 95% UTL95% Coverage | 0.0268 | 95% BCA UTL95% Coverage | 0.13 |
| 95% Bootstrap (%) UTL95% Coverage | 0.13 | 95% UPL (t) | 0.018 |
| 90% Percentile (z) | 0.012 | 95% Percentile (z) | 0.017 |
| 99% Percentile (z) | 0.0325 | 95% USL | 0.054 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -5.66 | 95% KM UTL (Lognormal)95% Coverage | 0.0271 |
| KM SD of Logged Data | 0.965 | 95% KM UPL (Lognormal) | 0.0181 |
| 95% KM Percentile Lognormal (z) | 0.017 | 95% KM USL (Lognormal) | 0.0549 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00863 | Mean in Log Scale | -5.4 |
| SD in Original Scale | 0.0207 | SD in Log Scale | 0.856 |
| 95% UTL95% Coverage | 0.0278 | 95% UPL (t) | 0.0195 |
| 90% Percentile (z) | 0.0135 | 95% Percentile (z) | 0.0185 |
| 99% Percentile (z) | 0.0331 | 95% USL | 0.0521 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 39 | 95% UTL with95% Coverage | 0.13 |
| Approx, f used to compute achieved CC | 2.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.865 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.041 |
| 95% USL | 0.13 | 95% KM Chebyshev UPL | 0.0981 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 40 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 38 | | |
| Number of Detects | 6 | Number of Non-Detects | 34 |
| Number of Distinct Detects | 6 | Number of Distinct Non-Detects | 32 |
| Minimum Detect | 8.2800E-8 | Minimum Non-Detect | 7.7400E-8 |
| Maximum Detect | 2.2900E-6 | Maximum Non-Detect | 9.3100E-7 |
| Variance Detected | 7.037E-13 | Percent Non-Detects | 85% |
| Mean Detected | 7.5813E-7 | SD Detected | 8.3888E-7 |
| Mean of Detected Logged Data | -14.7 | SD of Detected Logged Data | 1.282 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.117 | d2max (for USL) | 2.868 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.831 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.788 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.234 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.325 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 1.9355E-7 | KM SD | 3.8169E-7 |
| 95% UTL95% Coverage | 1.0017E-6 | 95% KM UPL (t) | 8.4464E-7 |
| 90% KM Percentile (z) | 6.8270E-7 | 95% KM Percentile (z) | 8.2137E-7 |
| 99% KM Percentile (z) | 1.0815E-6 | 95% KM USL | 1.2881E-6 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 2.5316E-7 | SD | 3.8026E-7 |
| 95% UTL95% Coverage | 1.0582E-6 | 95% UPL (t) | 9.0180E-7 |
| 90% Percentile (z) | 7.4048E-7 | 95% Percentile (z) | 8.7862E-7 |
| 99% Percentile (z) | 1.1378E-6 | 95% USL | 1.3436E-6 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.288 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.716 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.225 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.341 | 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) | 0.958 | k star (bias corrected MLE) | 0.59 |
| Theta hat (MLE) | 7.9159E-7 | Theta star (bias corrected MLE) | 1.2850E-6 |
| nu hat (MLE) | 11.49 | nu star (bias corrected) | 7.08 |
| MLE Mean (bias corrected) | 7.5813E-7 | | |
| MLE Sd (bias corrected) | 9.8702E-7 | 95% Percentile of Chisquare (2kstar) | 4.272 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 8.2800E-8 | Mean | 0.0085 |
| Maximum | 0.01 | Median | 0.01 |
| SD | 0.00362 | CV | 0.425 |
| k hat (MLE) | 0.474 | k star (bias corrected MLE) | 0.455 |
| Theta hat (MLE) | 0.0179 | Theta star (bias corrected MLE) | 0.0187 |
| nu hat (MLE) | 37.92 | nu star (bias corrected) | 36.41 |
| MLE Mean (bias corrected) | 0.0085 | MLE Sd (bias corrected) | 0.0126 |
| 95% Percentile of Chisquare (2kstar) | 3.615 | 90% Percentile | 0.0234 |
| 95% Percentile | 0.0338 | 99% Percentile | 0.0594 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0404 | 0.0599 | 95% Approx. Gamma UPL | 0.0305 | 0.0416 |
| 95% Gamma USL | 0.0637 | 0.108 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 1.9355E-7 | SD (KM) | 3.8169E-7 |
| Variance (KM) | 1.457E-13 | SE of Mean (KM) | 6.6947E-8 |
| k hat (KM) | 0.257 | k star (KM) | 0.255 |
| nu hat (KM) | 20.57 | nu star (KM) | 20.36 |
| theta hat (KM) | 7.5271E-7 | theta star (KM) | 7.6046E-7 |
| 80% gamma percentile (KM) | 2.8286E-7 | 90% gamma percentile (KM) | 5.8019E-7 |
| 95% gamma percentile (KM) | 9.3186E-7 | 99% gamma percentile (KM) | 1.8657E-6 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 6.8634E-7 | 6.5114E-7 | 95% Approx. Gamma UPL | 5.2798E-7 | 4.9461E-7 |
| 95% KM Gamma Percentile | 5.0682E-7 | 4.7408E-7 | 95% Gamma USL | 1.0512E-6 | 1.0288E-6 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.949 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.788 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.197 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.325 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.4343E-7 | Mean in Log Scale | -16.85 |
| SD in Original Scale | 3.9841E-7 | SD in Log Scale | 1.074 |
| 95% UTL95% Coverage | 4.6893E-7 | 95% BCA UTL95% Coverage | 2.2900E-6 |
| 95% Bootstrap (%) UTL95% Coverage | 2.2900E-6 | 95% UPL (t) | 3.0143E-7 |
| 90% Percentile (z) | 1.9111E-7 | 95% Percentile (z) | 2.8233E-7 |
| 99% Percentile (z) | 5.8705E-7 | 95% USL | 1.0499E-6 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -16 | 95% KM UTL (Lognormal)95% Coverage | 5.5799E-7 |
| KM SD of Logged Data | 0.758 | 95% KM UPL (Lognormal) | 4.0857E-7 |
| 95% KM Percentile Lognormal (z) | 3.9013E-7 | 95% KM USL (Lognormal) | 9.8513E-7 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 2.5316E-7 | Mean in Log Scale | -15.63 |
| SD in Original Scale | 3.8026E-7 | SD in Log Scale | 0.83 |
| 95% UTL95% Coverage | 9.4250E-7 | 95% UPL (t) | 6.6981E-7 |
| 90% Percentile (z) | 4.7096E-7 | 95% Percentile (z) | 6.3676E-7 |
| 99% Percentile (z) | 1.1212E-6 | 95% USL | 1.7572E-6 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 40 | 95% UTL with95% Coverage | 2.2900E-6 |
| Approx, f used to compute achieved CC | 2.105 | Approximate Actual Confidence Coefficient achieved by UTL | 0.871 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 9.9655E-7 |
| 95% USL | 2.2900E-6 | 95% KM Chebyshev UPL | 1.8780E-6 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.14/27/2018 5:11:53 PM |
| From File | BenningRoad_BackgroundSoil_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| Different or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_SVOCs|Benzo(a)anthracene (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 18 | | |
| Number of Detects | 18 | Number of Non-Detects | 2 |
| Number of Distinct Detects | 16 | Number of Distinct Non-Detects | 2 |
| Minimum Detect | 0.0061 | Minimum Non-Detect | 0.0039 |
| Maximum Detect | 0.67 | Maximum Non-Detect | 0.0076 |
| Variance Detected | 0.0302 | Percent Non-Detects | 10% |
| Mean Detected | 0.102 | SD Detected | 0.174 |
| Mean of Detected Logged Data | -3.215 | SD of Detected Logged Data | 1.325 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.589 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.897 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.318 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.202 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0926 | KM SD | 0.163 |
| 95% UTL95% Coverage | 0.483 | 95% KM UPL (t) | 0.381 |
| 90% KM Percentile (z) | 0.301 | 95% KM Percentile (z) | 0.36 |
| 99% KM Percentile (z) | 0.471 | 95% KM USL | 0.509 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0924 | SD | 0.167 |
| 95% UTL95% Coverage | 0.493 | 95% UPL (t) | 0.389 |
| 90% Percentile (z) | 0.307 | 95% Percentile (z) | 0.367 |
| 99% Percentile (z) | 0.481 | 95% USL | 0.52 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.244 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.787 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.256 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.213 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.653 | k star (bias corrected MLE) | 0.581 |
| Theta hat (MLE) | 0.157 | Theta star (bias corrected MLE) | 0.176 |
| nu hat (MLE) | 23.49 | nu star (bias corrected) | 20.91 |
| MLE Mean (bias corrected) | 0.102 | | |
| MLE Sd (bias corrected) | 0.134 | 95% Percentile of Chisquare (2kstar) | 4.229 |

**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 | 0.0061 | Mean | 0.0931 |
| Maximum | 0.67 | Median | 0.0225 |
| SD | 0.167 | CV | 1.792 |
| k hat (MLE) | 0.627 | k star (bias corrected MLE) | 0.566 |
| Theta hat (MLE) | 0.149 | Theta star (bias corrected MLE) | 0.165 |
| nu hat (MLE) | 25.06 | nu star (bias corrected) | 22.64 |
| MLE Mean (bias corrected) | 0.0931 | MLE Sd (bias corrected) | 0.124 |
| 95% Percentile of Chisquare (2kstar) | 4.159 | 90% Percentile | 0.245 |
| 95% Percentile | 0.342 | 99% Percentile | 0.578 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.537 | 0.569 | 95% Approx. Gamma UPL | 0.336 | 0.336 |
| 95% Gamma USL | 0.599 | 0.645 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0926 | SD (KM) | 0.163 |
| Variance (KM) | 0.0265 | SE of Mean (KM) | 0.0375 |
| k hat (KM) | 0.323 | k star (KM) | 0.308 |

| | | | |
|---|---|---|---|
| nu hat (KM) | 12.93 | nu star (KM) | 12.32 |
| theta hat (KM) | 0.286 | theta star (KM) | 0.301 |
| 80% gamma percentile (KM) | 0.143 | 90% gamma percentile (KM) | 0.272 |
| 95% gamma percentile (KM) | 0.42 | 99% gamma percentile (KM) | 0.803 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.526 | 0.561 | 95% Approx. Gamma UPL | 0.328 | 0.33 |
| 95% KM Gamma Percentile | 0.296 | 0.293 | 95% Gamma USL | 0.587 | 0.637 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.929 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.897 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.219 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.202 | Data Not Lognormal at 5% Significance Level |

**Detected Data appear Approximate Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0924 | Mean in Log Scale | -3.494 |
| SD in Original Scale | 0.167 | SD in Log Scale | 1.527 |
| 95% UTL95% Coverage | 1.179 | 95% BCA UTL95% Coverage | 0.67 |
| 95% Bootstrap (%) UTL95% Coverage | 0.67 | 95% UPL (t) | 0.455 |
| 90% Percentile (z) | 0.215 | 95% Percentile (z) | 0.374 |
| 99% Percentile (z) | 1.06 | 95% USL | 1.507 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.43 | 95% KM UTL (Lognormal)95% Coverage | 0.894 |
| KM SD of Logged Data | 1.385 | 95% KM UPL (Lognormal) | 0.377 |
| 95% KM Percentile Lognormal (z) | 0.316 | 95% KM USL (Lognormal) | 1.116 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0924 | Mean in Log Scale | -3.484 |
| SD in Original Scale | 0.167 | SD in Log Scale | 1.507 |
| 95% UTL95% Coverage | 1.134 | 95% UPL (t) | 0.443 |
| 90% Percentile (z) | 0.212 | 95% Percentile (z) | 0.366 |
| 99% Percentile (z) | 1.021 | 95% USL | 1.445 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data appear to follow a Discernible Distribution at 5% Significance Level**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 0.67 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.658 |
| 95% USL | 0.67 | 95% KM Chebyshev UPL | 0.82 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Benzo(a)anthracene (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 16 | | |
| Number of Detects | 8 | Number of Non-Detects | 11 |
| Number of Distinct Detects | 8 | Number of Distinct Non-Detects | 8 |
| Minimum Detect | 0.0016 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.096 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 0.0012 | Percent Non-Detects | 57.89% |
| Mean Detected | 0.0286 | SD Detected | 0.0346 |
| Mean of Detected Logged Data | -4.362 | SD of Detected Logged Data | 1.468 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.805 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.818 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.278 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.283 | Detected Data appear Normal at 5% Significance Level |

**Detected Data appear Approximate Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0137 | KM SD | 0.0246 |
| 95% UTL95% Coverage | 0.0733 | 95% KM UPL (t) | 0.0574 |
| 90% KM Percentile (z) | 0.0452 | 95% KM Percentile (z) | 0.0541 |
| 99% KM Percentile (z) | 0.0709 | 95% KM USL | 0.0759 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0141 | SD | 0.0251 |
| 95% UTL95% Coverage | 0.0748 | 95% UPL (t) | 0.0587 |
| 90% Percentile (z) | 0.0462 | 95% Percentile (z) | 0.0553 |

| | | | |
|---|---|---|---|
| 99% Percentile (z) | 0.0724 | 95% USL | 0.0775 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.3 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.189 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.304 | 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) | 0.741 | k star (bias corrected MLE) | 0.547 |
| Theta hat (MLE) | 0.0386 | Theta star (bias corrected MLE) | 0.0524 |
| nu hat (MLE) | 11.86 | nu star (bias corrected) | 8.746 |
| MLE Mean (bias corrected) | 0.0286 | | |
| MLE Sd (bias corrected) | 0.0387 | 95% Percentile of Chisquare (2kstar) | 4.068 |

**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 | 0.0016 | Mean | 0.0178 |
| Maximum | 0.096 | Median | 0.01 |
| SD | 0.0236 | CV | 1.32 |
| k hat (MLE) | 1.188 | k star (bias corrected MLE) | 1.035 |
| Theta hat (MLE) | 0.015 | Theta star (bias corrected MLE) | 0.0172 |
| nu hat (MLE) | 45.14 | nu star (bias corrected) | 39.34 |
| MLE Mean (bias corrected) | 0.0178 | MLE Sd (bias corrected) | 0.0175 |
| 95% Percentile of Chisquare (2kstar) | 6.128 | 90% Percentile | 0.0407 |
| 95% Percentile | 0.0528 | 99% Percentile | 0.0807 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0791 | 0.082 | 95% Approx. Gamma UPL | 0.0537 | 0.0537 |
| 95% Gamma USL | 0.084 | 0.0876 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0137 | SD (KM) | 0.0246 |
| Variance (KM) | 6.0397E-4 | SE of Mean (KM) | 0.00604 |
| k hat (KM) | 0.311 | k star (KM) | 0.297 |
| nu hat (KM) | 11.83 | nu star (KM) | 11.29 |
| theta hat (KM) | 0.044 | theta star (KM) | 0.0461 |
| 80% gamma percentile (KM) | 0.021 | 90% gamma percentile (KM) | 0.0405 |
| 95% gamma percentile (KM) | 0.0629 | 99% gamma percentile (KM) | 0.121 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0769 | 0.0798 | 95% Approx. Gamma UPL | 0.0477 | 0.0468 |
| 95% KM Gamma Percentile | 0.0427 | 0.0414 | 95% Gamma USL | 0.0828 | 0.0867 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.96 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.818 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.135 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.283 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0135 | Mean in Log Scale | -5.338 |
| SD in Original Scale | 0.0253 | SD in Log Scale | 1.295 |
| 95% UTL95% Coverage | 0.111 | 95% BCA UTL95% Coverage | 0.096 |
| 95% Bootstrap (%) UTL95% Coverage | 0.096 | 95% UPL (t) | 0.0481 |
| 90% Percentile (z) | 0.0253 | 95% Percentile (z) | 0.0404 |
| 99% Percentile (z) | 0.0978 | 95% USL | 0.127 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -5.286 | 95% KM UTL (Lognormal)95% Coverage | 0.101 |
| KM SD of Logged Data | 1.237 | 95% KM UPL (Lognormal) | 0.0457 |
| 95% KM Percentile Lognormal (z) | 0.0387 | 95% KM USL (Lognormal) | 0.116 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0141 | Mean in Log Scale | -5.123 |
| SD in Original Scale | 0.0251 | SD in Log Scale | 1.148 |
| 95% UTL95% Coverage | 0.0961 | 95% UPL (t) | 0.0459 |
| 90% Percentile (z) | 0.0259 | 95% Percentile (z) | 0.0393 |
| 99% Percentile (z) | 0.086 | 95% USL | 0.109 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with95% Coverage | 0.096 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |

| | | | |
|---|---|---|---|
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.096 |
| 95% USL | 0.096 | 95% KM Chebyshev UPL | 0.124 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Benzo(a)pyrene (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 17 | | |
| Number of Detects | 17 | Number of Non-Detects | 3 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 3 |
| Minimum Detect | 0.0056 | Minimum Non-Detect | 0.0039 |
| Maximum Detect | 1.5 | Maximum Non-Detect | 0.0076 |
| Variance Detected | 0.13 | Percent Non-Detects | 15% |
| Mean Detected | 0.153 | SD Detected | 0.361 |
| Mean of Detected Logged Data | -3.156 | SD of Detected Logged Data | 1.453 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.438 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.352 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.131 | KM SD | 0.327 |
| 95% UTL95% Coverage | 0.914 | 95% KM UPL (t) | 0.71 |
| 90% KM Percentile (z) | 0.55 | 95% KM Percentile (z) | 0.669 |
| 99% KM Percentile (z) | 0.891 | 95% KM USL | 0.967 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.13 | SD | 0.336 |
| 95% UTL95% Coverage | 0.934 | 95% UPL (t) | 0.725 |
| 90% Percentile (z) | 0.561 | 95% Percentile (z) | 0.682 |
| 99% Percentile (z) | 0.911 | 95% USL | 0.988 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.6 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.799 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.273 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.221 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.497 | k star (bias corrected MLE) | 0.449 |
| Theta hat (MLE) | 0.308 | Theta star (bias corrected MLE) | 0.341 |
| nu hat (MLE) | 16.9 | nu star (bias corrected) | 15.25 |
| MLE Mean (bias corrected) | 0.153 | | |
| MLE Sd (bias corrected) | 0.228 | 95% Percentile of Chisquare (2kstar) | 3.582 |

**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 | 0.0056 | Mean | 0.132 |
| Maximum | 1.5 | Median | 0.021 |
| SD | 0.335 | CV | 2.549 |
| k hat (MLE) | 0.476 | k star (bias corrected MLE) | 0.438 |
| Theta hat (MLE) | 0.276 | Theta star (bias corrected MLE) | 0.3 |
| nu hat (MLE) | 19.04 | nu star (bias corrected) | 17.52 |
| MLE Mean (bias corrected) | 0.132 | MLE Sd (bias corrected) | 0.199 |
| 95% Percentile of Chisquare (2kstar) | 3.526 | 90% Percentile | 0.365 |
| 95% Percentile | 0.529 | 99% Percentile | 0.938 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.789 | 0.804 | 95% Approx. Gamma UPL | 0.473 | 0.453 |
| 95% Gamma USL | 0.888 | 0.92 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.131 | SD (KM) | 0.327 |
| Variance (KM) | 0.107 | SE of Mean (KM) | 0.0754 |
| k hat (KM) | 0.16 | k star (KM) | 0.169 |
| nu hat (KM) | 6.388 | nu star (KM) | 6.763 |
| theta hat (KM) | 0.818 | theta star (KM) | 0.773 |
| 80% gamma percentile (KM) | 0.156 | 90% gamma percentile (KM) | 0.393 |

| | | | |
|---|---|---|---|
| 95% gamma percentile (KM) | 0.701 | 99% gamma percentile (KM) | 1.577 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.769 | 0.793 | 95% Approx. Gamma UPL | 0.46 | 0.443 |
| 95% KM Gamma Percentile | 0.409 | 0.389 | 95% Gamma USL | 0.867 | 0.909 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.919 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.231 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Lognormal at 5% Significance Level |

**Detected Data appear Approximate Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.13 | Mean in Log Scale | -3.625 |
| SD in Original Scale | 0.336 | SD in Log Scale | 1.761 |
| 95% UTL95% Coverage | 1.814 | 95% BCA UTL95% Coverage | 1.5 |
| 95% Bootstrap (%) UTL95% Coverage | 1.5 | 95% UPL (t) | 0.604 |
| 90% Percentile (z) | 0.255 | 95% Percentile (z) | 0.483 |
| 99% Percentile (z) | 1.605 | 95% USL | 2.407 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.497 | 95% KM UTL (Lognormal)95% Coverage | 1.192 |
| KM SD of Logged Data | 1.533 | 95% KM UPL (Lognormal) | 0.458 |
| 95% KM Percentile Lognormal (z) | 0.377 | 95% KM USL (Lognormal) | 1.525 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.13 | Mean in Log Scale | -3.556 |
| SD in Original Scale | 0.336 | SD in Log Scale | 1.657 |
| 95% UTL95% Coverage | 1.512 | 95% UPL (t) | 0.538 |
| 90% Percentile (z) | 0.239 | 95% Percentile (z) | 0.436 |
| 99% Percentile (z) | 1.347 | 95% USL | 1.973 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 1.5 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.445 |
| 95% USL | 1.5 | 95% KM Chebyshev UPL | 1.591 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Benzo(a)pyrene (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 15 | | |
| Number of Detects | 5 | Number of Non-Detects | 14 |
| Number of Distinct Detects | 5 | Number of Distinct Non-Detects | 10 |
| Minimum Detect | 0.011 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.095 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 0.00144 | Percent Non-Detects | 73.68% |
| Mean Detected | 0.0414 | SD Detected | 0.0379 |
| Mean of Detected Logged Data | -3.557 | SD of Detected Logged Data | 0.972 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.824 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.323 | **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) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0136 | KM SD | 0.0241 |
| 95% UTL95% Coverage | 0.0719 | 95% KM UPL (t) | 0.0564 |
| 90% KM Percentile (z) | 0.0444 | 95% KM Percentile (z) | 0.0532 |
| 99% KM Percentile (z) | 0.0696 | 95% KM USL | 0.0745 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0135 | SD | 0.0248 |
| 95% UTL95% Coverage | 0.0735 | 95% UPL (t) | 0.0576 |
| 90% Percentile (z) | 0.0453 | 95% Percentile (z) | 0.0543 |
| 99% Percentile (z) | 0.0711 | 95% USL | 0.0762 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | | |
|---|---|---|---|
| A-D Test Statistic | 0.494 | **Anderson-Darling GOF Test** | |
| 5% A-D Critical Value | 0.687 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.309 | **Kolmogorov-Smirnov GOF** | |
| 5% K-S Critical Value | 0.362 | Detected data appear Gamma Distributed at 5% Significance Level | |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.488 | k star (bias corrected MLE) | 0.728 |
| Theta hat (MLE) | 0.0278 | Theta star (bias corrected MLE) | 0.0568 |
| nu hat (MLE) | 14.88 | nu star (bias corrected) | 7.284 |
| MLE Mean (bias corrected) | 0.0414 | | |
| MLE Sd (bias corrected) | 0.0485 | 95% Percentile of Chisquare (2kstar) | 4.888 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.0183 |
| Maximum | 0.095 | Median | 0.01 |
| SD | 0.0228 | CV | 1.251 |
| k hat (MLE) | 1.679 | k star (bias corrected MLE) | 1.449 |
| Theta hat (MLE) | 0.0109 | Theta star (bias corrected MLE) | 0.0126 |
| nu hat (MLE) | 63.81 | nu star (bias corrected) | 55.07 |
| MLE Mean (bias corrected) | 0.0183 | MLE Sd (bias corrected) | 0.0152 |
| 95% Percentile of Chisquare (2kstar) | 7.637 | 90% Percentile | 0.0384 |
| 95% Percentile | 0.0481 | 99% Percentile | 0.0702 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0682 | 0.0675 | 95% Approx. Gamma UPL | 0.0484 | 0.047 |
| 95% Gamma USL | 0.072 | 0.0715 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0136 | SD (KM) | 0.0241 |
| Variance (KM) | 5.7861E-4 | SE of Mean (KM) | 0.00617 |
| k hat (KM) | 0.321 | k star (KM) | 0.305 |
| nu hat (KM) | 12.18 | nu star (KM) | 11.59 |
| theta hat (KM) | 0.0425 | theta star (KM) | 0.0446 |
| 80% gamma percentile (KM) | 0.021 | 90% gamma percentile (KM) | 0.0401 |
| 95% gamma percentile (KM) | 0.062 | 99% gamma percentile (KM) | 0.119 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0685 | 0.0687 | 95% Approx. Gamma UPL | 0.044 | 0.0424 |
| 95% KM Gamma Percentile | 0.0397 | 0.038 | 95% Gamma USL | 0.0733 | 0.0741 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.87 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.262 | **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

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0114 | Mean in Log Scale | -6.428 |
| SD in Original Scale | 0.0257 | SD in Log Scale | 1.916 |
| 95% UTL95% Coverage | 0.168 | 95% BCA UTL95% Coverage | 0.095 |
| 95% Bootstrap (%) UTL95% Coverage | 0.095 | 95% UPL (t) | 0.0489 |
| 90% Percentile (z) | 0.0188 | 95% Percentile (z) | 0.0378 |
| 99% Percentile (z) | 0.139 | 95% USL | 0.207 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -5.062 | 95% KM UTL (Lognormal)95% Coverage | 0.0721 |
| KM SD of Logged Data | 1.004 | 95% KM UPL (Lognormal) | 0.0378 |
| 95% KM Percentile Lognormal (z) | 0.033 | 95% KM USL (Lognormal) | 0.0804 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0135 | Mean in Log Scale | -5.102 |
| SD in Original Scale | 0.0248 | SD in Log Scale | 1.071 |
| 95% UTL95% Coverage | 0.0815 | 95% UPL (t) | 0.0409 |
| 90% Percentile (z) | 0.024 | 95% Percentile (z) | 0.0354 |
| 99% Percentile (z) | 0.0735 | 95% USL | 0.0915 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with95% Coverage | 0.095 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.095 |
| 95% USL | 0.095 | 95% KM Chebyshev UPL | 0.121 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Benzo(b)fluoranthene (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 17 | Number of Non-Detects | 3 |
| Number of Distinct Detects | 17 | Number of Distinct Non-Detects | 3 |
| Minimum Detect | 0.0073 | Minimum Non-Detect | 0.0039 |
| Maximum Detect | 1.3 | Maximum Non-Detect | 0.0076 |
| Variance Detected | 0.0991 | Percent Non-Detects | 15% |
| Mean Detected | 0.159 | SD Detected | 0.315 |
| Mean of Detected Logged Data | -2.872 | SD of Detected Logged Data | 1.356 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.509 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.315 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.136 | KM SD | 0.287 |
| 95% UTL95% Coverage | 0.824 | 95% KM UPL (t) | 0.645 |
| 90% KM Percentile (z) | 0.504 | 95% KM Percentile (z) | 0.608 |
| 99% KM Percentile (z) | 0.804 | 95% KM USL | 0.87 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.136 | SD | 0.295 |
| 95% UTL95% Coverage | 0.842 | 95% UPL (t) | 0.658 |
| 90% Percentile (z) | 0.513 | 95% Percentile (z) | 0.62 |
| 99% Percentile (z) | 0.821 | 95% USL | 0.889 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.314 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.79 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.271 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.219 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.597 | k star (bias corrected MLE) | 0.531 |
| Theta hat (MLE) | 0.266 | Theta star (bias corrected MLE) | 0.3 |
| nu hat (MLE) | 20.31 | nu star (bias corrected) | 18.06 |
| MLE Mean (bias corrected) | 0.159 | | |
| MLE Sd (bias corrected) | 0.218 | 95% Percentile of Chisquare (2kstar) | 3.994 |

**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 | 0.0073 | Mean | 0.137 |
| Maximum | 1.3 | Median | 0.0295 |
| SD | 0.294 | CV | 2.149 |
| k hat (MLE) | 0.548 | k star (bias corrected MLE) | 0.499 |
| Theta hat (MLE) | 0.25 | Theta star (bias corrected MLE) | 0.274 |
| nu hat (MLE) | 21.91 | nu star (bias corrected) | 19.96 |
| MLE Mean (bias corrected) | 0.137 | MLE Sd (bias corrected) | 0.194 |
| 95% Percentile of Chisquare (2kstar) | 3.837 | 90% Percentile | 0.37 |
| 95% Percentile | 0.526 | 99% Percentile | 0.909 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.811 | 0.849 | 95% Approx. Gamma UPL | 0.498 | 0.49 |
| 95% Gamma USL | 0.908 | 0.967 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.136 | SD (KM) | 0.287 |
| Variance (KM) | 0.0824 | SE of Mean (KM) | 0.0662 |
| k hat (KM) | 0.224 | k star (KM) | 0.224 |
| nu hat (KM) | 8.975 | nu star (KM) | 8.962 |
| theta hat (KM) | 0.606 | theta star (KM) | 0.607 |
| 80% gamma percentile (KM) | 0.189 | 90% gamma percentile (KM) | 0.41 |
| 95% gamma percentile (KM) | 0.679 | 99% gamma percentile (KM) | 1.406 |

**The following statistics are computed using gamma distribution and KM estimates**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.801 | 0.853 | 95% Approx. Gamma UPL | 0.488 | 0.486 |
| 95% KM Gamma Percentile | 0.437 | 0.429 | 95% Gamma USL | 0.898 | 0.974 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.929 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.227 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Lognormal at 5% Significance Level |

**Detected Data appear Approximate Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.136 | Mean in Log Scale | -3.325 |
| SD in Original Scale | 0.295 | SD in Log Scale | 1.666 |
| 95% UTL95% Coverage | 1.947 | 95% BCA UTL95% Coverage | 1.3 |
| 95% Bootstrap (%) UTL95% Coverage | 1.3 | 95% UPL (t) | 0.688 |
| 90% Percentile (z) | 0.304 | 95% Percentile (z) | 0.557 |
| 99% Percentile (z) | 1.734 | 95% USL | 2.544 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.263 | 95% KM UTL (Lognormal)95% Coverage | 1.496 |
| KM SD of Logged Data | 1.53 | 95% KM UPL (Lognormal) | 0.576 |
| 95% KM Percentile Lognormal (z) | 0.474 | 95% KM USL (Lognormal) | 1.913 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.136 | Mean in Log Scale | -3.315 |
| SD in Original Scale | 0.295 | SD in Log Scale | 1.652 |
| 95% UTL95% Coverage | 1.903 | 95% UPL (t) | 0.679 |
| 90% Percentile (z) | 0.302 | 95% Percentile (z) | 0.55 |
| 99% Percentile (z) | 1.696 | 95% USL | 2.482 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 1.3 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.257 |
| 95% USL | 1.3 | 95% KM Chebyshev UPL | 1.418 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Benzo(b)fluoranthene (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 15 | | |
| Number of Detects | 5 | Number of Non-Detects | 14 |
| Number of Distinct Detects | 5 | Number of Distinct Non-Detects | 10 |
| Minimum Detect | 0.012 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.12 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 0.00261 | Percent Non-Detects | 73.68% |
| Mean Detected | 0.0608 | SD Detected | 0.051 |
| Mean of Detected Logged Data | -3.178 | SD of Detected Logged Data | 1.039 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.847 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.232 | **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) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0187 | KM SD | 0.0344 |
| 95% UTL95% Coverage | 0.102 | 95% KM UPL (t) | 0.0799 |
| 90% KM Percentile (z) | 0.0628 | 95% KM Percentile (z) | 0.0752 |
| 99% KM Percentile (z) | 0.0987 | 95% KM USL | 0.106 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0186 | SD | 0.0353 |
| 95% UTL95% Coverage | 0.104 | 95% UPL (t) | 0.0815 |
| 90% Percentile (z) | 0.0639 | 95% Percentile (z) | 0.0768 |
| 99% Percentile (z) | 0.101 | 95% USL | 0.108 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.387 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.687 | Detected data appear Gamma Distributed at 5% Significance Level |

| | | | |
|---|---|---|---|
| K-S Test Statistic | 0.256 | **Kolmogorov-Smirnov GOF** | |
| 5% K-S Critical Value | 0.362 | Detected data appear Gamma Distributed at 5% Significance Level | |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.467 | k star (bias corrected MLE) | 0.72 |
| Theta hat (MLE) | 0.0415 | Theta star (bias corrected MLE) | 0.0844 |
| nu hat (MLE) | 14.67 | nu star (bias corrected) | 7.2 |
| MLE Mean (bias corrected) | 0.0608 | | |
| MLE Sd (bias corrected) | 0.0717 | 95% Percentile of Chisquare (2kstar) | 4.852 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.0234 |
| Maximum | 0.12 | Median | 0.01 |
| SD | 0.0333 | CV | 1.424 |
| k hat (MLE) | 1.196 | k star (bias corrected MLE) | 1.042 |
| Theta hat (MLE) | 0.0195 | Theta star (bias corrected MLE) | 0.0224 |
| nu hat (MLE) | 45.43 | nu star (bias corrected) | 39.59 |
| MLE Mean (bias corrected) | 0.0234 | MLE Sd (bias corrected) | 0.0229 |
| 95% Percentile of Chisquare (2kstar) | 6.153 | 90% Percentile | 0.0533 |
| 95% Percentile | 0.069 | 99% Percentile | 0.105 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.102 | 0.102 | 95% Approx. Gamma UPL | 0.0693 | 0.0674 |
| 95% Gamma USL | 0.109 | 0.109 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0187 | SD (KM) | 0.0344 |
| Variance (KM) | 0.00118 | SE of Mean (KM) | 0.00881 |
| k hat (KM) | 0.297 | k star (KM) | 0.285 |
| nu hat (KM) | 11.29 | nu star (KM) | 10.84 |
| theta hat (KM) | 0.063 | theta star (KM) | 0.0657 |
| 80% gamma percentile (KM) | 0.0283 | 90% gamma percentile (KM) | 0.0555 |
| 95% gamma percentile (KM) | 0.0871 | 99% gamma percentile (KM) | 0.169 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.104 | 0.106 | 95% Approx. Gamma UPL | 0.0643 | 0.0621 |
| 95% KM Gamma Percentile | 0.0576 | 0.0551 | 95% Gamma USL | 0.112 | 0.115 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.896 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.225 | **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**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0167 | Mean in Log Scale | -6.181 |
| SD in Original Scale | 0.0362 | SD in Log Scale | 2.007 |
| 95% UTL95% Coverage | 0.267 | 95% BCA UTL95% Coverage | 0.12 |
| 95% Bootstrap (%) UTL95% Coverage | 0.12 | 95% UPL (t) | 0.0735 |
| 90% Percentile (z) | 0.0271 | 95% Percentile (z) | 0.0561 |
| 99% Percentile (z) | 0.22 | 95% USL | 0.332 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -4.962 | 95% KM UTL (Lognormal)95% Coverage | 0.119 |
| KM SD of Logged Data | 1.168 | 95% KM UPL (Lognormal) | 0.0559 |
| 95% KM Percentile Lognormal (z) | 0.0478 | 95% KM USL (Lognormal) | 0.135 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0186 | Mean in Log Scale | -5.002 |
| SD in Original Scale | 0.0353 | SD in Log Scale | 1.237 |
| 95% UTL95% Coverage | 0.135 | 95% UPL (t) | 0.0607 |
| 90% Percentile (z) | 0.0328 | 95% Percentile (z) | 0.0514 |
| 99% Percentile (z) | 0.12 | 95% USL | 0.154 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with95% Coverage | 0.12 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.12 |
| 95% USL | 0.12 | 95% KM Chebyshev UPL | 0.172 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.

The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 16 | | |
| Number of Detects | 17 | Number of Non-Detects | 3 |
| Number of Distinct Detects | 13 | Number of Distinct Non-Detects | 3 |
| Minimum Detect | 0.0046 | Minimum Non-Detect | 0.0039 |
| Maximum Detect | 1.6 | Maximum Non-Detect | 0.0076 |
| Variance Detected | 0.146 | Percent Non-Detects | 15% |
| Mean Detected | 0.144 | SD Detected | 0.383 |
| Mean of Detected Logged Data | -3.381 | SD of Detected Logged Data | 1.486 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.389 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.397 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.123 | KM SD | 0.346 |
| 95% UTL95% Coverage | 0.952 | 95% KM UPL (t) | 0.736 |
| 90% KM Percentile (z) | 0.566 | 95% KM Percentile (z) | 0.692 |
| 99% KM Percentile (z) | 0.927 | 95% KM USL | 1.007 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.123 | SD | 0.355 |
| 95% UTL95% Coverage | 0.973 | 95% UPL (t) | 0.752 |
| 90% Percentile (z) | 0.578 | 95% Percentile (z) | 0.707 |
| 99% Percentile (z) | 0.948 | 95% USL | 1.03 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.967 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.809 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.276 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.222 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.448 | k star (bias corrected MLE) | 0.408 |
| Theta hat (MLE) | 0.322 | Theta star (bias corrected MLE) | 0.353 |
| nu hat (MLE) | 15.22 | nu star (bias corrected) | 13.87 |
| MLE Mean (bias corrected) | 0.144 | | |
| MLE Sd (bias corrected) | 0.226 | 95% Percentile of Chisquare (2kstar) | 3.367 |

**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 | 0.0046 | Mean | 0.124 |
| Maximum | 1.6 | Median | 0.0165 |
| SD | 0.354 | CV | 2.86 |
| k hat (MLE) | 0.439 | k star (bias corrected MLE) | 0.406 |
| Theta hat (MLE) | 0.282 | Theta star (bias corrected MLE) | 0.305 |
| nu hat (MLE) | 17.56 | nu star (bias corrected) | 16.26 |
| MLE Mean (bias corrected) | 0.124 | MLE Sd (bias corrected) | 0.194 |
| 95% Percentile of Chisquare (2kstar) | 3.359 | 90% Percentile | 0.349 |
| 95% Percentile | 0.512 | 99% Percentile | 0.921 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.737 | 0.732 | 95% Approx. Gamma UPL | 0.436 | 0.407 |
| 95% Gamma USL | 0.832 | 0.841 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.123 | SD (KM) | 0.346 |
| Variance (KM) | 0.12 | SE of Mean (KM) | 0.0797 |
| k hat (KM) | 0.127 | k star (KM) | 0.141 |
| nu hat (KM) | 5.074 | nu star (KM) | 5.646 |
| theta hat (KM) | 0.971 | theta star (KM) | 0.872 |
| 80% gamma percentile (KM) | 0.127 | 90% gamma percentile (KM) | 0.362 |
| 95% gamma percentile (KM) | 0.685 | 99% gamma percentile (KM) | 1.637 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.714 | 0.715 | 95% Approx. Gamma UPL | 0.421 | 0.394 |

| | | | | | |
|---|---|---|---|---|---|
| 95% KM Gamma Percentile | 0.374 | 0.345 | 95% Gamma USL | 0.807 | 0.822 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.891 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.892 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.241 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.207 | Data Not Lognormal at 5% Significance Level |

**Data Not Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.123 | Mean in Log Scale | -3.82 |
| SD in Original Scale | 0.355 | SD in Log Scale | 1.745 |
| 95% UTL95% Coverage | 1.437 | 95% BCA UTL95% Coverage | 1.6 |
| 95% Bootstrap (%) UTL95% Coverage | 1.6 | 95% UPL (t) | 0.483 |
| 90% Percentile (z) | 0.205 | 95% Percentile (z) | 0.387 |
| 99% Percentile (z) | 1.272 | 95% USL | 1.902 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.684 | 95% KM UTL (Lognormal)95% Coverage | 0.944 |
| KM SD of Logged Data | 1.514 | 95% KM UPL (Lognormal) | 0.367 |
| 95% KM Percentile Lognormal (z) | 0.303 | 95% KM USL (Lognormal) | 1.204 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.123 | Mean in Log Scale | -3.747 |
| SD in Original Scale | 0.355 | SD in Log Scale | 1.635 |
| 95% UTL95% Coverage | 1.185 | 95% UPL (t) | 0.427 |
| 90% Percentile (z) | 0.192 | 95% Percentile (z) | 0.347 |
| 99% Percentile (z) | 1.057 | 95% USL | 1.54 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

**Data do not follow a Discernible Distribution (0.05)**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 1.6 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.535 |
| 95% USL | 1.6 | 95% KM Chebyshev UPL | 1.667 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

### RA17_SO_SVOCs|Indeno(1,2,3-cd)pyrene (3 - 4 ft)

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 15 | | |
| Number of Detects | 5 | Number of Non-Detects | 14 |
| Number of Distinct Detects | 5 | Number of Distinct Non-Detects | 10 |
| Minimum Detect | 0.01 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.065 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 6.8270E-4 | Percent Non-Detects | 73.68% |
| Mean Detected | 0.0308 | SD Detected | 0.0261 |
| Mean of Detected Logged Data | -3.794 | SD of Detected Logged Data | 0.886 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.79 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.34 | **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) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0108 | KM SD | 0.0169 |
| 95% UTL95% Coverage | 0.0518 | 95% KM UPL (t) | 0.0409 |
| 90% KM Percentile (z) | 0.0325 | 95% KM Percentile (z) | 0.0387 |
| 99% KM Percentile (z) | 0.0502 | 95% KM USL | 0.0536 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0107 | SD | 0.0174 |
| 95% UTL95% Coverage | 0.053 | 95% UPL (t) | 0.0417 |
| 90% Percentile (z) | 0.0331 | 95% Percentile (z) | 0.0394 |
| 99% Percentile (z) | 0.0513 | 95% USL | 0.0549 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.621 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.685 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.343 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.361 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.744 | k star (bias corrected MLE) | 0.831 |
| Theta hat (MLE) | 0.0177 | Theta star (bias corrected MLE) | 0.0371 |
| nu hat (MLE) | 17.44 | nu star (bias corrected) | 8.31 |
| MLE Mean (bias corrected) | 0.0308 | | |
| MLE Sd (bias corrected) | 0.0338 | 95% Percentile of Chisquare (2kstar) | 5.318 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.01 | Mean | 0.0155 |
| Maximum | 0.065 | Median | 0.01 |
| SD | 0.0155 | CV | 1.002 |
| k hat (MLE) | 2.396 | k star (bias corrected MLE) | 2.053 |
| Theta hat (MLE) | 0.00646 | Theta star (bias corrected MLE) | 0.00754 |
| nu hat (MLE) | 91.05 | nu star (bias corrected) | 78.01 |
| MLE Mean (bias corrected) | 0.0155 | MLE Sd (bias corrected) | 0.0108 |
| 95% Percentile of Chisquare (2kstar) | 9.658 | 90% Percentile | 0.0299 |
| 95% Percentile | 0.0364 | 99% Percentile | 0.0508 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0498 | 0.0493 | 95% Approx. Gamma UPL | 0.0368 | 0.036 |
| 95% Gamma USL | 0.0522 | 0.0518 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0108 | SD (KM) | 0.0169 |
| Variance (KM) | 2.8613E-4 | SE of Mean (KM) | 0.00434 |
| k hat (KM) | 0.41 | k star (KM) | 0.38 |
| nu hat (KM) | 15.58 | nu star (KM) | 14.45 |
| theta hat (KM) | 0.0264 | theta star (KM) | 0.0285 |
| 80% gamma percentile (KM) | 0.0174 | 90% gamma percentile (KM) | 0.0309 |
| 95% gamma percentile (KM) | 0.0458 | 99% gamma percentile (KM) | 0.0835 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0499 | 0.05 | 95% Approx. Gamma UPL | 0.0331 | 0.0321 |
| 95% KM Gamma Percentile | 0.0302 | 0.0291 | 95% Gamma USL | 0.0532 | 0.0537 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.818 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.304 | **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**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00872 | Mean in Log Scale | -6.349 |
| SD in Original Scale | 0.0183 | SD in Log Scale | 1.708 |
| 95% UTL95% Coverage | 0.11 | 95% BCA UTL95% Coverage | 0.065 |
| 95% Bootstrap (%) UTL95% Coverage | 0.065 | 95% UPL (t) | 0.0365 |
| 90% Percentile (z) | 0.0156 | 95% Percentile (z) | 0.029 |
| 99% Percentile (z) | 0.093 | 95% USL | 0.132 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -5.124 | 95% KM UTL (Lognormal)95% Coverage | 0.0518 |
| KM SD of Logged Data | 0.893 | 95% KM UPL (Lognormal) | 0.0291 |
| 95% KM Percentile Lognormal (z) | 0.0259 | 95% KM USL (Lognormal) | 0.0571 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0107 | Mean in Log Scale | -5.164 |
| SD in Original Scale | 0.0174 | SD in Log Scale | 0.959 |
| 95% UTL95% Coverage | 0.0584 | 95% UPL (t) | 0.0315 |
| 90% Percentile (z) | 0.0195 | 95% Percentile (z) | 0.0277 |
| 99% Percentile (z) | 0.0532 | 95% USL | 0.0647 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with95% Coverage | 0.065 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.065 |
| 95% USL | 0.065 | 95% KM Chebyshev UPL | 0.0865 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|BaP-TE (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 19 | | |
| Number of Detects | 18 | Number of Non-Detects | 2 |
| Number of Distinct Detects | 17 | Number of Distinct Non-Detects | 2 |
| Minimum Detect | 0.00131 | Minimum Non-Detect | 0.0039 |
| Maximum Detect | 2.34 | Maximum Non-Detect | 0.0076 |
| Variance Detected | 0.301 | Percent Non-Detects | 10% |
| Mean Detected | 0.225 | SD Detected | 0.549 |
| Mean of Detected Logged Data | -2.986 | SD of Detected Logged Data | 1.743 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.431 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.897 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.348 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.202 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.203 | KM SD | 0.51 |
| 95% UTL95% Coverage | 1.426 | 95% KM UPL (t) | 1.107 |
| 90% KM Percentile (z) | 0.857 | 95% KM Percentile (z) | 1.042 |
| 99% KM Percentile (z) | 1.39 | 95% KM USL | 1.508 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.203 | SD | 0.524 |
| 95% UTL95% Coverage | 1.457 | 95% UPL (t) | 1.131 |
| 90% Percentile (z) | 0.874 | 95% Percentile (z) | 1.064 |
| 99% Percentile (z) | 1.421 | 95% USL | 1.542 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.21 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.814 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.251 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.217 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.435 | k star (bias corrected MLE) | 0.399 |
| Theta hat (MLE) | 0.518 | Theta star (bias corrected MLE) | 0.564 |
| nu hat (MLE) | 15.65 | nu star (bias corrected) | 14.37 |
| MLE Mean (bias corrected) | 0.225 | | |
| MLE Sd (bias corrected) | 0.356 | 95% Percentile of Chisquare (2kstar) | 3.32 |

**Gamma ROS Statistics using Imputed Non-Detects**

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.00131 | Mean | 0.203 |
| Maximum | 2.34 | Median | 0.0333 |
| SD | 0.523 | CV | 2.572 |
| k hat (MLE) | 0.42 | k star (bias corrected MLE) | 0.39 |
| Theta hat (MLE) | 0.485 | Theta star (bias corrected MLE) | 0.522 |
| nu hat (MLE) | 16.79 | nu star (bias corrected) | 15.6 |
| MLE Mean (bias corrected) | 0.203 | MLE Sd (bias corrected) | 0.326 |
| 95% Percentile of Chisquare (2kstar) | 3.27 | 90% Percentile | 0.577 |
| 95% Percentile | 0.853 | 99% Percentile | 1.548 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.282 | 1.353 | 95% Approx. Gamma UPL | 0.756 | 0.741 |
| 95% Gamma USL | 1.448 | 1.559 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.203 | SD (KM) | 0.51 |
| Variance (KM) | 0.261 | SE of Mean (KM) | 0.117 |
| k hat (KM) | 0.158 | k star (KM) | 0.167 |
| nu hat (KM) | 6.314 | nu star (KM) | 6.7 |
| theta hat (KM) | 1.285 | theta star (KM) | 1.211 |
| 80% gamma percentile (KM) | 0.24 | 90% gamma percentile (KM) | 0.609 |
| 95% gamma percentile (KM) | 1.091 | 99% gamma percentile (KM) | 2.459 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.255 | 1.349 | 95% Approx. Gamma UPL | 0.737 | 0.73 |
| 95% KM Gamma Percentile | 0.653 | 0.637 | 95% Gamma USL | 1.419 | 1.558 |

**Lognormal GOF Test on Detected Observations Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.975 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.897 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.168 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.202 | Detected Data appear Lognormal at 5% Significance Level | |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.203 | Mean in Log Scale | -3.291 |
| SD in Original Scale | 0.524 | SD in Log Scale | 1.902 |
| 95% UTL95% Coverage | 3.544 | 95% BCA UTL95% Coverage | 2.34 |
| 95% Bootstrap (%) UTL95% Coverage | 2.34 | 95% UPL (t) | 1.082 |
| 90% Percentile (z) | 0.426 | 95% Percentile (z) | 0.85 |
| 99% Percentile (z) | 3.105 | 95% USL | 4.81 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -3.308 | 95% KM UTL (Lognormal)95% Coverage | 3.387 |
| KM SD of Logged Data | 1.89 | 95% KM UPL (Lognormal) | 1.041 |
| 95% KM Percentile Lognormal (z) | 0.819 | 95% KM USL (Lognormal) | 4.588 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.203 | Mean in Log Scale | -3.278 |
| SD in Original Scale | 0.524 | SD in Log Scale | 1.881 |
| 95% UTL95% Coverage | 3.415 | 95% UPL (t) | 1.056 |
| 90% Percentile (z) | 0.42 | 95% Percentile (z) | 0.831 |
| 99% Percentile (z) | 2.995 | 95% USL | 4.619 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 2.34 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 2.254 |
| 95% USL | 2.34 | 95% KM Chebyshev UPL | 2.482 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_SVOCs|BaP-TE (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 19 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 16 | | |
| Number of Detects | 8 | Number of Non-Detects | 11 |
| Number of Distinct Detects | 8 | Number of Distinct Non-Detects | 8 |
| Minimum Detect | 1.6100E-4 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.147 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 0.00319 | Percent Non-Detects | 57.89% |
| Mean Detected | 0.0399 | SD Detected | 0.0565 |
| Mean of Detected Logged Data | -5.032 | SD of Detected Logged Data | 2.692 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.423 | d2max (for USL) | 2.531 |

**Normal GOF Test on Detects Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.742 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.818 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.33 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.283 | Data Not Normal at 5% Significance Level | |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.017 | KM SD | 0.0395 |
| 95% UTL95% Coverage | 0.113 | 95% KM UPL (t) | 0.0872 |
| 90% KM Percentile (z) | 0.0676 | 95% KM Percentile (z) | 0.0819 |
| 99% KM Percentile (z) | 0.109 | 95% KM USL | 0.117 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0188 | SD | 0.0398 |
| 95% UTL95% Coverage | 0.115 | 95% UPL (t) | 0.0896 |
| 90% Percentile (z) | 0.0698 | 95% Percentile (z) | 0.0842 |
| 99% Percentile (z) | 0.111 | 95% USL | 0.119 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | | |
|---|---|---|---|
| A-D Test Statistic | 0.374 | **Anderson-Darling GOF Test** | |
| 5% A-D Critical Value | 0.785 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.216 | **Kolmogorov-Smirnov GOF** | |
| 5% K-S Critical Value | 0.314 | Detected data appear Gamma Distributed at 5% Significance Level | |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.368 | k star (bias corrected MLE) | 0.313 |

| | | | |
|---|---|---|---|
| Theta hat (MLE) | 0.108 | Theta star (bias corrected MLE) | 0.127 |
| nu hat (MLE) | 5.892 | nu star (bias corrected) | 5.016 |
| MLE Mean (bias corrected) | 0.0399 | | |
| MLE Sd (bias corrected) | 0.0713 | 95% Percentile of Chisquare (2kstar) | 2.828 |

**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 | 1.6100E-4 | Mean | 0.0226 |
| Maximum | 0.147 | Median | 0.01 |
| SD | 0.0383 | CV | 1.698 |
| k hat (MLE) | 0.618 | k star (bias corrected MLE) | 0.556 |
| Theta hat (MLE) | 0.0365 | Theta star (bias corrected MLE) | 0.0406 |
| nu hat (MLE) | 23.5 | nu star (bias corrected) | 21.12 |
| MLE Mean (bias corrected) | 0.0226 | MLE Sd (bias corrected) | 0.0303 |
| 95% Percentile of Chisquare (2kstar) | 4.112 | 90% Percentile | 0.0598 |
| 95% Percentile | 0.0836 | 99% Percentile | 0.142 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.133 | 0.151 | 95% Approx. Gamma UPL | 0.0831 | 0.0881 |
| 95% Gamma USL | 0.143 | 0.165 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.017 | SD (KM) | 0.0395 |
| Variance (KM) | 0.00156 | SE of Mean (KM) | 0.00968 |
| k hat (KM) | 0.186 | k star (KM) | 0.191 |
| nu hat (KM) | 7.051 | nu star (KM) | 7.271 |
| theta hat (KM) | 0.0916 | theta star (KM) | 0.0888 |
| 80% gamma percentile (KM) | 0.0219 | 90% gamma percentile (KM) | 0.0514 |
| 95% gamma percentile (KM) | 0.0886 | 99% gamma percentile (KM) | 0.192 |

**The following statistics are computed using gamma distribution and KM estimates**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.121 | 0.131 | 95% Approx. Gamma UPL | 0.0647 | 0.0624 |
| 95% KM Gamma Percentile | 0.0558 | 0.0525 | 95% Gamma USL | 0.132 | 0.146 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.882 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.818 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.24 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.283 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0171 | Mean in Log Scale | -6.647 |
| SD in Original Scale | 0.0405 | SD in Log Scale | 2.268 |
| 95% UTL95% Coverage | 0.316 | 95% BCA UTL95% Coverage | 0.147 |
| 95% Bootstrap (%) UTL95% Coverage | 0.147 | 95% UPL (t) | 0.0733 |
| 90% Percentile (z) | 0.0237 | 95% Percentile (z) | 0.0541 |
| 99% Percentile (z) | 0.254 | 95% USL | 0.404 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -6.815 | 95% KM UTL (Lognormal)95% Coverage | 0.264 |
| KM SD of Logged Data | 2.263 | 95% KM UPL (Lognormal) | 0.0615 |
| 95% KM Percentile Lognormal (z) | 0.0454 | 95% KM USL (Lognormal) | 0.337 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0188 | Mean in Log Scale | -5.405 |
| SD in Original Scale | 0.0398 | SD in Log Scale | 1.72 |
| 95% UTL95% Coverage | 0.29 | 95% UPL (t) | 0.0959 |
| 90% Percentile (z) | 0.0407 | 95% Percentile (z) | 0.0761 |
| 99% Percentile (z) | 0.246 | 95% USL | 0.35 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 19 | 95% UTL with95% Coverage | 0.147 |
| Approx, f used to compute achieved CC | 1 | Approximate Actual Confidence Coefficient achieved by UTL | 0.623 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.147 |
| 95% USL | 0.147 | 95% KM Chebyshev UPL | 0.193 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_DioxinFurans|TCDD TEQ HH (0 - 1 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Distinct Observations | 20 |
| Minimum | 8.8200E-7 | First Quartile | 3.3500E-6 |
| Second Largest | 1.6100E-5 | Median | 5.0250E-6 |
| Maximum | 2.1000E-5 | Third Quartile | 6.7825E-6 |
| Mean | 6.1691E-6 | SD | 4.8496E-6 |
| Coefficient of Variation | N/A | Skewness | 2.008 |
| Mean of logged Data | -12.24 | SD of logged Data | 0.717 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.779 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.286 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1.7789E-5 | 90% Percentile (z) | 1.2384E-5 |
| 95% UPL (t) | 1.4762E-5 | 95% Percentile (z) | 1.4146E-5 |
| 95% USL | 1.8567E-5 | 99% Percentile (z) | 1.7451E-5 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.487 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.751 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.193 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.196 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.227 | k star (bias corrected MLE) | 1.927 |
| Theta hat (MLE) | 2.7697E-6 | Theta star (bias corrected MLE) | 3.2021E-6 |
| nu hat (MLE) | 89.09 | nu star (bias corrected) | 77.06 |
| MLE Mean (bias corrected) | 6.1691E-6 | MLE Sd (bias corrected) | 4.4446E-6 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.5246E-5 | 90% Percentile | 1.2104E-5 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.5547E-5 | 95% Percentile | 1.4808E-5 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 2.0585E-5 | 99% Percentile | 2.0817E-5 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 2.1547E-5 | | |
| 95% WH USL | 2.2135E-5 | 95% HW USL | 2.3337E-5 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.969 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.158 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 2.7023E-5 | 90% Percentile (z) | 1.2153E-5 |
| 95% UPL (t) | 1.7272E-5 | 95% Percentile (z) | 1.5769E-5 |
| 95% USL | 3.0320E-5 | 99% Percentile (z) | 2.5706E-5 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with 95% Coverage | 2.1000E-5 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.1000E-5 | 95% BCA Bootstrap UTL with 95% Coverage | 2.1000E-5 |
| 95% UPL | 2.0755E-5 | 90% Percentile | 1.1060E-5 |
| 90% Chebyshev UPL | 2.1077E-5 | 95% Percentile | 1.6345E-5 |
| 95% Chebyshev UPL | 2.7830E-5 | 99% Percentile | 2.0069E-5 |
| 95% USL | 2.1000E-5 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_SO_DioxinFurans|TCDD TEQ HH (3 - 4 ft)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Distinct Observations | 19 |
| Minimum | 1.3000E-7 | First Quartile | 9.9200E-7 |
| Second Largest | 2.3900E-5 | Median | 1.4700E-6 |
| Maximum | 2.7100E-5 | Third Quartile | 3.4225E-6 |
| Mean | 4.2509E-6 | SD | 7.4382E-6 |
| Coefficient of Variation | N/A | Skewness | 2.707 |
| Mean of logged Data | -13.27 | SD of logged Data | 1.339 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.531 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.344 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 2.2073E-5 | 90% Percentile (z) | 1.3783E-5 |
| 95% UPL (t) | 1.7430E-5 | 95% Percentile (z) | 1.6486E-5 |
| 95% USL | 2.3267E-5 | 99% Percentile (z) | 2.1555E-5 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 1.197 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.787 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.202 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.202 | Detected data appear Gamma Distributed at 5% Significance Level |

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

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.671 | k star (bias corrected MLE) | 0.603 |
| Theta hat (MLE) | 6.3382E-6 | Theta star (bias corrected MLE) | 7.0448E-6 |
| nu hat (MLE) | 26.83 | nu star (bias corrected) | 24.14 |
| MLE Mean (bias corrected) | 4.2509E-6 | MLE Sd (bias corrected) | 5.4723E-6 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.5046E-5 | 90% Percentile | 1.1042E-5 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.5184E-5 | 95% Percentile | 1.5265E-5 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 2.3719E-5 | 99% Percentile | 2.5474E-5 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 2.5333E-5 | | |
| 95% WH USL | 2.6390E-5 | 95% HW USL | 2.8613E-5 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.959 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.905 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.104 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.192 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 4.2492E-5 | 90% Percentile (z) | 9.5530E-6 |
| 95% UPL (t) | 1.8420E-5 | 95% Percentile (z) | 1.5540E-5 |
| 95% USL | 5.2687E-5 | 99% Percentile (z) | 3.8708E-5 |

**Nonparametric Distribution Free Background Statistics**

Data appear Approximate Gamma Distribution at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with 95% Coverage | 2.7100E-5 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.642 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.7100E-5 | 95% BCA Bootstrap UTL with 95% Coverage | 2.7100E-5 |
| 95% UPL | 2.6940E-5 | 90% Percentile | 7.3400E-6 |
| 90% Chebyshev UPL | 2.7117E-5 | 95% Percentile | 2.4060E-5 |
| 95% Chebyshev UPL | 3.7474E-5 | 99% Percentile | 2.6492E-5 |
| 95% USL | 2.7100E-5 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/24/2018 2:49:44 PM |
| From File | ProUCL_INPUT.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| Different or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**RA17_SO_Petroleum|Diesel Range Organics (C10-C20)**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 37 | Number of Missing Observations | 3 |
| Number of Distinct Observations | 14 | | |
| Number of Detects | 11 | Number of Non-Detects | 26 |
| Number of Distinct Detects | 10 | Number of Distinct Non-Detects | 6 |
| Minimum Detect | 6.7 | Minimum Non-Detect | 17 |
| Maximum Detect | 20 | Maximum Non-Detect | 24 |
| Variance Detected | 22.13 | Percent Non-Detects | 70.27% |
| Mean Detected | 12.9 | SD Detected | 4.704 |
| Mean of Detected Logged Data | 2.494 | SD of Detected Logged Data | 0.377 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.14 | d2max (for USL) | 2.835 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.936 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.121 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.251 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 11.71 | KM SD | 3.752 |
| 95% UTL95% Coverage | 19.74 | 95% KM UPL (t) | 18.13 |
| 90% KM Percentile (z) | 16.52 | 95% KM Percentile (z) | 17.88 |
| 99% KM Percentile (z) | 20.44 | 95% KM USL | 22.35 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 10.69 | SD | 2.93 |
| 95% UTL95% Coverage | 16.96 | 95% UPL (t) | 15.7 |
| 90% Percentile (z) | 14.44 | 95% Percentile (z) | 15.51 |
| 99% Percentile (z) | 17.5 | 95% USL | 18.99 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.217 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.73 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.11 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.256 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 8.111 | k star (bias corrected MLE) | 5.96 |
| Theta hat (MLE) | 1.59 | Theta star (bias corrected MLE) | 2.165 |
| nu hat (MLE) | 178.4 | nu star (bias corrected) | 131.1 |
| MLE Mean (bias corrected) | 12.9 | | |
| MLE Sd (bias corrected) | 5.284 | 95% Percentile of Chisquare (2kstar) | 20.92 |

**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 | 6.602 | Mean | 11.59 |
| Maximum | 20 | Median | 11 |
| SD | 3.367 | CV | 0.291 |
| k hat (MLE) | 12.77 | k star (bias corrected MLE) | 11.75 |
| Theta hat (MLE) | 0.908 | Theta star (bias corrected MLE) | 0.986 |
| nu hat (MLE) | 944.7 | nu star (bias corrected) | 869.5 |
| MLE Mean (bias corrected) | 11.59 | MLE Sd (bias corrected) | 3.381 |
| 95% Percentile of Chisquare (2kstar) | 35.79 | 90% Percentile | 16.08 |
| 95% Percentile | 17.65 | 99% Percentile | 20.87 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 19.71 | 19.88 | 95% Approx. Gamma UPL | 17.77 | 17.85 |
| 95% Gamma USL | 23.15 | 23.53 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 11.71 | SD (KM) | 3.752 |
| Variance (KM) | 14.08 | SE of Mean (KM) | 1.103 |
| k hat (KM) | 9.741 | k star (KM) | 8.969 |
| nu hat (KM) | 720.8 | nu star (KM) | 663.7 |
| theta hat (KM) | 1.202 | theta star (KM) | 1.306 |
| 80% gamma percentile (KM) | 14.81 | 90% gamma percentile (KM) | 16.92 |
| 95% gamma percentile (KM) | 18.8 | 99% gamma percentile (KM) | 22.67 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 21.02 | 21.26 | 95% Approx. Gamma UPL | 18.75 | 18.87 |
| 95% KM Gamma Percentile | 18.42 | 18.52 | 95% Gamma USL | 25.08 | 25.61 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.953 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.104 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.251 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 11.46 | Mean in Log Scale | 2.399 |
| SD in Original Scale | 3.364 | SD in Log Scale | 0.284 |
| 95% UTL95% Coverage | 20.22 | 95% BCA UTL95% Coverage | 20 |
| 95% Bootstrap (%) UTL95% Coverage | 20 | 95% UPL (t) | 17.9 |
| 90% Percentile (z) | 15.84 | 95% Percentile (z) | 17.57 |

| | | | |
|---|---|---|---|
| 99% Percentile (z) | 21.32 | 95% USL | 24.63 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | 2.409 | 95% KM UTL (Lognormal)95% Coverage | 22.13 |
| KM SD of Logged Data | 0.321 | 95% KM UPL (Lognormal) | 19.28 |
| 95% KM Percentile Lognormal (z) | 18.88 | 95% KM USL (Lognormal) | 27.67 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 10.69 | Mean in Log Scale | 2.34 |
| SD in Original Scale | 2.93 | SD in Log Scale | 0.23 |
| 95% UTL95% Coverage | 16.99 | 95% UPL (t) | 15.39 |
| 90% Percentile (z) | 13.94 | 95% Percentile (z) | 15.16 |
| 99% Percentile (z) | 17.73 | 95% USL | 19.93 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 37 | 95% UTL with95% Coverage | 24 |
| Approx, f used to compute achieved CC | 1.947 | Approximate Actual Confidence Coefficient achieved by UTL | 0.85 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 21.3 |
| 95% USL | 24 | 95% KM Chebyshev UPL | 28.29 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/25/2018 4:04:07 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| Different or Future K Observations | 1 |
| Number of Bootstrap Operations | 2000 |

**Dibenz**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 39 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 30 | | |
| Number of Detects | 16 | Number of Non-Detects | 23 |
| Number of Distinct Detects | 15 | Number of Distinct Non-Detects | 15 |
| Minimum Detect | 0.002 | Minimum Non-Detect | 0.0037 |
| Maximum Detect | 0.48 | Maximum Non-Detect | 0.0082 |
| Variance Detected | 0.0138 | Percent Non-Detects | 58.97% |
| Mean Detected | 0.0493 | SD Detected | 0.117 |
| Mean of Detected Logged Data | -4.193 | SD of Detected Logged Data | 1.385 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.124 | d2max (for USL) | 2.857 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.418 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.887 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.397 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.213 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.0222 | KM SD | 0.0763 |
| 95% UTL95% Coverage | 0.184 | 95% KM UPL (t) | 0.152 |
| 90% KM Percentile (z) | 0.12 | 95% KM Percentile (z) | 0.148 |
| 99% KM Percentile (z) | 0.2 | 95% KM USL | 0.24 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.0222 | SD | 0.0772 |
| 95% UTL95% Coverage | 0.186 | 95% UPL (t) | 0.154 |
| 90% Percentile (z) | 0.121 | 95% Percentile (z) | 0.149 |
| 99% Percentile (z) | 0.202 | 95% USL | 0.243 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 1.444 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.794 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.256 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.227 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.531 | k star (bias corrected MLE) | 0.473 |
| Theta hat (MLE) | 0.0928 | Theta star (bias corrected MLE) | 0.104 |
| nu hat (MLE) | 17.01 | nu star (bias corrected) | 15.15 |

| | | | |
|---|---|---|---|
| MLE Mean (bias corrected) | 0.0493 | | |
| MLE Sd (bias corrected) | 0.0717 | 95% Percentile of Chisquare (2kstar) | 3.709 |

**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 | 0.0261 |
| Maximum | 0.48 | Median | 0.01 |
| SD | 0.0763 | CV | 2.92 |
| k hat (MLE) | 0.755 | k star (bias corrected MLE) | 0.714 |
| Theta hat (MLE) | 0.0346 | Theta star (bias corrected MLE) | 0.0366 |
| nu hat (MLE) | 58.92 | nu star (bias corrected) | 55.72 |
| MLE Mean (bias corrected) | 0.0261 | MLE Sd (bias corrected) | 0.0309 |
| 95% Percentile of Chisquare (2kstar) | 4.828 | 90% Percentile | 0.0653 |
| 95% Percentile | 0.0883 | 99% Percentile | 0.143 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.101 | 0.093 | 95% Approx. Gamma UPL | 0.0747 | 0.0679 |
| 95% Gamma USL | 0.16 | 0.153 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.0222 | SD (KM) | 0.0763 |
| Variance (KM) | 0.00582 | SE of Mean (KM) | 0.0126 |
| k hat (KM) | 0.0844 | k star (KM) | 0.095 |
| nu hat (KM) | 6.585 | nu star (KM) | 7.411 |
| theta hat (KM) | 0.263 | theta star (KM) | 0.233 |
| 80% gamma percentile (KM) | 0.0142 | 90% gamma percentile (KM) | 0.0577 |
| 95% gamma percentile (KM) | 0.129 | 99% gamma percentile (KM) | 0.361 |

**The following statistics are computed using gamma distribution and KM estimates**

**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0942 | 0.0874 | 95% Approx. Gamma UPL | 0.0663 | 0.0596 |
| 95% KM Gamma Percentile | 0.0627 | 0.0561 | 95% Gamma USL | 0.161 | 0.159 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.929 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.155 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0216 | Mean in Log Scale | -5.419 |
| SD in Original Scale | 0.0774 | SD in Log Scale | 1.446 |
| 95% UTL95% Coverage | 0.0957 | 95% BCA UTL95% Coverage | 0.48 |
| 95% Bootstrap (%) UTL95% Coverage | 0.48 | 95% UPL (t) | 0.0524 |
| 90% Percentile (z) | 0.0283 | 95% Percentile (z) | 0.0478 |
| 99% Percentile (z) | 0.128 | 95% USL | 0.276 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -5.169 | 95% KM UTL (Lognormal)95% Coverage | 0.079 |
| KM SD of Logged Data | 1.238 | 95% KM UPL (Lognormal) | 0.0472 |
| 95% KM Percentile Lognormal (z) | 0.0436 | 95% KM USL (Lognormal) | 0.196 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.0222 | Mean in Log Scale | -5.102 |
| SD in Original Scale | 0.0772 | SD in Log Scale | 1.18 |
| 95% UTL95% Coverage | 0.0747 | 95% UPL (t) | 0.0456 |
| 90% Percentile (z) | 0.0276 | 95% Percentile (z) | 0.0424 |
| 99% Percentile (z) | 0.0948 | 95% USL | 0.177 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 39 | 95% UTL with95% Coverage | 0.48 |
| Approx, f used to compute achieved CC | 2.053 | Approximate Actual Confidence Coefficient achieved by UTL | 0.865 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.1 |
| 95% USL | 0.48 | 95% KM Chebyshev UPL | 0.359 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/17/2018 1:13:54 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 4.700 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Arsenic Site**
**Sample 2 Data: Arsenic Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 119 | 40 |
| Number of Missing Observations | 783 | 0 |
| Number of Distinct Observations | 72 | 29 |
| Minimum | 0.39 | 0.59 |
| Maximum | 190 | 30 |
| Mean | 10.33 | 4.653 |
| Median | 3.8 | 3.55 |
| SD | 21.01 | 4.747 |
| SE of Mean | 1.926 | 0.751 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 4.7**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 8482 |
| Standardized WMW U-Stat | -4.125 |
| Mean (U) | 2380 |
| SD(U) - Adj ties | 251.9 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 1.8564E-5 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 4.70**
**P-Value < alpha (0.05)**

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/17/2018 1:15:24 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 10.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Chromium Site**
**Sample 2 Data: Chromium Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 130 | 39 |
| Number of Missing Observations | 772 | 1 |
| Number of Distinct Observations | 58 | 23 |
| Minimum | 2.4 | 3.7 |
| Maximum | 400 | 57 |
| Mean | 29.39 | 15.57 |
| Median | 14 | 13 |
| SD | 50.47 | 10.25 |
| SE of Mean | 4.427 | 1.642 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 10**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 9895 |
| Standardized WMW U-Stat | -4.314 |
| Mean (U) | 2535 |
| SD(U) - Adj ties | 267.9 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 8.0188E-6 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2 + 10.00
P-Value < alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/17/2018 1:16:15 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 4.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Cobalt Site**
**Sample 2 Data: Cobalt Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 119 | 40 |
| Number of Missing Observations | 783 | 0 |
| Number of Distinct Observations | 73 | 34 |
| Minimum | 1 | 0.47 |
| Maximum | 240 | 16 |
| Mean | 12.52 | 6.297 |
| Median | 5.4 | 5.1 |
| SD | 28.28 | 4.278 |
| SE of Mean | 2.592 | 0.676 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 4**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 8442 |
| Standardized WMW U-Stat | -4.283 |
| Mean (U) | 2380 |
| SD(U) - Adj ties | 251.9 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 9.1996E-6 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2 + 4.00
P-Value < alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/17/2018 1:17:23 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 88.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Lead Surface Site**
**Sample 2 Data: Lead Surface Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|

| | | |
|---|---|---|
| Number of Valid Observations | 64 | 20 |
| Number of Missing Observations | 216 | 0 |
| Number of Distinct Observations | 52 | 19 |
| Minimum | 4.4 | 6.4 |
| Maximum | 2000 | 320 |
| Mean | 113.9 | 65.92 |
| Median | 45.5 | 30.5 |
| SD | 292.1 | 88.37 |
| SE of Mean | 36.51 | 19.76 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 88**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 2284 |
| Standardized WMW U-Stat | -4.59 |
| Mean (U) | 640 |
| SD(U) - Adj ties | 95.21 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 2.2160E-6 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 88.00**
**P-Value < alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/17/2018 1:18:11 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 40.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Lead Suburface Site**
**Sample 2 Data: Lead Subsurface Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 55 | 19 |
| Number of Missing Observations | 566 | 1 |
| Number of Distinct Observations | 49 | 18 |
| Minimum | 1.5 | 1.7 |
| Maximum | 5400 | 170 |
| Mean | 139.2 | 22.6 |
| Median | 15 | 8 |
| SD | 725.9 | 40.23 |
| SE of Mean | 97.88 | 9.229 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 40**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1774 |
| Standardized WMW U-Stat | -3.576 |
| Mean (U) | 522.5 |
| SD(U) - Adj ties | 80.81 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 1.7431E-4 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 40.00**
**P-Value < alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/24/2018 9:49:20 AM |

| | |
|---|---|
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 248.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Manganese Surface Site**
**Sample 2 Data: Manganese Surface Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 64 | 20 |
| Number of Distinct Observations | 37 | 20 |
| Minimum | 10 | 17 |
| Maximum | 6600 | 1000 |
| Mean | 326.6 | 243.6 |
| Median | 165 | 160 |
| SD | 827.7 | 248 |
| SE of Mean | 103.5 | 55.46 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 248**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 2241 |
| Standardized WMW U-Stat | -5.038 |
| Mean (U) | 640 |
| SD(U) - Adj ties | 95.18 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 2.3549E-7 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 248.00**
P-Value < alpha (0.05)

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 4:27:37 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 221.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Manganese Subsurface Site**
**Sample 2 Data: Manganese Subsurface Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 55 | 20 |
| Number of Distinct Observations | 40 | 18 |
| Minimum | 9.9 | 2 |
| Maximum | 810 | 1000 |
| Mean | 162 | 134.4 |
| Median | 120 | 72 |
| SD | 147.3 | 221.4 |
| SE of Mean | 19.86 | 49.5 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 221**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1659 |
| Standardized WMW U-Stat | -5.171 |
| Mean (U) | 550 |
| SD(U) - Adj ties | 83.44 |

| | |
|---|---|
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 1.1627E-7 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 221.00**
**P-Value < alpha (0.05)**

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/17/2018 1:22:08 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 17.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Nickel Site**
**Sample 2 Data: Nickel Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 119 | 40 |
| Number of Missing Observations | 783 | 0 |
| Number of Distinct Observations | 77 | 34 |
| Minimum | 0.78 | 0.99 |
| Maximum | 8000 | 88 |
| Mean | 203 | 12.16 |
| Median | 14 | 7.65 |
| SD | 968 | 16.53 |
| SE of Mean | 88.74 | 2.614 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 17**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 8668 |
| Standardized WMW U-Stat | -3.386 |
| Mean (U) | 2380 |
| SD(U) - Adj ties | 251.9 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 3.5418E-4 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2 + 17.00**
**P-Value < alpha (0.05)**

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/27/2018 4:30:49 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 7.400 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Vanadium Site**
**Sample 2 Data: Vanadium Background**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 125 | 36 |
| Number of Distinct Observations | 78 | 21 |
| Minimum | 2.9 | 3.4 |
| Maximum | 42000 | 36 |

| | | |
|---|---|---|
| Mean | 949.3 | 21.87 |
| Median | 31 | 22 |
| SD | 5026 | 7.394 |
| SE of Mean | 449.5 | 1.232 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 7.4**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 10319 |
| Standardized WMW U-Stat | 0.785 |
| Mean (U) | 2250 |
| SD(U) - Adj ties | 246.4 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.784 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 7.40**
**P-Value >= alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/20/2018 10:12:51 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: DRO Site**
**Sample 2 Data: DRO Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 181 | 37 |
| Number of Missing Observations | 723 | 3 |
| Number of Non-Detects | 110 | 26 |
| Number of Detect Data | 71 | 11 |
| Minimum Non-Detect | 18 | 21.7 |
| Maximum Non-Detect | 380 | 28.7 |
| Percent Non-detects | 60.77% | 70.27% |
| Minimum Detect | 10 | 11.4 |
| Maximum Detect | 11000 | 24.7 |
| Mean of Detects | 900.8 | 17.6 |
| Median of Detects | 99 | 16.7 |
| SD of Detects | 2039 | 4.704 |
| KM Mean | 362.7 | 16.41 |
| KM SD | 1340 | 3.752 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 3.288 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.999 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2**
**P-Value >= alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/20/2018 10:14:01 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |

| | |
|---|---|
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: ORO Site**
**Sample 2 Data: ORO Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 181 | 40 |
| Number of Missing Observations | 723 | 0 |
| Number of Non-Detects | 58 | 13 |
| Number of Detect Data | 123 | 27 |
| Minimum Non-Detect | 18 | 186 |
| Maximum Non-Detect | 22 | 193 |
| Percent Non-detects | 32.04% | 32.50% |
| Minimum Detect | 10 | 176.4 |
| Maximum Detect | 17000 | 1029 |
| Mean of Detects | 1209 | 267.7 |
| Median of Detects | 240 | 220 |
| SD of Detects | 2943 | 169.2 |
| KM Mean | 825.3 | 239.3 |
| KM SD | 2480 | 142.4 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -0.973 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.165 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2**
**P-Value >= alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/20/2018 11:24:05 PM |
| From File | Metals.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(a)anthracene surface site**
**Sample 2 Data: baa surface background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 114 | 20 |
| Number of Non-Detects | 17 | 2 |
| Number of Detect Data | 97 | 18 |
| Minimum Non-Detect | 0.0069 | 0.174 |
| Maximum Non-Detect | 0.16 | 0.178 |
| Percent Non-detects | 14.91% | 10.00% |
| Minimum Detect | 0.0027 | 0.176 |
| Maximum Detect | 14 | 0.84 |
| Mean of Detects | 0.771 | 0.272 |
| Median of Detects | 0.27 | 0.193 |
| SD of Detects | 1.581 | 0.174 |
| KM Mean | 0.658 | 0.263 |
| KM SD | 1.476 | 0.163 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -0.0757 |
| Critical z (0.05) | -1.645 |

| | |
|---|---|
| P-Value | 0.47 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/20/2018 11:25:16 PM |
| From File | Metals.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(a)anthracene subsurface site**
**Sample 2 Data: baa subsurface background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 405 | 19 |
| Number of Missing Observations | 0 | 1 |
| Number of Non-Detects | 56 | 11 |
| Number of Detect Data | 349 | 8 |
| Minimum Non-Detect | 0.007 | 0.0387 |
| Maximum Non-Detect | 3.8 | 0.0432 |
| Percent Non-detects | 13.83% | 57.89% |
| Minimum Detect | 0.0011 | 0.0366 |
| Maximum Detect | 720 | 0.131 |
| Mean of Detects | 8.664 | 0.0636 |
| Median of Detects | 0.78 | 0.0465 |
| SD of Detects | 50.93 | 0.0346 |
| KM Mean | 7.473 | 0.0487 |
| KM SD | 47.3 | 0.0246 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 4.801 |
| Critical z (0.05) | -1.645 |
| P-Value | 1 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/24/2018 10:14:12 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(a)pyrene surface Site**
**Sample 2 Data: Benzo(a)pyrene surface Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 114 | 20 |
| Number of Non-Detects | 19 | 3 |
| Number of Detect Data | 95 | 17 |
| Minimum Non-Detect | 0.0069 | 0.364 |
| Maximum Non-Detect | 0.37 | 0.368 |
| Percent Non-detects | 16.67% | 15.00% |

| | | |
|---|---|---|
| Minimum Detect | 0.0022 | 0.366 |
| Maximum Detect | 11 | 1.86 |
| Mean of Detects | 0.709 | 0.513 |
| Median of Detects | 0.31 | 0.385 |
| SD of Detects | 1.295 | 0.361 |
| KM Mean | 0.593 | 0.491 |
| KM SD | 1.204 | 0.327 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -1.739 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.041 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**
**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/24/2018 10:11:49 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(b)fluoranthene surface Site**
**Sample 2 Data: Benzo(b)fluoranthene surface Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 114 | 20 |
| Number of Non-Detects | 17 | 3 |
| Number of Detect Data | 97 | 17 |
| Minimum Non-Detect | 0.0069 | 0.314 |
| Maximum Non-Detect | 0.16 | 0.318 |
| Percent Non-detects | 14.91% | 15.00% |
| Minimum Detect | 0.0038 | 0.317 |
| Maximum Detect | 12 | 1.61 |
| Mean of Detects | 0.919 | 0.469 |
| Median of Detects | 0.38 | 0.341 |
| SD of Detects | 1.529 | 0.315 |
| KM Mean | 0.784 | 0.446 |
| KM SD | 1.44 | 0.287 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -0.518 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.302 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2**
**P-Value >= alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/24/2018 1:06:37 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |

| | |
|---|---|
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: BaP-TE surface site**
**Sample 2 Data: BaP-TE surface background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 114 | 20 |
| Number of Non-Detects | 17 | 2 |
| Number of Detect Data | 97 | 18 |
| Minimum Non-Detect | 0.0069 | 0.554 |
| Maximum Non-Detect | 0.16 | 0.558 |
| Percent Non-detects | 14.91% | 10.00% |
| Minimum Detect | 7.1400E-4 | 0.551 |
| Maximum Detect | 16.6 | 2.89 |
| Mean of Detects | 1.066 | 0.775 |
| Median of Detects | 0.445 | 0.586 |
| SD of Detects | 1.948 | 0.549 |
| KM Mean | 0.908 | 0.753 |
| KM SD | 1.827 | 0.51 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -2.027 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.0213 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**
**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/24/2018 1:07:50 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: BaP-TE subsurface site**
**Sample 2 Data: BaP-TE subsurface background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 405 | 19 |
| Number of Missing Observations | 0 | 1 |
| Number of Non-Detects | 53 | 11 |
| Number of Detect Data | 352 | 8 |
| Minimum Non-Detect | 0.007 | 0.0597 |
| Maximum Non-Detect | 3.8 | 0.0642 |
| Percent Non-detects | 13.09% | 57.89% |
| Minimum Detect | 3.4000E-6 | 0.0562 |
| Maximum Detect | 898 | 0.203 |
| Mean of Detects | 10.85 | 0.0959 |
| Median of Detects | 1.135 | 0.0724 |
| SD of Detects | 61.64 | 0.0565 |
| KM Mean | 9.435 | 0.073 |
| KM SD | 57.5 | 0.0395 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 4.683 |
| Critical z (0.05) | -1.645 |

| | |
|---|---|
| P-Value | 1 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/20/2018 10:15:13 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: daa Site**
**Sample 2 Data: daa Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 519 | 39 |
| Number of Missing Observations | 389 | 1 |
| Number of Non-Detects | 140 | 23 |
| Number of Detect Data | 379 | 16 |
| Minimum Non-Detect | 0.0069 | 0.124 |
| Maximum Non-Detect | 3.9 | 0.128 |
| Percent Non-detects | 26.97% | 58.97% |
| Minimum Detect | 0.002 | 0.122 |
| Maximum Detect | 100 | 0.6 |
| Mean of Detects | 1.215 | 0.169 |
| Median of Detects | 0.16 | 0.136 |
| SD of Detects | 6.478 | 0.117 |
| KM Mean | 0.897 | 0.142 |
| KM SD | 5.554 | 0.0763 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 2.002 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.977 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/24/2018 10:19:17 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Indeno(1,2,3-cd)pyrene surface Site**
**Sample 2 Data: Indeno(1,2,3-cd)pyrene surface Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 114 | 20 |
| Number of Non-Detects | 18 | 3 |
| Number of Detect Data | 96 | 17 |
| Minimum Non-Detect | 0.0069 | 0.384 |
| Maximum Non-Detect | 0.16 | 0.388 |

| | | |
|---|---|---|
| Percent Non-detects | 15.79% | 15.00% |
| Minimum Detect | 0.0021 | 0.385 |
| Maximum Detect | 7.1 | 1.98 |
| Mean of Detects | 0.521 | 0.524 |
| Median of Detects | 0.215 | 0.398 |
| SD of Detects | 0.87 | 0.383 |
| KM Mean | 0.441 | 0.503 |
| KM SD | 0.816 | 0.346 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -2.648 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00405 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**
**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/20/2018 10:16:49 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Naphthalene Site**
**Sample 2 Data: Naphthalene Background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 519 | 39 |
| Number of Missing Observations | 389 | 1 |
| Number of Non-Detects | 178 | 25 |
| Number of Detect Data | 341 | 14 |
| Minimum Non-Detect | 0.0069 | 0.0377 |
| Maximum Non-Detect | 5.9 | 0.075 |
| Percent Non-detects | 34.30% | 64.10% |
| Minimum Detect | 9.1000E-4 | 0.0351 |
| Maximum Detect | 130 | 0.164 |
| Mean of Detects | 1.064 | 0.0504 |
| Median of Detects | 0.066 | 0.0392 |
| SD of Detects | 9.066 | 0.0335 |
| KM Mean | 0.709 | 0.0418 |
| KM SD | 7.355 | 0.0205 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 3.077 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.999 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2**
**P-Value >= alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/24/2018 3:42:49 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |

| | |
|---|---|
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 2378 TCDD site**
**Sample 2 Data: 2378 TCDD background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 81 | 40 |
| Number of Non-Detects | 46 | 34 |
| Number of Detect Data | 35 | 6 |
| Minimum Non-Detect | 2.0800E-8 | 9.1740E-7 |
| Maximum Non-Detect | 2.2600E-6 | 1.7710E-6 |
| Percent Non-detects | 56.79% | 85.00% |
| Minimum Detect | 6.9000E-8 | 9.2280E-7 |
| Maximum Detect | 2.5500E-5 | 3.1300E-6 |
| Mean of Detects | 1.6654E-6 | 1.5981E-6 |
| Median of Detects | 7.3500E-7 | 1.3575E-6 |
| SD of Detects | 4.2365E-6 | 8.3888E-7 |
| KM Mean | 7.6670E-7 | 1.0335E-6 |
| KM SD | 2.8556E-6 | 3.8169E-7 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | 0.0589 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.523 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2**
**P-Value >= alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.19/27/2018 3:34:21 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: TCDD TEQ Surface Site**
**Sample 2 Data: TCDD TEQ Background Site**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 64 | 20 |
| Number of Distinct Observations | 61 | 20 |
| Minimum | 1.0100E-7 | 8.8200E-7 |
| Maximum | 4.8400E-4 | 2.1000E-5 |
| Mean | 2.8902E-5 | 6.1691E-6 |
| Median | 6.7300E-6 | 5.0250E-6 |
| SD | 6.6327E-5 | 4.8496E-6 |
| SE of Mean | 8.2909E-6 | 1.0844E-6 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 4.8000E-6**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 2616 |
| Standardized WMW U-Stat | -1.097 |
| Mean (U) | 640 |
| SD(U) - Adj ties | 95.22 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |

| | |
|---|---|
| P-Value (Adjusted for Ties) | 0.136 |

**Conclusion with Alpha = 0.05**
**Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.00**
**P-Value >= alpha (0.05)**

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.19/24/2018 3:27:12 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: TCDD TEQ subsurface site**
**Sample 2 Data: TCDD TEQ subsurface background + S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 17 | 20 |
| Number of Distinct Observations | 16 | 19 |
| Minimum | 3.6700E-8 | 7.5300E-6 |
| Maximum | 2.3500E-5 | 3.4500E-5 |
| Mean | 4.3352E-6 | 1.1651E-5 |
| Median | 1.2500E-6 | 8.8700E-6 |
| SD | 7.2180E-6 | 7.4382E-6 |
| SE of Mean | 1.7506E-6 | 1.6632E-6 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 189 |
| WMW U-Stat | 36 |
| Mean (U) | 170 |
| SD(U) - Adj ties | 32.81 |
| WMW U-Stat Critical Value (0.05) | 116 |
| Standardized WMW U-Stat | -4.1 |
| Approximate P-Value | 2.0700E-5 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**

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# ProUCL Output - Sediment

**RA18_SE_Metals|Aluminum**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 |
| Minimum | 1600 |
| Maximum | 20000 |
| Mean of Raw Data | 7293 |
| Standard Deviation of Raw Data | 4327 |
| Khat | 2.935 |
| Theta hat | 2485 |
| Kstar | 2.664 |
| Theta star | 2738 |
| Mean of Log Transformed Data | 8.715 |
| Standard Deviation of Log Transformed Data | 0.634 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.964 |
| Shapiro Wilk Test Statistic | 0.929 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0555 |
| Lilliefors Test Statistic | 0.115 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.995 |
| A-D Test Statistic | 0.207 |
| A-D Critical (0.05) Value | 0.753 |
| K-S Test Statistic | 0.089 |
| K-S Critical(0.05) Value | 0.161 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.99 |
| Shapiro Wilk Test Statistic | 0.974 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.689 |
| Lilliefors Test Statistic | 0.0877 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Metals|Antimony**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 29 | 1 | 3.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 0.16 | 0.16 | 0.16 | 0.16 | N/A |
| Statistics (Non-Detects Only) | 29 | 0.13 | 1.1 | 0.39 | 0.35 | 0.204 |
| Statistics (All: NDs treated as DL value) | 30 | 0.13 | 1.1 | 0.383 | 0.345 | 0.205 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 0.08 | 1.1 | 0.38 | 0.345 | 0.209 |
| Statistics (Normal ROS Imputed Data) | 30 | -0.0159 | 1.1 | 0.377 | 0.345 | 0.214 |
| Statistics (Gamma ROS Imputed Data) | 30 | 0.0691 | 1.1 | 0.38 | 0.345 | 0.209 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 0.122 | 1.1 | 0.381 | 0.345 | 0.207 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4.383 | 3.953 | 0.0891 | -1.059 | 0.493 | -0.465 |
| Statistics (NDs = DL) | 4.182 | 3.786 | 0.0915 | -1.085 | 0.505 | -0.465 |
| Statistics (NDs = DL/2) | 3.719 | 3.369 | 0.102 | -1.108 | 0.553 | -0.499 |
| Statistics (Gamma ROS Estimates) | 3.622 | 3.282 | 0.105 | -1.113 | 0.567 | -0.509 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.094 | 0.52 | -0.476 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.931 | 0.931 | 0.941 | 0.949 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.879 | 0.926 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.878 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.899 | 0.927 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.921 | 0.927 | Data Not Normal |
| Lilliefors (Detects Only) | 0.117 | 0.161 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.111 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.108 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.112 | 0.159 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.976 | 0.977 | 0.981 | 0.981 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.309 | 0.749 | |
| Kolmogorov-Smirnov (Detects Only) | 0.085 | 0.163 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.324 | 0.749 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.0943 | 0.161 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.221 | 0.75 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.0767 | 0.161 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.222 | 0.751 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.0781 | 0.161 | Data Appear Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.989 | 0.99 | 0.987 | 0.991 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.979 | 0.926 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.977 | 0.927 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.982 | 0.927 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.979 | 0.927 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.0869 | 0.161 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.0938 | 0.159 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.0783 | 0.159 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.0818 | 0.159 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_Metals|Arsenic**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 19 |
| Minimum | 1 |
| Maximum | 4.7 |
| Mean of Raw Data | 2.673 |
| Standard Deviation of Raw Data | 0.983 |
| Khat | 7.427 |
| Theta hat | 0.36 |
| Kstar | 6.706 |
| Theta star | 0.399 |
| Mean of Log Transformed Data | 0.914 |
| Standard Deviation of Log Transformed Data | 0.387 |
| Normal GOF Test Results | |
| Correlation Coefficient R | 0.983 |
| Shapiro Wilk Test Statistic | 0.956 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.273 |
| Lilliefors Test Statistic | 0.137 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data appear Normal at (0.05) Significance Level | |
| Gamma GOF Test Results | |
| Correlation Coefficient R | 0.988 |
| A-D Test Statistic | 0.233 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.0895 |
| K-S Critical(0.05) Value | 0.16 |
| Data appear Gamma Distributed at (0.05) Significance Level | |
| Lognormal GOF Test Results | |
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.966 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.491 |
| Lilliefors Test Statistic | 0.0932 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data appear Lognormal at (0.05) Significance Level | |

**RA18_SE_Metals|Barium**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 22 |
| Minimum | 17 |
| Maximum | 140 |
| Mean of Raw Data | 57.03 |
| Standard Deviation of Raw Data | 28.05 |
| Khat | 4.085 |
| Theta hat | 13.96 |
| Kstar | 3.699 |
| Theta star | 15.42 |
| Mean of Log Transformed Data | 3.916 |
| Standard Deviation of Log Transformed Data | 0.537 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.972 |
| Shapiro Wilk Test Statistic | 0.946 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.156 |
| Lilliefors Test Statistic | 0.11 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.989 |
| A-D Test Statistic | 0.333 |
| A-D Critical (0.05) Value | 0.749 |
| K-S Test Statistic | 0.101 |
| K-S Critical(0.05) Value | 0.161 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.221 |
| Lilliefors Test Statistic | 0.135 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Metals|Beryllium**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 |
| Minimum | 0.29 |
| Maximum | 1.7 |
| Mean of Raw Data | 0.846 |
| Standard Deviation of Raw Data | 0.356 |
| Khat | 5.732 |
| Theta hat | 0.148 |
| Kstar | 5.181 |
| Theta star | 0.163 |
| Mean of Log Transformed Data | -0.257 |
| Standard Deviation of Log Transformed Data | 0.442 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.978 |
| Shapiro Wilk Test Statistic | 0.95 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.202 |
| Lilliefors Test Statistic | 0.151 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.99 |
| A-D Test Statistic | 0.321 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.115 |
| K-S Critical(0.05) Value | 0.16 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.988 |
| Shapiro Wilk Test Statistic | 0.969 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.57 |
| Lilliefors Test Statistic | 0.142 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Metals|Cobalt**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 16 |
| Minimum | 4.4 |
| Maximum | 22 |
| Mean of Raw Data | 11.75 |
| Standard Deviation of Raw Data | 4.355 |
| Khat | 6.86 |
| Theta hat | 1.713 |
| Kstar | 6.196 |
| Theta star | 1.897 |
| Mean of Log Transformed Data | 2.389 |
| Standard Deviation of Log Transformed Data | 0.409 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.173 |
| Lilliefors Test Statistic | 0.128 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.973 |
| A-D Test Statistic | 0.749 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.149 |
| K-S Critical(0.05) Value | 0.16 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.966 |
| Shapiro Wilk Test Statistic | 0.928 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0508 |
| Lilliefors Test Statistic | 0.175 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**Cyanide**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 28 | 1 | 27 | 19 | 8 | 29.63% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 8 | 0.12 | 0.67 | 0.381 | 0.41 | 0.216 |
| Statistics (Non-Detects Only) | 19 | 0.082 | 0.99 | 0.387 | 0.37 | 0.258 |
| Statistics (All: NDs treated as DL value) | 27 | 0.082 | 0.99 | 0.386 | 0.37 | 0.242 |
| Statistics (All: NDs treated as DL/2 value) | 27 | 0.06 | 0.99 | 0.329 | 0.25 | 0.24 |
| Statistics (Normal ROS Imputed Data) | 27 | -0.0291 | 0.99 | 0.313 | 0.21 | 0.253 |
| Statistics (Gamma ROS Imputed Data) | 27 | 0.0532 | 0.99 | 0.317 | 0.21 | 0.245 |
| Statistics (Lognormal ROS Imputed Data) | 27 | 0.082 | 0.99 | 0.319 | 0.208 | 0.241 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2.334 | 2 | 0.166 | -1.177 | 0.721 | -0.612 |
| Statistics (NDs = DL) | 2.488 | 2.236 | 0.155 | -1.167 | 0.695 | -0.595 |
| Statistics (NDs = DL/2) | 2.065 | 1.86 | 0.159 | -1.373 | 0.759 | -0.553 |
| Statistics (Gamma ROS Estimates) | 1.889 | 1.704 | 0.168 | -1.437 | 0.795 | -0.553 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.392 | 0.712 | -0.512 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.956 | 0.958 | 0.943 | 0.955 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.907 | 0.901 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.911 | 0.923 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.887 | 0.923 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.912 | 0.923 | Data Not Normal |
| Lilliefors (Detects Only) | 0.203 | 0.197 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.184 | 0.167 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.177 | 0.167 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.189 | 0.167 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.984 | 0.976 | 0.994 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.489 | 0.751 | |
| Kolmogorov-Smirnov (Detects Only) | 0.167 | 0.201 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.776 | 0.754 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.153 | 0.17 | Detected Data appear Approximate Gamma Distribution |
| Anderson-Darling (NDs = DL/2) | 0.322 | 0.756 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.101 | 0.17 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.575 | 0.758 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.166 | 0.171 | Data Appear Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.979 | 0.972 | 0.991 | 0.975 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.949 | 0.901 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.934 | 0.923 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.971 | 0.923 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.938 | 0.923 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.131 | 0.197 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.16 | 0.167 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.0871 | 0.167 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.173 | 0.167 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_Metals|Manganese**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 20 |
| Minimum | 94 |
| Maximum | 440 |
| Mean of Raw Data | 232.8 |
| Standard Deviation of Raw Data | 91.66 |
| Khat | 6.397 |
| Theta hat | 36.39 |
| Kstar | 5.78 |
| Theta star | 40.28 |
| Mean of Log Transformed Data | 5.37 |
| Standard Deviation of Log Transformed Data | 0.419 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.179 |
| Lilliefors Test Statistic | 0.159 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.428 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.115 |
| K-S Critical(0.05) Value | 0.16 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.98 |
| Shapiro Wilk Test Statistic | 0.948 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.172 |
| Lilliefors Test Statistic | 0.131 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Metals|Nickel**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 20 |
| Minimum | 7.7 |
| Maximum | 40 |
| Mean of Raw Data | 20.87 |
| Standard Deviation of Raw Data | 8.635 |
| Khat | 5.563 |
| Theta hat | 3.752 |
| Kstar | 5.029 |
| Theta star | 4.15 |
| Mean of Log Transformed Data | 2.946 |
| Standard Deviation of Log Transformed Data | 0.455 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| Shapiro Wilk Test Statistic | 0.953 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.233 |
| Lilliefors Test Statistic | 0.106 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| A-D Test Statistic | 0.539 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.119 |
| K-S Critical(0.05) Value | 0.16 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.938 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0961 |
| Lilliefors Test Statistic | 0.132 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Metals|Thallium**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 28 | 2 | 6.67% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2 | 0.037 | 0.078 | 0.0575 | 0.0575 | 0.029 |
| Statistics (Non-Detects Only) | 28 | 0.035 | 0.29 | 0.156 | 0.16 | 0.0713 |
| Statistics (All: NDs treated as DL value) | 30 | 0.035 | 0.29 | 0.15 | 0.16 | 0.0734 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 0.0185 | 0.29 | 0.148 | 0.16 | 0.0761 |
| Statistics (Normal ROS Imputed Data) | 30 | 0.00558 | 0.29 | 0.148 | 0.16 | 0.076 |
| Statistics (Gamma ROS Imputed Data) | 30 | 0.035 | 0.29 | 0.15 | 0.16 | 0.0734 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 0.035 | 0.29 | 0.15 | 0.16 | 0.0736 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 3.595 | 0.0391 | -1.985 | 0.564 | -0.284 |
| Statistics (NDs = DL) | 3.499 | 3.171 | 0.0428 | -2.048 | 0.602 | -0.294 |
| Statistics (NDs = DL/2) | 2.888 | 2.621 | 0.0512 | -2.094 | 0.691 | -0.33 |
| Statistics (Gamma ROS Estimates) | 3.548 | 3.215 | 0.0422 | -2.046 | 0.595 | -0.291 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -2.049 | 0.598 | -0.292 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.991 | 0.988 | 0.99 | 0.992 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.969 | 0.924 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.96 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.964 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.972 | 0.927 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.0914 | 0.164 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.103 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.0964 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.0953 | 0.159 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.969 | 0.969 | 0.959 | 0.969 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.511 | 0.75 | |
| Kolmogorov-Smirnov (Detects Only) | 0.156 | 0.166 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.53 | 0.751 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.152 | 0.161 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.649 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.163 | 0.161 | Detected Data appear Approximate Gamma Distribution |
| Anderson-Darling (Gamma ROS Estimates) | 0.555 | 0.751 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.152 | 0.161 | Data Appear Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.962 | 0.965 | 0.951 | 0.965 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.917 | 0.924 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.918 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.901 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.919 | 0.927 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.178 | 0.164 | Data Not Lognormal |
| Lilliefors (NDs = DL) | 0.173 | 0.159 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.181 | 0.159 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.175 | 0.159 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_Metals|Vanadium**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 19 |
| Minimum | 11 |
| Maximum | 44 |
| Mean of Raw Data | 24.23 |
| Standard Deviation of Raw Data | 8.581 |
| Khat | 8.142 |
| Theta hat | 2.976 |
| Kstar | 7.35 |
| Theta star | 3.297 |
| Mean of Log Transformed Data | 3.125 |
| Standard Deviation of Log Transformed Data | 0.365 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.949 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.184 |
| Lilliefors Test Statistic | 0.166 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.532 |
| A-D Critical (0.05) Value | 0.746 |
| K-S Test Statistic | 0.154 |
| K-S Critical(0.05) Value | 0.16 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.958 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.325 |
| Lilliefors Test Statistic | 0.14 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_PestPCBs|4,4'-DDT**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 26 | 4 | 13.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 7.00E-05 | 8.50E-04 | 5.80E-04 | 7.00E-04 | 3.55E-04 |
| Statistics (Non-Detects Only) | 26 | 1.20E-04 | 0.0056 | 0.00152 | 0.0012 | 0.00134 |
| Statistics (All: NDs treated as DL value) | 30 | 7.00E-05 | 0.0056 | 0.0014 | 0.0011 | 0.00129 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 3.50E-05 | 0.0056 | 0.00136 | 0.0011 | 0.00132 |
| Statistics (Normal ROS Imputed Data) | 30 | -0.00162 | 0.0056 | 0.00125 | 0.0011 | 0.00145 |
| Statistics (Gamma ROS Imputed Data) | 30 | 1.20E-04 | 0.01 | 0.00265 | 0.0013 | 0.00318 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 8.42E-05 | 0.0056 | 0.00135 | 0.0011 | 0.00132 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.436 | 1.296 | 0.00106 | -6.874 | 1.001 | -0.146 |
| Statistics (NDs = DL) | 1.322 | 1.212 | 0.00106 | -6.997 | 1.054 | -0.151 |
| Statistics (NDs = DL/2) | 1.163 | 1.069 | 0.00117 | -7.089 | 1.149 | -0.162 |
| Statistics (Gamma ROS Estimates) | 0.913 | 0.844 | 0.00291 | -6.571 | 1.216 | -0.185 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -7.095 | 1.107 | -0.156 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.891 | 0.882 | 0.887 | 0.933 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.799 | 0.92 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.785 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.793 | 0.927 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.887 | 0.927 | Data Not Normal |
| Lilliefors (Detects Only) | 0.238 | 0.17 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.235 | 0.159 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.224 | 0.159 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.197 | 0.159 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.975 | 0.975 | 0.98 | 0.932 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.571 | 0.763 | |
| Kolmogorov-Smirnov (Detects Only) | 0.151 | 0.175 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.567 | 0.767 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.121 | 0.164 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.336 | 0.771 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.125 | 0.164 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 1.159 | 0.78 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.186 | 0.165 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.956 | 0.959 | 0.968 | 0.974 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.91 | 0.92 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.919 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.941 | 0.927 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.939 | 0.927 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.21 | 0.17 | Data Not Lognormal |
| Lilliefors (NDs = DL) | 0.178 | 0.159 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.189 | 0.159 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.192 | 0.159 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_PestPCBs|CHLORDANE (Technical)**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 18 |
| Number of Missing Observations | 5 |
| Number of Distinct Observations | 17 |
| Minimum | 0.012 |
| Maximum | 0.12 |
| Mean of Raw Data | 0.0518 |
| Standard Deviation of Raw Data | 0.0285 |
| Khat | 3.089 |
| Theta hat | 0.0168 |
| Kstar | 2.611 |
| Theta star | 0.0198 |
| Mean of Log Transformed Data | -3.13 |
| Standard Deviation of Log Transformed Data | 0.643 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.974 |
| Shapiro Wilk Test Statistic | 0.949 |
| Shapiro Wilk Critical (0.05) Value | 0.897 |
| Approximate Shapiro Wilk P Value | 0.413 |
| Lilliefors Test Statistic | 0.125 |
| Lilliefors Critical (0.05) Value | 0.202 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.983 |
| A-D Test Statistic | 0.398 |
| A-D Critical (0.05) Value | 0.745 |
| K-S Test Statistic | 0.147 |
| K-S Critical(0.05) Value | 0.205 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.97 |
| Shapiro Wilk Test Statistic | 0.936 |
| Shapiro Wilk Critical (0.05) Value | 0.897 |
| Approximate Shapiro Wilk P Value | 0.272 |
| Lilliefors Test Statistic | 0.185 |
| Lilliefors Critical (0.05) Value | 0.202 |

Data appear Lognormal at (0.05) Significance Level

Total PCBs (Aroclors)

**RA18_SE_PestPCBs|PCB, Total Aroclors (AECOM Calc)**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 29 |
| Minimum | 0.006 |
| Maximum | 0.19 |
| Mean of Raw Data | 0.0545 |
| Standard Deviation of Raw Data | 0.0422 |
| Khat | 1.811 |
| Theta hat | 0.0301 |
| Kstar | 1.652 |
| Theta star | 0.033 |
| Mean of Log Transformed Data | -3.21 |
| Standard Deviation of Log Transformed Data | 0.843 |
| Normal GOF Test Results | |
| Correlation Coefficient R | 0.933 |
| Shapiro Wilk Test Statistic | 0.876 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.00199 |
| Lilliefors Test Statistic | 0.129 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data appear Approximate Normal at (0.05) Significance Level | |
| Gamma GOF Test Results | |
| Correlation Coefficient R | 0.996 |
| A-D Test Statistic | 0.138 |
| A-D Critical (0.05) Value | 0.76 |
| K-S Test Statistic | 0.0681 |
| K-S Critical(0.05) Value | 0.162 |
| Data appear Gamma Distributed at (0.05) Significance Level | |
| Lognormal GOF Test Results | |
| Correlation Coefficient R | 0.988 |
| Shapiro Wilk Test Statistic | 0.972 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.638 |
| Lilliefors Test Statistic | 0.119 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data appear Lognormal at (0.05) Significance Level | |

**tPCB congener**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 29 |
| Number of Missing Observations | 2 |
| Number of Distinct Observations | 24 |
| Minimum | 0.0081 |
| Maximum | 0.38 |
| Mean of Raw Data | 0.118 |
| Standard Deviation of Raw Data | 0.0956 |
| Khat | 1.573 |
| Theta hat | 0.0753 |
| Kstar | 1.433 |
| Theta star | 0.0826 |
| Mean of Log Transformed Data | -2.484 |
| Standard Deviation of Log Transformed Data | 0.929 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.934 |
| Shapiro Wilk Test Statistic | 0.869 |
| Shapiro Wilk Critical (0.05) Value | 0.926 |
| Approximate Shapiro Wilk P Value | 0.00165 |
| Lilliefors Test Statistic | 0.158 |
| Lilliefors Critical (0.05) Value | 0.161 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.988 |
| A-D Test Statistic | 0.16 |
| A-D Critical (0.05) Value | 0.762 |
| K-S Test Statistic | 0.0873 |
| K-S Critical(0.05) Value | 0.165 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.968 |
| Shapiro Wilk Critical (0.05) Value | 0.926 |
| Approximate Shapiro Wilk P Value | 0.552 |
| Lilliefors Test Statistic | 0.123 |
| Lilliefors Critical (0.05) Value | 0.161 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|4-Methylphenol**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 24 | 7 | 2 | 5 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | 0.31 | 1.2 | 0.656 | 0.51 | 0.363 |
| Statistics (Non-Detects Only) | 2 | 0.034 | 0.043 | 0.0385 | 0.0385 | 0.00636 |
| Statistics (All: NDs treated as DL value) | 7 | 0.034 | 1.2 | 0.48 | 0.42 | 0.423 |
| Statistics (All: NDs treated as DL/2 value) | 7 | 0.034 | 0.6 | 0.245 | 0.21 | 0.205 |
| Statistics (Normal ROS Imputed Data) | 7 | 0.034 | 0.043 | 0.0385 | 0.0385 | 0.0026 |
| Statistics (Gamma ROS Imputed Data) | 7 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Lognormal ROS Imputed Data) | 7 | 0.034 | 0.043 | 0.0383 | 0.0382 | 0.0026 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (NDs = DL) | 0.99 | 0.661 | 0.485 | -1.319 | 1.402 | -1.063 |
| Statistics (NDs = DL/2) | 1.366 | 0.876 | 0.18 | -1.814 | 1.087 | -0.599 |
| Statistics (Gamma ROS Estimates) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -3.264 | 0.0678 | -0.0208 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 1 | 0.967 | 0.964 | 0.853 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (NDs = DL) | 0.927 | 0.803 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.921 | 0.803 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.777 | 0.803 | Data Not Normal |
| Lilliefors (Detects Only) | N/A | N/A | |
| Lilliefors (NDs = DL) | 0.186 | 0.304 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.195 | 0.304 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.357 | 0.304 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | 0.973 | 0.986 | 0.859 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | 0.351 | 0.728 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.198 | 0.32 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.251 | 0.723 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.184 | 0.318 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | N/A | 0.708 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | 0.311 | |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 1 | 0.938 | 0.966 | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (NDs = DL) | 0.863 | 0.803 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.917 | 0.803 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.777 | 0.803 | Data Not Lognormal |
| Lilliefors (Detects Only) | N/A | N/A | |
| Lilliefors (NDs = DL) | 0.256 | 0.304 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.196 | 0.304 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.357 | 0.304 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_SVOCs|Acetophenone**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 24 | 7 | 1 | 6 | 85.71% |

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 RA18_SE_SVOCs|Acetophenone was not processed!

**RA18_SE_SVOCs|bis-(2-Ethylhexyl)phthalate**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 29 | 1 | 3.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 1.7 | 1.7 | 1.7 | 1.7 | N/A |
| Statistics (Non-Detects Only) | 29 | 0.23 | 2.8 | 0.86 | 0.86 | 0.545 |
| Statistics (All: NDs treated as DL value) | 30 | 0.23 | 2.8 | 0.888 | 0.865 | 0.557 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 0.23 | 2.8 | 0.859 | 0.855 | 0.536 |
| Statistics (Normal ROS Imputed Data) | 30 | 0.23 | 2.8 | 0.858 | 0.84 | 0.536 |
| Statistics (Gamma ROS Imputed Data) | 30 | 0.23 | 2.8 | 0.855 | 0.84 | 0.536 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 0.23 | 2.8 | 0.853 | 0.84 | 0.537 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2.939 | 2.658 | 0.293 | -0.331 | 0.619 | -1.87 |
| Statistics (NDs = DL) | 2.888 | 2.621 | 0.307 | -0.302 | 0.628 | -2.078 |
| Statistics (NDs = DL/2) | 3.035 | 2.754 | 0.283 | -0.325 | 0.609 | -1.872 |
| Statistics (Gamma ROS Estimates) | 3.027 | 2.747 | 0.282 | -0.331 | 0.608 | -1.838 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -0.333 | 0.608 | -1.826 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.917 | 0.931 | 0.917 | 0.917 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.854 | 0.926 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.877 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.854 | 0.927 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.854 | 0.927 | Data Not Normal |
| Lilliefors (Detects Only) | 0.163 | 0.161 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.154 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.162 | 0.159 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.162 | 0.159 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.97 | 0.98 | 0.968 | 0.97 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.492 | 0.753 | |
| Kolmogorov-Smirnov (Detects Only) | 0.116 | 0.164 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.442 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.11 | 0.161 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.508 | 0.752 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.128 | 0.161 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.431 | 0.752 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.108 | 0.161 | Data Appear Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.981 | 0.984 | 0.981 | 0.984 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.958 | 0.926 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.961 | 0.927 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.958 | 0.927 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.964 | 0.927 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.155 | 0.161 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.15 | 0.159 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.167 | 0.159 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.138 | 0.159 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_SVOCs|Di-n-octylphthalate**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 3 | 27 | 90.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 27 | 0.013 | 1.2 | 0.158 | 0.036 | 0.277 |
| Statistics (Non-Detects Only) | 3 | 0.042 | 0.3 | 0.143 | 0.087 | 0.138 |
| Statistics (All: NDs treated as DL value) | 30 | 0.013 | 1.2 | 0.156 | 0.04 | 0.265 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 0.0065 | 0.6 | 0.0854 | 0.02 | 0.137 |
| Statistics (Normal ROS Imputed Data) | 30 | -0.542 | 0.3 | -0.348 | -0.398 | 0.18 |
| Statistics (Gamma ROS Imputed Data) | 30 | 0.01 | 0.3 | 0.0233 | 0.01 | 0.0544 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 6.54E-04 | 0.3 | 0.0161 | 0.0019 | 0.0562 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (NDs = DL) | 0.7 | 0.652 | 0.223 | -2.719 | 1.219 | -0.448 |
| Statistics (NDs = DL/2) | 0.687 | 0.641 | 0.124 | -3.342 | 1.263 | -0.378 |
| Statistics (Gamma ROS Estimates) | 0.948 | 0.876 | 0.0246 | -4.372 | 0.758 | -0.173 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -5.904 | 1.331 | -0.225 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.936 | 0.745 | 0.775 | 0.799 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.876 | 0.767 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.574 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.615 | 0.927 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.656 | 0.927 | Data Not Normal |
| Lilliefors (Detects Only) | 0.324 | 0.425 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.321 | 0.159 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.307 | 0.159 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.334 | 0.159 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | 0.958 | 0.976 | 0.74 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | 2.441 | 0.792 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.25 | 0.167 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.158 | 0.793 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.229 | 0.167 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 9.549 | 0.778 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.54 | 0.165 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.989 | 0.948 | 0.955 | 0.799 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.978 | 0.767 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.89 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.901 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.656 | 0.927 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.235 | 0.425 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.211 | 0.159 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.193 | 0.159 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.334 | 0.159 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_SVOCs|Total High-molecular-weight PAHs**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 |
| Minimum | 1.4 |
| Maximum | 28 |
| Mean of Raw Data | 6.577 |
| Standard Deviation of Raw Data | 4.919 |
| Khat | 2.459 |
| Theta hat | 2.675 |
| Kstar | 2.235 |
| Theta star | 2.943 |
| Mean of Log Transformed Data | 1.667 |
| Standard Deviation of Log Transformed Data | 0.683 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.838 |
| Shapiro Wilk Test Statistic | 0.73 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 1.00E-06 |
| Lilliefors Test Statistic | 0.204 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data not Normal at (0.05) Significance Level | |

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.906 |
| A-D Test Statistic | 0.667 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.128 |
| K-S Critical(0.05) Value | 0.162 |
| Data appear Gamma Distributed at (0.05) Significance Level | |

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.088 |
| Lilliefors Test Statistic | 0.133 |
| Lilliefors Critical (0.05) Value | 0.159 |
| Data appear Lognormal at (0.05) Significance Level | |

**RA18_SE_SVOCs|Benzo(a)anthracene**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 |
| Minimum | 0.1 |
| Maximum | 2.7 |
| Mean of Raw Data | 0.515 |
| Standard Deviation of Raw Data | 0.469 |
| Khat | 2.078 |
| Theta hat | 0.248 |
| Kstar | 1.893 |
| Theta star | 0.272 |
| Mean of Log Transformed Data | -0.924 |
| Standard Deviation of Log Transformed Data | 0.724 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.775 |
| Shapiro Wilk Test Statistic | 0.634 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 1.60E-08 |
| Lilliefors Test Statistic | 0.234 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.874 |
| A-D Test Statistic | 0.725 |
| A-D Critical (0.05) Value | 0.758 |
| K-S Test Statistic | 0.138 |
| K-S Critical(0.05) Value | 0.162 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.968 |
| Shapiro Wilk Test Statistic | 0.943 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.126 |
| Lilliefors Test Statistic | 0.164 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|Benzo(a)pyrene**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 27 |
| Minimum | 0.12 |
| Maximum | 2.6 |
| Mean of Raw Data | 0.576 |
| Standard Deviation of Raw Data | 0.452 |
| Khat | 2.405 |
| Theta hat | 0.24 |
| Kstar | 2.187 |
| Theta star | 0.263 |
| Mean of Log Transformed Data | -0.773 |
| Standard Deviation of Log Transformed Data | 0.685 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.816 |
| Shapiro Wilk Test Statistic | 0.696 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 2.18E-07 |
| Lilliefors Test Statistic | 0.209 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.891 |
| A-D Test Statistic | 0.661 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.13 |
| K-S Critical(0.05) Value | 0.162 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.94 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.105 |
| Lilliefors Test Statistic | 0.147 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|Benzo(b)fluoranthene**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 23 |
| Minimum | 0.19 |
| Maximum | 2.8 |
| Mean of Raw Data | 0.829 |
| Standard Deviation of Raw Data | 0.518 |
| Khat | 2.847 |
| Theta hat | 0.291 |
| Kstar | 2.584 |
| Theta star | 0.321 |
| Mean of Log Transformed Data | -0.373 |
| Standard Deviation of Log Transformed Data | 0.646 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.904 |
| Shapiro Wilk Test Statistic | 0.837 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 2.15E-04 |
| Lilliefors Test Statistic | 0.17 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.94 |
| A-D Test Statistic | 0.668 |
| A-D Critical (0.05) Value | 0.753 |
| K-S Test Statistic | 0.129 |
| K-S Critical(0.05) Value | 0.161 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.073 |
| Lilliefors Test Statistic | 0.132 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|Benzo(k)fluoranthene**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 25 |
| Minimum | 0.072 |
| Maximum | 1.4 |
| Mean of Raw Data | 0.317 |
| Standard Deviation of Raw Data | 0.247 |
| Khat | 2.408 |
| Theta hat | 0.131 |
| Kstar | 2.19 |
| Theta star | 0.145 |
| Mean of Log Transformed Data | -1.372 |
| Standard Deviation of Log Transformed Data | 0.68 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.832 |
| Shapiro Wilk Test Statistic | 0.721 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 6.49E-07 |
| Lilliefors Test Statistic | 0.172 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.91 |
| A-D Test Statistic | 0.487 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.114 |
| K-S Critical(0.05) Value | 0.162 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.951 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.215 |
| Lilliefors Test Statistic | 0.116 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|Chrysene**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 |
| Minimum | 0.18 |
| Maximum | 3.3 |
| Mean of Raw Data | 0.784 |
| Standard Deviation of Raw Data | 0.576 |
| Khat | 2.551 |
| Theta hat | 0.307 |
| Kstar | 2.318 |
| Theta star | 0.338 |
| Mean of Log Transformed Data | -0.452 |
| Standard Deviation of Log Transformed Data | 0.669 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.833 |
| Shapiro Wilk Test Statistic | 0.723 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 7.31E-07 |
| Lilliefors Test Statistic | 0.201 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.899 |
| A-D Test Statistic | 0.763 |
| A-D Critical (0.05) Value | 0.755 |
| K-S Test Statistic | 0.142 |
| K-S Critical(0.05) Value | 0.162 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.96 |
| Shapiro Wilk Test Statistic | 0.925 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0412 |
| Lilliefors Test Statistic | 0.138 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs|Dibenzo(a,h)anthracene**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 26 | 4 | 13.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 0.0027 | 0.085 | 0.0307 | 0.0175 | 0.037 |
| Statistics (Non-Detects Only) | 26 | 0.026 | 0.4 | 0.137 | 0.125 | 0.0805 |
| Statistics (All: NDs treated as DL value) | 30 | 0.0027 | 0.4 | 0.123 | 0.12 | 0.0842 |
| Statistics (All: NDs treated as DL/2 value) | 30 | 0.00135 | 0.4 | 0.121 | 0.12 | 0.086 |
| Statistics (Normal ROS Imputed Data) | 30 | -0.0399 | 0.4 | 0.116 | 0.12 | 0.0935 |
| Statistics (Gamma ROS Imputed Data) | 30 | 0.01 | 0.4 | 0.122 | 0.12 | 0.0854 |
| Statistics (Lognormal ROS Imputed Data) | 30 | 0.026 | 0.4 | 0.124 | 0.12 | 0.0828 |

**GOF Statistics – Sediment – Raw Dataset**

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 3.118 | 2.784 | 0.044 | -2.155 | 0.618 | -0.287 |
| Statistics (NDs = DL) | 1.697 | 1.55 | 0.0725 | -2.418 | 1.001 | -0.414 |
| Statistics (NDs = DL/2) | 1.399 | 1.281 | 0.0865 | -2.51 | 1.178 | -0.469 |
| Statistics (Gamma ROS Estimates) | 1.697 | 1.55 | 0.0716 | -2.43 | 0.949 | -0.391 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -2.32 | 0.722 | -0.311 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.942 | 0.955 | 0.956 | 0.97 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.898 | 0.92 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.921 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.923 | 0.927 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.949 | 0.927 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.12 | 0.17 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.102 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.104 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.0861 | 0.159 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.978 | 0.979 | 0.975 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.364 | 0.75 | |
| Kolmogorov-Smirnov (Detects Only) | 0.141 | 0.172 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.473 | 0.761 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.129 | 0.163 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.672 | 0.766 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.142 | 0.163 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.538 | 0.761 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.135 | 0.163 | Data Appear Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.98 | 0.922 | 0.902 | 0.978 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.965 | 0.92 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.867 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.829 | 0.927 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.947 | 0.927 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.16 | 0.17 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.155 | 0.159 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.18 | 0.159 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.15 | 0.159 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_SVOCs|Indeno(1,2,3-cd)pyrene**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 25 |
| Minimum | 0.12 |
| Maximum | 1.5 |
| Mean of Raw Data | 0.527 |
| Standard Deviation of Raw Data | 0.302 |
| Khat | 2.962 |
| Theta hat | 0.178 |
| Kstar | 2.688 |
| Theta star | 0.196 |
| Mean of Log Transformed Data | -0.819 |
| Standard Deviation of Log Transformed Data | 0.642 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.951 |
| Shapiro Wilk Test Statistic | 0.912 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.018 |
| Lilliefors Test Statistic | 0.0997 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.968 |
| A-D Test Statistic | 0.608 |
| A-D Critical (0.05) Value | 0.753 |
| K-S Test Statistic | 0.13 |
| K-S Critical(0.05) Value | 0.161 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.97 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0733 |
| Lilliefors Test Statistic | 0.153 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs_ID0016|2,3,5-Trimethylnaphthalene**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 6 |
| Number of Missing Observations | 25 |
| Number of Distinct Observations | 6 |
| Minimum | 0.0034 |
| Maximum | 0.0164 |
| Mean of Raw Data | 0.00887 |
| Standard Deviation of Raw Data | 0.00526 |
| Khat | 3.242 |
| Theta hat | 0.00273 |
| Kstar | 1.732 |
| Theta star | 0.00512 |
| Mean of Log Transformed Data | -4.888 |
| Standard Deviation of Log Transformed Data | 0.639 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.97 |
| Shapiro Wilk Test Statistic | 0.92 |
| Shapiro Wilk Critical (0.05) Value | 0.788 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.214 |
| Lilliefors Critical (0.05) Value | 0.325 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| A-D Test Statistic | 0.289 |
| A-D Critical (0.05) Value | 0.701 |
| K-S Test Statistic | 0.19 |
| K-S Critical(0.05) Value | 0.334 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.788 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.171 |
| Lilliefors Critical (0.05) Value | 0.325 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs_ID0016|2,6-Dimethylnaphthalene**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 6 |
| Number of Missing Observations | 25 |
| Number of Distinct Observations | 6 |
| Minimum | 0.0056 |
| Maximum | 0.0369 |
| Mean of Raw Data | 0.0152 |
| Standard Deviation of Raw Data | 0.0118 |
| Khat | 2.423 |
| Theta hat | 0.00627 |
| Kstar | 1.323 |
| Theta star | 0.0115 |
| Mean of Log Transformed Data | -4.408 |
| Standard Deviation of Log Transformed Data | 0.707 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.907 |
| Shapiro Wilk Test Statistic | 0.827 |
| Shapiro Wilk Critical (0.05) Value | 0.788 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.234 |
| Lilliefors Critical (0.05) Value | 0.325 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.359 |
| A-D Critical (0.05) Value | 0.703 |
| K-S Test Statistic | 0.26 |
| K-S Critical(0.05) Value | 0.335 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.971 |
| Shapiro Wilk Test Statistic | 0.936 |
| Shapiro Wilk Critical (0.05) Value | 0.788 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.236 |
| Lilliefors Critical (0.05) Value | 0.325 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_SVOCs_ID0016|Total High-molecular-weight PAHs**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 27 |
| Number of Missing Observations | 4 |
| Number of Distinct Observations | 22 |
| Minimum | 2.1 |
| Maximum | 12 |
| Mean of Raw Data | 6.926 |
| Standard Deviation of Raw Data | 3.303 |
| Khat | 3.977 |
| Theta hat | 1.742 |
| Kstar | 3.56 |
| Theta star | 1.946 |
| Mean of Log Transformed Data | 1.804 |
| Standard Deviation of Log Transformed Data | 0.548 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.971 |
| Shapiro Wilk Test Statistic | 0.92 |
| Shapiro Wilk Critical (0.05) Value | 0.923 |
| Approximate Shapiro Wilk P Value | 0.0423 |
| Lilliefors Test Statistic | 0.143 |
| Lilliefors Critical (0.05) Value | 0.167 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.949 |
| A-D Test Statistic | 0.668 |
| A-D Critical (0.05) Value | 0.749 |
| K-S Test Statistic | 0.16 |
| K-S Critical(0.05) Value | 0.169 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.916 |
| Shapiro Wilk Critical (0.05) Value | 0.923 |
| Approximate Shapiro Wilk P Value | 0.0333 |
| Lilliefors Test Statistic | 0.157 |
| Lilliefors Critical (0.05) Value | 0.167 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**RA18_SE_Petroleum|Diesel Range Organics (C10-C20)**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Missing Observations | 24 |
| Number of Distinct Observations | 4 |
| Minimum | 33 |
| Maximum | 44 |
| Mean of Raw Data | 38 |
| Standard Deviation of Raw Data | 4.967 |
| Khat | 78.84 |
| Theta hat | 0.482 |
| Kstar | 19.88 |
| Theta star | 1.912 |
| Mean of Log Transformed Data | 3.631 |
| Standard Deviation of Log Transformed Data | 0.13 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| Shapiro Wilk Test Statistic | 0.953 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.227 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| A-D Test Statistic | 0.271 |
| A-D Critical (0.05) Value | 0.656 |
| K-S Test Statistic | 0.253 |
| K-S Critical(0.05) Value | 0.394 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| Shapiro Wilk Test Statistic | 0.957 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.22 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA18_SE_Petroleum|TPH-C10-28**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 23 |
| Number of Distinct Observations | 17 |
| Minimum | 53 |
| Maximum | 1100 |
| Mean of Raw Data | 293.8 |
| Standard Deviation of Raw Data | 225.9 |
| Khat | 2.466 |
| Theta hat | 119.1 |
| Kstar | 2.173 |
| Theta star | 135.2 |
| Mean of Log Transformed Data | 5.467 |
| Standard Deviation of Log Transformed Data | 0.661 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.866 |
| Shapiro Wilk Test Statistic | 0.767 |
| Shapiro Wilk Critical (0.05) Value | 0.914 |
| Approximate Shapiro Wilk P Value | 5.79E-05 |
| Lilliefors Test Statistic | 0.202 |
| Lilliefors Critical (0.05) Value | 0.18 |
| Data not Normal at (0.05) Significance Level | |

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.956 |
| A-D Test Statistic | 0.563 |
| A-D Critical (0.05) Value | 0.753 |
| K-S Test Statistic | 0.15 |
| K-S Critical(0.05) Value | 0.183 |
| Data appear Gamma Distributed at (0.05) Significance Level | |

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| Shapiro Wilk Test Statistic | 0.975 |
| Shapiro Wilk Critical (0.05) Value | 0.914 |
| Approximate Shapiro Wilk P Value | 0.804 |
| Lilliefors Test Statistic | 0.146 |
| Lilliefors Critical (0.05) Value | 0.18 |
| Data appear Lognormal at (0.05) Significance Level | |

**RA18_SE_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 11 | 10 | 47.62% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 2.23E-08 | 3.38E-07 | 1.67E-07 | 1.63E-07 | 8.52E-08 |
| Statistics (Non-Detects Only) | 11 | 4.10E-08 | 7.20E-07 | 3.03E-07 | 2.70E-07 | 2.39E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 2.23E-08 | 7.20E-07 | 2.38E-07 | 1.64E-07 | 1.91E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 1.12E-08 | 7.20E-07 | 1.98E-07 | 9.70E-08 | 2.05E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -2.93E-07 | 7.20E-07 | 1.51E-07 | 5.11E-08 | 2.45E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 4.10E-08 | 0.01 | 0.00476 | 7.20E-07 | 0.00512 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 1.55E-08 | 7.20E-07 | 1.85E-07 | 6.33E-08 | 2.11E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.439 | 1.107 | 2.10E-07 | -15.4 | 1.005 | -0.0653 |
| Statistics (NDs = DL) | 1.65 | 1.446 | 1.44E-07 | -15.58 | 0.895 | -0.0574 |
| Statistics (NDs = DL/2) | 1.181 | 1.044 | 1.68E-07 | -15.91 | 1.034 | -0.065 |
| Statistics (Gamma ROS Estimates) | 0.156 | 0.165 | 0.0306 | -10.26 | 5.568 | -0.543 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -16.06 | 1.05 | -0.0654 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.961 | 0.937 | 0.878 | 0.929 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.904 | 0.85 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.876 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.769 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.87 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.206 | 0.251 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.198 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.281 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.254 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.962 | 0.993 | 0.974 | 0.49 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.38 | 0.743 | |
| Kolmogorov-Smirnov (Detects Only) | 0.178 | 0.26 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.179 | 0.757 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.1 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.873 | 0.765 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.213 | 0.194 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.482 | 0.937 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.342 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.97 | 0.989 | 0.974 | 0.948 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.921 | 0.85 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.976 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.951 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.895 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.192 | 0.251 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.127 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.151 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.232 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,7,8-Pentachlorodibenzo-p-dioxin**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 10 | 11 | 52.38% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 11 | 2.61E-07 | 1.60E-06 | 8.16E-07 | 7.70E-07 | 4.80E-07 |
| Statistics (Non-Detects Only) | 10 | 2.19E-07 | 2.20E-06 | 1.09E-06 | 8.90E-07 | 7.75E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 2.19E-07 | 2.20E-06 | 9.48E-07 | 7.70E-07 | 6.37E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 1.31E-07 | 2.20E-06 | 7.34E-07 | 5.50E-07 | 6.50E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -2.59E-07 | 2.20E-06 | 5.59E-07 | 2.91E-07 | 7.63E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 2.19E-07 | 0.01 | 0.00524 | 0.01 | 0.00512 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 1.78E-07 | 2.20E-06 | 6.63E-07 | 3.32E-07 | 6.71E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.903 | 1.399 | 5.74E-07 | -14.01 | 0.843 | -0.0601 |
| Statistics (NDs = DL) | 2.196 | 1.914 | 4.31E-07 | -14.11 | 0.744 | -0.0527 |
| Statistics (NDs = DL/2) | 1.565 | 1.373 | 4.69E-07 | -14.48 | 0.866 | -0.0598 |
| Statistics (Gamma ROS Estimates) | 0.193 | 0.197 | 0.0271 | -9.085 | 4.847 | -0.534 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -14.62 | 0.847 | -0.058 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.948 | 0.954 | 0.901 | 0.925 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.872 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.896 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.804 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.846 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.234 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.192 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.266 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.236 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.933 | 0.969 | 0.969 | 0.479 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.498 | 0.736 | |
| Kolmogorov-Smirnov (Detects Only) | 0.187 | 0.27 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.645 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.169 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.572 | 0.758 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.166 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.652 | 0.902 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.372 | 0.21 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.963 | 0.971 | 0.984 | 0.936 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.905 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.928 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.954 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.861 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.185 | 0.262 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.178 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.109 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.193 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 16 | 5 | 23.81% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | 9.20E-07 | 4.80E-06 | 2.04E-06 | 1.60E-06 | 1.58E-06 |
| Statistics (Non-Detects Only) | 16 | 9.89E-07 | 1.20E-05 | 4.38E-06 | 3.40E-06 | 3.28E-06 |
| Statistics (All: NDs treated as DL value) | 21 | 9.20E-07 | 1.20E-05 | 3.82E-06 | 2.40E-06 | 3.10E-06 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 4.60E-07 | 1.20E-05 | 3.58E-06 | 2.40E-06 | 3.22E-06 |
| Statistics (Normal ROS Imputed Data) | 21 | -3.58E-06 | 1.20E-05 | 3.10E-06 | 2.33E-06 | 3.78E-06 |
| Statistics (Gamma ROS Imputed Data) | 21 | 9.89E-07 | 0.01 | 0.00238 | 5.20E-06 | 0.00436 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 4.55E-07 | 1.20E-05 | 3.56E-06 | 2.33E-06 | 3.22E-06 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.946 | 1.623 | 2.25E-06 | -12.62 | 0.791 | -0.0627 |
| Statistics (NDs = DL) | 1.803 | 1.577 | 2.12E-06 | -12.78 | 0.799 | -0.0625 |
| Statistics (NDs = DL/2) | 1.388 | 1.222 | 2.58E-06 | -12.94 | 0.952 | -0.0736 |
| Statistics (Gamma ROS Estimates) | 0.163 | 0.171 | 0.0147 | -10.71 | 3.563 | -0.333 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -12.94 | 0.925 | -0.0715 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.944 | 0.921 | 0.923 | 0.978 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.885 | 0.887 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.845 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.849 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.959 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.216 | 0.213 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.236 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.25 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.182 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.99 | 0.989 | 0.991 | 0.749 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.386 | 0.751 | |
| Kolmogorov-Smirnov (Detects Only) | 0.179 | 0.218 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.64 | 0.756 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.179 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.401 | 0.761 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.161 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.797 | 0.931 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.423 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.981 | 0.976 | 0.989 | 0.986 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.946 | 0.887 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.939 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.967 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.963 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.139 | 0.213 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.132 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.112 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.115 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 16 | 5 | 23.81% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | 1.40E-07 | 2.00E-06 | 7.38E-07 | 5.10E-07 | 7.25E-07 |
| Statistics (Non-Detects Only) | 16 | 3.75E-07 | 4.70E-06 | 1.92E-06 | 1.60E-06 | 1.39E-06 |
| Statistics (All: NDs treated as DL value) | 21 | 1.40E-07 | 4.70E-06 | 1.64E-06 | 1.10E-06 | 1.35E-06 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 7.00E-08 | 4.70E-06 | 1.55E-06 | 1.05E-06 | 1.39E-06 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.58E-06 | 4.70E-06 | 1.36E-06 | 1.05E-06 | 1.62E-06 |
| Statistics (Gamma ROS Imputed Data) | 21 | 3.75E-07 | 0.01 | 0.00238 | 2.32E-06 | 0.00436 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 1.71E-07 | 4.70E-06 | 1.55E-06 | 1.05E-06 | 1.38E-06 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.874 | 1.564 | 1.03E-06 | -13.45 | 0.832 | -0.0619 |
| Statistics (NDs = DL) | 1.484 | 1.304 | 1.11E-06 | -13.69 | 0.945 | -0.069 |
| Statistics (NDs = DL/2) | 1.173 | 1.037 | 1.32E-06 | -13.86 | 1.12 | -0.0808 |
| Statistics (Gamma ROS Estimates) | 0.146 | 0.156 | 0.0164 | -11.34 | 3.927 | -0.346 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -13.79 | 0.975 | -0.0707 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.959 | 0.941 | 0.938 | 0.982 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.905 | 0.887 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.877 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.872 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.963 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.199 | 0.213 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.2 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.22 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.159 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.976 | 0.979 | 0.976 | 0.737 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.342 | 0.751 | |
| Kolmogorov-Smirnov (Detects Only) | 0.135 | 0.218 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.452 | 0.759 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.146 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.298 | 0.766 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.104 | 0.194 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.858 | 0.947 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.435 | 0.214 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.979 | 0.979 | 0.98 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.939 | 0.887 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.954 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.956 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.947 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.153 | 0.213 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.155 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.125 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.135 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 17 | 4 | 19.05% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 1.40E-06 | 5.50E-06 | 2.60E-06 | 1.75E-06 | 1.94E-06 |
| Statistics (Non-Detects Only) | 17 | 8.54E-07 | 1.10E-05 | 4.57E-06 | 3.40E-06 | 3.47E-06 |
| Statistics (All: NDs treated as DL value) | 21 | 8.54E-07 | 1.10E-05 | 4.19E-06 | 2.60E-06 | 3.29E-06 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 7.00E-07 | 1.10E-05 | 3.95E-06 | 2.60E-06 | 3.40E-06 |
| Statistics (Normal ROS Imputed Data) | 21 | 3.64E-07 | 1.10E-05 | 3.91E-06 | 2.51E-06 | 3.42E-06 |
| Statistics (Gamma ROS Imputed Data) | 21 | 8.54E-07 | 0.01 | 0.00191 | 5.30E-06 | 0.00402 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 8.54E-07 | 1.10E-05 | 3.96E-06 | 2.05E-06 | 3.36E-06 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.688 | 1.429 | 2.71E-06 | -12.62 | 0.872 | -0.0691 |
| Statistics (NDs = DL) | 1.728 | 1.513 | 2.43E-06 | -12.7 | 0.833 | -0.0656 |
| Statistics (NDs = DL/2) | 1.434 | 1.261 | 2.75E-06 | -12.83 | 0.929 | -0.0724 |
| Statistics (Gamma ROS Estimates) | 0.158 | 0.167 | 0.0121 | -11.09 | 3.318 | -0.299 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -12.79 | 0.865 | -0.0676 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.947 | 0.931 | 0.926 | 0.929 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.877 | 0.892 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.855 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.844 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.852 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.185 | 0.207 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.219 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.209 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.221 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.959 | 0.967 | 0.966 | 0.802 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.549 | 0.753 | |
| Kolmogorov-Smirnov (Detects Only) | 0.153 | 0.212 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.781 | 0.756 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.193 | 0.192 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.684 | 0.76 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.152 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 4.138 | 0.935 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.454 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.97 | 0.968 | 0.972 | 0.956 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.919 | 0.892 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.922 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.926 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.897 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.148 | 0.207 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.16 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.131 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.162 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 |
| Minimum | 1.70E-05 |
| Maximum | 2.60E-04 |
| Mean of Raw Data | 1.03E-04 |
| Standard Deviation of Raw Data | 7.73E-05 |
| Khat | 1.771 |
| Theta hat | 5.84E-05 |
| Kstar | 1.549 |
| Theta star | 6.67E-05 |
| Mean of Log Transformed Data | -9.485 |
| Standard Deviation of Log Transformed Data | 0.848 |
| | |
| Normal GOF Test Results | |
| | |
| Correlation Coefficient R | 0.952 |
| Shapiro Wilk Test Statistic | 0.893 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.0235 |
| Lilliefors Test Statistic | 0.201 |
| Lilliefors Critical (0.05) Value | 0.188 |
| Data not Normal at (0.05) Significance Level | |
| | |
| Gamma GOF Test Results | |
| | |
| Correlation Coefficient R | 0.974 |
| A-D Test Statistic | 0.371 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.113 |
| K-S Critical(0.05) Value | 0.192 |
| Data appear Gamma Distributed at (0.05) Significance Level | |
| | |
| Lognormal GOF Test Results | |
| | |
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.953 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.388 |
| Lilliefors Test Statistic | 0.118 |
| Lilliefors Critical (0.05) Value | 0.188 |
| Data appear Lognormal at (0.05) Significance Level | |

**RA18_SE_DioxinFurans|Octachlorochlorodibenzo-p-dioxin**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 |
| Minimum | 5.20E-04 |
| Maximum | 0.008 |
| Mean of Raw Data | 0.00342 |
| Standard Deviation of Raw Data | 0.00246 |
| Khat | 1.772 |
| Theta hat | 0.00193 |
| Kstar | 1.55 |
| Theta star | 0.0022 |
| Mean of Log Transformed Data | -5.987 |
| Standard Deviation of Log Transformed Data | 0.869 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.958 |
| Shapiro Wilk Test Statistic | 0.903 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.0376 |
| Lilliefors Test Statistic | 0.17 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.963 |
| A-D Test Statistic | 0.361 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.12 |
| K-S Critical(0.05) Value | 0.192 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.187 |
| Lilliefors Test Statistic | 0.142 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Lognormal at (0.05) Significance Level

**2,3,7,8-TCDF**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 |
| Minimum | 1.57E-07 |
| Maximum | 3.30E-06 |
| Mean of Raw Data | 8.84E-07 |
| Standard Deviation of Raw Data | 7.61E-07 |
| Khat | 1.967 |
| Theta hat | 4.50E-07 |
| Kstar | 1.718 |
| Theta star | 5.15E-07 |
| Mean of Log Transformed Data | -14.21 |
| Standard Deviation of Log Transformed Data | 0.749 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.863 |
| Shapiro Wilk Test Statistic | 0.756 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 7.15E-05 |
| Lilliefors Test Statistic | 0.249 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.961 |
| A-D Test Statistic | 0.581 |
| A-D Critical (0.05) Value | 0.754 |
| K-S Test Statistic | 0.149 |
| K-S Critical(0.05) Value | 0.192 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.97 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.722 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Lognormal at (0.05) Significance Level

**1,2,3,7,8-PeCDF**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 10 | 11 | 52.38% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 11 | 4.34E-08 | 5.70E-07 | 2.48E-07 | 1.88E-07 | 1.52E-07 |
| Statistics (Non-Detects Only) | 10 | 2.40E-07 | 1.70E-06 | 6.46E-07 | 4.65E-07 | 4.96E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 4.34E-08 | 1.70E-06 | 4.38E-07 | 2.57E-07 | 4.04E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 2.17E-08 | 1.70E-06 | 3.73E-07 | 2.40E-07 | 4.30E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -5.64E-07 | 1.70E-06 | 9.84E-08 | -1.27E-07 | 6.44E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 2.40E-07 | 0.01 | 0.00524 | 0.01 | 0.00512 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 7.87E-08 | 1.70E-06 | 3.63E-07 | 1.54E-07 | 4.33E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2.161 | 1.58 | 2.99E-07 | -14.5 | 0.735 | -0.0507 |
| Statistics (NDs = DL) | 1.665 | 1.459 | 2.63E-07 | -14.97 | 0.833 | -0.0557 |
| Statistics (NDs = DL/2) | 1.077 | 0.955 | 3.46E-07 | -15.33 | 1.07 | -0.0698 |
| Statistics (Gamma ROS Estimates) | 0.183 | 0.189 | 0.0286 | -9.318 | 5.088 | -0.546 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -15.34 | 0.98 | -0.0639 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.917 | 0.87 | 0.851 | 0.948 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.836 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.767 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.732 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.892 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.206 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.223 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.295 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.16 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.988 | 0.978 | 0.983 | 0.472 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.536 | 0.735 | |
| Kolmogorov-Smirnov (Detects Only) | 0.232 | 0.27 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.606 | 0.757 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.165 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.619 | 0.768 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.189 | 0.195 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.766 | 0.911 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.374 | 0.211 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.952 | 0.979 | 0.987 | 0.949 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.883 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.968 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.976 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.888 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.23 | 0.262 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.12 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.117 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.162 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|2,3,4,7,8-Pentachlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 16 | 5 | 23.81% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | 2.80E-07 | 1.30E-06 | 8.26E-07 | 8.80E-07 | 4.08E-07 |
| Statistics (Non-Detects Only) | 16 | 4.25E-07 | 2.55E-06 | 1.25E-06 | 1.21E-06 | 6.51E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 2.80E-07 | 2.55E-06 | 1.15E-06 | 1.20E-06 | 6.21E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 1.40E-07 | 2.55E-06 | 1.05E-06 | 9.91E-07 | 6.79E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -3.61E-07 | 2.55E-06 | 1.02E-06 | 9.91E-07 | 7.24E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 4.25E-07 | 0.01 | 0.00238 | 1.33E-06 | 0.00436 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 2.60E-07 | 2.55E-06 | 1.07E-06 | 9.91E-07 | 6.59E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 3.683 | 3.034 | 3.40E-07 | -13.73 | 0.574 | -0.0418 |
| Statistics (NDs = DL) | 3.414 | 2.958 | 3.37E-07 | -13.83 | 0.595 | -0.043 |
| Statistics (NDs = DL/2) | 2.334 | 2.033 | 4.51E-07 | -13.99 | 0.743 | -0.0531 |
| Statistics (Gamma ROS Estimates) | 0.141 | 0.152 | 0.0169 | -11.56 | 4.015 | -0.347 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -13.93 | 0.64 | -0.0459 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.971 | 0.97 | 0.964 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.932 | 0.887 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.936 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.923 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.959 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.14 | 0.213 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.148 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.152 | 0.188 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.114 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.982 | 0.986 | 0.985 | 0.733 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.337 | 0.743 | |
| Kolmogorov-Smirnov (Detects Only) | 0.163 | 0.216 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.296 | 0.749 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.126 | 0.191 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.28 | 0.752 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.14 | 0.191 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 4.207 | 0.951 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.452 | 0.214 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.973 | 0.982 | 0.979 | 0.983 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.932 | 0.887 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.959 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.958 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.958 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.194 | 0.213 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.153 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.163 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.158 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,6,7,8-Hexachlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 14 | 7 | 33.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | 5.20E-07 | 2.10E-06 | 1.18E-06 | 1.00E-06 | 6.21E-07 |
| Statistics (Non-Detects Only) | 14 | 5.06E-07 | 3.60E-06 | 1.51E-06 | 1.17E-06 | 9.50E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 5.06E-07 | 3.60E-06 | 1.40E-06 | 1.00E-06 | 8.54E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 2.60E-07 | 3.60E-06 | 1.21E-06 | 9.00E-07 | 9.03E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.64E-07 | 3.60E-06 | 1.14E-06 | 8.48E-07 | 9.73E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 5.06E-07 | 0.01 | 0.00333 | 2.10E-06 | 0.00483 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 4.13E-07 | 3.60E-06 | 1.22E-06 | 8.20E-07 | 8.84E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 3.047 | 2.442 | 4.97E-07 | -13.57 | 0.606 | -0.0447 |
| Statistics (NDs = DL) | 3.188 | 2.764 | 4.40E-07 | -13.64 | 0.585 | -0.0429 |
| Statistics (NDs = DL/2) | 2.191 | 1.91 | 5.50E-07 | -13.87 | 0.722 | -0.052 |
| Statistics (Gamma ROS Estimates) | 0.157 | 0.166 | 0.0213 | -10.58 | 4.36 | -0.412 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -13.82 | 0.633 | -0.0458 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.938 | 0.939 | 0.919 | 0.945 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.874 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.879 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.844 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.894 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.231 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.205 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.239 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.253 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.984 | 0.988 | 0.985 | 0.635 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.442 | 0.742 | |
| Kolmogorov-Smirnov (Detects Only) | 0.222 | 0.23 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.478 | 0.749 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.171 | 0.191 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.419 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.174 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.529 | 0.936 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.391 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.982 | 0.983 | 0.99 | 0.971 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.952 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.955 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.973 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.933 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.198 | 0.226 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.14 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.127 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.207 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,7,8,9-HxCDF**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 4 | 17 | 80.95% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 17 | 4.00E-08 | 4.87E-07 | 1.35E-07 | 1.10E-07 | 1.01E-07 |
| Statistics (Non-Detects Only) | 4 | 7.91E-08 | 1.30E-06 | 4.10E-07 | 1.30E-07 | 5.94E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 4.00E-08 | 1.30E-06 | 1.87E-07 | 1.10E-07 | 2.71E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 2.00E-08 | 1.30E-06 | 1.33E-07 | 6.50E-08 | 2.72E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.26E-06 | 1.30E-06 | -5.84E-07 | -7.40E-07 | 5.88E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 7.91E-08 | 0.01 | 0.0081 | 0.01 | 0.00402 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 4.08E-09 | 1.30E-06 | 8.91E-08 | 1.38E-08 | 2.80E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.835 | 0.375 | 4.91E-07 | -15.42 | 1.271 | -0.0825 |
| Statistics (NDs = DL) | 1.438 | 1.264 | 1.30E-07 | -15.88 | 0.739 | -0.0465 |
| Statistics (NDs = DL/2) | 0.963 | 0.857 | 1.38E-07 | -16.44 | 0.867 | -0.0527 |
| Statistics (Gamma ROS Estimates) | 0.362 | 0.342 | 0.0224 | -6.664 | 4.377 | -0.657 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -17.73 | 1.356 | -0.0765 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.816 | 0.651 | 0.578 | 0.889 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.677 | 0.748 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.45 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.361 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.804 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.416 | 0.375 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.385 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.398 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.28 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.979 | 0.829 | 0.794 | 0.313 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.655 | 0.669 | |
| Kolmogorov-Smirnov (Detects Only) | 0.398 | 0.404 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 2.201 | 0.76 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.287 | 0.193 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.555 | 0.772 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.306 | 0.195 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 7.035 | 0.833 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.561 | 0.204 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.898 | 0.911 | 0.907 | 0.899 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.815 | 0.748 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.848 | 0.908 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.843 | 0.908 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.819 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.334 | 0.375 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.208 | 0.188 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.193 | 0.188 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.28 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,4,7,8-Hexachlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 14 | 7 | 33.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | 6.70E-07 | 2.60E-06 | 1.33E-06 | 1.20E-06 | 6.15E-07 |
| Statistics (Non-Detects Only) | 14 | 4.03E-07 | 7.00E-06 | 2.39E-06 | 1.36E-06 | 2.03E-06 |
| Statistics (All: NDs treated as DL value) | 21 | 4.03E-07 | 7.00E-06 | 2.04E-06 | 1.20E-06 | 1.75E-06 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 3.35E-07 | 7.00E-06 | 1.82E-06 | 8.71E-07 | 1.84E-06 |
| Statistics (Normal ROS Imputed Data) | 21 | -5.63E-07 | 7.00E-06 | 1.78E-06 | 9.75E-07 | 1.89E-06 |
| Statistics (Gamma ROS Imputed Data) | 21 | 4.03E-07 | 0.01 | 0.00333 | 4.30E-06 | 0.00483 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 3.99E-07 | 7.00E-06 | 1.83E-06 | 8.71E-07 | 1.83E-06 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.523 | 1.245 | 1.57E-06 | -13.31 | 0.908 | -0.0682 |
| Statistics (NDs = DL) | 1.796 | 1.571 | 1.14E-06 | -13.41 | 0.781 | -0.0582 |
| Statistics (NDs = DL/2) | 1.334 | 1.175 | 1.36E-06 | -13.64 | 0.905 | -0.0664 |
| Statistics (Gamma ROS Estimates) | 0.162 | 0.17 | 0.0206 | -10.41 | 4.266 | -0.41 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -13.6 | 0.865 | -0.0636 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.924 | 0.893 | 0.868 | 0.905 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.848 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.8 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.755 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.825 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.238 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.262 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.277 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.26 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.973 | 0.977 | 0.97 | 0.64 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.643 | 0.75 | |
| Kolmogorov-Smirnov (Detects Only) | 0.214 | 0.233 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.894 | 0.756 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.205 | 0.192 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 1.286 | 0.762 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.212 | 0.193 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.226 | 0.932 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.371 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.967 | 0.974 | 0.959 | 0.946 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.922 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.943 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.91 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.886 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.176 | 0.226 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.156 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.175 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.221 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|2,3,4,6,7,8-Hexachlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 14 | 7 | 33.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | 2.70E-07 | 1.60E-06 | 9.56E-07 | 1.10E-06 | 5.35E-07 |
| Statistics (Non-Detects Only) | 14 | 3.92E-07 | 2.80E-06 | 1.37E-06 | 1.02E-06 | 8.85E-07 |
| Statistics (All: NDs treated as DL value) | 21 | 2.70E-07 | 2.80E-06 | 1.23E-06 | 1.10E-06 | 7.97E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 1.35E-07 | 2.80E-06 | 1.07E-06 | 7.50E-07 | 8.47E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -6.48E-07 | 2.80E-06 | 9.52E-07 | 7.33E-07 | 9.87E-07 |
| Statistics (Gamma ROS Imputed Data) | 21 | 3.92E-07 | 0.01 | 0.00333 | 2.25E-06 | 0.00483 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 2.14E-07 | 2.80E-06 | 1.06E-06 | 7.33E-07 | 8.51E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2.45 | 1.972 | 5.60E-07 | -13.72 | 0.709 | -0.0517 |
| Statistics (NDs = DL) | 2.414 | 2.101 | 5.11E-07 | -13.83 | 0.711 | -0.0514 |
| Statistics (NDs = DL/2) | 1.741 | 1.524 | 6.17E-07 | -14.06 | 0.851 | -0.0606 |
| Statistics (Gamma ROS Estimates) | 0.154 | 0.164 | 0.0217 | -10.68 | 4.438 | -0.416 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -14.06 | 0.795 | -0.0566 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.947 | 0.96 | 0.924 | 0.963 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.874 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.909 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.844 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.919 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.192 | 0.226 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.138 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.228 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.169 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.951 | 0.978 | 0.963 | 0.633 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.493 | 0.744 | |
| Kolmogorov-Smirnov (Detects Only) | 0.179 | 0.231 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.28 | 0.752 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.105 | 0.191 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.46 | 0.756 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.14 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.447 | 0.939 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.396 | 0.213 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.969 | 0.985 | 0.982 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.914 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.957 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.957 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.945 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.175 | 0.226 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.0977 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.114 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.13 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|1,2,3,4,6,7,8-Heptachlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 19 | 2 | 9.52% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2 | 4.70E-06 | 6.70E-06 | 5.70E-06 | 5.70E-06 | 1.41E-06 |
| Statistics (Non-Detects Only) | 19 | 3.31E-06 | 3.50E-05 | 1.50E-05 | 1.04E-05 | 1.02E-05 |
| Statistics (All: NDs treated as DL value) | 21 | 3.31E-06 | 3.50E-05 | 1.41E-05 | 1.00E-05 | 1.01E-05 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 2.35E-06 | 3.50E-05 | 1.38E-05 | 1.00E-05 | 1.04E-05 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.60E-06 | 3.50E-05 | 1.36E-05 | 1.00E-05 | 1.06E-05 |
| Statistics (Gamma ROS Imputed Data) | 21 | 3.31E-06 | 0.01 | 9.66E-04 | 1.10E-05 | 0.003 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 3.31E-06 | 3.50E-05 | 1.40E-05 | 1.00E-05 | 1.02E-05 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2.226 | 1.91 | 6.74E-06 | -11.35 | 0.735 | -0.0648 |
| Statistics (NDs = DL) | 2.145 | 1.87 | 6.58E-06 | -11.42 | 0.735 | -0.0643 |
| Statistics (NDs = DL/2) | 1.83 | 1.6 | 7.56E-06 | -11.49 | 0.822 | -0.0716 |
| Statistics (Gamma ROS Estimates) | 0.196 | 0.2 | 0.00493 | -10.71 | 2.145 | -0.2 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -11.45 | 0.771 | -0.0673 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.945 | 0.931 | 0.94 | 0.955 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.878 | 0.901 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.855 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.872 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.904 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.231 | 0.197 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.24 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.227 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.217 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.964 | 0.965 | 0.966 | 0.881 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.588 | 0.751 | |
| Kolmogorov-Smirnov (Detects Only) | 0.185 | 0.201 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.763 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.174 | 0.192 | Detected Data appear Approximate Gamma Distribution |
| Anderson-Darling (NDs = DL/2) | 0.545 | 0.755 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.172 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 5.306 | 0.9 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.493 | 0.21 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.977 | 0.974 | 0.98 | 0.974 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.939 | 0.901 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.934 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.948 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.932 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.187 | 0.197 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.176 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.17 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.175 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,7,8,9-HpCDF**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 7 | 14 | 66.67% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 14 | 6.60E-08 | 2.30E-06 | 9.35E-07 | 8.10E-07 | 6.68E-07 |
| Statistics (Non-Detects Only) | 7 | 4.10E-07 | 3.80E-06 | 1.55E-06 | 8.30E-07 | 1.31E-06 |
| Statistics (All: NDs treated as DL value) | 21 | 6.60E-08 | 3.80E-06 | 1.14E-06 | 8.30E-07 | 9.45E-07 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 3.30E-08 | 3.80E-06 | 8.27E-07 | 5.50E-07 | 9.27E-07 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.71E-06 | 3.80E-06 | -1.27E-07 | -5.91E-07 | 1.46E-06 |
| Statistics (Gamma ROS Imputed Data) | 21 | 4.10E-07 | 0.01 | 0.00667 | 0.01 | 0.00483 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 1.13E-07 | 3.80E-06 | 6.49E-07 | 2.49E-07 | 9.70E-07 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.654 | 1.04 | 9.35E-07 | -13.71 | 0.89 | -0.0649 |
| Statistics (NDs = DL) | 1.572 | 1.379 | 7.25E-07 | -14.04 | 0.933 | -0.0665 |
| Statistics (NDs = DL/2) | 1.153 | 1.02 | 7.18E-07 | -14.5 | 1.068 | -0.0736 |
| Statistics (Gamma ROS Estimates) | 0.267 | 0.261 | 0.025 | -7.641 | 4.426 | -0.579 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -14.88 | 1.015 | -0.0682 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.928 | 0.928 | 0.841 | 0.923 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.849 | 0.803 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.864 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.718 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.853 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.279 | 0.304 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.188 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.261 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.259 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.978 | 0.994 | 0.972 | 0.403 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.476 | 0.719 | |
| Kolmogorov-Smirnov (Detects Only) | 0.246 | 0.316 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.264 | 0.758 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.118 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.483 | 0.766 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.139 | 0.194 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 4.872 | 0.862 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.468 | 0.207 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.958 | 0.975 | 0.98 | 0.924 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.894 | 0.803 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.958 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.97 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.849 | 0.908 | Data Not Lognormal |
| Lilliefors (Detects Only) | 0.2 | 0.304 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.0991 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.109 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.26 | 0.188 | Data Not Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**RA18_SE_DioxinFurans|Octachlorochlorodibenzofuran**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 15 | 6 | 28.57% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 6 | 8.90E-06 | 5.80E-05 | 2.20E-05 | 1.65E-05 | 1.79E-05 |
| Statistics (Non-Detects Only) | 15 | 5.56E-06 | 8.50E-05 | 3.96E-05 | 2.98E-05 | 2.62E-05 |
| Statistics (All: NDs treated as DL value) | 21 | 5.56E-06 | 8.50E-05 | 3.46E-05 | 2.70E-05 | 2.50E-05 |
| Statistics (All: NDs treated as DL/2 value) | 21 | 4.45E-06 | 8.50E-05 | 3.14E-05 | 2.70E-05 | 2.60E-05 |
| Statistics (Normal ROS Imputed Data) | 21 | -1.07E-05 | 8.50E-05 | 2.99E-05 | 2.64E-05 | 2.75E-05 |
| Statistics (Gamma ROS Imputed Data) | 21 | 5.56E-06 | 0.01 | 0.00289 | 5.60E-05 | 0.00461 |
| Statistics (Lognormal ROS Imputed Data) | 21 | 5.56E-06 | 8.50E-05 | 3.13E-05 | 2.64E-05 | 2.58E-05 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1.975 | 1.625 | 2.01E-05 | -10.41 | 0.844 | -0.0811 |
| Statistics (NDs = DL) | 1.915 | 1.674 | 1.81E-05 | -10.56 | 0.807 | -0.0764 |
| Statistics (NDs = DL/2) | 1.439 | 1.265 | 2.18E-05 | -10.75 | 0.951 | -0.0885 |
| Statistics (Gamma ROS Estimates) | 0.245 | 0.242 | 0.0118 | -8.752 | 2.778 | -0.317 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -10.72 | 0.888 | -0.0828 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.972 | 0.949 | 0.939 | 0.962 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.927 | 0.881 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.888 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.868 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.918 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.179 | 0.22 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.195 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.192 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.169 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.961 | 0.97 | 0.968 | 0.744 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.347 | 0.747 | |
| Kolmogorov-Smirnov (Detects Only) | 0.156 | 0.224 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.479 | 0.755 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.149 | 0.192 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.631 | 0.76 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.18 | 0.193 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 3.052 | 0.873 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.386 | 0.208 | Data Not Gamma Distributed |

Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.967 | 0.981 | 0.971 | 0.971 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.924 | 0.881 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.952 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.927 | 0.908 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.926 | 0.908 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.171 | 0.22 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.15 | 0.188 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.162 | 0.188 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.186 | 0.188 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

**TCDD TEQ HH**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 |
| Minimum | 8.12E-07 |
| Maximum | 1.26E-05 |
| Mean of Raw Data | 4.47E-06 |
| Standard Deviation of Raw Data | 3.76E-06 |
| Khat | 1.625 |
| Theta hat | 2.75E-06 |
| Kstar | 1.425 |
| Theta star | 3.14E-06 |
| Mean of Log Transformed Data | -12.66 |
| Standard Deviation of Log Transformed Data | 0.859 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.921 |
| Shapiro Wilk Test Statistic | 0.838 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.00195 |
| Lilliefors Test Statistic | 0.207 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| A-D Test Statistic | 0.436 |
| A-D Critical (0.05) Value | 0.757 |
| K-S Test Statistic | 0.113 |
| K-S Critical(0.05) Value | 0.193 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.987 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.487 |
| Lilliefors Test Statistic | 0.089 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Lognormal at (0.05) Significance Level

**Antimony_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 29 | 1 | 3.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | -1.833 | -1.833 | -1.833 | -1.833 | N/A |
| Statistics (Non-Detects Only) | 29 | -2.04 | 0.0953 | -1.059 | -1.05 | 0.493 |
| Statistics (All: NDs treated as DL value) | 30 | -2.04 | 0.0953 | -1.085 | -1.064 | 0.505 |
| Statistics (All: NDs treated as DL/2 value) | 30 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 30 | -2.102 | 0.0953 | -1.094 | -1.064 | 0.52 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.989 | 0.99 | 0.99 | 0.991 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.979 | 0.926 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.977 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.98 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.979 | 0.927 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.0869 | 0.161 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.0938 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.085 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.0818 | 0.159 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**Cyanide_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 28 | 1 | 27 | 19 | 8 | 29.63% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 8 | -2.12 | -0.4 | -1.143 | -0.916 | 0.676 |
| Statistics (Non-Detects Only) | 19 | -2.501 | -0.0101 | -1.177 | -0.994 | 0.721 |
| Statistics (All: NDs treated as DL value) | 27 | -2.501 | -0.0101 | -1.167 | -0.994 | 0.695 |
| Statistics (All: NDs treated as DL/2 value) | 27 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 27 | -2.501 | -0.0101 | -1.392 | -1.568 | 0.712 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.979 | 0.972 | 0.969 | 0.975 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.949 | 0.901 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.934 | 0.923 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.929 | 0.923 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.938 | 0.923 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.131 | 0.197 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.16 | 0.167 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.136 | 0.167 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.173 | 0.167 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**4,4'-DDT_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 26 | 4 | 13.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | -9.567 | -7.07 | -7.796 | -7.273 | 1.189 |
| Statistics (Non-Detects Only) | 26 | -9.028 | -5.185 | -6.874 | -6.725 | 1.001 |
| Statistics (All: NDs treated as DL value) | 30 | -9.567 | -5.185 | -6.997 | -6.812 | 1.054 |
| Statistics (All: NDs treated as DL/2 value) | 30 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 30 | -9.382 | -5.185 | -7.095 | -6.812 | 1.107 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.956 | 0.959 | 0.967 | 0.974 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.91 | 0.92 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.919 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.929 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.939 | 0.927 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.21 | 0.17 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.178 | 0.159 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.148 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.192 | 0.159 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**PCB, Total Aroclors_LN**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 29 |
| Minimum | -5.116 |
| Maximum | -1.661 |
| Mean of Raw Data | -3.21 |
| Standard Deviation of Raw Data | 0.843 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.988 |
| Shapiro Wilk Test Statistic | 0.972 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.638 |
| Lilliefors Test Statistic | 0.119 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

**tPCB congener_LN**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 29 |
| Number of Missing Observations | 2 |
| Number of Distinct Observations | 24 |
| Minimum | -4.816 |
| Maximum | -0.968 |
| Mean of Raw Data | -2.484 |
| Standard Deviation of Raw Data | 0.929 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.968 |
| Shapiro Wilk Critical (0.05) Value | 0.926 |
| Approximate Shapiro Wilk P Value | 0.552 |
| Lilliefors Test Statistic | 0.123 |
| Lilliefors Critical (0.05) Value | 0.161 |

Data appear Normal at (0.05) Significance Level

**SVOCs|bis-(2-Ethylhexyl)phthalate_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 2 | 29 | 28 | 1 | 3.45% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 0.531 | 0.531 | 0.531 | 0.531 | N/A |
| Statistics (Non-Detects Only) | 28 | -1.47 | 1.03 | -0.343 | -0.175 | 0.627 |
| Statistics (All: NDs treated as DL value) | 29 | -1.47 | 1.03 | -0.313 | -0.151 | 0.637 |
| Statistics (All: NDs treated as DL/2 value) | 29 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 29 | -1.47 | 1.03 | -0.345 | -0.198 | 0.616 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.982 | 0.984 | 0.981 | 0.985 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.96 | 0.924 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.962 | 0.926 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.957 | 0.926 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.966 | 0.926 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.147 | 0.164 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.142 | 0.161 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.149 | 0.161 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.13 | 0.161 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**SVOCsTotal High-molecular-weight PAHs_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 |
| Minimum | 0.336 |
| Maximum | 3.332 |
| Mean of Raw Data | 1.667 |
| Standard Deviation of Raw Data | 0.683 |
| Khat | 4.495 |
| Theta hat | 0.371 |
| Kstar | 4.067 |
| Theta star | 0.41 |
| Mean of Log Transformed Data | 0.395 |
| Standard Deviation of Log Transformed Data | 0.544 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.088 |
| Lilliefors Test Statistic | 0.133 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.931 |
| A-D Test Statistic | 1.512 |
| A-D Critical (0.05) Value | 0.748 |
| K-S Test Statistic | 0.19 |
| K-S Critical(0.05) Value | 0.16 |

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.92 |
| Shapiro Wilk Test Statistic | 0.85 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 4.56E-04 |
| Lilliefors Test Statistic | 0.22 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data not Lognormal at (0.05) Significance Level

**SVOCs|Benzo(a)anthracene_LN**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 |
| Minimum | -2.303 |
| Maximum | 0.993 |
| Mean of Raw Data | -0.924 |
| Standard Deviation of Raw Data | 0.724 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.968 |
| Shapiro Wilk Test Statistic | 0.943 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.126 |
| Lilliefors Test Statistic | 0.164 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate Normal at (0.05) Significance Level

**SVOCs|Benzo(a)pyrene_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 27 |
| Minimum | -2.12 |
| Maximum | 0.956 |
| Mean of Raw Data | -0.773 |
| Standard Deviation of Raw Data | 0.685 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.94 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.105 |
| Lilliefors Test Statistic | 0.147 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

**SVOCs|Benzo(b)fluoranthene_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 23 |
| Minimum | -1.661 |
| Maximum | 1.03 |
| Mean of Raw Data | -0.373 |
| Standard Deviation of Raw Data | 0.646 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.073 |
| Lilliefors Test Statistic | 0.132 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

**VOCs|Benzo(k)fluoranthene_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 25 |
| Minimum | -2.631 |
| Maximum | 0.336 |
| Mean of Raw Data | -1.372 |
| Standard Deviation of Raw Data | 0.68 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.951 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.215 |
| Lilliefors Test Statistic | 0.116 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

**SVOCs|Chrysene_LN**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 |
| Minimum | -1.715 |
| Maximum | 1.194 |
| Mean of Raw Data | -0.452 |
| Standard Deviation of Raw Data | 0.669 |

Data contains values <= 0
Data not gamma or lognormal

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.96 |
| Shapiro Wilk Test Statistic | 0.925 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0412 |
| Lilliefors Test Statistic | 0.138 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Approximate Normal at (0.05) Significance Level

**SVOCs|Dibenzo(a,h)anthracene_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 1 | 30 | 26 | 4 | 13.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | -5.915 | -2.465 | -4.128 | -4.066 | 1.42 |
| Statistics (Non-Detects Only) | 26 | -3.65 | -0.916 | -2.155 | -2.08 | 0.618 |
| Statistics (All: NDs treated as DL value) | 30 | -5.915 | -0.916 | -2.418 | -2.12 | 1.001 |
| Statistics (All: NDs treated as DL/2 value) | 30 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 30 | -3.65 | -0.916 | -2.32 | -2.12 | 0.722 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.98 | 0.922 | 0.983 | 0.978 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.965 | 0.92 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.867 | 0.927 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.969 | 0.927 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.947 | 0.927 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.16 | 0.17 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.155 | 0.159 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.139 | 0.159 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.15 | 0.159 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**SVOCs|Indeno(1,2,3-cd)pyrene_LN**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 30 |
| Number of Missing Observations | 1 |
| Number of Distinct Observations | 25 |
| Minimum | -2.12 |
| Maximum | 0.405 |
| Mean of Raw Data | -0.819 |
| Standard Deviation of Raw Data | 0.642 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.97 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.927 |
| Approximate Shapiro Wilk P Value | 0.0733 |
| Lilliefors Test Statistic | 0.153 |
| Lilliefors Critical (0.05) Value | 0.159 |

Data appear Normal at (0.05) Significance Level

**ID0016|Total High-molecular-weight PAHs_LN**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 27 |
| Number of Missing Observations | 4 |
| Number of Distinct Observations | 22 |
| Minimum | 0.742 |
| Maximum | 2.485 |
| Mean of Raw Data | 1.804 |
| Standard Deviation of Raw Data | 0.548 |
| Khat | 9.491 |
| Theta hat | 0.19 |
| Kstar | 8.461 |
| Theta star | 0.213 |
| Mean of Log Transformed Data | 0.537 |
| Standard Deviation of Log Transformed Data | 0.351 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.967 |
| Shapiro Wilk Test Statistic | 0.916 |
| Shapiro Wilk Critical (0.05) Value | 0.923 |
| Approximate Shapiro Wilk P Value | 0.0333 |
| Lilliefors Test Statistic | 0.157 |
| Lilliefors Critical (0.05) Value | 0.167 |

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.932 |
| A-D Test Statistic | 0.955 |
| A-D Critical (0.05) Value | 0.744 |
| K-S Test Statistic | 0.158 |
| K-S Critical(0.05) Value | 0.168 |

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.947 |
| Shapiro Wilk Test Statistic | 0.885 |
| Shapiro Wilk Critical (0.05) Value | 0.923 |
| Approximate Shapiro Wilk P Value | 0.00597 |
| Lilliefors Test Statistic | 0.162 |
| Lilliefors Critical (0.05) Value | 0.167 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**TPH-C10-28_LN**

Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 23 |
| Number of Distinct Observations | 17 |
| Minimum | 3.97 |
| Maximum | 7.003 |
| Mean of Raw Data | 5.467 |
| Standard Deviation of Raw Data | 0.661 |
| Khat | 70.69 |
| Theta hat | 0.0773 |
| Kstar | 61.5 |
| Theta star | 0.0889 |
| Mean of Log Transformed Data | 1.692 |
| Standard Deviation of Log Transformed Data | 0.122 |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| Shapiro Wilk Test Statistic | 0.975 |
| Shapiro Wilk Critical (0.05) Value | 0.914 |
| Approximate Shapiro Wilk P Value | 0.804 |
| Lilliefors Test Statistic | 0.146 |
| Lilliefors Critical (0.05) Value | 0.18 |

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.316 |
| A-D Critical (0.05) Value | 0.741 |
| K-S Test Statistic | 0.151 |
| K-S Critical(0.05) Value | 0.181 |

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.979 |
| Shapiro Wilk Test Statistic | 0.97 |
| Shapiro Wilk Critical (0.05) Value | 0.914 |
| Approximate Shapiro Wilk P Value | 0.688 |
| Lilliefors Test Statistic | 0.161 |
| Lilliefors Critical (0.05) Value | 0.18 |
| Data appear Lognormal at (0.05) Significance Level | |

**2,3,7,8-TCDD_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 11 | 10 | 47.62% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | -17.62 | -14.9 | -15.79 | -15.63 | 0.755 |
| Statistics (Non-Detects Only) | 11 | -17.01 | -14.14 | -15.4 | -15.12 | 1.005 |
| Statistics (All: NDs treated as DL value) | 21 | -17.62 | -14.14 | -15.58 | -15.62 | 0.895 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -17.99 | -14.14 | -16.06 | -16.58 | 1.05 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.97 | 0.989 | 0.896 | 0.948 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.921 | 0.85 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.976 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.782 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.895 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.192 | 0.251 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.127 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.256 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.232 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,7,8-PeCDD_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 10 | 11 | 52.38% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 11 | -15.16 | -13.35 | -14.21 | -14.08 | 0.67 |
| Statistics (Non-Detects Only) | 10 | -15.33 | -13.03 | -14.01 | -13.98 | 0.843 |
| Statistics (All: NDs treated as DL value) | 21 | -15.33 | -13.03 | -14.11 | -14.08 | 0.744 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -15.54 | -13.03 | -14.62 | -14.92 | 0.847 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.963 | 0.971 | 0.889 | 0.936 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.905 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.928 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.769 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.861 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.185 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.178 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.307 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.193 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,6,7,8-HxCDD_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 16 | 5 | 23.81% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | -13.9 | -12.25 | -13.29 | -13.35 | 0.642 |
| Statistics (Non-Detects Only) | 16 | -13.83 | -11.33 | -12.62 | -12.63 | 0.791 |
| Statistics (All: NDs treated as DL value) | 21 | -13.9 | -11.33 | -12.78 | -12.94 | 0.799 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -14.6 | -11.33 | -12.94 | -12.97 | 0.925 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.981 | 0.976 | 0.882 | 0.986 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.946 | 0.887 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.939 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.765 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.963 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.139 | 0.213 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.132 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.282 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.115 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,7,8-HxCDD_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 16 | 5 | 23.81% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 5 | -15.78 | -13.12 | -14.47 | -14.49 | 0.942 |
| Statistics (Non-Detects Only) | 16 | -14.8 | -12.27 | -13.45 | -13.38 | 0.832 |
| Statistics (All: NDs treated as DL value) | 21 | -15.78 | -12.27 | -13.69 | -13.72 | 0.945 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -15.58 | -12.27 | -13.79 | -13.77 | 0.975 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.979 | 0.979 | 0.887 | 0.979 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.939 | 0.887 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.954 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.775 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.947 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.153 | 0.213 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.155 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.304 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.135 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,7,8,9-HxCDD_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 17 | 4 | 19.05% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | -13.48 | -12.11 | -13.03 | -13.26 | 0.624 |
| Statistics (Non-Detects Only) | 17 | -13.97 | -11.42 | -12.62 | -12.59 | 0.872 |
| Statistics (All: NDs treated as DL value) | 21 | -13.97 | -11.42 | -12.7 | -12.86 | 0.833 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -13.97 | -11.42 | -12.79 | -13.1 | 0.865 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.97 | 0.968 | 0.878 | 0.956 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.919 | 0.892 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.922 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.762 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.897 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.148 | 0.207 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.16 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.303 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.162 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,6,7,8-HpCDD_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 |
| Minimum | -10.98 |
| Maximum | -8.255 |
| Mean of Raw Data | -9.485 |
| Standard Deviation of Raw Data | 0.848 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.953 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.388 |
| Lilliefors Test Statistic | 0.118 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Normal at (0.05) Significance Level

**OCDD_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 |
| Minimum | -7.562 |
| Maximum | -4.828 |
| Mean of Raw Data | -5.987 |
| Standard Deviation of Raw Data | 0.869 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.187 |
| Lilliefors Test Statistic | 0.142 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Normal at (0.05) Significance Level

**2,3,7,8-TCDF_LN**

| | |
|---|---|
| Raw Statistics | |
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 |
| Minimum | -15.67 |
| Maximum | -12.62 |
| Mean of Raw Data | -14.21 |
| Standard Deviation of Raw Data | 0.749 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.97 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.722 |
| Lilliefors Test Statistic | 0.113 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Normal at (0.05) Significance Level

**1,2,3,7,8-PeCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 10 | 11 | 52.38% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 11 | -16.95 | -14.38 | -15.4 | -15.49 | 0.693 |
| Statistics (Non-Detects Only) | 10 | -15.24 | -13.28 | -14.5 | -14.59 | 0.735 |
| Statistics (All: NDs treated as DL value) | 21 | -16.95 | -13.28 | -14.97 | -15.17 | 0.833 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -16.36 | -13.28 | -15.34 | -15.69 | 0.98 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.952 | 0.979 | 0.881 | 0.949 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.883 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.968 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.754 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.888 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.23 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.12 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.283 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.162 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,6,7,8-HxCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 14 | 7 | 33.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | -14.47 | -13.07 | -13.78 | -13.82 | 0.557 |
| Statistics (Non-Detects Only) | 14 | -14.5 | -12.53 | -13.57 | -13.68 | 0.606 |
| Statistics (All: NDs treated as DL value) | 21 | -14.5 | -12.53 | -13.64 | -13.82 | 0.585 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -14.7 | -12.53 | -13.82 | -14.01 | 0.633 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.982 | 0.983 | 0.868 | 0.971 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.952 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.955 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.735 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.933 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.198 | 0.226 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.14 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.309 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.207 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,7,8,9-HxCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 4 | 17 | 80.95% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 17 | -17.03 | -14.54 | -15.98 | -16.02 | 0.56 |
| Statistics (Non-Detects Only) | 4 | -16.35 | -13.55 | -15.42 | -15.88 | 1.271 |
| Statistics (All: NDs treated as DL value) | 21 | -17.03 | -13.55 | -15.88 | -16.02 | 0.739 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -19.32 | -13.55 | -17.73 | -18.1 | 1.356 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.898 | 0.911 | 0.764 | 0.899 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.815 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.848 | 0.908 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.583 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.819 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.334 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.208 | 0.188 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.425 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.28 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,7,8-HxCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 14 | 7 | 33.33% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | -14.22 | -12.86 | -13.61 | -13.63 | 0.417 |
| Statistics (Non-Detects Only) | 14 | -14.72 | -11.87 | -13.31 | -13.53 | 0.908 |
| Statistics (All: NDs treated as DL value) | 21 | -14.72 | -11.87 | -13.41 | -13.63 | 0.781 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -14.73 | -11.87 | -13.6 | -13.95 | 0.865 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.967 | 0.974 | 0.894 | 0.946 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.922 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.943 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.781 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.886 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.176 | 0.226 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.156 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.261 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.221 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,6,7,8-HpCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 19 | 2 | 9.52% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 2 | -12.27 | -11.91 | -12.09 | -12.09 | 0.251 |
| Statistics (Non-Detects Only) | 19 | -12.62 | -10.26 | -11.35 | -11.47 | 0.735 |
| Statistics (All: NDs treated as DL value) | 21 | -12.62 | -10.26 | -11.42 | -11.51 | 0.735 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -12.62 | -10.26 | -11.45 | -11.51 | 0.771 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.977 | 0.974 | 0.846 | 0.974 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.939 | 0.901 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.934 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.723 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.932 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.187 | 0.197 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.176 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.274 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.175 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**1,2,3,4,7,8,9-HpCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 7 | 14 | 66.67% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 14 | -16.53 | -12.98 | -14.2 | -14.03 | 0.942 |
| Statistics (Non-Detects Only) | 7 | -14.71 | -12.48 | -13.71 | -14 | 0.89 |
| Statistics (All: NDs treated as DL value) | 21 | -16.53 | -12.48 | -14.04 | -14 | 0.933 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -15.99 | -12.48 | -14.88 | -15.21 | 1.015 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.958 | 0.975 | 0.868 | 0.924 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.894 | 0.803 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.958 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.737 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.849 | 0.908 | Data Not Normal |
| Lilliefors (Detects Only) | 0.2 | 0.304 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.0991 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.322 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.26 | 0.188 | Data Not Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**OCDF_LN**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 31 | 10 | 21 | 15 | 6 | 28.57% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 6 | -11.63 | -9.755 | -10.92 | -11.01 | 0.624 |
| Statistics (Non-Detects Only) | 15 | -12.1 | -9.373 | -10.41 | -10.42 | 0.844 |
| Statistics (All: NDs treated as DL value) | 21 | -12.1 | -9.373 | -10.56 | -10.52 | 0.807 |
| Statistics (All: NDs treated as DL/2 value) | 21 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 21 | -12.1 | -9.373 | -10.72 | -10.54 | 0.888 |

Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.967 | 0.981 | 0.918 | 0.971 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.924 | 0.881 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.952 | 0.908 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.83 | 0.908 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.926 | 0.908 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.171 | 0.22 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.15 | 0.188 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.277 | 0.188 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.186 | 0.188 | Data Appear Normal |

Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

**TCDD TEQ HH_LN**

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 21 |
| Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 |
| Minimum | -14.02 |
| Maximum | -11.28 |
| Mean of Raw Data | -12.66 |
| Standard Deviation of Raw Data | 0.859 |
| Data contains values <= 0 | |
| Data not gamma or lognormal | |

Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.987 |
| Shapiro Wilk Test Statistic | 0.959 |
| Shapiro Wilk Critical (0.05) Value | 0.908 |
| Approximate Shapiro Wilk P Value | 0.487 |
| Lilliefors Test Statistic | 0.089 |
| Lilliefors Critical (0.05) Value | 0.188 |

Data appear Normal at (0.05) Significance Level

**Rosner's Outlier Test for RA18_SE_Metals|Aluminum**

| | |
|---|---|
| Mean | 7293 |
| Standard Deviation | 4327 |
| Number of data | 30 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 7293 | 4254 | 20000 | 10 | 2.987 | 2.91 | 3.24 |
| 2 | 6855 | 3664 | 15000 | 15 | 2.223 | 2.89 | 3.22 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 20000

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for Antimony_LN**

| | |
|---|---|
| Mean | -1.085 |
| Standard Deviation | 0.505 |
| Number of data | 30 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.085 | 0.496 | 0.0953 | 24 | 2.379 | 2.91 | 3.24 |
| 2 | -1.126 | 0.461 | -2.04 | 14 | 1.986 | 2.89 | 3.22 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Arsenic**

| | |
|---|---|
| Mean | 2.673 |
| Standard Deviation | 0.983 |
| Number of data | 30 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 2.673 | 0.966 | 4.7 | 7 | 2.098 | 2.91 | 3.24 |
| 2 | 2.603 | 0.921 | 4.7 | 15 | 2.276 | 2.89 | 3.22 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Barium**

| | |
|---|---|
| Mean | 57.03 |
| Standard Deviation | 28.05 |
| Number of data | 30 |
| Number of suspected outliers | 3 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 57.03 | 27.58 | 140 | 10 | 3.009 | 2.91 | 3.24 |
| 2 | 54.17 | 23.67 | 100 | 30 | 1.936 | 2.89 | 3.22 |
| 3 | 52.54 | 22.37 | 92 | 15 | 1.764 | 2.88 | 3.2 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 140

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Beryllium**

| | |
|---|---|
| Mean | 0.846 |
| Standard Deviation | 0.356 |
| Number of data | 30 |
| Number of suspected outliers | 3 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.846 | 0.35 | 1.7 | 10 | 2.44 | 2.91 | 3.24 |
| 2 | 0.817 | 0.323 | 1.6 | 30 | 2.425 | 2.89 | 3.22 |
| 3 | 0.789 | 0.291 | 1.35 | 15 | 1.929 | 2.88 | 3.2 |

For 5% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Cobalt**

| | |
|---|---|
| Mean | 11.75 |
| Standard Deviation | 4.355 |
| Number of data | 30 |
| Number of suspected outliers | 3 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 11.75 | 4.282 | 22 | 30 | 2.393 | 2.91 | 3.24 |
| 2 | 11.4 | 3.971 | 21 | 24 | 2.418 | 2.89 | 3.22 |
| 3 | 11.06 | 3.58 | 4.4 | 1 | 1.859 | 2.88 | 3.2 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for Cyanide_LN**

| | |
|---|---|
| Mean | -1.167 |
| Standard Deviation | 0.695 |
| Number of data | 27 |
| Number of suspected outliers | 10 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.167 | 0.682 | -2.501 | 23 | 1.956 | 2.86 | 3.18 |
| 2 | -1.116 | 0.654 | -0.0101 | 10 | 1.69 | 2.84 | 3.16 |
| 3 | -1.16 | 0.627 | -2.207 | 14 | 1.67 | 2.82 | 3.14 |
| 4 | -1.116 | 0.6 | -2.12 | 2 | 1.672 | 2.8 | 3.11 |
| 5 | -1.073 | 0.574 | -0.261 | 20 | 1.414 | 2.78 | 3.09 |
| 6 | -1.11 | 0.559 | -1.833 | 3 | 1.294 | 2.754 | 3.058 |
| 7 | -1.075 | 0.548 | -1.833 | 12 | 1.382 | 2.728 | 3.026 |
| 8 | -1.037 | 0.533 | -1.833 | 13 | 1.491 | 2.702 | 2.994 |
| 9 | -0.996 | 0.513 | -1.772 | 5 | 1.513 | 2.676 | 2.962 |
| 10 | -0.952 | 0.491 | -1.772 | 18 | 1.669 | 2.65 | 2.93 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Manganese**

| | |
|---|---|
| Mean | 232.8 |
| Standard Deviation | 91.66 |
| Number of data | 30 |
| Number of suspected outliers | 3 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 232.8 | 90.12 | 440 | 15 | 2.299 | 2.91 | 3.24 |
| 2 | 225.7 | 84.36 | 390 | 18 | 1.948 | 2.89 | 3.22 |
| 3 | 219.8 | 79.65 | 380 | 24 | 2.012 | 2.88 | 3.2 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Nickel**

| | |
|---|---|
| Mean | 20.87 |
| Standard Deviation | 8.635 |
| Number of data | 30 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 20.87 | 8.489 | 40 | 30 | 2.253 | 2.91 | 3.24 |
| 2 | 20.21 | 7.981 | 38 | 24 | 2.228 | 2.89 | 3.22 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Thallium**

| | |
|---|---|
| Mean | 0.15 |
| Standard Deviation | 0.0734 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.15 | 0.0722 | 0.29 | 10 | 1.941 | 2.91 | 3.24 |
| 2 | 0.145 | 0.0697 | 0.28 | 30 | 1.937 | 2.89 | 3.22 |
| 3 | 0.14 | 0.0659 | 0.25 | 15 | 1.667 | 2.88 | 3.2 |
| 4 | 0.136 | 0.0635 | 0.24 | 24 | 1.637 | 2.86 | 3.18 |
| 5 | 0.132 | 0.0612 | 0.23 | 9 | 1.601 | 2.84 | 3.16 |
| 6 | 0.128 | 0.059 | 0.035 | 18 | 1.58 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_Metals|Vanadium**

| | |
|---|---|
| Mean | 24.23 |
| Standard Deviation | 8.581 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 24.23 | 8.437 | 44 | 7 | 2.343 | 2.91 | 3.24 |
| 2 | 23.55 | 7.863 | 39 | 10 | 1.965 | 2.89 | 3.22 |
| 3 | 23 | 7.414 | 36 | 30 | 1.754 | 2.88 | 3.2 |
| 4 | 22.52 | 7.095 | 11 | 21 | 1.624 | 2.86 | 3.18 |
| 5 | 22.96 | 6.844 | 34 | 24 | 1.613 | 2.84 | 3.16 |
| 6 | 22.52 | 6.596 | 13 | 14 | 1.443 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_PestPCBs|4,4'-DDT**

| | |
|---|---|
| Mean | 0.0014 |
| Standard Deviation | 0.00129 |
| Number of data | 30 |
| Number of suspected outliers | 10 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.0014 | 0.00127 | 0.0056 | 30 | 3.314 | 2.91 | 3.24 |
| 2 | 0.00125 | 0.00103 | 0.005 | 28 | 3.621 | 2.89 | 3.22 |
| 3 | 0.00112 | 7.56E-04 | 0.0032 | 29 | 2.753 | 2.88 | 3.2 |
| 4 | 0.00104 | 6.49E-04 | 0.0024 | 20 | 2.094 | 2.86 | 3.18 |
| 5 | 9.89E-04 | 6.01E-04 | 0.0022 | 6 | 2.015 | 2.84 | 3.16 |
| 6 | 9.41E-04 | 5.59E-04 | 0.0022 | 11 | 2.252 | 2.818 | 3.134 |
| 7 | 8.88E-04 | 5.04E-04 | 0.002 | 7 | 2.204 | 2.796 | 3.108 |
| 8 | 8.40E-04 | 4.55E-04 | 7.00E-05 | 23 | 1.691 | 2.774 | 3.082 |
| 9 | 8.75E-04 | 4.33E-04 | 1.20E-04 | 12 | 1.742 | 2.752 | 3.056 |
| 10 | 9.11E-04 | 4.09E-04 | 1.30E-04 | 10 | 1.909 | 2.73 | 3.03 |

For 5% significance level, there are 2 Potential Outliers
Potential outliers are:
0.0056, 0.005

For 1% Significance Level, there are 2 Potential Outliers
Potential outliers are:
0.0056, 0.005

**Dixon's Outlier Test for RA18_SE_PestPCBs|CHLORDANE (Technical)**

Number of Observations = 18
10% critical value: 0.424
5% critical value: 0.475
1% critical value: 0.561

1. Observation Value 0.12 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.410

For 10% significance level, 0.12 is not an outlier.
For 5% significance level, 0.12 is not an outlier.
For 1% significance level, 0.12 is not an outlier.

2. Observation Value 0.012 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.119

For 10% significance level, 0.012 is not an outlier.
For 5% significance level, 0.012 is not an outlier.
For 1% significance level, 0.012 is not an outlier.

**Rosner's Outlier Test for PCB, Total Aroclors_LN**

| | |
|---|---|
| Mean | -3.21 |
| Standard Deviation | 0.843 |
| Number of data | 30 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -3.21 | 0.829 | -5.116 | 14 | 2.298 | 2.91 | 3.24 |
| 2 | -3.145 | 0.776 | -5.021 | 16 | 2.417 | 2.89 | 3.22 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/21/2019 2:41:12 PM |
| From File | Input_COPCs_mg_kg_Rev_May2019_d.xls |
| Full Precision | OFF |

**Rosner's Outlier Test for tPCB congener_LN**

| | |
|---|---|
| Mean | -2.484 |
| Standard Deviation | 0.929 |
| Number of data | 29 |
| Number of suspected outliers | 1 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -2.484 | 0.913 | -4.816 | 14 | 2.554 | 2.89 | 3.22 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/21/2019 2:42:21 PM |
| From File | Input_COPCs_mg_kg_Rev_May2019_d.xls |
| Full Precision | OFF |

**Rosner's Outlier Test for SVOCs|bis-(2-Ethylhexyl)phthalate_LN**

| | |
|---|---|
| Mean | -0.313 |
| Standard Deviation | 0.637 |
| Number of data | 29 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -0.313 | 0.625 | 1.03 | 29 | 2.146 | 2.89 | 3.22 |
| 2 | -0.361 | 0.592 | -1.47 | 10 | 1.872 | 2.88 | 3.2 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for SVOCsTotal High-molecular-weight PAHs_LN**

| | |
|---|---|
| Mean | 1.667 |
| Standard Deviation | 0.683 |
| Number of data | 30 |
| Number of suspected outliers | 7 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 1.667 | 0.672 | 3.332 | 28 | 2.48 | 2.91 | 3.24 |
| 2 | 1.609 | 0.617 | 0.336 | 26 | 2.062 | 2.89 | 3.22 |
| 3 | 1.655 | 0.577 | 0.47 | 12 | 2.053 | 2.88 | 3.2 |
| 4 | 1.699 | 0.538 | 0.531 | 14 | 2.17 | 2.86 | 3.18 |
| 5 | 1.743 | 0.495 | 0.742 | 6 | 2.025 | 2.84 | 3.16 |
| 6 | 1.784 | 0.46 | 0.742 | 7 | 2.266 | 2.818 | 3.134 |
| 7 | 1.827 | 0.414 | 0.875 | 10 | 2.298 | 2.796 | 3.108 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for SVOCs|Benzo(a)anthracene_LN**

| | |
|---|---|
| Mean | -0.924 |
| Standard Deviation | 0.724 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -0.924 | 0.712 | 0.993 | 28 | 2.692 | 2.91 | 3.24 |
| 2 | -0.99 | 0.638 | -2.303 | 26 | 2.057 | 2.89 | 3.22 |
| 3 | -0.943 | 0.597 | -2.207 | 12 | 2.118 | 2.88 | 3.2 |
| 4 | -0.896 | 0.553 | -2.04 | 14 | 2.067 | 2.86 | 3.18 |
| 5 | -0.852 | 0.514 | -1.833 | 6 | 1.908 | 2.84 | 3.16 |
| 6 | -0.813 | 0.483 | -1.833 | 7 | 2.11 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for SVOCs|Benzo(a)pyrene_LN**

| | |
|---|---|
| Mean | -0.773 |
| Standard Deviation | 0.685 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -0.773 | 0.673 | 0.956 | 28 | 2.568 | 2.91 | 3.24 |
| 2 | -0.833 | 0.613 | -2.12 | 26 | 2.101 | 2.89 | 3.22 |
| 3 | -0.787 | 0.571 | -2.04 | 12 | 2.196 | 2.88 | 3.2 |
| 4 | -0.741 | 0.525 | -1.897 | 14 | 2.203 | 2.86 | 3.18 |
| 5 | -0.696 | 0.481 | -1.661 | 6 | 2.007 | 2.84 | 3.16 |
| 6 | -0.658 | 0.448 | -1.661 | 7 | 2.242 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for SVOCs|Benzo(b)fluoranthene_LN**

| | |
|---|---|
| Mean | -0.373 |
| Standard Deviation | 0.646 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -0.373 | 0.635 | 1.03 | 28 | 2.208 | 2.91 | 3.24 |
| 2 | -0.421 | 0.6 | -1.661 | 26 | 2.067 | 2.89 | 3.22 |
| 3 | -0.377 | 0.56 | -1.47 | 14 | 1.95 | 2.88 | 3.2 |
| 4 | -0.337 | 0.528 | -1.427 | 12 | 2.067 | 2.86 | 3.18 |
| 5 | -0.295 | 0.49 | -1.347 | 7 | 2.147 | 2.84 | 3.16 |
| 6 | -0.253 | 0.45 | -1.204 | 6 | 2.116 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for VOCs|Benzo(k)fluoranthene_LN**

| | |
|---|---|
| Mean | -1.372 |
| Standard Deviation | 0.68 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -1.372 | 0.668 | 0.336 | 28 | 2.556 | 2.91 | 3.24 |
| 2 | -1.431 | 0.609 | -2.631 | 12 | 1.972 | 2.89 | 3.22 |
| 3 | -1.388 | 0.574 | -2.526 | 14 | 1.984 | 2.88 | 3.2 |
| 4 | -1.346 | 0.539 | -2.489 | 26 | 2.123 | 2.86 | 3.18 |
| 5 | -1.302 | 0.497 | -2.354 | 7 | 2.116 | 2.84 | 3.16 |
| 6 | -1.259 | 0.458 | -2.207 | 10 | 2.069 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Rosner's Outlier Test for RA18_SE_SVOCs|Chrysene**

| | |
|---|---|
| Mean | 0.784 |
| Standard Deviation | 0.576 |
| Number of data | 30 |
| Number of suspected outliers | 5 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.784 | 0.566 | 3.3 | 28 | 4.445 | 2.91 | 3.24 |
| 2 | 0.697 | 0.331 | 0.18 | 26 | 1.563 | 2.89 | 3.22 |
| 3 | 0.715 | 0.321 | 0.21 | 12 | 1.573 | 2.88 | 3.2 |
| 4 | 0.734 | 0.311 | 0.21 | 14 | 1.683 | 2.86 | 3.18 |
| 5 | 0.754 | 0.299 | 0.24 | 6 | 1.719 | 2.84 | 3.16 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 3.3

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 3.3

**Rosner's Outlier Test for RA18_SE_SVOCs|Dibenzo(a,h)anthracene**

| | |
|---|---|
| Mean | 0.123 |
| Standard Deviation | 0.0842 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 0.123 | 0.0828 | 0.4 | 28 | 3.345 | 2.91 | 3.24 |
| 2 | 0.114 | 0.0672 | 0.25 | 17 | 2.032 | 2.89 | 3.22 |
| 3 | 0.109 | 0.063 | 0.22 | 8 | 1.769 | 2.88 | 3.2 |
| 4 | 0.105 | 0.0602 | 0.0027 | 6 | 1.692 | 2.86 | 3.18 |
| 5 | 0.108 | 0.0578 | 0.014 | 19 | 1.635 | 2.84 | 3.16 |
| 6 | 0.112 | 0.0556 | 0.021 | 21 | 1.641 | 2.818 | 3.134 |

For 5% Significance Level, there is 1 Potential Outlier
Potential outliers is: 0.4

For 1% Significance Level, there is 1 Potential Outlier
Potential outliers is: 0.4

**Rosner's Outlier Test for SVOCs|Indeno(1,2,3-cd)pyrene_LN**

| | |
|---|---|
| Mean | -0.819 |
| Standard Deviation | 0.642 |
| Number of data | 30 |
| Number of suspected outliers | 6 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | -0.819 | 0.631 | -2.12 | 26 | 2.063 | 2.91 | 3.24 |
| 2 | -0.774 | 0.603 | 0.405 | 28 | 1.955 | 2.89 | 3.22 |
| 3 | -0.816 | 0.569 | -1.833 | 12 | 1.786 | 2.88 | 3.2 |
| 4 | -0.778 | 0.543 | -1.833 | 14 | 1.94 | 2.86 | 3.18 |
| 5 | -0.738 | 0.511 | -1.772 | 6 | 2.024 | 2.84 | 3.16 |
| 6 | -0.696 | 0.475 | -1.715 | 7 | 2.145 | 2.818 | 3.134 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Dixon's Outlier Test for RA18_SE_SVOCs_ID0016|2,3,5-Trimethylnaphthalene**

Number of Observations = 6
10% critical value: 0.482
5% critical value: 0.56
1% critical value: 0.698

1. Observation Value 0.0164 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.238

For 10% significance level, 0.0164 is not an outlier.
For 5% significance level, 0.0164 is not an outlier.
For 1% significance level, 0.0164 is not an outlier.

2. Observation Value 0.0034 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.062

For 10% significance level, 0.0034 is not an outlier.
For 5% significance level, 0.0034 is not an outlier.
For 1% significance level, 0.0034 is not an outlier.

**Dixon's Outlier Test for RA18_SE_SVOCs_ID0016|2,6-Dimethylnaphthalene**

Number of Observations = 6
10% critical value: 0.482
5% critical value: 0.56
1% critical value: 0.698

1. Observation Value 0.0369 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.562

For 10% significance level, 0.0369 is an outlier.
For 5% significance level, 0.0369 is an outlier.
For 1% significance level, 0.0369 is not an outlier.

2. Observation Value 0.0056 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.061

For 10% significance level, 0.0056 is not an outlier.
For 5% significance level, 0.0056 is not an outlier.
For 1% significance level, 0.0056 is not an outlier.

**Rosner's Outlier Test for RA18_SE_SVOCs_ID0016|Total High-molecular-weight PAHs**

| | |
|---|---|
| Mean | 6.926 |
| Standard Deviation | 3.303 |
| Number of data | 27 |
| Number of suspected outliers | 2 |

| # | Mean | sd | Potential outlier | Obs. Number | Test value | Critical value (5%) | Critical value (1%) |
|---|---|---|---|---|---|---|---|
| 1 | 6.926 | 3.241 | 12 | 11 | 1.565 | 2.86 | 3.18 |
| 2 | 6.731 | 3.206 | 12 | 19 | 1.644 | 2.84 | 3.16 |

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

**Dixon's Outlier Test for RA18_SE_Petroleum|Diesel Range Organics (C10-C20)**

Number of Observations = 4
10% critical value: 0.679
5% critical value: 0.765
1% critical value: 0.889

1. Observation Value 44 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.364

For 10% significance level, 44 is not an outlier.
For 5% significance level, 44 is not an outlier.
For 1% significance level, 44 is not an outlier.

2. Observation Value 33 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.182

For 10% significance level, 33 is not an outlier.
For 5% significance level, 33 is not an outlier.
For 1% significance level, 33 is not an outlier.

**Dixon's Outlier Test for RA18_SE_Petroleum|Diesel Range Organics (C10-C20)**

Number of Observations = 4
10% critical value: 0.679
5% critical value: 0.765
1% critical value: 0.889

1. Observation Value 44 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.364

For 10% significance level, 44 is not an outlier.
For 5% significance level, 44 is not an outlier.
For 1% significance level, 44 is not an outlier.

2. Observation Value 33 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.182

For 10% significance level, 33 is not an outlier.
For 5% significance level, 33 is not an outlier.
For 1% significance level, 33 is not an outlier.

**Dixon's Outlier Test for 2,3,7,8-TCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -14.1440146249363 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.151

For 10% significance level, -14.1440146249363 is not an outlier.
For 5% significance level, -14.1440146249363 is not an outlier.
For 1% significance level, -14.1440146249363 is not an outlier.

2. Observation Value -17.6186791584803 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.301

For 10% significance level, -17.6186791584803 is not an outlier.
For 5% significance level, -17.6186791584803 is not an outlier.
For 1% significance level, -17.6186791584803 is not an outlier.

**Dixon's Outlier Test for 1,2,3,7,8-PeCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -13.0270531976 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.102

For 10% significance level, -13.0270531976 is not an outlier.
For 5% significance level, -13.0270531976 is not an outlier.
For 1% significance level, -13.0270531976 is not an outlier.

2. Observation Value -15.3341941071299 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.165

For 10% significance level, -15.3341941071299 is not an outlier.
For 5% significance level, -15.3341941071299 is not an outlier.
For 1% significance level, -15.3341941071299 is not an outlier.

**Dixon's Outlier Test for 1,2,3,6,7,8-HxCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -11.3306039081763 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.149

For 10% significance level, -11.3306039081763 is not an outlier.
For 5% significance level, -11.3306039081763 is not an outlier.
For 1% significance level, -11.3306039081763 is not an outlier.

2. Observation Value -13.8988921669033 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.081

For 10% significance level, -13.8988921669033 is not an outlier.
For 5% significance level, -13.8988921669033 is not an outlier.
For 1% significance level, -13.8988921669033 is not an outlier.

**Dixon's Outlier Test for 1,2,3,4,7,8-HxCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -12.2679480492483 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.088

For 10% significance level, -12.2679480492483 is not an outlier.
For 5% significance level, -12.2679480492483 is not an outlier.
For 1% significance level, -12.2679480492483 is not an outlier.

2. Observation Value -15.7816234143371 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.335

For 10% significance level, -15.7816234143371 is not an outlier.
For 5% significance level, -15.7816234143371 is not an outlier.
For 1% significance level, -15.7816234143371 is not an outlier.

**Dixon's Outlier Test for 1,2,3,7,8,9-HxCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -11.4176152851659 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.071

For 10% significance level, -11.4176152851659 is not an outlier.
For 5% significance level, -11.4176152851659 is not an outlier.
For 1% significance level, -11.4176152851659 is not an outlier.

2. Observation Value -13.9733346431578 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.138

For 10% significance level, -13.9733346431578 is not an outlier.
For 5% significance level, -13.9733346431578 is not an outlier.
For 1% significance level, -13.9733346431578 is not an outlier.

**Dixon's Outlier Test for 1,2,3,4,6,7,8-HpCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -8.25482892694875 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.063

For 10% significance level, -8.25482892694875 is not an outlier.
For 5% significance level, -8.25482892694875 is not an outlier.
For 1% significance level, -8.25482892694875 is not an outlier.

2. Observation Value -10.9822972139081 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.164

For 10% significance level, -10.9822972139081 is not an outlier.
For 5% significance level, -10.9822972139081 is not an outlier.
For 1% significance level, -10.9822972139081 is not an outlier.

**Dixon's Outlier Test for OCDD_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -4.8283137373023 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.021

For 10% significance level, -4.8283137373023 is not an outlier.
For 5% significance level, -4.8283137373023 is not an outlier.
For 1% significance level, -4.8283137373023 is not an outlier.

2. Observation Value -7.5616817463888 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.107

For 10% significance level, -7.5616817463888 is not an outlier.
For 5% significance level, -7.5616817463888 is not an outlier.
For 1% significance level, -7.5616817463888 is not an outlier.

**Dixon's Outlier Test for 2,3,7,8-TCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -12.6215880894918 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.289

For 10% significance level, -12.6215880894918 is not an outlier.
For 5% significance level, -12.6215880894918 is not an outlier.
For 1% significance level, -12.6215880894918 is not an outlier.

2. Observation Value -15.6670200315981 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.234

For 10% significance level, -15.6670200315981 is not an outlier.
For 5% significance level, -15.6670200315981 is not an outlier.
For 1% significance level, -15.6670200315981 is not an outlier.

**Dixon's Outlier Test for 1,2,3,7,8-PeCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -13.2848823069021 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.262

For 10% significance level, -13.2848823069021 is not an outlier.
For 5% significance level, -13.2848823069021 is not an outlier.
For 1% significance level, -13.2848823069021 is not an outlier.

2. Observation Value -16.9528063958401 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.409

For 10% significance level, -16.9528063958401 is an outlier.
For 5% significance level, -16.9528063958401 is not an outlier.
For 1% significance level, -16.9528063958401 is not an outlier.

**Dixon's Outlier Test for RA18_SE_DioxinFurans|2,3,4,7,8-Pentachlorodibenzofuran**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value 2.55E-06 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.344

For 10% significance level, 2.55E-06 is not an outlier.
For 5% significance level, 2.55E-06 is not an outlier.
For 1% significance level, 2.55E-06 is not an outlier.

2. Observation Value 2.8E-07 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.097

For 10% significance level, 2.8E-07 is not an outlier.
For 5% significance level, 2.8E-07 is not an outlier.
For 1% significance level, 2.8E-07 is not an outlier.

**Dixon's Outlier Test for 1,2,3,6,7,8-HxCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -12.5345767125022 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.158

For 10% significance level, -12.5345767125022 is not an outlier.
For 5% significance level, -12.5345767125022 is not an outlier.
For 1% significance level, -12.5345767125022 is not an outlier.

2. Observation Value -14.4967291676589 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.082

For 10% significance level, -14.4967291676589 is not an outlier.
For 5% significance level, -14.4967291676589 is not an outlier.
For 1% significance level, -14.4967291676589 is not an outlier.

**Dixon's Outlier Test for 1,2,3,7,8,9-HxCDF**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value 1.3E-06 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.896

For 10% significance level, 1.3E-06 is an outlier.
For 5% significance level, 1.3E-06 is an outlier.
For 1% significance level, 1.3E-06 is an outlier.

2. Observation Value 4E-08 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.205

For 10% significance level, 4E-08 is not an outlier.
For 5% significance level, 4E-08 is not an outlier.
For 1% significance level, 4E-08 is not an outlier.

**Dixon's Outlier Test for 1,2,3,4,7,8-HxCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -11.869600408909 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.198

For 10% significance level, -11.869600408909 is not an outlier.
For 5% significance level, -11.869600408909 is not an outlier.
For 1% significance level, -11.869600408909 is not an outlier.

2. Observation Value -14.7243292749997 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.213

For 10% significance level, -14.7243292749997 is not an outlier.
For 5% significance level, -14.7243292749997 is not an outlier.
For 1% significance level, -14.7243292749997 is not an outlier.

**Dixon's Outlier Test for RA18_SE_DioxinFurans|2,3,4,6,7,8-Hexachlorodibenzofuran**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value 2.8E-06 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.208

For 10% significance level, 2.8E-06 is not an outlier.
For 5% significance level, 2.8E-06 is not an outlier.
For 1% significance level, 2.8E-06 is not an outlier.

2. Observation Value 2.7E-07 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.060

For 10% significance level, 2.7E-07 is not an outlier.
For 5% significance level, 2.7E-07 is not an outlier.
For 1% significance level, 2.7E-07 is not an outlier.

**Dixon's Outlier Test for 1,2,3,4,6,7,8-HpCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -10.2601624964749 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.148

For 10% significance level, -10.2601624964749 is not an outlier.
For 5% significance level, -10.2601624964749 is not an outlier.
For 1% significance level, -10.2601624964749 is not an outlier.

2. Observation Value -12.6185623685753 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.170

For 10% significance level, -12.6185623685753 is not an outlier.
For 5% significance level, -12.6185623685753 is not an outlier.
For 1% significance level, -12.6185623685753 is not an outlier.

**Dixon's Outlier Test for 1,2,3,4,7,8,9-HpCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -12.4805094912319 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.213

For 10% significance level, -12.4805094912319 is not an outlier.
For 5% significance level, -12.4805094912319 is not an outlier.
For 1% significance level, -12.4805094912319 is not an outlier.

2. Observation Value -16.53361109492 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.477

For 10% significance level, -16.53361109492 is an outlier.
For 5% significance level, -16.53361109492 is an outlier.
For 1% significance level, -16.53361109492 is not an outlier.

**Dixon's Outlier Test for OCDF_LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -9.37285930147396 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.081

For 10% significance level, -9.37285930147396 is not an outlier.
For 5% significance level, -9.37285930147396 is not an outlier.
For 1% significance level, -9.37285930147396 is not an outlier.

2. Observation Value -12.0999124497018 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.204

For 10% significance level, -12.0999124497018 is not an outlier.
For 5% significance level, -12.0999124497018 is not an outlier.
For 1% significance level, -12.0999124497018 is not an outlier.

**Dixon's Outlier Test for TCDD TEQ_HH _LN**

Number of Observations = 21
10% critical value: 0.391
5% critical value: 0.44
1% critical value: 0.524

1. Observation Value -11.2818137440068 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.085

For 10% significance level, -11.2818137440068 is not an outlier.
For 5% significance level, -11.2818137440068 is not an outlier.
For 1% significance level, -11.2818137440068 is not an outlier.

2. Observation Value -14.0237654967847 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.144

For 10% significance level, -14.0237654967847 is not an outlier.
For 5% significance level, -14.0237654967847 is not an outlier.
For 1% significance level, -14.0237654967847 is not an outlier.

**Aluminum_OL**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 29 | Number of Distinct Observations | 25 |
| | | Number of Missing Observations | 2 |
| Minimum | 1600 | First Quartile | 3500 |
| Second Largest | 13000 | Median | 6400 |
| Maximum | 15000 | Third Quartile | 9300 |
| Mean | 6855 | SD | 3664 |
| Coefficient of Variation | 0.535 | Skewness | 0.462 |
| Mean of logged Data | 8.674 | SD of logged Data | 0.603 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.232 | d2max (for USL) | 2.73 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.949 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.108 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.161 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 15034 | 90% Percentile (z) | 11551 |
| 95% UPL (t) | 13195 | 95% Percentile (z) | 12882 |
| 95% USL | 16859 | 99% Percentile (z) | 15380 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.305 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.752 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.0939 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.164 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 3.303 | k star (bias corrected MLE) | 2.984 |
| Theta hat (MLE) | 2075 | Theta star (bias corrected MLE) | 2297 |
| nu hat (MLE) | 191.6 | nu star (bias corrected) | 173.1 |
| MLE Mean (bias corrected) | 6855 | MLE Sd (bias corrected) | 3968 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 14705 | 90% Percentile | 12176 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 15062 | 95% Percentile | 14408 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 18149 | 99% Percentile | 19248 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 18916 | | |
| 95% WH USL | 22062 | 95% HW USL | 23430 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.956 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.101 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.161 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 22488 | 90% Percentile (z) | 12672 |
| 95% UPL (t) | 16613 | 95% Percentile (z) | 15779 |
| 95% USL | 30374 | 99% Percentile (z) | 23806 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 29 | 95% UTL with 95% Coverage | 15000 |
| Approx, f used to compute achieved CC | 1.526 | Approximate Actual Confidence Coefficient achieved by U | 0.774 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 15000 | 95% BCA Bootstrap UTL with 95% Coverage | 14200 |
| 95% UPL | 14000 | 90% Percentile | 12000 |
| 90% Chebyshev UPL | 18036 | 95% Percentile | 12600 |
| 95% Chebyshev UPL | 23100 | 99% Percentile | 14440 |
| 95% USL | 15000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Antimony**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 | | |
| Number of Detects | 29 | Number of Non-Detects | 1 |
| Number of Distinct Detects | 23 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.13 | Minimum Non-Detect | 0.16 |
| Maximum Detect | 1.1 | Maximum Non-Detect | 0.16 |
| Variance Detected | 0.0418 | Percent Non-Detects | 3.33% |
| Mean Detected | 0.39 | SD Detected | 0.204 |
| Mean of Detected Logged Data | -1.059 | SD of Detected Logged Data | 0.493 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.879 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.117 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.161 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 0.382 | KM SD | 0.203 |
| 95% UTL95% Coverage | 0.832 | 95% KM UPL (t) | 0.732 |
| 90% KM Percentile (z) | 0.642 | 95% KM Percentile (z) | 0.715 |
| 99% KM Percentile (z) | 0.854 | 95% KM USL | 0.939 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 0.38 | SD | 0.209 |
| 95% UTL95% Coverage | 0.843 | 95% UPL (t) | 0.74 |
| 90% Percentile (z) | 0.647 | 95% Percentile (z) | 0.723 |
| 99% Percentile (z) | 0.865 | 95% USL | 0.953 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.309 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.749 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.085 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.163 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 4.383 | k star (bias corrected MLE) | 3.953 |
| Theta hat (MLE) | 0.0891 | Theta star (bias corrected MLE) | 0.0988 |
| nu hat (MLE) | 254.2 | nu star (bias corrected) | 229.2 |
| MLE Mean (bias corrected) | 0.39 | | |
| MLE Sd (bias corrected) | 0.196 | 95% Percentile of Chisquare (2kstar) | 15.37 |

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 | 0.0691 | Mean | 0.38 |
| Maximum | 1.1 | Median | 0.345 |
| SD | 0.209 | CV | 0.551 |
| k hat (MLE) | 3.622 | k star (bias corrected MLE) | 3.282 |
| Theta hat (MLE) | 0.105 | Theta star (bias corrected MLE) | 0.116 |
| nu hat (MLE) | 217.3 | nu star (bias corrected) | 196.9 |
| MLE Mean (bias corrected) | 0.38 | MLE Sd (bias corrected) | 0.21 |
| 95% Percentile of Chisquare (2kstar) | 13.43 | 90% Percentile | 0.661 |
| 95% Percentile | 0.777 | 99% Percentile | 1.027 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.963 | 0.996 | 95% Approx. Gamma UPL | 0.789 | 0.804 |
| 95% Gamma USL | 1.174 | 1.236 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.382 | SD (KM) | 0.203 |
| Variance (KM) | 0.0412 | SE of Mean (KM) | 0.0377 |
| k hat (KM) | 3.538 | k star (KM) | 3.207 |
| nu hat (KM) | 212.3 | nu star (KM) | 192.4 |
| theta hat (KM) | 0.108 | theta star (KM) | 0.119 |
| 80% gamma percentile (KM) | 0.54 | 90% gamma percentile (KM) | 0.667 |
| 95% gamma percentile (KM) | 0.786 | 99% gamma percentile (KM) | 1.042 |

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.918 | 0.939 | 95% Approx. Gamma UPL | 0.76 | 0.768 |
| 95% KM Gamma Percentile | 0.735 | 0.742 | 95% Gamma USL | 1.108 | 1.151 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.979 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0869 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.381 | Mean in Log Scale | -1.094 |
| SD in Original Scale | 0.207 | SD in Log Scale | 0.52 |
| 95% UTL95% Coverage | 1.063 | 95% BCA UTL95% Coverage | 1.1 |
| 95% Bootstrap (%) UTL95% Coverage | 1.1 | 95% UPL (t) | 0.823 |
| 90% Percentile (z) | 0.653 | 95% Percentile (z) | 0.788 |
| 99% Percentile (z) | 1.124 | 95% USL | 1.398 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -1.092 | 95% KM UTL (Lognormal)95% Coverage | 1.036 |
| KM SD of Logged Data | 0.508 | 95% KM UPL (Lognormal) | 0.807 |
| 95% KM Percentile Lognormal (z) | 0.774 | 95% KM USL (Lognormal) | 1.353 |

| | | | |
|---|---|---|---|
| Background DL/2 Statistics Assuming Lognormal Distribution | | | |
| Mean in Original Scale | 0.38 | Mean in Log Scale | -1.108 |
| SD in Original Scale | 0.209 | SD in Log Scale | 0.553 |
| 95% UTL95% Coverage | 1.128 | 95% UPL (t) | 0.859 |
| 90% Percentile (z) | 0.671 | 95% Percentile (z) | 0.821 |
| 99% Percentile (z) | 1.197 | 95% USL | 1.509 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 30 | 95% UTL with95% Coverage | 1.1 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.869 |
| 95% USL | 1.1 | 95% KM Chebyshev UPL | 1.281 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Arsenic**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 19 |
| | | Number of Missing Observations | 1 |
| Minimum | 1 | First Quartile | 1.95 |
| Second Largest | 4.7 | Median | 2.45 |
| Maximum | 4.7 | Third Quartile | 3.3 |
| Mean | 2.673 | SD | 0.983 |
| Coefficient of Variation | 0.368 | Skewness | 0.477 |
| Mean of logged Data | 0.914 | SD of logged Data | 0.387 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.956 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.137 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 4.855 | 90% Percentile (z) | 3.933 |
| 95% UPL (t) | 4.37 | 95% Percentile (z) | 4.29 |
| 95% USL | 5.371 | 99% Percentile (z) | 4.959 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.233 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.0895 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 7.427 | k star (bias corrected MLE) | 6.706 |
| Theta hat (MLE) | 0.36 | Theta star (bias corrected MLE) | 0.399 |
| nu hat (MLE) | 445.6 | nu star (bias corrected) | 402.4 |
| MLE Mean (bias corrected) | 2.673 | MLE Sd (bias corrected) | 1.032 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 4.619 | 90% Percentile | 4.052 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 4.67 | 95% Percentile | 4.566 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 5.364 | 99% Percentile | 5.639 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 5.47 | | |
| 95% WH USL | 6.241 | 95% HW USL | 6.43 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.966 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0932 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 5.896 | 90% Percentile (z) | 4.099 |
| 95% UPL (t) | 4.871 | 95% Percentile (z) | 4.718 |
| 95% USL | 7.225 | 99% Percentile (z) | 6.144 |

Nonparametric Distribution Free Background Statistics
Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 4.7 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 4.7 | 95% BCA Bootstrap UTL with 95% Coverage | 4.7 |
| 95% UPL | 4.7 | 90% Percentile | 3.93 |
| 90% Chebyshev UPL | 5.67 | 95% Percentile | 4.475 |
| 95% Chebyshev UPL | 7.027 | 99% Percentile | 4.7 |
| 95% USL | 4.7 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Barium_OL**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 29 | Number of Distinct Observations | 21 |
| | | Number of Missing Observations | 2 |
| Minimum | 17 | First Quartile | 37 |
| Second Largest | 92 | Median | 54 |
| Maximum | 100 | Third Quartile | 75 |
| Mean | 54.17 | SD | 23.67 |
| Coefficient of Variation | 0.437 | Skewness | 0.129 |
| Mean of logged Data | 3.881 | SD of logged Data | 0.509 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.232 | d2max (for USL) | 2.73 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.958 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.0864 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.161 | Data appear Normal at 5% Significance Level |

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 107 | 90% Percentile (z) | 84.51 |
| 95% UPL (t) | 95.13 | 95% Percentile (z) | 93.11 |
| 95% USL | 118.8 | 99% Percentile (z) | 109.2 |

| | | | |
|---|---|---|---|
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.498 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.749 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.116 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.163 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 4.654 | k star (bias corrected MLE) | 4.196 |
| Theta hat (MLE) | 11.64 | Theta star (bias corrected MLE) | 12.91 |
| nu hat (MLE) | 269.9 | nu star (bias corrected) | 243.3 |
| MLE Mean (bias corrected) | 54.17 | MLE Sd (bias corrected) | 26.45 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 105.5 | 90% Percentile | 89.62 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 107.7 | 95% Percentile | 103.7 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 126.8 | 99% Percentile | 133.7 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 131.3 | | |
| 95% WH USL | 150.6 | 95% HW USL | 158.3 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.923 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.149 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.161 | Data appear Lognormal at 5% Significance Level | |
| Data appear Approximate Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 151 | 90% Percentile (z) | 93.08 |
| 95% UPL (t) | 117 | 95% Percentile (z) | 112 |
| 95% USL | 194.6 | 99% Percentile (z) | 158.5 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 29 | 95% UTL with 95% Coverage | 100 |
| Approx, f used to compute achieved CC | 1.526 | Approximate Actual Confidence Coefficient achieved by U | 0.774 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 100 | 95% BCA Bootstrap UTL with 95% Coverage | 96.8 |
| 95% UPL | 96 | 90% Percentile | 82.4 |
| 90% Chebyshev UPL | 126.4 | 95% Percentile | 92 |
| 95% Chebyshev UPL | 159.1 | 99% Percentile | 97.76 |
| 95% USL | 100 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Beryllium**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 26 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.29 | First Quartile | 0.548 |
| Second Largest | 1.6 | Median | 0.84 |
| Maximum | 1.7 | Third Quartile | 1.1 |
| Mean | 0.846 | SD | 0.356 |
| Coefficient of Variation | 0.421 | Skewness | 0.613 |
| Mean of logged Data | -0.257 | SD of logged Data | 0.442 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

| | | | |
|---|---|---|---|
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.95 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.151 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.636 | 90% Percentile (z) | 1.302 |
| 95% UPL (t) | 1.461 | 95% Percentile (z) | 1.432 |
| 95% USL | 1.823 | 99% Percentile (z) | 1.674 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.321 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.115 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 5.732 | k star (bias corrected MLE) | 5.181 |
| Theta hat (MLE) | 0.148 | Theta star (bias corrected MLE) | 0.163 |
| nu hat (MLE) | 343.9 | nu star (bias corrected) | 310.9 |
| MLE Mean (bias corrected) | 0.846 | MLE Sd (bias corrected) | 0.372 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.556 | 90% Percentile | 1.343 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.577 | 95% Percentile | 1.535 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.838 | 99% Percentile | 1.94 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.881 | | |
| 95% WH USL | 2.173 | 95% HW USL | 2.253 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.969 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.142 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 2.063 | 90% Percentile (z) | 1.362 |
| 95% UPL (t) | 1.659 | 95% Percentile (z) | 1.6 |
| 95% USL | 2.601 | 99% Percentile (z) | 2.162 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 1.7 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1.7 | 95% BCA Bootstrap UTL with 95% Coverage | 1.7 |
| 95% UPL | 1.645 | 90% Percentile | 1.305 |
| 90% Chebyshev UPL | 1.932 | 95% Percentile | 1.488 |
| 95% Chebyshev UPL | 2.424 | 99% Percentile | 1.671 |
| 95% USL | 1.7 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Cobalt**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 16 |
| | | Number of Missing Observations | 1 |
| Minimum | 4.4 | First Quartile | 8.25 |
| Second Largest | 21 | Median | 12 |
| Maximum | 22 | Third Quartile | 14 |
| Mean | 11.75 | SD | 4.355 |
| Coefficient of Variation | 0.371 | Skewness | 0.281 |
| Mean of logged Data | 2.389 | SD of logged Data | 0.409 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.948 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.128 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 21.42 | 90% Percentile (z) | 17.34 |
| 95% UPL (t) | 19.28 | 95% Percentile (z) | 18.92 |
| 95% USL | 23.71 | 99% Percentile (z) | 21.89 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.749 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.746 | Data Not Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.149 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data follow Appr. Gamma Distribution at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 6.86 | k star (bias corrected MLE) | 6.196 |
| Theta hat (MLE) | 1.713 | Theta star (bias corrected MLE) | 1.897 |
| nu hat (MLE) | 411.6 | nu star (bias corrected) | 371.7 |
| MLE Mean (bias corrected) | 11.75 | MLE Sd (bias corrected) | 4.722 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 20.7 | 90% Percentile | 18.06 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 20.99 | 95% Percentile | 20.44 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 24.16 | 99% Percentile | 25.42 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 24.73 | | |
| 95% WH USL | 28.24 | 95% HW USL | 29.25 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.928 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.175 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Lognormal at 5% Significance Level | |
| Data appear Approximate Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 27.07 | 90% Percentile (z) | 18.43 |
| 95% UPL (t) | 22.12 | 95% Percentile (z) | 21.39 |
| 95% USL | 33.56 | 99% Percentile (z) | 28.28 |

Nonparametric Distribution Free Background Statistics
Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 22 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 22 | 95% BCA Bootstrap UTL with 95% Coverage | 22 |
| 95% UPL | 21.45 | 90% Percentile | 15.15 |
| 90% Chebyshev UPL | 25.04 | 95% Percentile | 18.98 |
| 95% Chebyshev UPL | 31.05 | 99% Percentile | 21.71 |
| 95% USL | 22 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Cyanide**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 27 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 22 | | |
| Number of Detects | 19 | Number of Non-Detects | 8 |
| Number of Distinct Detects | 17 | Number of Distinct Non-Detects | 8 |
| Minimum Detect | 0.082 | Minimum Non-Detect | 0.12 |
| Maximum Detect | 0.99 | Maximum Non-Detect | 0.67 |
| Variance Detected | 0.0664 | Percent Non-Detects | 29.63% |
| Mean Detected | 0.387 | SD Detected | 0.258 |
| Mean of Detected Logged Data | -1.177 | SD of Detected Logged Data | 0.721 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.26 | d2max (for USL) | 2.698 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.907 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.901 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.203 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.197 | Data Not Normal at 5% Significance Level |

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 0.323 | KM SD | 0.242 |
| 95% UTL95% Coverage | 0.87 | 95% KM UPL (t) | 0.743 |
| 90% KM Percentile (z) | 0.633 | 95% KM Percentile (z) | 0.721 |
| 99% KM Percentile (z) | 0.886 | 95% KM USL | 0.975 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 0.329 | SD | 0.24 |
| 95% UTL95% Coverage | 0.871 | 95% UPL (t) | 0.746 |
| 90% Percentile (z) | 0.637 | 95% Percentile (z) | 0.724 |
| 99% Percentile (z) | 0.887 | 95% USL | 0.976 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.489 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.751 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.167 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.201 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.334 | k star (bias corrected MLE) | 2 |
| Theta hat (MLE) | 0.166 | Theta star (bias corrected MLE) | 0.194 |
| nu hat (MLE) | 88.68 | nu star (bias corrected) | 76.01 |
| MLE Mean (bias corrected) | 0.387 | | |
| MLE Sd (bias corrected) | 0.274 | 95% Percentile of Chisquare (2kstar) | 9.489 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 0.0532 | Mean | 0.317 |
| Maximum | 0.99 | Median | 0.21 |
| SD | 0.245 | CV | 0.772 |
| k hat (MLE) | 1.889 | k star (bias corrected MLE) | 1.704 |
| Theta hat (MLE) | 0.168 | Theta star (bias corrected MLE) | 0.186 |
| nu hat (MLE) | 102 | nu star (bias corrected) | 92.01 |
| MLE Mean (bias corrected) | 0.317 | MLE Sd (bias corrected) | 0.243 |
| 95% Percentile of Chisquare (2kstar) | 8.511 | 90% Percentile | 0.64 |
| 95% Percentile | 0.791 | 99% Percentile | 1.13 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.064 | 1.121 | 95% Approx. Gamma UPL | 0.811 | 0.833 |
| 95% Gamma USL | 1.311 | 1.414 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.323 | SD (KM) | 0.242 |
| Variance (KM) | 0.0584 | SE of Mean (KM) | 0.0493 |
| k hat (KM) | 1.792 | k star (KM) | 1.617 |
| nu hat (KM) | 96.76 | nu star (KM) | 87.34 |
| theta hat (KM) | 0.181 | theta star (KM) | 0.2 |
| 80% gamma percentile (KM) | 0.496 | 90% gamma percentile (KM) | 0.662 |
| 95% gamma percentile (KM) | 0.822 | 99% gamma percentile (KM) | 1.181 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.043 | 1.09 | 95% Approx. Gamma UPL | 0.802 | 0.819 |
| 95% KM Gamma Percentile | 0.764 | 0.777 | 95% Gamma USL | 1.279 | 1.366 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.949 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.901 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.131 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.197 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.319 | Mean in Log Scale | -1.392 |
| SD in Original Scale | 0.241 | SD in Log Scale | 0.712 |
| 95% UTL95% Coverage | 1.242 | 95% BCA UTL95% Coverage | 0.99 |
| 95% Bootstrap (%) UTL95% Coverage | 0.99 | 95% UPL (t) | 0.856 |
| 90% Percentile (z) | 0.619 | 95% Percentile (z) | 0.802 |
| 99% Percentile (z) | 1.303 | 95% USL | 1.697 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -1.402 | 95% KM UTL (Lognormal)95% Coverage | 1.322 |
| KM SD of Logged Data | 0.744 | 95% KM UPL (Lognormal) | 0.896 |
| 95% KM Percentile Lognormal (z) | 0.836 | 95% KM USL (Lognormal) | 1.831 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.329 | Mean in Log Scale | -1.373 |
| SD in Original Scale | 0.24 | SD in Log Scale | 0.759 |
| 95% UTL95% Coverage | 1.41 | 95% UPL (t) | 0.948 |
| 90% Percentile (z) | 0.671 | 95% Percentile (z) | 0.884 |
| 99% Percentile (z) | 1.483 | 95% USL | 1.966 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 27 | 95% UTL with95% Coverage | 0.99 |
| Approx, f used to compute achieved CC | 1.421 | Approximate Actual Confidence Coefficient achieved by U | 0.75 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.902 |
| 95% USL | 0.99 | 95% KM Chebyshev UPL | 1.396 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Manganese**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 20 |
| | | Number of Missing Observations | 1 |
| Minimum | 94 | First Quartile | 180 |
| Second Largest | 390 | Median | 230 |
| Maximum | 440 | Third Quartile | 272.5 |
| Mean | 232.8 | SD | 91.66 |
| Coefficient of Variation | 0.394 | Skewness | 0.464 |
| Mean of logged Data | 5.37 | SD of logged Data | 0.419 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.948 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.159 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level |

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 436.3 | 90% Percentile (z) | 350.3 |
| 95% UPL (t) | 391.1 | 95% Percentile (z) | 383.6 |
| 95% USL | 484.4 | 99% Percentile (z) | 446 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.428 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.115 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 6.397 | k star (bias corrected MLE) | 5.78 |
| Theta hat (MLE) | 36.39 | Theta star (bias corrected MLE) | 40.28 |
| nu hat (MLE) | 383.8 | nu star (bias corrected) | 346.8 |
| MLE Mean (bias corrected) | 232.8 | MLE Sd (bias corrected) | 96.83 |

| | | | |
|---|---|---|---|
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 416.8 | 90% Percentile | 362.3 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 422.2 | 95% Percentile | 411.5 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 488.6 | 99% Percentile | 514.8 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 499.7 | | |
| 95% WH USL | 573.8 | 95% HW USL | 593.7 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.948 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.131 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 544.7 | 90% Percentile (z) | 367.6 |
| 95% UPL (t) | 443.1 | 95% Percentile (z) | 428.1 |
| 95% USL | 678.8 | 99% Percentile (z) | 569.6 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 440 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 440 | 95% BCA Bootstrap UTL with 95% Coverage | 440 |
| 95% UPL | 412.5 | 90% Percentile | 371 |
| 90% Chebyshev UPL | 512.3 | 95% Percentile | 385.5 |
| 95% Chebyshev UPL | 639 | 99% Percentile | 425.5 |
| 95% USL | 440 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Nickel**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 20 |
| | | Number of Missing Observations | 1 |
| Minimum | 7.7 | First Quartile | 14 |
| Second Largest | 38 | Median | 21 |
| Maximum | 40 | Third Quartile | 26.75 |
| Mean | 20.87 | SD | 8.635 |
| Coefficient of Variation | 0.414 | Skewness | 0.321 |
| Mean of logged Data | 2.946 | SD of logged Data | 0.455 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.953 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.106 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 40.04 | 90% Percentile (z) | 31.94 |
| 95% UPL (t) | 35.79 | 95% Percentile (z) | 35.08 |
| 95% USL | 44.58 | 99% Percentile (z) | 40.96 |

| | | | |
|---|---|---|---|
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.539 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.119 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 5.563 | k star (bias corrected MLE) | 5.029 |
| Theta hat (MLE) | 3.752 | Theta star (bias corrected MLE) | 4.15 |
| nu hat (MLE) | 333.8 | nu star (bias corrected) | 301.8 |
| MLE Mean (bias corrected) | 20.87 | MLE Sd (bias corrected) | 9.308 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 38.71 | 90% Percentile | 33.33 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 39.32 | 95% Percentile | 38.16 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 45.81 | 99% Percentile | 48.35 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 47.05 | | |
| 95% WH USL | 54.27 | 95% HW USL | 56.48 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.938 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.132 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 52.2 | 90% Percentile (z) | 34.07 |
| 95% UPL (t) | 41.72 | 95% Percentile (z) | 40.19 |
| 95% USL | 66.27 | 99% Percentile (z) | 54.78 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 40 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 40 | 95% BCA Bootstrap UTL with 95% Coverage | 40 |
| 95% UPL | 38.9 | 90% Percentile | 30.4 |
| 90% Chebyshev UPL | 47.21 | 95% Percentile | 36.2 |
| 95% Chebyshev UPL | 59.13 | 99% Percentile | 39.42 |
| 95% USL | 40 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Thallium**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 24 | | |
| Number of Detects | 28 | Number of Non-Detects | 2 |
| Number of Distinct Detects | 22 | Number of Distinct Non-Detects | 2 |
| Minimum Detect | 0.035 | Minimum Non-Detect | 0.037 |
| Maximum Detect | 0.29 | Maximum Non-Detect | 0.078 |
| Variance Detected | 0.00508 | Percent Non-Detects | 6.67% |
| Mean Detected | 0.156 | SD Detected | 0.0713 |
| Mean of Detected Logged Data | -1.985 | SD of Detected Logged Data | 0.564 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test on Detects Only

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.969 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.924 | Detected Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.0914 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.164 | Detected Data appear Normal at 5% Significance Level | |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 0.149 | KM SD | 0.0733 |
| 95% UTL95% Coverage | 0.312 | 95% KM UPL (t) | 0.276 |
| 90% KM Percentile (z) | 0.243 | 95% KM Percentile (z) | 0.269 |
| 99% KM Percentile (z) | 0.319 | 95% KM USL | 0.35 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 0.148 | SD | 0.0761 |
| 95% UTL95% Coverage | 0.317 | 95% UPL (t) | 0.279 |
| 90% Percentile (z) | 0.245 | 95% Percentile (z) | 0.273 |
| 99% Percentile (z) | 0.325 | 95% USL | 0.357 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | | |
|---|---|---|---|
| A-D Test Statistic | 0.511 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.75 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.156 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.166 | Detected data appear Gamma Distributed at 5% Significance Level | |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 4 | k star (bias corrected MLE) | 3.595 |
| Theta hat (MLE) | 0.0391 | Theta star (bias corrected MLE) | 0.0435 |
| nu hat (MLE) | 224 | nu star (bias corrected) | 201.3 |
| MLE Mean (bias corrected) | 0.156 | | |
| MLE Sd (bias corrected) | 0.0825 | 95% Percentile of Chisquare (2kstar) | 14.34 |

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 | 0.035 | Mean | 0.15 |
| Maximum | 0.29 | Median | 0.16 |
| SD | 0.0734 | CV | 0.49 |
| k hat (MLE) | 3.548 | k star (bias corrected MLE) | 3.215 |
| Theta hat (MLE) | 0.0422 | Theta star (bias corrected MLE) | 0.0466 |
| nu hat (MLE) | 212.9 | nu star (bias corrected) | 192.9 |
| MLE Mean (bias corrected) | 0.15 | MLE Sd (bias corrected) | 0.0835 |
| 95% Percentile of Chisquare (2kstar) | 13.23 | 90% Percentile | 0.262 |
| 95% Percentile | 0.308 | 99% Percentile | 0.408 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.384 | 0.402 | 95% Approx. Gamma UPL | 0.314 | 0.323 |
| 95% Gamma USL | 0.47 | 0.501 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.149 | SD (KM) | 0.0733 |
| Variance (KM) | 0.00537 | SE of Mean (KM) | 0.0136 |
| k hat (KM) | 4.135 | k star (KM) | 3.743 |
| nu hat (KM) | 248.1 | nu star (KM) | 224.6 |
| theta hat (KM) | 0.036 | theta star (KM) | 0.0398 |
| 80% gamma percentile (KM) | 0.207 | 90% gamma percentile (KM) | 0.252 |
| 95% gamma percentile (KM) | 0.294 | 99% gamma percentile (KM) | 0.383 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.387 | 0.406 | 95% Approx. Gamma UPL | 0.316 | 0.325 |
| 95% KM Gamma Percentile | 0.305 | 0.313 | 95% Gamma USL | 0.474 | 0.508 |

Lognormal GOF Test on Detected Observations Only

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.917 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.924 | Data Not Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.178 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.164 | Data Not Lognormal at 5% Significance Level | |

Data Not Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.15 | Mean in Log Scale | -2.049 |
| SD in Original Scale | 0.0736 | SD in Log Scale | 0.598 |
| 95% UTL95% Coverage | 0.486 | 95% BCA UTL95% Coverage | 0.29 |
| 95% Bootstrap (%) UTL95% Coverage | 0.29 | 95% UPL (t) | 0.362 |
| 90% Percentile (z) | 0.277 | 95% Percentile (z) | 0.345 |
| 99% Percentile (z) | 0.518 | 95% USL | 0.666 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -2.063 | 95% KM UTL (Lognormal)95% Coverage | 0.497 |
| KM SD of Logged Data | 0.614 | 95% KM UPL (Lognormal) | 0.367 |
| 95% KM Percentile Lognormal (z) | 0.349 | 95% KM USL (Lognormal) | 0.686 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.148 | Mean in Log Scale | -2.094 |
| SD in Original Scale | 0.0761 | SD in Log Scale | 0.691 |
| 95% UTL95% Coverage | 0.571 | 95% UPL (t) | 0.406 |
| 90% Percentile (z) | 0.299 | 95% Percentile (z) | 0.384 |
| 99% Percentile (z) | 0.615 | 95% USL | 0.821 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with95% Coverage | 0.29 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.285 |
| 95% USL | 0.29 | 95% KM Chebyshev UPL | 0.474 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Metals|Vanadium**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 19 |
| | | Number of Missing Observations | 1 |
| Minimum | 11 | First Quartile | 17 |
| Second Largest | 39 | Median | 23.5 |
| Maximum | 44 | Third Quartile | 31 |
| Mean | 24.23 | SD | 8.581 |
| Coefficient of Variation | 0.354 | Skewness | 0.396 |
| Mean of logged Data | 3.125 | SD of logged Data | 0.365 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

| | | | |
|---|---|---|---|
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.949 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.166 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level | |
| Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 43.28 | 90% Percentile (z) | 35.23 |
| 95% UPL (t) | 39.05 | 95% Percentile (z) | 38.35 |
| 95% USL | 47.79 | 99% Percentile (z) | 44.2 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.532 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.746 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.154 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.16 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 8.142 | k star (bias corrected MLE) | 7.35 |
| Theta hat (MLE) | 2.976 | Theta star (bias corrected MLE) | 3.297 |
| nu hat (MLE) | 488.5 | nu star (bias corrected) | 441 |
| MLE Mean (bias corrected) | 24.23 | MLE Sd (bias corrected) | 8.938 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 41.01 | 90% Percentile | 36.16 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 41.38 | 95% Percentile | 40.56 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 47.37 | 99% Percentile | 49.7 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 48.15 | | |
| 95% WH USL | 54.83 | 95% HW USL | 56.25 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.958 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.14 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 51.15 | 90% Percentile (z) | 36.33 |
| 95% UPL (t) | 42.74 | 95% Percentile (z) | 41.47 |
| 95% USL | 61.95 | 99% Percentile (z) | 53.18 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 44 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 44 | 95% BCA Bootstrap UTL with 95% Coverage | 41.75 |
| 95% UPL | 41.25 | 90% Percentile | 34.2 |
| 90% Chebyshev UPL | 50.4 | 95% Percentile | 37.65 |
| 95% Chebyshev UPL | 62.26 | 99% Percentile | 42.55 |
| 95% USL | 44 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**4,4'-DDT_OL**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 28 | Number of Missing Observations | 2 |
| Number of Distinct Observations | 23 | | |
| Number of Detects | 24 | Number of Non-Detects | 4 |
| Number of Distinct Detects | 19 | Number of Distinct Non-Detects | 4 |
| Minimum Detect | 1.20E-04 | Minimum Non-Detect | 7.00E-05 |
| Maximum Detect | 0.0032 | Maximum Non-Detect | 8.50E-04 |
| Variance Detected | 5.96E-07 | Percent Non-Detects | 14.29% |
| Mean Detected | 0.00121 | SD Detected | 7.72E-04 |
| Mean of Detected Logged Data | -7.01 | SD of Detected Logged Data | 0.915 |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.246 | d2max (for USL) | 2.714 |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.941 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.916 | Detected Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.152 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.177 | Detected Data appear Normal at 5% Significance Level | |
| Detected Data appear Normal at 5% Significance Level | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 0.00106 | KM SD | 7.87E-04 |
| 95% UTL95% Coverage | 0.00283 | 95% KM UPL (t) | 0.00243 |
| 90% KM Percentile (z) | 0.00207 | 95% KM Percentile (z) | 0.00236 |
| 99% KM Percentile (z) | 0.00289 | 95% KM USL | 0.0032 |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 0.00108 | SD | 7.86E-04 |
| 95% UTL95% Coverage | 0.00284 | 95% UPL (t) | 0.00244 |
| 90% Percentile (z) | 0.00208 | 95% Percentile (z) | 0.00237 |
| 99% Percentile (z) | 0.00291 | 95% USL | 0.00321 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.767 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.757 | Data Not Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.192 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.18 | Data Not Gamma Distributed at 5% Significance Level | |
| Data Not Gamma Distributed at 5% Significance Level | | | |
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 1.865 | k star (bias corrected MLE) | 1.659 |
| Theta hat (MLE) | 6.48E-04 | Theta star (bias corrected MLE) | 7.28E-04 |
| nu hat (MLE) | 89.51 | nu star (bias corrected) | 79.65 |
| MLE Mean (bias corrected) | 0.00121 | | |
| MLE Sd (bias corrected) | 9.38E-04 | 95% Percentile of Chisquare (2kstar) | 8.361 |
| 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 | 1.20E-04 | Mean | 0.00246 |
| Maximum | 0.01 | Median | 0.00125 |
| SD | 0.00321 | CV | 1.304 |
| k hat (MLE) | 0.887 | k star (bias corrected MLE) | 0.815 |
| Theta hat (MLE) | 0.00278 | Theta star (bias corrected MLE) | 0.00302 |
| nu hat (MLE) | 49.65 | nu star (bias corrected) | 45.66 |
| MLE Mean (bias corrected) | 0.00246 | MLE Sd (bias corrected) | 0.00273 |
| 95% Percentile of Chisquare (2kstar) | 5.254 | 90% Percentile | 0.00596 |
| 95% Percentile | 0.00794 | 99% Percentile | 0.0126 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0112 | 0.012 | 95% Approx. Gamma UPL | 0.00794 | 0.00816 |
| 95% Gamma USL | 0.0149 | 0.0166 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.00106 | SD (KM) | 7.87E-04 |
| Variance (KM) | 6.19E-07 | SE of Mean (KM) | 1.53E-04 |
| k hat (KM) | 1.829 | k star (KM) | 1.657 |
| nu hat (KM) | 102.4 | nu star (KM) | 92.78 |
| theta hat (KM) | 5.82E-04 | theta star (KM) | 6.42E-04 |
| 80% gamma percentile (KM) | 0.00163 | 90% gamma percentile (KM) | 0.00216 |
| 95% gamma percentile (KM) | 0.00268 | 99% gamma percentile (KM) | 0.00384 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.00409 | 0.00455 | 95% Approx. Gamma UPL | 0.00304 | 0.00325 |
| 95% KM Gamma Percentile | 0.00288 | 0.00306 | 95% Gamma USL | 0.00524 | 0.00605 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.857 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.916 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.244 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.177 | Data Not Lognormal at 5% Significance Level |

Data Not Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00107 | Mean in Log Scale | -7.217 |
| SD in Original Scale | 7.94E-04 | SD in Log Scale | 1.005 |
| 95% UTL95% Coverage | 0.00701 | 95% BCA UTL95% Coverage | 0.00292 |
| 95% Bootstrap (%) UTL95% Coverage | 0.0032 | 95% UPL (t) | 0.00419 |
| 90% Percentile (z) | 0.00266 | 95% Percentile (z) | 0.00383 |
| 99% Percentile (z) | 0.0076 | 95% USL | 0.0112 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -7.272 | 95% KM UTL (Lognormal)95% Coverage | 0.00795 |
| KM SD of Logged Data | 1.085 | 95% KM UPL (Lognormal) | 0.00456 |
| 95% KM Percentile Lognormal (z) | 0.00414 | 95% KM USL (Lognormal) | 0.0132 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.00108 | Mean in Log Scale | -7.221 |
| SD in Original Scale | 7.86E-04 | SD in Log Scale | 1.071 |
| 95% UTL95% Coverage | 0.00811 | 95% UPL (t) | 0.00468 |
| 90% Percentile (z) | 0.00289 | 95% Percentile (z) | 0.00426 |
| 99% Percentile (z) | 0.00884 | 95% USL | 0.0134 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 28 | 95% UTL with95% Coverage | 0.0032 |
| Approx, f used to compute achieved CC | 1.474 | Approximate Actual Confidence Coefficient achieved by U | 0.762 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.00284 |
| 95% USL | 0.0032 | 95% KM Chebyshev UPL | 0.00455 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_PestPCBs|CHLORDANE (Technical)**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 18 | Number of Distinct Observations | 17 |
| | | Number of Missing Observations | 5 |
| Minimum | 0.012 | First Quartile | 0.0265 |
| Second Largest | 0.093 | Median | 0.0545 |
| Maximum | 0.12 | Third Quartile | 0.063 |
| Mean | 0.0518 | SD | 0.0285 |
| Coefficient of Variation | 0.549 | Skewness | 0.618 |
| Mean of logged Data | -3.13 | SD of logged Data | 0.643 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.453 | d2max (for USL) | 2.504 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.949 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.897 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.125 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.202 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 0.122 | 90% Percentile (z) | 0.0883 |
| 95% UPL (t) | 0.103 | 95% Percentile (z) | 0.0987 |
| 95% USL | 0.123 | 99% Percentile (z) | 0.118 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.398 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.745 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.147 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.205 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 3.089 | k star (bias corrected MLE) | 2.611 |
| Theta hat (MLE) | 0.0168 | Theta star (bias corrected MLE) | 0.0198 |
| nu hat (MLE) | 111.2 | nu star (bias corrected) | 94.01 |
| MLE Mean (bias corrected) | 0.0518 | MLE Sd (bias corrected) | 0.0321 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.117 | 90% Percentile | 0.0948 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.121 | 95% Percentile | 0.113 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.156 | 99% Percentile | 0.154 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.165 | | |
| 95% WH USL | 0.159 | 95% HW USL | 0.169 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.936 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.897 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.185 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.202 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 0.212 | 90% Percentile (z) | 0.0997 |
| 95% UPL (t) | 0.138 | 95% Percentile (z) | 0.126 |
| 95% USL | 0.219 | 99% Percentile (z) | 0.195 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 18 | 95% UTL with 95% Coverage | 0.12 |
| Approx, f used to compute achieved CC | 0.947 | Approximate Actual Confidence Coefficient achieved by U | 0.603 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.12 | 95% BCA Bootstrap UTL with 95% Coverage | 0.12 |
| 95% UPL | 0.12 | 90% Percentile | 0.0832 |
| 90% Chebyshev UPL | 0.14 | 95% Percentile | 0.0971 |
| 95% Chebyshev UPL | 0.179 | 99% Percentile | 0.115 |
| 95% USL | 0.12 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_PestPCBs|PCB, Total Aroclors (AECOM Calc)**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 29 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.006 | First Quartile | 0.0243 |
| Second Largest | 0.14 | Median | 0.0455 |
| Maximum | 0.19 | Third Quartile | 0.0708 |
| Mean | 0.0545 | SD | 0.0422 |
| Coefficient of Variation | 0.774 | Skewness | 1.487 |
| Mean of logged Data | -3.21 | SD of logged Data | 0.843 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.876 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.129 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level |

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.148 | 90% Percentile (z) | 0.109 |
| 95% UPL (t) | 0.127 | 95% Percentile (z) | 0.124 |
| 95% USL | 0.17 | 99% Percentile (z) | 0.153 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.138 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.76 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0681 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.811 | k star (bias corrected MLE) | 1.652 |
| Theta hat (MLE) | 0.0301 | Theta star (bias corrected MLE) | 0.033 |
| nu hat (MLE) | 108.6 | nu star (bias corrected) | 99.1 |
| MLE Mean (bias corrected) | 0.0545 | MLE Sd (bias corrected) | 0.0424 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.141 | 90% Percentile | 0.111 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.146 | 95% Percentile | 0.138 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.182 | 99% Percentile | 0.197 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.194 | | |
| 95% WH USL | 0.234 | 95% HW USL | 0.257 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.972 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.119 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.262 | 90% Percentile (z) | 0.119 |
| 95% UPL (t) | 0.173 | 95% Percentile (z) | 0.161 |
| 95% USL | 0.408 | 99% Percentile (z) | 0.287 |

Nonparametric Distribution Free Background Statistics
Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 0.19 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.19 | 95% BCA Bootstrap UTL with 95% Coverage | 0.19 |
| 95% UPL | 0.163 | 90% Percentile | 0.102 |
| 90% Chebyshev UPL | 0.183 | 95% Percentile | 0.131 |
| 95% Chebyshev UPL | 0.241 | 99% Percentile | 0.176 |
| 95% USL | 0.19 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**tPCB congener**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 29 | Number of Distinct Observations | 24 |
| | | Number of Missing Observations | 2 |
| Minimum | 0.0081 | First Quartile | 0.05 |
| Second Largest | 0.37 | Median | 0.099 |
| Maximum | 0.38 | Third Quartile | 0.16 |
| Mean | 0.118 | SD | 0.0956 |
| Coefficient of Variation | 0.807 | Skewness | 1.352 |
| Mean of logged Data | -2.484 | SD of logged Data | 0.929 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.232 | d2max (for USL) | 2.73 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.869 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.158 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.161 | Data appear Normal at 5% Significance Level |

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.332 | 90% Percentile (z) | 0.241 |
| 95% UPL (t) | 0.284 | 95% Percentile (z) | 0.276 |
| 95% USL | 0.379 | 99% Percentile (z) | 0.341 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.16 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.762 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0873 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.165 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.573 | k star (bias corrected MLE) | 1.433 |
| Theta hat (MLE) | 0.0753 | Theta star (bias corrected MLE) | 0.0826 |
| nu hat (MLE) | 91.24 | nu star (bias corrected) | 83.14 |
| MLE Mean (bias corrected) | 0.118 | MLE Sd (bias corrected) | 0.0989 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.321 | 90% Percentile | 0.25 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.335 | 95% Percentile | 0.313 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.423 | 99% Percentile | 0.457 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.456 | | |
| 95% WH USL | 0.545 | 95% HW USL | 0.605 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.968 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.123 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.161 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.664 | 90% Percentile (z) | 0.274 |
| 95% UPL (t) | 0.416 | 95% Percentile (z) | 0.385 |
| 95% USL | 1.055 | 99% Percentile (z) | 0.725 |

Nonparametric Distribution Free Background Statistics
Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 29 | 95% UTL with 95% Coverage | 0.38 |
| Approx, f used to compute achieved CC | 1.526 | Approximate Actual Confidence Coefficient achieved by U | 0.774 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.38 | 95% BCA Bootstrap UTL with 95% Coverage | 0.38 |
| 95% UPL | 0.375 | 90% Percentile | 0.223 |
| 90% Chebyshev UPL | 0.41 | 95% Percentile | 0.318 |
| 95% Chebyshev UPL | 0.542 | 99% Percentile | 0.377 |
| 95% USL | 0.38 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|bis-(2-Ethylhexyl)phthalate**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Missing Observations | 1 |
| Number of Distinct Observations | 26 | | |
| Number of Detects | 29 | Number of Non-Detects | 1 |
| Number of Distinct Detects | 25 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.23 | Minimum Non-Detect | 1.7 |
| Maximum Detect | 2.8 | Maximum Non-Detect | 1.7 |
| Variance Detected | 0.297 | Percent Non-Detects | 3.33% |
| Mean Detected | 0.86 | SD Detected | 0.545 |
| Mean of Detected Logged Data | -0.331 | SD of Detected Logged Data | 0.619 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.854 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.163 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.161 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 0.856 | KM SD | 0.531 |
| 95% UTL95% Coverage | 2.035 | 95% KM UPL (t) | 1.773 |
| 90% KM Percentile (z) | 1.537 | 95% KM Percentile (z) | 1.73 |
| 99% KM Percentile (z) | 2.091 | 95% KM USL | 2.314 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 0.859 | SD | 0.536 |
| 95% UTL95% Coverage | 2.049 | 95% UPL (t) | 1.785 |
| 90% Percentile (z) | 1.546 | 95% Percentile (z) | 1.741 |
| 99% Percentile (z) | 2.106 | 95% USL | 2.33 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.492 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.753 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.116 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.164 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.939 | k star (bias corrected MLE) | 2.658 |
| Theta hat (MLE) | 0.293 | Theta star (bias corrected MLE) | 0.323 |
| nu hat (MLE) | 170.5 | nu star (bias corrected) | 154.2 |
| MLE Mean (bias corrected) | 0.86 | | |
| MLE Sd (bias corrected) | 0.527 | 95% Percentile of Chisquare (2kstar) | 11.56 |

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 | 0.23 | Mean | 0.855 |
| Maximum | 2.8 | Median | 0.84 |
| SD | 0.536 | CV | 0.627 |
| k hat (MLE) | 3.027 | k star (bias corrected MLE) | 2.747 |
| Theta hat (MLE) | 0.282 | Theta star (bias corrected MLE) | 0.311 |
| nu hat (MLE) | 181.6 | nu star (bias corrected) | 164.8 |
| MLE Mean (bias corrected) | 0.855 | MLE Sd (bias corrected) | 0.516 |
| 95% Percentile of Chisquare (2kstar) | 11.83 | 90% Percentile | 1.546 |
| 95% Percentile | 1.841 | 99% Percentile | 2.482 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 2.319 | 2.397 | 95% Approx. Gamma UPL | 1.872 | 1.904 |
| 95% Gamma USL | 2.867 | 3.022 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.856 | SD (KM) | 0.531 |
| Variance (KM) | 0.282 | SE of Mean (KM) | 0.0994 |
| k hat (KM) | 2.599 | k star (KM) | 2.361 |
| nu hat (KM) | 155.9 | nu star (KM) | 141.7 |
| theta hat (KM) | 0.329 | theta star (KM) | 0.363 |
| 80% gamma percentile (KM) | 1.257 | 90% gamma percentile (KM) | 1.602 |
| 95% gamma percentile (KM) | 1.928 | 99% gamma percentile (KM) | 2.646 |

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 2.306 | 2.383 | 95% Approx. Gamma UPL | 1.863 | 1.895 |
| 95% KM Gamma Percentile | 1.795 | 1.821 | 95% Gamma USL | 2.849 | 3.002 |

Lognormal GOF Test on Detected Observations Only

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.958 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.155 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.853 | Mean in Log Scale | -0.333 |
| SD in Original Scale | 0.537 | SD in Log Scale | 0.608 |
| 95% UTL95% Coverage | 2.765 | 95% BCA UTL95% Coverage | 2.8 |
| 95% Bootstrap (%) UTL95% Coverage | 2.8 | 95% UPL (t) | 2.049 |
| 90% Percentile (z) | 1.563 | 95% Percentile (z) | 1.949 |
| 99% Percentile (z) | 2.95 | 95% USL | 3.805 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -0.334 | 95% KM UTL (Lognormal)95% Coverage | 2.75 |
| KM SD of Logged Data | 0.606 | 95% KM UPL (Lognormal) | 2.04 |
| 95% KM Percentile Lognormal (z) | 1.941 | 95% KM USL (Lognormal) | 3.781 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.859 | Mean in Log Scale | -0.325 |
| SD in Original Scale | 0.536 | SD in Log Scale | 0.609 |
| 95% UTL95% Coverage | 2.791 | 95% UPL (t) | 2.067 |
| 90% Percentile (z) | 1.576 | 95% Percentile (z) | 1.966 |
| 99% Percentile (z) | 2.977 | 95% USL | 3.842 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with95% Coverage | 2.8 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 2.25 |
| 95% USL | 2.8 | 95% KM Chebyshev UPL | 3.209 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Total High-molecular-weight PAHs**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 26 |
| | | Number of Missing Observations | 1 |
| Minimum | 1.4 | First Quartile | 3.4 |
| Second Largest | 11 | Median | 6.3 |
| Maximum | 28 | Third Quartile | 8.4 |
| Mean | 6.577 | SD | 4.919 |
| Coefficient of Variation | 0.748 | Skewness | 2.873 |
| Mean of logged Data | 1.667 | SD of logged Data | 0.683 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.73 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.204 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level | |

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 17.5 | 90% Percentile (z) | 12.88 |
| 95% UPL (t) | 15.07 | 95% Percentile (z) | 14.67 |
| 95% USL | 20.08 | 99% Percentile (z) | 18.02 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.667 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.128 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.459 | k star (bias corrected MLE) | 2.235 |
| Theta hat (MLE) | 2.675 | Theta star (bias corrected MLE) | 2.943 |
| nu hat (MLE) | 147.5 | nu star (bias corrected) | 134.1 |
| MLE Mean (bias corrected) | 6.577 | MLE Sd (bias corrected) | 4.399 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 15.3 | 90% Percentile | 12.46 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 15.6 | 95% Percentile | 15.07 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 19.27 | 99% Percentile | 20.8 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 20.03 | | |
| 95% WH USL | 24.2 | 95% HW USL | 25.72 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.937 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.133 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 24.12 | 90% Percentile (z) | 12.71 |
| 95% UPL (t) | 17.23 | 95% Percentile (z) | 16.29 |
| 95% USL | 34.53 | 99% Percentile (z) | 25.94 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 28 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 28 | 95% BCA Bootstrap UTL with 95% Coverage | 28 |
| 95% UPL | 18.65 | 90% Percentile | 9.19 |
| 90% Chebyshev UPL | 21.58 | 95% Percentile | 10.55 |
| 95% Chebyshev UPL | 28.37 | 99% Percentile | 23.07 |
| 95% USL | 28 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Benzo(a)anthracene**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 24 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.1 | First Quartile | 0.225 |
| Second Largest | 0.94 | Median | 0.45 |
| Maximum | 2.7 | Third Quartile | 0.623 |
| Mean | 0.515 | SD | 0.469 |
| Coefficient of Variation | 0.911 | Skewness | 3.639 |
| Mean of logged Data | -0.924 | SD of logged Data | 0.724 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.634 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.234 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1.555 | 90% Percentile (z) | 1.115 |
| 95% UPL (t) | 1.324 | 95% Percentile (z) | 1.286 |
| 95% USL | 1.801 | 99% Percentile (z) | 1.605 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.725 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.758 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.138 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.078 | k star (bias corrected MLE) | 1.893 |
| Theta hat (MLE) | 0.248 | Theta star (bias corrected MLE) | 0.272 |
| nu hat (MLE) | 124.7 | nu star (bias corrected) | 113.6 |
| MLE Mean (bias corrected) | 0.515 | MLE Sd (bias corrected) | 0.374 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.254 | 90% Percentile | 1.014 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.271 | 95% Percentile | 1.242 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.603 | 99% Percentile | 1.75 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.657 | | |
| 95% WH USL | 2.041 | 95% HW USL | 2.16 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.943 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.164 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data Not Lognormal at 5% Significance Level |

Data appear Approximate Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1.982 | 90% Percentile (z) | 1.004 |
| 95% UPL (t) | 1.387 | 95% Percentile (z) | 1.307 |
| 95% USL | 2.899 | 99% Percentile (z) | 2.14 |

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 2.7 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.7 | 95% BCA Bootstrap UTL with 95% Coverage | 1.908 |
| 95% UPL | 1.732 | 90% Percentile | 0.742 |
| 90% Chebyshev UPL | 1.944 | 95% Percentile | 0.859 |
| 95% Chebyshev UPL | 2.592 | 99% Percentile | 2.19 |
| 95% USL | 2.7 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Benzo(a)pyrene**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 27 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.12 | First Quartile | 0.29 |
| Second Largest | 0.95 | Median | 0.53 |
| Maximum | 2.6 | Third Quartile | 0.734 |
| Mean | 0.576 | SD | 0.452 |
| Coefficient of Variation | 0.784 | Skewness | 3.165 |
| Mean of logged Data | -0.773 | SD of logged Data | 0.685 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.696 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.209 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.579 | 90% Percentile (z) | 1.155 |
| 95% UPL (t) | 1.356 | 95% Percentile (z) | 1.319 |
| 95% USL | 1.816 | 99% Percentile (z) | 1.627 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.661 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.13 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 2.405 | k star (bias corrected MLE) | 2.187 |
| Theta hat (MLE) | 0.24 | Theta star (bias corrected MLE) | 0.263 |
| nu hat (MLE) | 144.3 | nu star (bias corrected) | 131.2 |
| MLE Mean (bias corrected) | 0.576 | MLE Sd (bias corrected) | 0.39 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.347 | 90% Percentile | 1.097 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.37 | 95% Percentile | 1.329 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.7 | 99% Percentile | 1.84 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.762 | | |
| 95% WH USL | 2.138 | 95% HW USL | 2.267 |

| | | | |
|---|---|---|---|
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.94 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.147 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |

| | | | |
|---|---|---|---|
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 2.11 | 90% Percentile (z) | 1.11 |
| 95% UPL (t) | 1.506 | 95% Percentile (z) | 1.423 |
| 95% USL | 3.024 | 99% Percentile (z) | 2.27 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 2.6 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.6 | 95% BCA Bootstrap UTL with 95% Coverage | 2.6 |
| 95% UPL | 1.693 | 90% Percentile | 0.823 |
| 90% Chebyshev UPL | 1.953 | 95% Percentile | 0.905 |
| 95% Chebyshev UPL | 2.577 | 99% Percentile | 2.122 |
| 95% USL | 2.6 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Benzo(b)fluoranthene**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 23 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.19 | First Quartile | 0.433 |
| Second Largest | 1.3 | Median | 0.825 |
| Maximum | 2.8 | Third Quartile | 1.1 |
| Mean | 0.829 | SD | 0.518 |
| Coefficient of Variation | 0.625 | Skewness | 1.781 |
| Mean of logged Data | -0.373 | SD of logged Data | 0.646 |

| | | | |
|---|---|---|---|
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

| | | | |
|---|---|---|---|
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.837 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.17 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |

| | | | |
|---|---|---|---|
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.979 | 90% Percentile (z) | 1.493 |
| 95% UPL (t) | 1.724 | 95% Percentile (z) | 1.681 |
| 95% USL | 2.251 | 99% Percentile (z) | 2.034 |

| | | |
|---|---|---|
| Gamma GOF Test | | |
| A-D Test Statistic | 0.668 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.753 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.129 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.161 | Detected data appear Gamma Distributed at 5% Significance Level |
| Detected data appear Gamma Distributed at 5% Significance Level | | |

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.847 | k star (bias corrected MLE) | 2.584 |
| Theta hat (MLE) | 0.291 | Theta star (bias corrected MLE) | 0.321 |
| nu hat (MLE) | 170.8 | nu star (bias corrected) | 155.1 |
| MLE Mean (bias corrected) | 0.829 | MLE Sd (bias corrected) | 0.516 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.852 | 90% Percentile | 1.521 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.896 | 95% Percentile | 1.818 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 2.305 | 99% Percentile | 2.468 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 2.403 | | |
| 95% WH USL | 2.862 | 95% HW USL | 3.048 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.934 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.132 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 2.89 | 90% Percentile (z) | 1.576 |
| 95% UPL (t) | 2.102 | 95% Percentile (z) | 1.993 |
| 95% USL | 4.058 | 99% Percentile (z) | 3.096 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 2.8 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.8 | 95% BCA Bootstrap UTL with 95% Coverage | 2.125 |
| 95% UPL | 1.975 | 90% Percentile | 1.2 |
| 90% Chebyshev UPL | 2.409 | 95% Percentile | 1.255 |
| 95% Chebyshev UPL | 3.124 | 99% Percentile | 2.365 |
| 95% USL | 2.8 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Benzo(k)fluoranthene**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 30 | Number of Distinct Observations | 25 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.072 | First Quartile | 0.183 |
| Second Largest | 0.52 | Median | 0.295 |
| Maximum | 1.4 | Third Quartile | 0.38 |
| Mean | 0.317 | SD | 0.247 |
| Coefficient of Variation | 0.779 | Skewness | 2.989 |
| Mean of logged Data | -1.372 | SD of logged Data | 0.68 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.721 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.172 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.865 | 90% Percentile (z) | 0.633 |
| 95% UPL (t) | 0.743 | 95% Percentile (z) | 0.723 |
| 95% USL | 0.994 | 99% Percentile (z) | 0.891 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.487 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.114 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.408 | k star (bias corrected MLE) | 2.19 |
| Theta hat (MLE) | 0.131 | Theta star (bias corrected MLE) | 0.145 |
| nu hat (MLE) | 144.5 | nu star (bias corrected) | 131.4 |
| MLE Mean (bias corrected) | 0.317 | MLE Sd (bias corrected) | 0.214 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.74 | 90% Percentile | 0.603 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.752 | 95% Percentile | 0.73 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.934 | 99% Percentile | 1.011 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.967 | | |
| 95% WH USL | 1.175 | 95% HW USL | 1.244 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.951 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.116 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1.147 | 90% Percentile (z) | 0.606 |
| 95% UPL (t) | 0.821 | 95% Percentile (z) | 0.776 |
| 95% USL | 1.639 | 99% Percentile (z) | 1.233 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 1.4 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1.4 | 95% BCA Bootstrap UTL with 95% Coverage | 1.004 |
| 95% UPL | 0.916 | 90% Percentile | 0.5 |
| 90% Chebyshev UPL | 1.069 | 95% Percentile | 0.511 |
| 95% Chebyshev UPL | 1.41 | 99% Percentile | 1.145 |
| 95% USL | 1.4 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Chrysene_OL**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 29 | Number of Distinct Observations | 23 |
| | | Number of Missing Observations | 2 |
| Minimum | 0.18 | First Quartile | 0.4 |
| Second Largest | 1.15 | Median | 0.71 |
| Maximum | 1.2 | Third Quartile | 0.96 |
| Mean | 0.697 | SD | 0.331 |
| Coefficient of Variation | 0.475 | Skewness | -0.183 |
| Mean of logged Data | -0.509 | SD of logged Data | 0.602 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.232 | d2max (for USL) | 2.73 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.922 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.132 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.161 | Data appear Normal at 5% Significance Level | |
| Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.435 | 90% Percentile (z) | 1.121 |
| 95% UPL (t) | 1.269 | 95% Percentile (z) | 1.241 |
| 95% USL | 1.6 | 99% Percentile (z) | 1.466 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 1.069 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.751 | Data Not Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.136 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.164 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data follow Appr. Gamma Distribution at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 3.536 | k star (bias corrected MLE) | 3.193 |
| Theta hat (MLE) | 0.197 | Theta star (bias corrected MLE) | 0.218 |
| nu hat (MLE) | 205.1 | nu star (bias corrected) | 185.2 |
| MLE Mean (bias corrected) | 0.697 | MLE Sd (bias corrected) | 0.39 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.468 | 90% Percentile | 1.22 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.512 | 95% Percentile | 1.437 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.801 | 99% Percentile | 1.905 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.89 | | |
| 95% WH USL | 2.179 | 95% HW USL | 2.331 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.87 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.926 | Data Not Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.161 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.161 | Data appear Lognormal at 5% Significance Level | |
| Data appear Approximate Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 2.306 | 90% Percentile (z) | 1.301 |
| 95% UPL (t) | 1.704 | 95% Percentile (z) | 1.619 |
| 95% USL | 3.113 | 99% Percentile (z) | 2.441 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Approximate Normal at 5% Significance Level | | | |

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 29 | 95% UTL with 95% Coverage | 1.2 |
| Approx, f used to compute achieved CC | 1.526 | Approximate Actual Confidence Coefficient achieved by U | 0.774 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1.2 | 95% BCA Bootstrap UTL with 95% Coverage | 1.18 |
| 95% UPL | 1.175 | 90% Percentile | 1.1 |
| 90% Chebyshev UPL | 1.706 | 95% Percentile | 1.13 |
| 95% Chebyshev UPL | 2.163 | 99% Percentile | 1.186 |
| 95% USL | 1.2 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Dibenzo(a,h)anthracene_OL**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 29 | Number of Missing Observations | 2 |
| Number of Distinct Observations | 21 | | |
| Number of Detects | 25 | Number of Non-Detects | 4 |
| Number of Distinct Detects | 17 | Number of Distinct Non-Detects | 4 |
| Minimum Detect | 0.026 | Minimum Non-Detect | 0.0027 |
| Maximum Detect | 0.25 | Maximum Non-Detect | 0.085 |
| Variance Detected | 0.00377 | Percent Non-Detects | 13.79% |
| Mean Detected | 0.127 | SD Detected | 0.0614 |
| Mean of Detected Logged Data | -2.204 | SD of Detected Logged Data | 0.575 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.232 | d2max (for USL) | 2.73 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.954 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.918 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.146 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.173 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 0.111 | KM SD | 0.0688 |
| 95% UTL95% Coverage | 0.265 | 95% KM UPL (t) | 0.23 |
| 90% KM Percentile (z) | 0.199 | 95% KM Percentile (z) | 0.224 |
| 99% KM Percentile (z) | 0.271 | 95% KM USL | 0.299 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 0.111 | SD | 0.0692 |
| 95% UTL95% Coverage | 0.266 | 95% UPL (t) | 0.231 |
| 90% Percentile (z) | 0.2 | 95% Percentile (z) | 0.225 |
| 99% Percentile (z) | 0.272 | 95% USL | 0.3 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.547 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.749 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.179 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.175 | Data Not Gamma Distributed at 5% Significance Level |

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

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 3.762 | k star (bias corrected MLE) | 3.337 |
| Theta hat (MLE) | 0.0337 | Theta star (bias corrected MLE) | 0.038 |
| nu hat (MLE) | 188.1 | nu star (bias corrected) | 166.9 |
| MLE Mean (bias corrected) | 0.127 | | |
| MLE Sd (bias corrected) | 0.0694 | 95% Percentile of Chisquare (2kstar) | 13.59 |

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 | 0.0248 | Mean | 0.114 |
| Maximum | 0.25 | Median | 0.12 |
| SD | 0.0659 | CV | 0.579 |
| k hat (MLE) | 2.555 | k star (bias corrected MLE) | 2.313 |
| Theta hat (MLE) | 0.0445 | Theta star (bias corrected MLE) | 0.0492 |
| nu hat (MLE) | 148.2 | nu star (bias corrected) | 134.2 |
| MLE Mean (bias corrected) | 0.114 | MLE Sd (bias corrected) | 0.0748 |
| 95% Percentile of Chisquare (2kstar) | 10.49 | 90% Percentile | 0.214 |
| 95% Percentile | 0.258 | 99% Percentile | 0.355 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.333 | 0.353 | 95% Approx. Gamma UPL | 0.264 | 0.274 |
| 95% Gamma USL | 0.413 | 0.447 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 0.111 | SD (KM) | 0.0688 |
| Variance (KM) | 0.00473 | SE of Mean (KM) | 0.0131 |
| k hat (KM) | 2.603 | k star (KM) | 2.357 |
| nu hat (KM) | 151 | nu star (KM) | 136.7 |
| theta hat (KM) | 0.0426 | theta star (KM) | 0.0471 |
| 80% gamma percentile (KM) | 0.163 | 90% gamma percentile (KM) | 0.208 |
| 95% gamma percentile (KM) | 0.25 | 99% gamma percentile (KM) | 0.343 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.423 | 0.494 | 95% Approx. Gamma UPL | 0.318 | 0.353 |
| 95% KM Gamma Percentile | 0.302 | 0.333 | 95% Gamma USL | 0.549 | 0.67 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.93 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.918 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.181 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.173 | Data Not Lognormal at 5% Significance Level |

Detected Data appear Approximate Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.114 | Mean in Log Scale | -2.36 |
| SD in Original Scale | 0.0651 | SD in Log Scale | 0.67 |
| 95% UTL95% Coverage | 0.421 | 95% BCA UTL95% Coverage | 0.238 |
| 95% Bootstrap (%) UTL95% Coverage | 0.25 | 95% UPL (t) | 0.301 |
| 90% Percentile (z) | 0.223 | 95% Percentile (z) | 0.284 |
| 99% Percentile (z) | 0.449 | 95% USL | 0.588 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -2.641 | 95% KM UTL (Lognormal)95% Coverage | 1.256 |
| KM SD of Logged Data | 1.285 | 95% KM UPL (Lognormal) | 0.659 |
| 95% KM Percentile Lognormal (z) | 0.591 | 95% KM USL (Lognormal) | 2.383 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.111 | Mean in Log Scale | -2.565 |
| SD in Original Scale | 0.0692 | SD in Log Scale | 1.159 |
| 95% UTL95% Coverage | 1.022 | 95% UPL (t) | 0.571 |
| 90% Percentile (z) | 0.34 | 95% Percentile (z) | 0.517 |
| 99% Percentile (z) | 1.14 | 95% USL | 1.82 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 29 | 95% UTL with95% Coverage | 0.25 |
| Approx, f used to compute achieved CC | 1.526 | Approximate Actual Confidence Coefficient achieved by U | 0.774 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 0.235 |
| 95% USL | 0.25 | 95% KM Chebyshev UPL | 0.416 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Indeno(1,2,3-cd)pyrene**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 25 |
| | | Number of Missing Observations | 1 |
| Minimum | 0.12 | First Quartile | 0.285 |
| Second Largest | 0.88 | Median | 0.49 |
| Maximum | 1.5 | Third Quartile | 0.755 |
| Mean | 0.527 | SD | 0.302 |
| Coefficient of Variation | 0.574 | Skewness | 0.978 |
| Mean of logged Data | -0.819 | SD of logged Data | 0.642 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.912 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.0997 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Normal at 5% Significance Level | |
| Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.198 | 90% Percentile (z) | 0.915 |
| 95% UPL (t) | 1.049 | 95% Percentile (z) | 1.024 |
| 95% USL | 1.357 | 99% Percentile (z) | 1.231 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.608 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.753 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.13 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.161 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 2.962 | k star (bias corrected MLE) | 2.688 |
| Theta hat (MLE) | 0.178 | Theta star (bias corrected MLE) | 0.196 |
| nu hat (MLE) | 177.7 | nu star (bias corrected) | 161.3 |
| MLE Mean (bias corrected) | 0.527 | MLE Sd (bias corrected) | 0.321 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.165 | 90% Percentile | 0.958 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.196 | 95% Percentile | 1.142 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.446 | 99% Percentile | 1.543 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.512 | | |
| 95% WH USL | 1.79 | 95% HW USL | 1.913 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.934 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.153 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1.833 | 90% Percentile (z) | 1.004 |
| 95% UPL (t) | 1.336 | 95% Percentile (z) | 1.267 |
| 95% USL | 2.567 | 99% Percentile (z) | 1.962 |

Nonparametric Distribution Free Background Statistics
Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 1.5 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1.5 | 95% BCA Bootstrap UTL with 95% Coverage | 1.5 |
| 95% UPL | 1.159 | 90% Percentile | 0.802 |
| 90% Chebyshev UPL | 1.449 | 95% Percentile | 0.853 |
| 95% Chebyshev UPL | 1.867 | 99% Percentile | 1.32 |
| 95% USL | 1.5 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs_ID0016|2,3,5-Trimethylnaphthalene**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 6 | Number of Distinct Observations | 6 |
| | | Number of Missing Observations | 25 |
| Minimum | 0.0034 | First Quartile | 0.00463 |
| Second Largest | 0.0133 | Median | 0.00795 |
| Maximum | 0.0164 | Third Quartile | 0.0125 |
| Mean | 0.00887 | SD | 0.00526 |
| Coefficient of Variation | 0.593 | Skewness | 0.465 |
| Mean of logged Data | -4.888 | SD of logged Data | 0.639 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 3.708 | d2max (for USL) | 1.822 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.92 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.788 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.214 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.325 | Data appear Normal at 5% Significance Level |

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.0284 | 90% Percentile (z) | 0.0156 |
| 95% UPL (t) | 0.0203 | 95% Percentile (z) | 0.0175 |
| 95% USL | 0.0184 | 99% Percentile (z) | 0.0211 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.289 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.701 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.19 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.334 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 3.242 | k star (bias corrected MLE) | 1.732 |
| Theta hat (MLE) | 0.00273 | Theta star (bias corrected MLE) | 0.00512 |
| nu hat (MLE) | 38.91 | nu star (bias corrected) | 20.79 |
| MLE Mean (bias corrected) | 0.00887 | MLE Sd (bias corrected) | 0.00674 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.0247 | 90% Percentile | 0.0178 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.0258 | 95% Percentile | 0.022 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.0451 | 99% Percentile | 0.0314 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.0501 | | |
| 95% WH USL | 0.0211 | 95% HW USL | 0.0217 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.934 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.788 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.171 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.325 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.0807 | 90% Percentile (z) | 0.0171 |
| 95% UPL (t) | 0.0303 | 95% Percentile (z) | 0.0216 |
| 95% USL | 0.0242 | 99% Percentile (z) | 0.0334 |

Nonparametric Distribution Free Background Statistics
Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 6 | 95% UTL with 95% Coverage | 0.0164 |
| Approx, f used to compute achieved CC | 0.316 | Approximate Actual Confidence Coefficient achieved by U | 0.265 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.0164 | 95% BCA Bootstrap UTL with 95% Coverage | 0.0164 |
| 95% UPL | 0.0164 | 90% Percentile | 0.0149 |
| 90% Chebyshev UPL | 0.0259 | 95% Percentile | 0.0156 |
| 95% Chebyshev UPL | 0.0336 | 99% Percentile | 0.0162 |
| 95% USL | 0.0164 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**ID0016|2,6-Dimethylnaphthalene_OL**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 5 | Number of Distinct Observations | 5 |
| | | Number of Missing Observations | 24 |
| Minimum | 0.0056 | First Quartile | 0.0075 |
| Second Largest | 0.014 | Median | 0.0078 |
| Maximum | 0.0193 | Third Quartile | 0.014 |
| Mean | 0.0108 | SD | 0.00569 |
| Coefficient of Variation | 0.525 | Skewness | 0.969 |
| Mean of logged Data | -4.63 | SD of logged Data | 0.506 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 4.203 | d2max (for USL) | 1.671 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.88 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.762 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.303 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.343 | Data appear Normal at 5% Significance Level |

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 0.0347 | 90% Percentile (z) | 0.0181 |
| 95% UPL (t) | 0.0241 | 95% Percentile (z) | 0.0202 |
| 95% USL | 0.0203 | 99% Percentile (z) | 0.0241 |

| | | | |
|---|---|---|---|
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.374 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.681 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.305 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.358 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 4.92 | k star (bias corrected MLE) | 2.101 |
| Theta hat (MLE) | 0.0022 | Theta star (bias corrected MLE) | 0.00516 |
| nu hat (MLE) | 49.2 | nu star (bias corrected) | 21.01 |
| MLE Mean (bias corrected) | 0.0108 | MLE Sd (bias corrected) | 0.00748 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.0279 | 90% Percentile | 0.0208 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.0286 | 95% Percentile | 0.0253 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.0518 | 99% Percentile | 0.0352 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.0564 | | |
| 95% WH USL | 0.0216 | 95% HW USL | 0.0218 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.925 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.762 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.271 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.343 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 0.0818 | 90% Percentile (z) | 0.0187 |
| 95% UPL (t) | 0.0318 | 95% Percentile (z) | 0.0224 |
| 95% USL | 0.0227 | 99% Percentile (z) | 0.0317 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 5 | 95% UTL with 95% Coverage | 0.0193 |
| Approx, f used to compute achieved CC | 0.263 | Approximate Actual Confidence Coefficient achieved by U | 0.226 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.0193 | 95% BCA Bootstrap UTL with 95% Coverage | 0.0193 |
| 95% UPL | 0.0193 | 90% Percentile | 0.0172 |
| 90% Chebyshev UPL | 0.0295 | 95% Percentile | 0.0182 |
| 95% Chebyshev UPL | 0.038 | 99% Percentile | 0.0191 |
| 95% USL | 0.0193 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_SVOCs|Total High-molecular-weight PAHs**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 30 | Number of Distinct Observations | 26 |
| | | Number of Missing Observations | 1 |
| Minimum | 1.4 | First Quartile | 3.4 |
| Second Largest | 11 | Median | 6.3 |
| Maximum | 28 | Third Quartile | 8.4 |
| Mean | 6.577 | SD | 4.919 |
| Coefficient of Variation | 0.748 | Skewness | 2.873 |
| Mean of logged Data | 1.667 | SD of logged Data | 0.683 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.22 | d2max (for USL) | 2.745 |

| | | | |
|---|---|---|---|
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.73 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.204 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 17.5 | 90% Percentile (z) | 12.88 |
| 95% UPL (t) | 15.07 | 95% Percentile (z) | 14.67 |
| 95% USL | 20.08 | 99% Percentile (z) | 18.02 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.667 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.128 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.162 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 2.459 | k star (bias corrected MLE) | 2.235 |
| Theta hat (MLE) | 2.675 | Theta star (bias corrected MLE) | 2.943 |
| nu hat (MLE) | 147.5 | nu star (bias corrected) | 134.1 |
| MLE Mean (bias corrected) | 6.577 | MLE Sd (bias corrected) | 4.399 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 15.3 | 90% Percentile | 12.46 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 15.6 | 95% Percentile | 15.07 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 19.27 | 99% Percentile | 20.8 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 20.03 | | |
| 95% WH USL | 24.2 | 95% HW USL | 25.72 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.937 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.927 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.133 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.159 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 24.12 | 90% Percentile (z) | 12.71 |
| 95% UPL (t) | 17.23 | 95% Percentile (z) | 16.29 |
| 95% USL | 34.53 | 99% Percentile (z) | 25.94 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 30 | 95% UTL with 95% Coverage | 28 |
| Approx, f used to compute achieved CC | 1.579 | Approximate Actual Confidence Coefficient achieved by U | 0.785 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 28 | 95% BCA Bootstrap UTL with 95% Coverage | 28 |
| 95% UPL | 18.65 | 90% Percentile | 9.19 |
| 90% Chebyshev UPL | 21.58 | 95% Percentile | 10.55 |
| 95% Chebyshev UPL | 28.37 | 99% Percentile | 23.07 |
| 95% USL | 28 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Petroleum|Diesel Range Organics (C10-C20)**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 4 | Number of Distinct Observations | 4 |
| | | Number of Missing Observations | 24 |
| Minimum | 33 | First Quartile | 34.5 |
| Second Largest | 40 | Median | 37.5 |
| Maximum | 44 | Third Quartile | 41 |
| Mean | 38 | SD | 4.967 |
| Coefficient of Variation | 0.131 | Skewness | 0.392 |
| Mean of logged Data | 3.631 | SD of logged Data | 0.13 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 5.144 | d2max (for USL) | 1.462 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.953 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.748 | Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.227 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.375 | Data appear Normal at 5% Significance Level | |
| Data appear Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 63.55 | 90% Percentile (z) | 44.36 |
| 95% UPL (t) | 51.07 | 95% Percentile (z) | 46.17 |
| 95% USL | 45.26 | 99% Percentile (z) | 49.55 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.271 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.656 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.253 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.394 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 78.84 | k star (bias corrected MLE) | 19.88 |
| Theta hat (MLE) | 0.482 | Theta star (bias corrected MLE) | 1.912 |
| nu hat (MLE) | 630.8 | nu star (bias corrected) | 159 |
| MLE Mean (bias corrected) | 38 | MLE Sd (bias corrected) | 8.523 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 52.34 | 90% Percentile | 49.25 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 52.53 | 95% Percentile | 53.02 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 69.28 | 99% Percentile | 60.58 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 70.24 | | |
| 95% WH USL | 45.51 | 95% HW USL | 45.55 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.957 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.748 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.22 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.375 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 73.66 | 90% Percentile (z) | 44.6 |
| 95% UPL (t) | 53.15 | 95% Percentile (z) | 46.75 |
| 95% USL | 45.66 | 99% Percentile (z) | 51.08 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Normal at 5% Significance Level | | | |

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 4 | 95% UTL with 95% Coverage | 44 |
| Approx, f used to compute achieved CC | 0.211 | Approximate Actual Confidence Coefficient achieved by U | 0.185 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | N/A | 95% BCA Bootstrap UTL with 95% Coverage | N/A |
| 95% UPL | 44 | 90% Percentile | 42.8 |
| 90% Chebyshev UPL | 54.66 | 95% Percentile | 43.4 |
| 95% Chebyshev UPL | 62.2 | 99% Percentile | 43.88 |
| 95% USL | 44 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_Petroleum|TPH-C10-28**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 23 | Number of Distinct Observations | 17 |
| Minimum | 53 | First Quartile | 160 |
| Second Largest | 580 | Median | 210 |
| Maximum | 1100 | Third Quartile | 330 |
| Mean | 293.8 | SD | 225.9 |
| Coefficient of Variation | 0.769 | Skewness | 2.304 |
| Mean of logged Data | 5.467 | SD of logged Data | 0.661 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.328 | d2max (for USL) | 2.624 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.767 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.914 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.202 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.18 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 819.7 | 90% Percentile (z) | 583.3 |
| 95% UPL (t) | 690 | 95% Percentile (z) | 665.4 |
| 95% USL | 886.5 | 99% Percentile (z) | 819.3 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.563 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.753 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.15 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.183 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.466 | k star (bias corrected MLE) | 2.173 |
| Theta hat (MLE) | 119.1 | Theta star (bias corrected MLE) | 135.2 |
| nu hat (MLE) | 113.4 | nu star (bias corrected) | 99.98 |
| MLE Mean (bias corrected) | 293.8 | MLE Sd (bias corrected) | 199.3 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 693.8 | 90% Percentile | 560.5 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 702.8 | 95% Percentile | 679 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 906.3 | 99% Percentile | 940.6 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 937.3 | | |
| 95% WH USL | 1031 | 95% HW USL | 1079 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.975 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.914 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.146 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.18 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1103 | 90% Percentile (z) | 552.2 |
| 95% UPL (t) | 754.7 | 95% Percentile (z) | 702.2 |
| 95% USL | 1341 | 99% Percentile (z) | 1102 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 23 | 95% UTL with 95% Coverage | 1100 |
| Approx, f used to compute achieved CC | 1.211 | Approximate Actual Confidence Coefficient achieved by U | 0.693 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1100 | 95% BCA Bootstrap UTL with 95% Coverage | 1100 |
| 95% UPL | 996 | 90% Percentile | 542 |
| 90% Chebyshev UPL | 986 | 95% Percentile | 578 |
| 95% Chebyshev UPL | 1300 | 99% Percentile | 985.6 |
| 95% USL | 1100 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|2,3,7,8-Tetrachlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 11 | Number of Non-Detects | 10 |
| Number of Distinct Detects | 11 | Number of Distinct Non-Detects | 10 |
| Minimum Detect | 4.10E-08 | Minimum Non-Detect | 2.23E-08 |
| Maximum Detect | 7.20E-07 | Maximum Non-Detect | 3.38E-07 |
| Variance Detected | 5.72E-14 | Percent Non-Detects | 47.62% |
| Mean Detected | 3.03E-07 | SD Detected | 2.39E-07 |
| Mean of Detected Logged Data | -15.4 | SD of Detected Logged Data | 1.005 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.904 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.206 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.251 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 1.88E-07 | KM SD | 2.06E-07 |
| 95% UTL95% Coverage | 6.77E-07 | 95% KM UPL (t) | 5.52E-07 |
| 90% KM Percentile (z) | 4.52E-07 | 95% KM Percentile (z) | 5.27E-07 |
| 99% KM Percentile (z) | 6.67E-07 | 95% KM USL | 7.20E-07 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 1.98E-07 | SD | 2.05E-07 |
| 95% UTL95% Coverage | 6.84E-07 | 95% UPL (t) | 5.60E-07 |
| 90% Percentile (z) | 4.61E-07 | 95% Percentile (z) | 5.35E-07 |
| 99% Percentile (z) | 6.75E-07 | 95% USL | 7.27E-07 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | | | |
|---|---|---|---|---|
| A-D Test Statistic | | 0.38 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | | 0.743 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | | 0.178 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | | 0.26 | 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) | 1.439 | k star (bias corrected MLE) | 1.107 |
| Theta hat (MLE) | 2.10E-07 | Theta star (bias corrected MLE) | 2.73E-07 |
| nu hat (MLE) | 31.67 | nu star (bias corrected) | 24.36 |
| MLE Mean (bias corrected) | 3.03E-07 | | |
| MLE Sd (bias corrected) | 2.88E-07 | 95% Percentile of Chisquare (2kstar) | 6.401 |

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 4.10E-08 | Mean | 0.00476 |
| Maximum | 0.01 | Median | 7.20E-07 |
| SD | 0.00512 | CV | 1.075 |
| k hat (MLE) | 0.156 | k star (bias corrected MLE) | 0.165 |
| Theta hat (MLE) | 0.0306 | Theta star (bias corrected MLE) | 0.0288 |
| nu hat (MLE) | 6.538 | nu star (bias corrected) | 6.937 |
| MLE Mean (bias corrected) | 0.00476 | MLE Sd (bias corrected) | 0.0117 |
| 95% Percentile of Chisquare (2kstar) | 1.782 | 90% Percentile | 0.0143 |
| 95% Percentile | 0.0257 | 99% Percentile | 0.0582 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0466 | 0.0727 | 95% Approx. Gamma UPL | 0.0256 | 0.0336 |
| 95% Gamma USL | 0.0558 | 0.0921 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.88E-07 | SD (KM) | 2.06E-07 |
| Variance (KM) | 4.25E-14 | SE of Mean (KM) | 4.79E-08 |
| k hat (KM) | 0.83 | k star (KM) | 0.743 |
| nu hat (KM) | 34.84 | nu star (KM) | 31.2 |
| theta hat (KM) | 2.26E-07 | theta star (KM) | 2.53E-07 |
| 80% gamma percentile (KM) | 3.08E-07 | 90% gamma percentile (KM) | 4.65E-07 |
| 95% gamma percentile (KM) | 6.26E-07 | 99% gamma percentile (KM) | 1.01E-06 |

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 8.69E-07 | 9.35E-07 | 95% Approx. Gamma UPL | 5.91E-07 | 6.08E-07 |
| 95% KM Gamma Percentile | 5.44E-07 | 5.55E-07 | 95% Gamma USL | 9.82E-07 | 1.07E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.921 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.85 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.192 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.251 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.85E-07 | Mean in Log Scale | -16.06 |
| SD in Original Scale | 2.11E-07 | SD in Log Scale | 1.05 |
| 95% UTL95% Coverage | 1.28E-06 | 95% BCA UTL95% Coverage | 7.20E-07 |
| 95% Bootstrap (%) UTL95% Coverage | 7.20E-07 | 95% UPL (t) | 6.79E-07 |
| 90% Percentile (z) | 4.09E-07 | 95% Percentile (z) | 5.98E-07 |
| 99% Percentile (z) | 1.22E-06 | 95% USL | 1.60E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -16.07 | 95% KM UTL (Lognormal)95% Coverage | 1.37E-06 |
| KM SD of Logged Data | 1.082 | 95% KM UPL (Lognormal) | 7.10E-07 |
| 95% KM Percentile Lognormal (z) | 6.23E-07 | 95% KM USL (Lognormal) | 1.72E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.98E-07 | Mean in Log Scale | -15.91 |
| SD in Original Scale | 2.05E-07 | SD in Log Scale | 1.034 |
| 95% UTL95% Coverage | 1.42E-06 | 95% UPL (t) | 7.61E-07 |
| 90% Percentile (z) | 4.62E-07 | 95% Percentile (z) | 6.72E-07 |
| 99% Percentile (z) | 1.36E-06 | 95% USL | 1.77E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 7.20E-07 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 7.10E-07 |
| 95% USL | 7.20E-07 | 95% KM Chebyshev UPL | 1.11E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,7,8-Pentachlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 | | |
| Number of Detects | 10 | Number of Non-Detects | 11 |
| Number of Distinct Detects | 10 | Number of Distinct Non-Detects | 10 |
| Minimum Detect | 2.19E-07 | Minimum Non-Detect | 2.61E-07 |
| Maximum Detect | 2.20E-06 | Maximum Non-Detect | 1.60E-06 |
| Variance Detected | 6.01E-13 | Percent Non-Detects | 52.38% |
| Mean Detected | 1.09E-06 | SD Detected | 7.75E-07 |
| Mean of Detected Logged Data | -14.01 | SD of Detected Logged Data | 0.843 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.872 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.842 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.234 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.262 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 6.83E-07 | KM SD | 6.54E-07 |
| 95% UTL95% Coverage | 2.23E-06 | 95% KM UPL (t) | 1.84E-06 |
| 90% KM Percentile (z) | 1.52E-06 | 95% KM Percentile (z) | 1.76E-06 |
| 99% KM Percentile (z) | 2.20E-06 | 95% KM USL | 2.37E-06 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 7.34E-07 | SD | 6.50E-07 |
| 95% UTL95% Coverage | 2.27E-06 | 95% UPL (t) | 1.88E-06 |
| 90% Percentile (z) | 1.57E-06 | 95% Percentile (z) | 1.80E-06 |
| 99% Percentile (z) | 2.25E-06 | 95% USL | 2.41E-06 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.498 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.736 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.187 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.27 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.903 | k star (bias corrected MLE) | 1.399 |
| Theta hat (MLE) | 5.74E-07 | Theta star (bias corrected MLE) | 7.81E-07 |
| nu hat (MLE) | 38.07 | nu star (bias corrected) | 27.98 |
| MLE Mean (bias corrected) | 1.09E-06 | | |
| MLE Sd (bias corrected) | 9.24E-07 | 95% Percentile of Chisquare (2kstar) | 7.462 |

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 | 2.19E-07 | Mean | 0.00524 |
| Maximum | 0.01 | Median | 0.01 |
| SD | 0.00512 | CV | 0.977 |
| k hat (MLE) | 0.193 | k star (bias corrected MLE) | 0.197 |
| Theta hat (MLE) | 0.0271 | Theta star (bias corrected MLE) | 0.0266 |
| nu hat (MLE) | 8.109 | nu star (bias corrected) | 8.284 |
| MLE Mean (bias corrected) | 0.00524 | MLE Sd (bias corrected) | 0.0118 |
| 95% Percentile of Chisquare (2kstar) | 2.04 | 90% Percentile | 0.0158 |
| 95% Percentile | 0.0271 | 99% Percentile | 0.0581 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0495 | 0.0771 | 95% Approx. Gamma UPL | 0.0279 | 0.0369 |
| 95% Gamma USL | 0.059 | 0.0966 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 6.83E-07 | SD (KM) | 6.54E-07 |
| Variance (KM) | 4.28E-13 | SE of Mean (KM) | 1.54E-07 |
| k hat (KM) | 1.089 | k star (KM) | 0.965 |
| nu hat (KM) | 45.74 | nu star (KM) | 40.54 |
| theta hat (KM) | 6.27E-07 | theta star (KM) | 7.07E-07 |
| 80% gamma percentile (KM) | 1.10E-06 | 90% gamma percentile (KM) | 1.59E-06 |
| 95% gamma percentile (KM) | 2.07E-06 | 99% gamma percentile (KM) | 3.20E-06 |

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 2.64E-06 | 2.75E-06 | 95% Approx. Gamma UPL | 1.89E-06 | 1.91E-06 |
| 95% KM Gamma Percentile | 1.76E-06 | 1.76E-06 | 95% Gamma USL | 2.94E-06 | 3.10E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.905 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.842 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.185 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 6.63E-07 | Mean in Log Scale | -14.62 |
| SD in Original Scale | 6.71E-07 | SD in Log Scale | 0.847 |
| 95% UTL95% Coverage | 3.35E-06 | 95% BCA UTL95% Coverage | 2.20E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 2.20E-06 | 95% UPL (t) | 2.01E-06 |
| 90% Percentile (z) | 1.33E-06 | 95% Percentile (z) | 1.81E-06 |
| 99% Percentile (z) | 3.23E-06 | 95% USL | 4.00E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -14.58 | 95% KM UTL (Lognormal)95% Coverage | 3.30E-06 |
| KM SD of Logged Data | 0.825 | 95% KM UPL (Lognormal) | 2.00E-06 |
| 95% KM Percentile Lognormal (z) | 1.81E-06 | 95% KM USL (Lognormal) | 3.92E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 7.34E-07 | Mean in Log Scale | -14.48 |
| SD in Original Scale | 6.50E-07 | SD in Log Scale | 0.866 |
| 95% UTL95% Coverage | 4.02E-06 | 95% UPL (t) | 2.38E-06 |
| 90% Percentile (z) | 1.57E-06 | 95% Percentile (z) | 2.15E-06 |
| 99% Percentile (z) | 3.87E-06 | 95% USL | 4.83E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 2.20E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 2.19E-06 |
| 95% USL | 2.20E-06 | 95% KM Chebyshev UPL | 3.60E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 | | |
| Number of Detects | 16 | Number of Non-Detects | 5 |
| Number of Distinct Detects | 16 | Number of Distinct Non-Detects | 5 |
| Minimum Detect | 9.89E-07 | Minimum Non-Detect | 9.20E-07 |
| Maximum Detect | 1.20E-05 | Maximum Non-Detect | 4.80E-06 |
| Variance Detected | 1.08E-11 | Percent Non-Detects | 23.81% |
| Mean Detected | 4.38E-06 | SD Detected | 3.28E-06 |
| Mean of Detected Logged Data | -12.62 | SD of Detected Logged Data | 0.791 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.885 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.887 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.216 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.213 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 3.61E-06 | KM SD | 3.10E-06 |
| 95% UTL95% Coverage | 1.10E-05 | 95% KM UPL (t) | 9.09E-06 |
| 90% KM Percentile (z) | 7.59E-06 | 95% KM Percentile (z) | 8.72E-06 |
| 99% KM Percentile (z) | 1.08E-05 | 95% KM USL | 1.16E-05 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 3.58E-06 | SD | 3.22E-06 |
| 95% UTL95% Coverage | 1.12E-05 | 95% UPL (t) | 9.26E-06 |
| 90% Percentile (z) | 7.70E-06 | 95% Percentile (z) | 8.87E-06 |
| 99% Percentile (z) | 1.11E-05 | 95% USL | 1.19E-05 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.386 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.751 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.179 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.218 | 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) | 1.946 | k star (bias corrected MLE) | 1.623 |
| Theta hat (MLE) | 2.25E-06 | Theta star (bias corrected MLE) | 2.70E-06 |
| nu hat (MLE) | 62.29 | nu star (bias corrected) | 51.94 |
| MLE Mean (bias corrected) | 4.38E-06 | | |
| MLE Sd (bias corrected) | 3.44E-06 | 95% Percentile of Chisquare (2kstar) | 8.238 |

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 | 9.89E-07 | Mean | 0.00238 |
| Maximum | 0.01 | Median | 5.20E-06 |
| SD | 0.00436 | CV | 1.83 |
| k hat (MLE) | 0.163 | k star (bias corrected MLE) | 0.171 |
| Theta hat (MLE) | 0.0147 | Theta star (bias corrected MLE) | 0.0139 |
| nu hat (MLE) | 6.829 | nu star (bias corrected) | 7.187 |
| MLE Mean (bias corrected) | 0.00238 | MLE Sd (bias corrected) | 0.00576 |
| 95% Percentile of Chisquare (2kstar) | 1.832 | 90% Percentile | 0.00717 |
| 95% Percentile | 0.0128 | 99% Percentile | 0.0286 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0197 | 0.0234 | 95% Approx. Gamma UPL | 0.0103 | 0.0104 |
| 95% Gamma USL | 0.024 | 0.03 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 3.61E-06 | SD (KM) | 3.10E-06 |
| Variance (KM) | 9.63E-12 | SE of Mean (KM) | 7.01E-07 |
| k hat (KM) | 1.356 | k star (KM) | 1.194 |
| nu hat (KM) | 56.95 | nu star (KM) | 50.15 |
| theta hat (KM) | 2.67E-06 | theta star (KM) | 3.03E-06 |
| 80% gamma percentile (KM) | 5.73E-06 | 90% gamma percentile (KM) | 7.97E-06 |
| 95% gamma percentile (KM) | 1.02E-05 | 99% gamma percentile (KM) | 1.52E-05 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.36E-05 | 1.43E-05 | 95% Approx. Gamma UPL | 9.77E-06 | 9.99E-06 |
| 95% KM Gamma Percentile | 9.12E-06 | 9.26E-06 | 95% Gamma USL | 1.51E-05 | 1.61E-05 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.946 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.139 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.56E-06 | Mean in Log Scale | -12.94 |
| SD in Original Scale | 3.22E-06 | SD in Log Scale | 0.925 |
| 95% UTL95% Coverage | 2.16E-05 | 95% BCA UTL95% Coverage | 1.20E-05 |
| 95% Bootstrap (%) UTL95% Coverage | 1.20E-05 | 95% UPL (t) | 1.23E-05 |
| 90% Percentile (z) | 7.88E-06 | 95% Percentile (z) | 1.10E-05 |
| 99% Percentile (z) | 2.07E-05 | 95% USL | 2.62E-05 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -12.88 | 95% KM UTL (Lognormal)95% Coverage | 1.82E-05 |
| KM SD of Logged Data | 0.828 | 95% KM UPL (Lognormal) | 1.10E-05 |
| 95% KM Percentile Lognormal (z) | 9.96E-06 | 95% KM USL (Lognormal) | 2.16E-05 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.58E-06 | Mean in Log Scale | -12.94 |
| SD in Original Scale | 3.22E-06 | SD in Log Scale | 0.952 |
| 95% UTL95% Coverage | 2.29E-05 | 95% UPL (t) | 1.29E-05 |
| 90% Percentile (z) | 8.11E-06 | 95% Percentile (z) | 1.15E-05 |
| 99% Percentile (z) | 2.19E-05 | 95% USL | 2.79E-05 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 1.20E-05 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.17E-05 |
| 95% USL | 1.20E-05 | 95% KM Chebyshev UPL | 1.75E-05 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 16 | Number of Non-Detects | 5 |
| Number of Distinct Detects | 16 | Number of Distinct Non-Detects | 5 |
| Minimum Detect | 3.75E-07 | Minimum Non-Detect | 1.40E-07 |
| Maximum Detect | 4.70E-06 | Maximum Non-Detect | 2.00E-06 |
| Variance Detected | 1.93E-12 | Percent Non-Detects | 23.81% |
| Mean Detected | 1.92E-06 | SD Detected | 1.39E-06 |
| Mean of Detected Logged Data | -13.45 | SD of Detected Logged Data | 0.832 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.905 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.199 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 1.55E-06 | KM SD | 1.36E-06 |
| 95% UTL95% Coverage | 4.77E-06 | 95% KM UPL (t) | 3.94E-06 |
| 90% KM Percentile (z) | 3.29E-06 | 95% KM Percentile (z) | 3.78E-06 |
| 99% KM Percentile (z) | 4.71E-06 | 95% KM USL | 5.05E-06 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 1.55E-06 | SD | 1.39E-06 |
| 95% UTL95% Coverage | 4.85E-06 | 95% UPL (t) | 4.01E-06 |
| 90% Percentile (z) | 3.34E-06 | 95% Percentile (z) | 3.84E-06 |
| 99% Percentile (z) | 4.79E-06 | 95% USL | 5.14E-06 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

| | | | |
|---|---|---|---|
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.342 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.751 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.135 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.218 | 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) | 1.874 | k star (bias corrected MLE) | 1.564 |
| Theta hat (MLE) | 1.03E-06 | Theta star (bias corrected MLE) | 1.23E-06 |
| nu hat (MLE) | 59.97 | nu star (bias corrected) | 50.06 |
| MLE Mean (bias corrected) | 1.92E-06 | | |
| MLE Sd (bias corrected) | 1.54E-06 | 95% Percentile of Chisquare (2kstar) | 8.037 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 3.75E-07 | Mean | 0.00238 |
| Maximum | 0.01 | Median | 2.32E-06 |
| SD | 0.00436 | CV | 1.832 |
| k hat (MLE) | 0.146 | k star (bias corrected MLE) | 0.156 |
| Theta hat (MLE) | 0.0164 | Theta star (bias corrected MLE) | 0.0152 |
| nu hat (MLE) | 6.112 | nu star (bias corrected) | 6.572 |
| MLE Mean (bias corrected) | 0.00238 | MLE Sd (bias corrected) | 0.00602 |
| 95% Percentile of Chisquare (2kstar) | 1.708 | 90% Percentile | 0.0071 |
| 95% Percentile | 0.013 | 99% Percentile | 0.03 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0199 | 0.0239 | 95% Approx. Gamma UPL | 0.0103 | 0.0103 |
| 95% Gamma USL | 0.0243 | 0.0308 | | | |

| | | | |
|---|---|---|---|
| Estimates of Gamma Parameters using KM Estimates | | | |
| Mean (KM) | 1.55E-06 | SD (KM) | 1.36E-06 |
| Variance (KM) | 1.84E-12 | SE of Mean (KM) | 3.07E-07 |
| k hat (KM) | 1.305 | k star (KM) | 1.151 |
| nu hat (KM) | 54.82 | nu star (KM) | 48.32 |
| theta hat (KM) | 1.19E-06 | theta star (KM) | 1.35E-06 |
| 80% gamma percentile (KM) | 2.46E-06 | 90% gamma percentile (KM) | 3.45E-06 |
| 95% gamma percentile (KM) | 4.42E-06 | 99% gamma percentile (KM) | 6.66E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 6.55E-06 | 7.16E-06 | 95% Approx. Gamma UPL | 4.59E-06 | 4.81E-06 |
| 95% KM Gamma Percentile | 4.25E-06 | 4.42E-06 | 95% Gamma USL | 7.34E-06 | 8.15E-06 |

| | | | |
|---|---|---|---|
| Lognormal GOF Test on Detected Observations Only | | | |
| Shapiro Wilk Test Statistic | 0.939 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.153 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Lognormal at 5% Significance Level | |
| Detected Data appear Lognormal at 5% Significance Level | | | |

| | | | |
|---|---|---|---|
| Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects | | | |
| Mean in Original Scale | 1.55E-06 | Mean in Log Scale | -13.79 |
| SD in Original Scale | 1.38E-06 | SD in Log Scale | 0.975 |
| 95% UTL95% Coverage | 1.03E-05 | 95% BCA UTL95% Coverage | 4.70E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 4.70E-06 | 95% UPL (t) | 5.73E-06 |
| 90% Percentile (z) | 3.57E-06 | 95% Percentile (z) | 5.09E-06 |
| 99% Percentile (z) | 9.90E-06 | 95% USL | 1.27E-05 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -13.84 | 95% KM UTL (Lognormal)95% Coverage | 1.13E-05 |
| KM SD of Logged Data | 1.032 | 95% KM UPL (Lognormal) | 6.06E-06 |
| 95% KM Percentile Lognormal (z) | 5.35E-06 | 95% KM USL (Lognormal) | 1.41E-05 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.55E-06 | Mean in Log Scale | -13.86 |
| SD in Original Scale | 1.39E-06 | SD in Log Scale | 1.12 |
| 95% UTL95% Coverage | 1.36E-05 | 95% UPL (t) | 6.92E-06 |
| 90% Percentile (z) | 4.03E-06 | 95% Percentile (z) | 6.05E-06 |
| 99% Percentile (z) | 1.30E-05 | 95% USL | 1.72E-05 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 4.70E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 4.62E-06 |
| 95% USL | 4.70E-06 | 95% KM Chebyshev UPL | 7.60E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 17 | Number of Non-Detects | 4 |
| Number of Distinct Detects | 16 | Number of Distinct Non-Detects | 4 |
| Minimum Detect | 8.54E-07 | Minimum Non-Detect | 1.40E-06 |
| Maximum Detect | 1.10E-05 | Maximum Non-Detect | 5.50E-06 |
| Variance Detected | 1.21E-11 | Percent Non-Detects | 19.05% |
| Mean Detected | 4.57E-06 | SD Detected | 3.47E-06 |
| Mean of Detected Logged Data | -12.62 | SD of Detected Logged Data | 0.872 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.877 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.892 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.185 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.207 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 3.96E-06 | KM SD | 3.30E-06 |
| 95% UTL95% Coverage | 1.18E-05 | 95% KM UPL (t) | 9.79E-06 |
| 90% KM Percentile (z) | 8.19E-06 | 95% KM Percentile (z) | 9.39E-06 |
| 99% KM Percentile (z) | 1.16E-05 | 95% KM USL | 1.25E-05 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 3.95E-06 | SD | 3.40E-06 |
| 95% UTL95% Coverage | 1.20E-05 | 95% UPL (t) | 9.94E-06 |
| 90% Percentile (z) | 8.30E-06 | 95% Percentile (z) | 9.53E-06 |
| 99% Percentile (z) | 1.18E-05 | 95% USL | 1.27E-05 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.549 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.753 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.153 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.212 | 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) | 1.688 | k star (bias corrected MLE) | 1.429 |
| Theta hat (MLE) | 2.71E-06 | Theta star (bias corrected MLE) | 3.20E-06 |
| nu hat (MLE) | 57.39 | nu star (bias corrected) | 48.59 |
| MLE Mean (bias corrected) | 4.57E-06 | | |
| MLE Sd (bias corrected) | 3.82E-06 | 95% Percentile of Chisquare (2kstar) | 7.568 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 8.54E-07 | Mean | 0.00191 |
| Maximum | 0.01 | Median | 5.30E-06 |
| SD | 0.00402 | CV | 2.107 |
| k hat (MLE) | 0.158 | k star (bias corrected MLE) | 0.167 |
| Theta hat (MLE) | 0.0121 | Theta star (bias corrected MLE) | 0.0114 |
| nu hat (MLE) | 6.63 | nu star (bias corrected) | 7.016 |
| MLE Mean (bias corrected) | 0.00191 | MLE Sd (bias corrected) | 0.00467 |
| 95% Percentile of Chisquare (2kstar) | 1.798 | 90% Percentile | 0.00573 |
| 95% Percentile | 0.0103 | 99% Percentile | 0.0232 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0146 | 0.0161 | 95% Approx. Gamma UPL | 0.0075 | 0.00705 |
| 95% Gamma USL | 0.0179 | 0.0207 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 3.96E-06 | SD (KM) | 3.30E-06 |
| Variance (KM) | 1.09E-11 | SE of Mean (KM) | 7.46E-07 |
| k hat (KM) | 1.441 | k star (KM) | 1.267 |
| nu hat (KM) | 60.51 | nu star (KM) | 53.2 |
| theta hat (KM) | 2.75E-06 | theta star (KM) | 3.13E-06 |
| 80% gamma percentile (KM) | 6.24E-06 | 90% gamma percentile (KM) | 8.61E-06 |
| 95% gamma percentile (KM) | 1.09E-05 | 99% gamma percentile (KM) | 1.62E-05 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.52E-05 | 1.62E-05 | 95% Approx. Gamma UPL | 1.09E-05 | 1.12E-05 |
| 95% KM Gamma Percentile | 1.02E-05 | 1.04E-05 | 95% Gamma USL | 1.70E-05 | 1.83E-05 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.919 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.892 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.148 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.96E-06 | Mean in Log Scale | -12.79 |
| SD in Original Scale | 3.36E-06 | SD in Log Scale | 0.865 |
| 95% UTL95% Coverage | 2.16E-05 | 95% BCA UTL95% Coverage | 1.10E-05 |
| 95% Bootstrap (%) UTL95% Coverage | 1.10E-05 | 95% UPL (t) | 1.28E-05 |
| 90% Percentile (z) | 8.43E-06 | 95% Percentile (z) | 1.15E-05 |
| 99% Percentile (z) | 2.08E-05 | 95% USL | 2.59E-05 |

| | | | |
|---|---|---|---|
| Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution | | | |
| KM Mean of Logged Data | -12.8 | 95% KM UTL (Lognormal)95% Coverage | 2.14E-05 |
| KM SD of Logged Data | 0.866 | 95% KM UPL (Lognormal) | 1.27E-05 |
| 95% KM Percentile Lognormal (z) | 1.14E-05 | 95% KM USL (Lognormal) | 2.57E-05 |

| | | | |
|---|---|---|---|
| Background DL/2 Statistics Assuming Lognormal Distribution | | | |
| Mean in Original Scale | 3.95E-06 | Mean in Log Scale | -12.83 |
| SD in Original Scale | 3.40E-06 | SD in Log Scale | 0.929 |
| 95% UTL95% Coverage | 2.42E-05 | 95% UPL (t) | 1.38E-05 |
| 90% Percentile (z) | 8.81E-06 | 95% Percentile (z) | 1.23E-05 |
| 99% Percentile (z) | 2.32E-05 | 95% USL | 2.94E-05 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 1.10E-05 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.09E-05 |
| 95% USL | 1.10E-05 | 95% KM Chebyshev UPL | 1.87E-05 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin** 1,2,3,4,6,7,

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Distinct Observations | 21 |
| | | Number of Missing Observations | 10 |
| Minimum | 1.70E-05 | First Quartile | 4.38E-05 |
| Second Largest | 2.40E-04 | Median | 7.10E-05 |
| Maximum | 2.60E-04 | Third Quartile | 1.50E-04 |
| Mean | 1.03E-04 | SD | 7.73E-05 |
| Coefficient of Variation | 0.748 | Skewness | 0.742 |
| Mean of logged Data | -9.485 | SD of logged Data | 0.848 |

| | | | |
|---|---|---|---|
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

| | | |
|---|---|---|
| Normal GOF Test | | |
| Shapiro Wilk Test Statistic | 0.893 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.908 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.201 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.188 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

| | | | |
|---|---|---|---|
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 2.87E-04 | 90% Percentile (z) | 2.03E-04 |
| 95% UPL (t) | 2.40E-04 | 95% Percentile (z) | 2.31E-04 |
| 95% USL | 3.03E-04 | 99% Percentile (z) | 2.83E-04 |

| | | |
|---|---|---|
| Gamma GOF Test | | |
| A-D Test Statistic | 0.371 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.113 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.192 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.771 | k star (bias corrected MLE) | 1.549 |
| Theta hat (MLE) | 5.84E-05 | Theta star (bias corrected MLE) | 6.67E-05 |
| nu hat (MLE) | 74.36 | nu star (bias corrected) | 65.07 |
| MLE Mean (bias corrected) | 1.03E-04 | MLE Sd (bias corrected) | 8.31E-05 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 2.77E-04 | 90% Percentile | 2.14E-04 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 2.88E-04 | 95% Percentile | 2.66E-04 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 3.81E-04 | 99% Percentile | 3.85E-04 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 4.09E-04 | | |
| 95% WH USL | 4.22E-04 | 95% HW USL | 4.59E-04 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.953 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.908 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.118 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.188 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 5.67E-04 | 90% Percentile (z) | 2.25E-04 |
| 95% UPL (t) | 3.39E-04 | 95% Percentile (z) | 3.06E-04 |
| 95% USL | 6.77E-04 | 99% Percentile (z) | 5.46E-04 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with 95% Coverage | 2.60E-04 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 2.60E-04 | 95% BCA Bootstrap UTL with 95% Coverage | 2.60E-04 |
| 95% UPL | 2.58E-04 | 90% Percentile | 2.25E-04 |
| 90% Chebyshev UPL | 3.41E-04 | 95% Percentile | 2.40E-04 |
| 95% Chebyshev UPL | 4.48E-04 | 99% Percentile | 2.56E-04 |
| 95% USL | 2.60E-04 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|Octachlorochlorodibenzo-p-dioxin**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Distinct Observations | 20 |
| | | Number of Missing Observations | 10 |
| Minimum | 5.20E-04 | First Quartile | 0.0014 |
| Second Largest | 0.00775 | Median | 0.00255 |
| Maximum | 0.008 | Third Quartile | 0.0053 |
| Mean | 0.00342 | SD | 0.00246 |
| Coefficient of Variation | 0.72 | Skewness | 0.618 |
| Mean of logged Data | -5.987 | SD of logged Data | 0.869 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.903 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.908 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.17 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.188 | Data appear Normal at 5% Significance Level |

Data appear Approximate Normal at 5% Significance Level

| | | | |
|---|---|---|---|
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 0.00925 | 90% Percentile (z) | 0.00657 |
| 95% UPL (t) | 0.00776 | 95% Percentile (z) | 0.00746 |
| 95% USL | 0.00976 | 99% Percentile (z) | 0.00914 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.361 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.12 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.192 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 1.772 | k star (bias corrected MLE) | 1.55 |
| Theta hat (MLE) | 0.00193 | Theta star (bias corrected MLE) | 0.0022 |
| nu hat (MLE) | 74.41 | nu star (bias corrected) | 65.11 |
| MLE Mean (bias corrected) | 0.00342 | MLE Sd (bias corrected) | 0.00274 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 0.00918 | 90% Percentile | 0.00706 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 0.00958 | 95% Percentile | 0.0088 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 0.0126 | 99% Percentile | 0.0127 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 0.0136 | | |
| 95% WH USL | 0.014 | 95% HW USL | 0.0153 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.937 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.908 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.142 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.188 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |
| | | | |
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 0.0197 | 90% Percentile (z) | 0.00765 |
| 95% UPL (t) | 0.0116 | 95% Percentile (z) | 0.0105 |
| 95% USL | 0.0236 | 99% Percentile (z) | 0.019 |
| | | | |
| Nonparametric Distribution Free Background Statistics | | | |
| Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 21 | 95% UTL with 95% Coverage | 0.008 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 0.008 | 95% BCA Bootstrap UTL with 95% Coverage | 0.008 |
| 95% UPL | 0.00798 | 90% Percentile | 0.0076 |
| 90% Chebyshev UPL | 0.011 | 95% Percentile | 0.00775 |
| 95% Chebyshev UPL | 0.0144 | 99% Percentile | 0.00795 |
| 95% USL | 0.008 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**2,3,7,8-TCDF**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Distinct Observations | 19 |
| | | Number of Missing Observations | 10 |
| Minimum | 1.57E-07 | First Quartile | 4.50E-07 |
| Second Largest | 2.45E-06 | Median | 5.75E-07 |
| Maximum | 3.30E-06 | Third Quartile | 1.00E-06 |
| Mean | 8.84E-07 | SD | 7.61E-07 |
| Coefficient of Variation | N/A | Skewness | 2.11 |
| Mean of logged Data | -14.21 | SD of logged Data | 0.749 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.756 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.908 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.249 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.188 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 2.69E-06 | 90% Percentile (z) | 1.86E-06 |
| 95% UPL (t) | 2.23E-06 | 95% Percentile (z) | 2.14E-06 |
| 95% USL | 2.85E-06 | 99% Percentile (z) | 2.66E-06 |

Gamma GOF Test

| | | |
|---|---|---|
| A-D Test Statistic | 0.581 | Anderson-Darling Gamma GOF Test |
| 5% A-D Critical Value | 0.754 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.149 | Kolmogorov-Smirnov Gamma GOF Test |
| 5% K-S Critical Value | 0.192 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.967 | k star (bias corrected MLE) | 1.718 |
| Theta hat (MLE) | 4.50E-07 | Theta star (bias corrected MLE) | 5.15E-07 |
| nu hat (MLE) | 82.61 | nu star (bias corrected) | 72.14 |
| MLE Mean (bias corrected) | 8.84E-07 | MLE Sd (bias corrected) | 6.75E-07 |

Background Statistics Assuming Gamma Distribution

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 2.27E-06 | 90% Percentile | 1.78E-06 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 2.30E-06 | 95% Percentile | 2.20E-06 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 3.08E-06 | 99% Percentile | 3.14E-06 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 3.21E-06 | | |
| 95% WH USL | 3.40E-06 | 95% HW USL | 3.58E-06 |

Lognormal GOF Test

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.97 | Shapiro Wilk Lognormal GOF Test |
| 5% Shapiro Wilk Critical Value | 0.908 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.113 | Lilliefors Lognormal GOF Test |
| 5% Lilliefors Critical Value | 0.188 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 3.96E-06 | 90% Percentile (z) | 1.75E-06 |
| 95% UPL (t) | 2.52E-06 | 95% Percentile (z) | 2.30E-06 |
| 95% USL | 4.64E-06 | 99% Percentile (z) | 3.83E-06 |

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with 95% Coverage | 3.30E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 3.30E-06 | 95% BCA Bootstrap UTL with 95% Coverage | 3.30E-06 |
| 95% UPL | 3.22E-06 | 90% Percentile | 1.60E-06 |
| 90% Chebyshev UPL | 3.22E-06 | 95% Percentile | 2.45E-06 |
| 95% Chebyshev UPL | 4.28E-06 | 99% Percentile | 3.13E-06 |
| 95% USL | 3.30E-06 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**1,2,3,7,8-PeCDF**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 21 | | |
| Number of Detects | 10 | Number of Non-Detects | 11 |
| Number of Distinct Detects | 10 | Number of Distinct Non-Detects | 11 |
| Minimum Detect | 2.40E-07 | Minimum Non-Detect | 4.34E-08 |
| Maximum Detect | 1.70E-06 | Maximum Non-Detect | 5.70E-07 |
| Variance Detected | 2.46E-13 | Percent Non-Detects | 52.38% |
| Mean Detected | 6.46E-07 | SD Detected | 4.96E-07 |
| Mean of Detected Logged Data | -14.5 | SD of Detected Logged Data | 0.735 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.836 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.842 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.206 | 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) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 3.53E-07 | KM SD | 4.33E-07 |
| 95% UTL95% Coverage | 1.38E-06 | 95% KM UPL (t) | 1.12E-06 |
| 90% KM Percentile (z) | 9.08E-07 | 95% KM Percentile (z) | 1.07E-06 |
| 99% KM Percentile (z) | 1.36E-06 | 95% KM USL | 1.47E-06 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 3.73E-07 | SD | 4.30E-07 |
| 95% UTL95% Coverage | 1.39E-06 | 95% UPL (t) | 1.13E-06 |
| 90% Percentile (z) | 9.23E-07 | 95% Percentile (z) | 1.08E-06 |
| 99% Percentile (z) | 1.37E-06 | 95% USL | 1.48E-06 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.536 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.735 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.232 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.27 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 2.161 | k star (bias corrected MLE) | 1.58 |
| Theta hat (MLE) | 2.99E-07 | Theta star (bias corrected MLE) | 4.09E-07 |
| nu hat (MLE) | 43.23 | nu star (bias corrected) | 31.59 |
| MLE Mean (bias corrected) | 6.46E-07 | | |
| MLE Sd (bias corrected) | 5.14E-07 | 95% Percentile of Chisquare (2kstar) | 8.089 |

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 | 2.40E-07 | Mean | 0.00524 |
| Maximum | 0.01 | Median | 0.01 |
| SD | 0.00512 | CV | 0.977 |
| k hat (MLE) | 0.183 | k star (bias corrected MLE) | 0.189 |
| Theta hat (MLE) | 0.0286 | Theta star (bias corrected MLE) | 0.0277 |
| nu hat (MLE) | 7.704 | nu star (bias corrected) | 7.937 |
| MLE Mean (bias corrected) | 0.00524 | MLE Sd (bias corrected) | 0.0121 |
| 95% Percentile of Chisquare (2kstar) | 1.976 | 90% Percentile | 0.0158 |
| 95% Percentile | 0.0274 | 99% Percentile | 0.0595 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0499 | 0.0786 | 95% Approx. Gamma UPL | 0.0281 | 0.0374 |
| 95% Gamma USL | 0.0595 | 0.0987 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 3.53E-07 | SD (KM) | 4.33E-07 |
| Variance (KM) | 1.88E-13 | SE of Mean (KM) | 1.01E-07 |
| k hat (KM) | 0.662 | k star (KM) | 0.599 |
| nu hat (KM) | 27.8 | nu star (KM) | 25.16 |
| theta hat (KM) | 5.33E-07 | theta star (KM) | 5.89E-07 |
| 80% gamma percentile (KM) | 5.81E-07 | 90% gamma percentile (KM) | 9.17E-07 |
| 95% gamma percentile (KM) | 1.27E-06 | 99% gamma percentile (KM) | 2.12E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.81E-06 | 1.99E-06 | 95% Approx. Gamma UPL | 1.19E-06 | 1.24E-06 |
| 95% KM Gamma Percentile | 1.09E-06 | 1.12E-06 | 95% Gamma USL | 2.06E-06 | 2.31E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.883 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.842 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.23 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.63E-07 | Mean in Log Scale | -15.34 |
| SD in Original Scale | 4.33E-07 | SD in Log Scale | 0.98 |
| 95% UTL95% Coverage | 2.22E-06 | 95% BCA UTL95% Coverage | 1.70E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 1.70E-06 | 95% UPL (t) | 1.23E-06 |
| 90% Percentile (z) | 7.63E-07 | 95% Percentile (z) | 1.09E-06 |
| 99% Percentile (z) | 2.12E-06 | 95% USL | 2.72E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -15.61 | 95% KM UTL (Lognormal)95% Coverage | 3.36E-06 |
| KM SD of Logged Data | 1.266 | 95% KM UPL (Lognormal) | 1.56E-06 |
| 95% KM Percentile Lognormal (z) | 1.34E-06 | 95% KM USL (Lognormal) | 4.38E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.73E-07 | Mean in Log Scale | -15.33 |
| SD in Original Scale | 4.30E-07 | SD in Log Scale | 1.07 |
| 95% UTL95% Coverage | 2.77E-06 | 95% UPL (t) | 1.45E-06 |
| 90% Percentile (z) | 8.63E-07 | 95% Percentile (z) | 1.27E-06 |
| 99% Percentile (z) | 2.64E-06 | 95% USL | 3.47E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 1.70E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1.65E-06 |
| 95% USL | 1.70E-06 | 95% KM Chebyshev UPL | 2.29E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|2,3,4,7,8-Pentachlorodibenzofuran**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 | | |
| Number of Detects | 16 | Number of Non-Detects | 5 |
| Number of Distinct Detects | 15 | Number of Distinct Non-Detects | 5 |
| Minimum Detect | 4.25E-07 | Minimum Non-Detect | 2.80E-07 |
| Maximum Detect | 2.55E-06 | Maximum Non-Detect | 1.30E-06 |
| Variance Detected | 4.24E-13 | Percent Non-Detects | 23.81% |
| Mean Detected | 1.25E-06 | SD Detected | 6.51E-07 |
| Mean of Detected Logged Data | -13.73 | SD of Detected Logged Data | 0.574 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.932 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.14 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Normal at 5% Significance Level | |
| Detected Data appear Normal at 5% Significance Level | | | |
| | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 1.07E-06 | KM SD | 6.51E-07 |
| 95% UTL95% Coverage | 2.61E-06 | 95% KM UPL (t) | 2.22E-06 |
| 90% KM Percentile (z) | 1.90E-06 | 95% KM Percentile (z) | 2.14E-06 |
| 99% KM Percentile (z) | 2.58E-06 | 95% KM USL | 2.75E-06 |
| | | | |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 1.05E-06 | SD | 6.79E-07 |
| 95% UTL95% Coverage | 2.66E-06 | 95% UPL (t) | 2.25E-06 |
| 90% Percentile (z) | 1.92E-06 | 95% Percentile (z) | 2.17E-06 |
| 99% Percentile (z) | 2.63E-06 | 95% USL | 2.80E-06 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.337 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.743 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.163 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.216 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 3.683 | k star (bias corrected MLE) | 3.034 |
| Theta hat (MLE) | 3.40E-07 | Theta star (bias corrected MLE) | 4.13E-07 |
| nu hat (MLE) | 117.8 | nu star (bias corrected) | 97.08 |
| MLE Mean (bias corrected) | 1.25E-06 | | |
| MLE Sd (bias corrected) | 7.19E-07 | 95% Percentile of Chisquare (2kstar) | 12.69 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 4.25E-07 | Mean | 0.00238 |
| Maximum | 0.01 | Median | 1.33E-06 |
| SD | 0.00436 | CV | 1.832 |
| k hat (MLE) | 0.141 | k star (bias corrected MLE) | 0.152 |
| Theta hat (MLE) | 0.0169 | Theta star (bias corrected MLE) | 0.0156 |
| nu hat (MLE) | 5.903 | nu star (bias corrected) | 6.393 |
| MLE Mean (bias corrected) | 0.00238 | MLE Sd (bias corrected) | 0.00611 |
| 95% Percentile of Chisquare (2kstar) | 1.671 | 90% Percentile | 0.00708 |
| 95% Percentile | 0.0131 | 99% Percentile | 0.0304 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.02 | 0.024 | 95% Approx. Gamma UPL | 0.0102 | 0.0103 |
| 95% Gamma USL | 0.0244 | 0.031 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.07E-06 | SD (KM) | 6.51E-07 |
| Variance (KM) | 4.24E-13 | SE of Mean (KM) | 1.49E-07 |
| k hat (KM) | 2.694 | k star (KM) | 2.341 |
| nu hat (KM) | 113.1 | nu star (KM) | 98.31 |
| theta hat (KM) | 3.97E-07 | theta star (KM) | 4.57E-07 |
| 80% gamma percentile (KM) | 1.57E-06 | 90% gamma percentile (KM) | 2.00E-06 |
| 95% gamma percentile (KM) | 2.41E-06 | 99% gamma percentile (KM) | 3.31E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 3.21E-06 | 3.37E-06 | 95% Approx. Gamma UPL | 2.45E-06 | 2.51E-06 |
| 95% KM Gamma Percentile | 2.32E-06 | 2.36E-06 | 95% Gamma USL | 3.51E-06 | 3.71E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.932 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.887 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.194 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.213 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.07E-06 | Mean in Log Scale | -13.93 |
| SD in Original Scale | 6.59E-07 | SD in Log Scale | 0.64 |
| 95% UTL95% Coverage | 4.05E-06 | 95% BCA UTL95% Coverage | 2.55E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 2.55E-06 | 95% UPL (t) | 2.75E-06 |
| 90% Percentile (z) | 2.02E-06 | 95% Percentile (z) | 2.54E-06 |
| 99% Percentile (z) | 3.93E-06 | 95% USL | 4.63E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -13.95 | 95% KM UTL (Lognormal)95% Coverage | 4.12E-06 |
| KM SD of Logged Data | 0.654 | 95% KM UPL (Lognormal) | 2.77E-06 |
| 95% KM Percentile Lognormal (z) | 2.56E-06 | 95% KM USL (Lognormal) | 4.73E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.05E-06 | Mean in Log Scale | -13.99 |
| SD in Original Scale | 6.79E-07 | SD in Log Scale | 0.743 |
| 95% UTL95% Coverage | 4.87E-06 | 95% UPL (t) | 3.11E-06 |
| 90% Percentile (z) | 2.17E-06 | 95% Percentile (z) | 2.84E-06 |
| 99% Percentile (z) | 4.71E-06 | 95% USL | 5.69E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 2.55E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 2.54E-06 |
| 95% USL | 2.55E-06 | 95% KM Chebyshev UPL | 3.97E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,6,7,8-Hexachlorodibenzofuran**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 14 | Number of Non-Detects | 7 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 5.06E-07 | Minimum Non-Detect | 5.20E-07 |
| Maximum Detect | 3.60E-06 | Maximum Non-Detect | 2.10E-06 |
| Variance Detected | 9.03E-13 | Percent Non-Detects | 33.33% |
| Mean Detected | 1.51E-06 | SD Detected | 9.50E-07 |
| Mean of Detected Logged Data | -13.57 | SD of Detected Logged Data | 0.606 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.874 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.231 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.226 | Data Not Normal at 5% Significance Level | |
| Detected Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 1.24E-06 | KM SD | 8.59E-07 |
| 95% UTL95% Coverage | 3.28E-06 | 95% KM UPL (t) | 2.76E-06 |
| 90% KM Percentile (z) | 2.34E-06 | 95% KM Percentile (z) | 2.65E-06 |
| 99% KM Percentile (z) | 3.24E-06 | 95% KM USL | 3.46E-06 |
| | | | |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 1.21E-06 | SD | 9.03E-07 |
| 95% UTL95% Coverage | 3.35E-06 | 95% UPL (t) | 2.80E-06 |
| 90% Percentile (z) | 2.36E-06 | 95% Percentile (z) | 2.69E-06 |
| 99% Percentile (z) | 3.31E-06 | 95% USL | 3.54E-06 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.442 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.742 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.222 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.23 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 3.047 | k star (bias corrected MLE) | 2.442 |
| Theta hat (MLE) | 4.97E-07 | Theta star (bias corrected MLE) | 6.20E-07 |
| nu hat (MLE) | 85.32 | nu star (bias corrected) | 68.37 |
| MLE Mean (bias corrected) | 1.51E-06 | | |
| MLE Sd (bias corrected) | 9.69E-07 | 95% Percentile of Chisquare (2kstar) | 10.89 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 5.06E-07 | Mean | 0.00333 |
| Maximum | 0.01 | Median | 2.10E-06 |
| SD | 0.00483 | CV | 1.448 |
| k hat (MLE) | 0.157 | k star (bias corrected MLE) | 0.166 |
| Theta hat (MLE) | 0.0213 | Theta star (bias corrected MLE) | 0.0201 |
| nu hat (MLE) | 6.573 | nu star (bias corrected) | 6.967 |
| MLE Mean (bias corrected) | 0.00333 | MLE Sd (bias corrected) | 0.00819 |
| 95% Percentile of Chisquare (2kstar) | 1.788 | 90% Percentile | 0.01 |
| 95% Percentile | 0.018 | 99% Percentile | 0.0407 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0308 | 0.0416 | 95% Approx. Gamma UPL | 0.0163 | 0.0185 |
| 95% Gamma USL | 0.0373 | 0.0531 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.24E-06 | SD (KM) | 8.59E-07 |
| Variance (KM) | 7.39E-13 | SE of Mean (KM) | 1.98E-07 |
| k hat (KM) | 2.076 | k star (KM) | 1.811 |
| nu hat (KM) | 87.2 | nu star (KM) | 76.08 |
| theta hat (KM) | 5.96E-07 | theta star (KM) | 6.84E-07 |
| 80% gamma percentile (KM) | 1.88E-06 | 90% gamma percentile (KM) | 2.47E-06 |
| 95% gamma percentile (KM) | 3.03E-06 | 99% gamma percentile (KM) | 4.30E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 3.70E-06 | 3.81E-06 | 95% Approx. Gamma UPL | 2.83E-06 | 2.85E-06 |
| 95% KM Gamma Percentile | 2.67E-06 | 2.69E-06 | 95% Gamma USL | 4.04E-06 | 4.19E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.952 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.198 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.226 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.22E-06 | Mean in Log Scale | -13.82 |
| SD in Original Scale | 8.84E-07 | SD in Log Scale | 0.633 |
| 95% UTL95% Coverage | 4.45E-06 | 95% BCA UTL95% Coverage | 3.60E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 3.60E-06 | 95% UPL (t) | 3.03E-06 |
| 90% Percentile (z) | 2.23E-06 | 95% Percentile (z) | 2.81E-06 |
| 99% Percentile (z) | 4.32E-06 | 95% USL | 5.08E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -13.8 | 95% KM UTL (Lognormal)95% Coverage | 4.29E-06 |
| KM SD of Logged Data | 0.608 | 95% KM UPL (Lognormal) | 2.97E-06 |
| 95% KM Percentile Lognormal (z) | 2.76E-06 | 95% KM USL (Lognormal) | 4.87E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.21E-06 | Mean in Log Scale | -13.87 |
| SD in Original Scale | 9.03E-07 | SD in Log Scale | 0.722 |
| 95% UTL95% Coverage | 5.22E-06 | 95% UPL (t) | 3.37E-06 |
| 90% Percentile (z) | 2.38E-06 | 95% Percentile (z) | 3.09E-06 |
| 99% Percentile (z) | 5.06E-06 | 95% USL | 6.08E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 3.60E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 3.52E-06 |
| 95% USL | 3.60E-06 | 95% KM Chebyshev UPL | 5.07E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,4,7,8-Hexachlorodibenzofuran**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 | | |
| Number of Detects | 14 | Number of Non-Detects | 7 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 6 |
| Minimum Detect | 4.03E-07 | Minimum Non-Detect | 6.70E-07 |
| Maximum Detect | 7.00E-06 | Maximum Non-Detect | 2.60E-06 |
| Variance Detected | 4.12E-12 | Percent Non-Detects | 33.33% |
| Mean Detected | 2.39E-06 | SD Detected | 2.03E-06 |
| Mean of Detected Logged Data | -13.31 | SD of Detected Logged Data | 0.908 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.848 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.238 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.226 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |
| | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 1.83E-06 | KM SD | 1.79E-06 |
| 95% UTL95% Coverage | 6.07E-06 | 95% KM UPL (t) | 4.99E-06 |
| 90% KM Percentile (z) | 4.12E-06 | 95% KM Percentile (z) | 4.77E-06 |
| 99% KM Percentile (z) | 5.99E-06 | 95% KM USL | 6.45E-06 |
| | | | |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 1.82E-06 | SD | 1.84E-06 |
| 95% UTL95% Coverage | 6.19E-06 | 95% UPL (t) | 5.07E-06 |
| 90% Percentile (z) | 4.18E-06 | 95% Percentile (z) | 4.85E-06 |
| 99% Percentile (z) | 6.11E-06 | 95% USL | 6.58E-06 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.643 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.75 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.214 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.233 | 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) | 1.523 | k star (bias corrected MLE) | 1.245 |
| Theta hat (MLE) | 1.57E-06 | Theta star (bias corrected MLE) | 1.92E-06 |
| nu hat (MLE) | 42.66 | nu star (bias corrected) | 34.85 |
| MLE Mean (bias corrected) | 2.39E-06 | | |
| MLE Sd (bias corrected) | 2.15E-06 | 95% Percentile of Chisquare (2kstar) | 6.909 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 4.03E-07 | Mean | 0.00333 |
| Maximum | 0.01 | Median | 4.30E-06 |
| SD | 0.00483 | CV | 1.448 |
| k hat (MLE) | 0.162 | k star (bias corrected MLE) | 0.17 |
| Theta hat (MLE) | 0.0206 | Theta star (bias corrected MLE) | 0.0196 |
| nu hat (MLE) | 6.79 | nu star (bias corrected) | 7.153 |
| MLE Mean (bias corrected) | 0.00333 | MLE Sd (bias corrected) | 0.00808 |
| 95% Percentile of Chisquare (2kstar) | 1.825 | 90% Percentile | 0.01 |
| 95% Percentile | 0.0179 | 99% Percentile | 0.0401 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0306 | 0.0411 | 95% Approx. Gamma UPL | 0.0163 | 0.0184 |
| 95% Gamma USL | 0.037 | 0.0525 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.83E-06 | SD (KM) | 1.79E-06 |
| Variance (KM) | 3.20E-12 | SE of Mean (KM) | 4.07E-07 |
| k hat (KM) | 1.046 | k star (KM) | 0.928 |
| nu hat (KM) | 43.93 | nu star (KM) | 38.99 |
| theta hat (KM) | 1.75E-06 | theta star (KM) | 1.97E-06 |
| 80% gamma percentile (KM) | 2.96E-06 | 90% gamma percentile (KM) | 4.29E-06 |
| 95% gamma percentile (KM) | 5.63E-06 | 99% gamma percentile (KM) | 8.75E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 7.23E-06 | 7.57E-06 | 95% Approx. Gamma UPL | 5.14E-06 | 5.21E-06 |
| 95% KM Gamma Percentile | 4.78E-06 | 4.81E-06 | 95% Gamma USL | 8.07E-06 | 8.55E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.922 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.176 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.226 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.83E-06 | Mean in Log Scale | -13.6 |
| SD in Original Scale | 1.83E-06 | SD in Log Scale | 0.865 |
| 95% UTL95% Coverage | 9.63E-06 | 95% BCA UTL95% Coverage | 7.00E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 7.00E-06 | 95% UPL (t) | 5.70E-06 |
| 90% Percentile (z) | 3.75E-06 | 95% Percentile (z) | 5.14E-06 |
| 99% Percentile (z) | 9.27E-06 | 95% USL | 1.15E-05 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -13.61 | 95% KM UTL (Lognormal)95% Coverage | 9.34E-06 |
| KM SD of Logged Data | 0.856 | 95% KM UPL (Lognormal) | 5.56E-06 |
| 95% KM Percentile Lognormal (z) | 5.02E-06 | 95% KM USL (Lognormal) | 1.12E-05 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.82E-06 | Mean in Log Scale | -13.64 |
| SD in Original Scale | 1.84E-06 | SD in Log Scale | 0.905 |
| 95% UTL95% Coverage | 1.02E-05 | 95% UPL (t) | 5.91E-06 |
| 90% Percentile (z) | 3.81E-06 | 95% Percentile (z) | 5.30E-06 |
| 99% Percentile (z) | 9.82E-06 | 95% USL | 1.24E-05 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 7.00E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 6.75E-06 |
| 95% USL | 7.00E-06 | 95% KM Chebyshev UPL | 9.81E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|2,3,4,6,7,8-Hexachlorodibenzofuran**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 14 | Number of Non-Detects | 7 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 7 |
| Minimum Detect | 3.92E-07 | Minimum Non-Detect | 2.70E-07 |
| Maximum Detect | 2.80E-06 | Maximum Non-Detect | 1.60E-06 |
| Variance Detected | 7.84E-13 | Percent Non-Detects | 33.33% |
| Mean Detected | 1.37E-06 | SD Detected | 8.85E-07 |
| Mean of Detected Logged Data | -13.72 | SD of Detected Logged Data | 0.709 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.874 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.192 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.226 | Detected Data appear Normal at 5% Significance Level | |
| Detected Data appear Approximate Normal at 5% Significance Level | | | |
| | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 1.07E-06 | KM SD | 8.31E-07 |
| 95% UTL95% Coverage | 3.04E-06 | 95% KM UPL (t) | 2.54E-06 |
| 90% KM Percentile (z) | 2.14E-06 | 95% KM Percentile (z) | 2.44E-06 |
| 99% KM Percentile (z) | 3.01E-06 | 95% KM USL | 3.22E-06 |
| | | | |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 1.07E-06 | SD | 8.47E-07 |
| 95% UTL95% Coverage | 3.08E-06 | 95% UPL (t) | 2.57E-06 |
| 90% Percentile (z) | 2.16E-06 | 95% Percentile (z) | 2.47E-06 |
| 99% Percentile (z) | 3.04E-06 | 95% USL | 3.26E-06 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.493 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.744 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.179 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.231 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 2.45 | k star (bias corrected MLE) | 1.972 |
| Theta hat (MLE) | 5.60E-07 | Theta star (bias corrected MLE) | 6.96E-07 |
| nu hat (MLE) | 68.59 | nu star (bias corrected) | 55.23 |
| MLE Mean (bias corrected) | 1.37E-06 | | |
| MLE Sd (bias corrected) | 9.77E-07 | 95% Percentile of Chisquare (2kstar) | 9.398 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 3.92E-07 | Mean | 0.00333 |
| Maximum | 0.01 | Median | 2.25E-06 |
| SD | 0.00483 | CV | 1.449 |
| k hat (MLE) | 0.154 | k star (bias corrected MLE) | 0.164 |
| Theta hat (MLE) | 0.0217 | Theta star (bias corrected MLE) | 0.0204 |
| nu hat (MLE) | 6.463 | nu star (bias corrected) | 6.873 |
| MLE Mean (bias corrected) | 0.00333 | MLE Sd (bias corrected) | 0.00824 |
| 95% Percentile of Chisquare (2kstar) | 1.769 | 90% Percentile | 0.00999 |
| 95% Percentile | 0.018 | 99% Percentile | 0.041 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0308 | 0.0418 | 95% Approx. Gamma UPL | 0.0163 | 0.0186 |
| 95% Gamma USL | 0.0373 | 0.0534 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.07E-06 | SD (KM) | 8.31E-07 |
| Variance (KM) | 6.90E-13 | SE of Mean (KM) | 1.91E-07 |
| k hat (KM) | 1.666 | k star (KM) | 1.46 |
| nu hat (KM) | 69.98 | nu star (KM) | 61.32 |
| theta hat (KM) | 6.44E-07 | theta star (KM) | 7.35E-07 |
| 80% gamma percentile (KM) | 1.66E-06 | 90% gamma percentile (KM) | 2.25E-06 |
| 95% gamma percentile (KM) | 2.82E-06 | 99% gamma percentile (KM) | 4.11E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 3.79E-06 | 3.99E-06 | 95% Approx. Gamma UPL | 2.77E-06 | 2.84E-06 |
| 95% KM Gamma Percentile | 2.60E-06 | 2.64E-06 | 95% Gamma USL | 4.18E-06 | 4.46E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.914 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.874 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.175 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.226 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.06E-06 | Mean in Log Scale | -14.06 |
| SD in Original Scale | 8.51E-07 | SD in Log Scale | 0.795 |
| 95% UTL95% Coverage | 5.17E-06 | 95% BCA UTL95% Coverage | 2.80E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 2.80E-06 | 95% UPL (t) | 3.20E-06 |
| 90% Percentile (z) | 2.17E-06 | 95% Percentile (z) | 2.90E-06 |
| 99% Percentile (z) | 4.99E-06 | 95% USL | 6.11E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -14.04 | 95% KM UTL (Lognormal)95% Coverage | 5.04E-06 |
| KM SD of Logged Data | 0.779 | 95% KM UPL (Lognormal) | 3.15E-06 |
| 95% KM Percentile Lognormal (z) | 2.86E-06 | 95% KM USL (Lognormal) | 5.94E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.07E-06 | Mean in Log Scale | -14.06 |
| SD in Original Scale | 8.47E-07 | SD in Log Scale | 0.851 |
| 95% UTL95% Coverage | 5.90E-06 | 95% UPL (t) | 3.53E-06 |
| 90% Percentile (z) | 2.34E-06 | 95% Percentile (z) | 3.18E-06 |
| 99% Percentile (z) | 5.68E-06 | 95% USL | 7.06E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 2.80E-06 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 2.80E-06 |
| 95% USL | 2.80E-06 | 95% KM Chebyshev UPL | 4.78E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|1,2,3,4,6,7,8-Heptachlorodibenzofuran**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 19 | | |
| Number of Detects | 19 | Number of Non-Detects | 2 |
| Number of Distinct Detects | 17 | Number of Distinct Non-Detects | 2 |
| Minimum Detect | 3.31E-06 | Minimum Non-Detect | 4.70E-06 |
| Maximum Detect | 3.50E-05 | Maximum Non-Detect | 6.70E-06 |
| Variance Detected | 1.05E-10 | Percent Non-Detects | 9.52% |
| Mean Detected | 1.50E-05 | SD Detected | 1.02E-05 |
| Mean of Detected Logged Data | -11.35 | SD of Detected Logged Data | 0.735 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test on Detects Only | | | |
| Shapiro Wilk Test Statistic | 0.878 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.901 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.231 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.197 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |
| | | | |
| Kaplan Meier (KM) Background Statistics Assuming Normal Distribution | | | |
| KM Mean | 1.40E-05 | KM SD | 9.98E-06 |
| 95% UTL95% Coverage | 3.76E-05 | 95% KM UPL (t) | 3.16E-05 |
| 90% KM Percentile (z) | 2.68E-05 | 95% KM Percentile (z) | 3.04E-05 |
| 99% KM Percentile (z) | 3.72E-05 | 95% KM USL | 3.97E-05 |
| | | | |
| DL/2 Substitution Background Statistics Assuming Normal Distribution | | | |
| Mean | 1.38E-05 | SD | 1.04E-05 |
| 95% UTL95% Coverage | 3.84E-05 | 95% UPL (t) | 3.21E-05 |
| 90% Percentile (z) | 2.71E-05 | 95% Percentile (z) | 3.09E-05 |
| 99% Percentile (z) | 3.80E-05 | 95% USL | 4.06E-05 |
| DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons | | | |
| | | | |
| Gamma GOF Tests on Detected Observations Only | | | |
| A-D Test Statistic | 0.588 | Anderson-Darling GOF Test | |
| 5% A-D Critical Value | 0.751 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.185 | Kolmogorov-Smirnov GOF | |
| 5% K-S Critical Value | 0.201 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics on Detected Data Only | | | |
| k hat (MLE) | 2.226 | k star (bias corrected MLE) | 1.91 |
| Theta hat (MLE) | 6.74E-06 | Theta star (bias corrected MLE) | 7.85E-06 |
| nu hat (MLE) | 84.6 | nu star (bias corrected) | 72.58 |
| MLE Mean (bias corrected) | 1.50E-05 | | |
| MLE Sd (bias corrected) | 1.09E-05 | 95% Percentile of Chisquare (2kstar) | 9.194 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 3.31E-06 | Mean | 9.66E-04 |
| Maximum | 0.01 | Median | 1.10E-05 |
| SD | 0.003 | CV | 3.109 |
| k hat (MLE) | 0.196 | k star (bias corrected MLE) | 0.2 |
| Theta hat (MLE) | 0.00493 | Theta star (bias corrected MLE) | 0.00483 |
| nu hat (MLE) | 8.236 | nu star (bias corrected) | 8.393 |
| MLE Mean (bias corrected) | 9.66E-04 | MLE Sd (bias corrected) | 0.00216 |
| 95% Percentile of Chisquare (2kstar) | 2.06 | 90% Percentile | 0.00292 |
| 95% Percentile | 0.00498 | 99% Percentile | 0.0106 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.00576 | 0.00521 | 95% Approx. Gamma UPL | 0.00299 | 0.00241 |
| 95% Gamma USL | 0.00701 | 0.0066 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 1.40E-05 | SD (KM) | 9.98E-06 |
| Variance (KM) | 9.96E-11 | SE of Mean (KM) | 2.24E-06 |
| k hat (KM) | 1.96 | k star (KM) | 1.712 |
| nu hat (KM) | 82.33 | nu star (KM) | 71.9 |
| theta hat (KM) | 7.13E-06 | theta star (KM) | 8.16E-06 |
| 80% gamma percentile (KM) | 2.13E-05 | 90% gamma percentile (KM) | 2.82E-05 |
| 95% gamma percentile (KM) | 3.49E-05 | 99% gamma percentile (KM) | 4.97E-05 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 4.73E-05 | 4.99E-05 | 95% Approx. Gamma UPL | 3.51E-05 | 3.60E-05 |
| 95% KM Gamma Percentile | 3.29E-05 | 3.36E-05 | 95% Gamma USL | 5.22E-05 | 5.56E-05 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.939 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.901 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.187 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.197 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.40E-05 | Mean in Log Scale | -11.45 |
| SD in Original Scale | 1.02E-05 | SD in Log Scale | 0.771 |
| 95% UTL95% Coverage | 6.61E-05 | 95% BCA UTL95% Coverage | 3.50E-05 |
| 95% Bootstrap (%) UTL95% Coverage | 3.50E-05 | 95% UPL (t) | 4.15E-05 |
| 90% Percentile (z) | 2.86E-05 | 95% Percentile (z) | 3.78E-05 |
| 99% Percentile (z) | 6.39E-05 | 95% USL | 7.77E-05 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -11.45 | 95% KM UTL (Lognormal)95% Coverage | 6.30E-05 |
| KM SD of Logged Data | 0.749 | 95% KM UPL (Lognormal) | 4.00E-05 |
| 95% KM Percentile Lognormal (z) | 3.66E-05 | 95% KM USL (Lognormal) | 7.37E-05 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.38E-05 | Mean in Log Scale | -11.49 |
| SD in Original Scale | 1.04E-05 | SD in Log Scale | 0.822 |
| 95% UTL95% Coverage | 7.22E-05 | 95% UPL (t) | 4.39E-05 |
| 90% Percentile (z) | 2.95E-05 | 95% Percentile (z) | 3.97E-05 |
| 99% Percentile (z) | 6.96E-05 | 95% USL | 8.58E-05 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 3.50E-05 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 3.49E-05 |
| 95% USL | 3.50E-05 | 95% KM Chebyshev UPL | 5.85E-05 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**1,2,3,4,7,8,9-HpCDF_OL**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 20 | Number of Missing Observations | 11 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 7 | Number of Non-Detects | 13 |
| Number of Distinct Detects | 7 | Number of Distinct Non-Detects | 13 |
| Minimum Detect | 4.10E-07 | Minimum Non-Detect | 2.64E-07 |
| Maximum Detect | 3.80E-06 | Maximum Non-Detect | 2.30E-06 |
| Variance Detected | 1.72E-12 | Percent Non-Detects | 65% |
| Mean Detected | 1.55E-06 | SD Detected | 1.31E-06 |
| Mean of Detected Logged Data | -13.71 | SD of Detected Logged Data | 0.89 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.396 | d2max (for USL) | 2.557 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.849 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.803 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.279 | 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) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 7.87E-07 | KM SD | 9.22E-07 |
| 95% UTL95% Coverage | 3.00E-06 | 95% KM UPL (t) | 2.42E-06 |
| 90% KM Percentile (z) | 1.97E-06 | 95% KM Percentile (z) | 2.30E-06 |
| 99% KM Percentile (z) | 2.93E-06 | 95% KM USL | 3.14E-06 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 8.67E-07 | SD | 9.33E-07 |
| 95% UTL95% Coverage | 3.10E-06 | 95% UPL (t) | 2.52E-06 |
| 90% Percentile (z) | 2.06E-06 | 95% Percentile (z) | 2.40E-06 |
| 99% Percentile (z) | 3.04E-06 | 95% USL | 3.25E-06 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.476 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.719 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.246 | Kolmogorov-Smirnov GOF |
| 5% K-S Critical Value | 0.316 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.654 | k star (bias corrected MLE) | 1.04 |
| Theta hat (MLE) | 9.35E-07 | Theta star (bias corrected MLE) | 1.49E-06 |
| nu hat (MLE) | 23.15 | nu star (bias corrected) | 14.56 |
| MLE Mean (bias corrected) | 1.55E-06 | | |
| MLE Sd (bias corrected) | 1.52E-06 | 95% Percentile of Chisquare (2kstar) | 6.146 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 4.10E-07 | Mean | 0.0065 |
| Maximum | 0.01 | Median | 0.01 |
| SD | 0.00489 | CV | 0.753 |
| k hat (MLE) | 0.257 | k star (bias corrected MLE) | 0.251 |
| Theta hat (MLE) | 0.0253 | Theta star (bias corrected MLE) | 0.0259 |
| nu hat (MLE) | 10.26 | nu star (bias corrected) | 10.06 |
| MLE Mean (bias corrected) | 0.0065 | MLE Sd (bias corrected) | 0.013 |
| 95% Percentile of Chisquare (2kstar) | 2.43 | 90% Percentile | 0.0195 |
| 95% Percentile | 0.0314 | 99% Percentile | 0.0631 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0566 | 0.091 | 95% Approx. Gamma UPL | 0.0332 | 0.0458 |
| 95% Gamma USL | 0.064 | 0.107 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 7.87E-07 | SD (KM) | 9.22E-07 |
| Variance (KM) | 8.50E-13 | SE of Mean (KM) | 2.27E-07 |
| k hat (KM) | 0.728 | k star (KM) | 0.652 |
| nu hat (KM) | 29.13 | nu star (KM) | 26.09 |
| theta hat (KM) | 1.08E-06 | theta star (KM) | 1.21E-06 |
| 80% gamma percentile (KM) | 1.30E-06 | 90% gamma percentile (KM) | 2.01E-06 |
| 95% gamma percentile (KM) | 2.75E-06 | 99% gamma percentile (KM) | 4.52E-06 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 3.13E-06 | 3.18E-06 | 95% Approx. Gamma UPL | 2.19E-06 | 2.17E-06 |
| 95% KM Gamma Percentile | 2.03E-06 | 2.00E-06 | 95% Gamma USL | 3.40E-06 | 3.49E-06 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.894 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.803 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.2 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.304 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 6.95E-07 | Mean in Log Scale | -14.75 |
| SD in Original Scale | 9.78E-07 | SD in Log Scale | 0.967 |
| 95% UTL95% Coverage | 4.00E-06 | 95% BCA UTL95% Coverage | 3.80E-06 |
| 95% Bootstrap (%) UTL95% Coverage | 3.80E-06 | 95% UPL (t) | 2.19E-06 |
| 90% Percentile (z) | 1.36E-06 | 95% Percentile (z) | 1.93E-06 |
| 99% Percentile (z) | 3.74E-06 | 95% USL | 4.67E-06 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -14.46 | 95% KM UTL (Lognormal)95% Coverage | 3.51E-06 |
| KM SD of Logged Data | 0.794 | 95% KM UPL (Lognormal) | 2.14E-06 |
| 95% KM Percentile Lognormal (z) | 1.93E-06 | 95% KM USL (Lognormal) | 3.98E-06 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 8.67E-07 | Mean in Log Scale | -14.36 |
| SD in Original Scale | 9.33E-07 | SD in Log Scale | 0.888 |
| 95% UTL95% Coverage | 4.86E-06 | 95% UPL (t) | 2.79E-06 |
| 90% Percentile (z) | 1.81E-06 | 95% Percentile (z) | 2.49E-06 |
| 99% Percentile (z) | 4.57E-06 | 95% USL | 5.61E-06 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

| | | | |
|---|---|---|---|
| Order of Statistic, r | 20 | 95% UTL with95% Coverage | 3.80E-06 |
| Approx, f used to compute achieved CC | 1.053 | Approximate Actual Confidence Coefficient achieved by U | 0.642 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 3.74E-06 |
| 95% USL | 3.80E-06 | 95% KM Chebyshev UPL | 4.91E-06 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA18_SE_DioxinFurans|Octachlorochlorodibenzofuran**

General Statistics

| | | | |
|---|---|---|---|
| Total Number of Observations | 21 | Number of Missing Observations | 10 |
| Number of Distinct Observations | 20 | | |
| Number of Detects | 15 | Number of Non-Detects | 6 |
| Number of Distinct Detects | 14 | Number of Distinct Non-Detects | 6 |
| Minimum Detect | 5.56E-06 | Minimum Non-Detect | 8.90E-06 |
| Maximum Detect | 8.50E-05 | Maximum Non-Detect | 5.80E-05 |
| Variance Detected | 6.86E-10 | Percent Non-Detects | 28.57% |
| Mean Detected | 3.96E-05 | SD Detected | 2.62E-05 |
| Mean of Detected Logged Data | -10.41 | SD of Detected Logged Data | 0.844 |

Critical Values for Background Threshold Values (BTVs)

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |

Normal GOF Test on Detects Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.927 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.881 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.179 | Lilliefors GOF Test |
| 5% Lilliefors Critical Value | 0.22 | Detected Data appear Normal at 5% Significance Level |

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| KM Mean | 3.13E-05 | KM SD | 2.56E-05 |
| 95% UTL95% Coverage | 9.21E-05 | 95% KM UPL (t) | 7.65E-05 |
| 90% KM Percentile (z) | 6.41E-05 | 95% KM Percentile (z) | 7.35E-05 |
| 99% KM Percentile (z) | 9.09E-05 | 95% KM USL | 9.74E-05 |

DL/2 Substitution Background Statistics Assuming Normal Distribution

| | | | |
|---|---|---|---|
| Mean | 3.14E-05 | SD | 2.60E-05 |
| 95% UTL95% Coverage | 9.31E-05 | 95% UPL (t) | 7.73E-05 |
| 90% Percentile (z) | 6.47E-05 | 95% Percentile (z) | 7.42E-05 |
| 99% Percentile (z) | 9.19E-05 | 95% USL | 9.85E-05 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

| | | |
|---|---|---|
| A-D Test Statistic | 0.347 | Anderson-Darling GOF Test |
| 5% A-D Critical Value | 0.747 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.156 | 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) | 1.975 | k star (bias corrected MLE) | 1.625 |
| Theta hat (MLE) | 2.01E-05 | Theta star (bias corrected MLE) | 2.44E-05 |
| nu hat (MLE) | 59.26 | nu star (bias corrected) | 48.74 |
| MLE Mean (bias corrected) | 3.96E-05 | | |
| MLE Sd (bias corrected) | 3.11E-05 | 95% Percentile of Chisquare (2kstar) | 8.243 |

Gamma ROS Statistics using Imputed Non-Detects
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

| | | | |
|---|---|---|---|
| Minimum | 5.56E-06 | Mean | 0.00289 |
| Maximum | 0.01 | Median | 5.60E-05 |
| SD | 0.00461 | CV | 1.598 |
| k hat (MLE) | 0.245 | k star (bias corrected MLE) | 0.242 |
| Theta hat (MLE) | 0.0118 | Theta star (bias corrected MLE) | 0.0119 |
| nu hat (MLE) | 10.31 | nu star (bias corrected) | 10.17 |
| MLE Mean (bias corrected) | 0.00289 | MLE Sd (bias corrected) | 0.00586 |
| 95% Percentile of Chisquare (2kstar) | 2.366 | 90% Percentile | 0.00868 |
| 95% Percentile | 0.0141 | 99% Percentile | 0.0286 |

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 0.0235 | 0.0283 | 95% Approx. Gamma UPL | 0.0129 | 0.0137 |
| 95% Gamma USL | 0.0281 | 0.0354 | | | |

Estimates of Gamma Parameters using KM Estimates

| | | | |
|---|---|---|---|
| Mean (KM) | 3.13E-05 | SD (KM) | 2.56E-05 |
| Variance (KM) | 6.57E-10 | SE of Mean (KM) | 5.88E-06 |
| k hat (KM) | 1.491 | k star (KM) | 1.31 |
| nu hat (KM) | 62.61 | nu star (KM) | 55 |
| theta hat (KM) | 2.10E-05 | theta star (KM) | 2.39E-05 |
| 80% gamma percentile (KM) | 4.91E-05 | 90% gamma percentile (KM) | 6.74E-05 |
| 95% gamma percentile (KM) | 8.54E-05 | 99% gamma percentile (KM) | 1.26E-04 |

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| 95% Approx. Gamma UTL with 95% Coverage | 1.25E-04 | 1.35E-04 | 95% Approx. Gamma UPL | 8.89E-05 | 9.25E-05 |
| 95% KM Gamma Percentile | 8.27E-05 | 8.54E-05 | 95% Gamma USL | 1.40E-04 | 1.53E-04 |

Lognormal GOF Test on Detected Observations Only

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.924 | Shapiro Wilk GOF Test |
| 5% Shapiro Wilk Critical Value | 0.881 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.171 | 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

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.13E-05 | Mean in Log Scale | -10.72 |
| SD in Original Scale | 2.58E-05 | SD in Log Scale | 0.888 |
| 95% UTL95% Coverage | 1.81E-04 | 95% BCA UTL95% Coverage | 8.50E-05 |
| 95% Bootstrap (%) UTL95% Coverage | 8.50E-05 | 95% UPL (t) | 1.06E-04 |
| 90% Percentile (z) | 6.87E-05 | 95% Percentile (z) | 9.48E-05 |
| 99% Percentile (z) | 1.74E-04 | 95% USL | 2.18E-04 |

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -10.77 | 95% KM UTL (Lognormal)95% Coverage | 1.96E-04 |
| KM SD of Logged Data | 0.942 | 95% KM UPL (Lognormal) | 1.11E-04 |
| 95% KM Percentile Lognormal (z) | 9.89E-05 | 95% KM USL (Lognormal) | 2.39E-04 |

Background DL/2 Statistics Assuming Lognormal Distribution

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3.14E-05 | Mean in Log Scale | -10.75 |
| SD in Original Scale | 2.60E-05 | SD in Log Scale | 0.951 |
| 95% UTL95% Coverage | 2.04E-04 | 95% UPL (t) | 1.15E-04 |
| 90% Percentile (z) | 7.23E-05 | 95% Percentile (z) | 1.02E-04 |
| 99% Percentile (z) | 1.95E-04 | 95% USL | 2.49E-04 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics
Data appear to follow a Discernible Distribution at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects) | | | |
| Order of Statistic, r | 21 | 95% UTL with95% Coverage | 8.50E-05 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| Approximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 8.45E-05 |
| 95% USL | 8.50E-05 | 95% KM Chebyshev UPL | 1.46E-04 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**TCDD TEQ HH**

| | | | |
|---|---|---|---|
| General Statistics | | | |
| Total Number of Observations | 21 | Number of Distinct Observations | 21 |
| | | Number of Missing Observations | 10 |
| Minimum | 8.12E-07 | First Quartile | 1.63E-06 |
| Second Largest | 1.23E-05 | Median | 2.97E-06 |
| Maximum | 1.26E-05 | Third Quartile | 6.25E-06 |
| Mean | 4.47E-06 | SD | 3.76E-06 |
| Coefficient of Variation | N/A | Skewness | 1.135 |
| Mean of logged Data | -12.66 | SD of logged Data | 0.859 |
| | | | |
| Critical Values for Background Threshold Values (BTVs) | | | |
| Tolerance Factor K (For UTL) | 2.371 | d2max (for USL) | 2.58 |
| | | | |
| Normal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.838 | Shapiro Wilk GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.908 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.207 | Lilliefors GOF Test | |
| 5% Lilliefors Critical Value | 0.188 | Data Not Normal at 5% Significance Level | |
| Data Not Normal at 5% Significance Level | | | |
| | | | |
| Background Statistics Assuming Normal Distribution | | | |
| 95% UTL with 95% Coverage | 1.34E-05 | 90% Percentile (z) | 9.29E-06 |
| 95% UPL (t) | 1.11E-05 | 95% Percentile (z) | 1.07E-05 |
| 95% USL | 1.42E-05 | 99% Percentile (z) | 1.32E-05 |
| | | | |
| Gamma GOF Test | | | |
| A-D Test Statistic | 0.436 | Anderson-Darling Gamma GOF Test | |
| 5% A-D Critical Value | 0.757 | Detected data appear Gamma Distributed at 5% Significance Level | |
| K-S Test Statistic | 0.113 | Kolmogorov-Smirnov Gamma GOF Test | |
| 5% K-S Critical Value | 0.193 | Detected data appear Gamma Distributed at 5% Significance Level | |
| Detected data appear Gamma Distributed at 5% Significance Level | | | |
| | | | |
| Gamma Statistics | | | |
| k hat (MLE) | 1.625 | k star (bias corrected MLE) | 1.425 |
| Theta hat (MLE) | 2.75E-06 | Theta star (bias corrected MLE) | 3.14E-06 |
| nu hat (MLE) | 68.26 | nu star (bias corrected) | 59.84 |
| MLE Mean (bias corrected) | 4.47E-06 | MLE Sd (bias corrected) | 3.75E-06 |
| | | | |
| Background Statistics Assuming Gamma Distribution | | | |
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 1.23E-05 | 90% Percentile | 9.44E-06 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 1.27E-05 | 95% Percentile | 1.19E-05 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1.71E-05 | 99% Percentile | 1.73E-05 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1.82E-05 | | |
| 95% WH USL | 1.90E-05 | 95% HW USL | 2.05E-05 |
| | | | |
| Lognormal GOF Test | | | |
| Shapiro Wilk Test Statistic | 0.959 | Shapiro Wilk Lognormal GOF Test | |
| 5% Shapiro Wilk Critical Value | 0.908 | Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.089 | Lilliefors Lognormal GOF Test | |
| 5% Lilliefors Critical Value | 0.188 | Data appear Lognormal at 5% Significance Level | |
| Data appear Lognormal at 5% Significance Level | | | |

| | | | |
|---|---|---|---|
| Background Statistics assuming Lognormal Distribution | | | |
| 95% UTL with 95% Coverage | 2.44E-05 | 90% Percentile (z) | 9.59E-06 |
| 95% UPL (t) | 1.45E-05 | 95% Percentile (z) | 1.31E-05 |
| 95% USL | 2.93E-05 | 99% Percentile (z) | 2.35E-05 |

Nonparametric Distribution Free Background Statistics
Data appear Gamma Distributed at 5% Significance Level

| | | | |
|---|---|---|---|
| Nonparametric Upper Limits for Background Threshold Values | | | |
| Order of Statistic, r | 21 | 95% UTL with 95% Coverage | 1.26E-05 |
| Approx, f used to compute achieved CC | 1.105 | Approximate Actual Confidence Coefficient achieved by U | 0.659 |
| | | Approximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 1.26E-05 | 95% BCA Bootstrap UTL with 95% Coverage | 1.26E-05 |
| 95% UPL | 1.26E-05 | 90% Percentile | 1.03E-05 |
| 90% Chebyshev UPL | 1.60E-05 | 95% Percentile | 1.23E-05 |
| 95% Chebyshev UPL | 2.13E-05 | 99% Percentile | 1.25E-05 |
| 95% USL | 1.26E-05 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 3:55:36 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 4,4'-DDT_OL_SD(site)**
**Sample 2 Data: 4,4'-DDT_OL_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 49 | 28 |
| Number of Missing Observations | 36 | 3 |
| Number of Non-Detects | 16 | 4 |
| Number of Detect Data | 33 | 24 |
| Minimum Non-Detect | 4.40E-05 | 8.42E-04 |
| Maximum Non-Detect | 0.0013 | 0.00162 |
| Percent Non-detects | 32.65% | 14.29% |
| Minimum Detect | 3.70E-04 | 8.92E-04 |
| Maximum Detect | 1.5 | 0.00397 |
| Mean of Detects | 0.0512 | 0.00198 |
| Median of Detects | 0.0025 | 0.00192 |
| SD of Detects | 0.26 | 7.72E-04 |
| KM Mean | 0.0346 | 0.00184 |
| KM SD | 0.212 | 7.87E-04 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -0.655 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.256 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:07:47 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: PCB, Total Aroclors (AECOM Calc)_SD(site)**
**Sample 2 Data: PCB, Total Aroclors (AECOM Calc)_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 83 | 30 |
| Minimum Non-Detect | 0.0084 | N/A |
| Maximum Non-Detect | 0.0084 | N/A |
| Percent Non-detects | 1.19% | 0.00% |
| Minimum Detect | 0.0031 | 0.0482 |
| Maximum Detect | 1.9 | 0.232 |
| Mean of Detects | 0.313 | 0.0967 |
| Median of Detects | 0.17 | 0.0877 |
| SD of Detects | 0.37 | 0.0422 |
| KM Mean | 0.309 | 0.0967 |
| KM SD | 0.367 | 0.0422 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 3.378 |
| Critical z (0.05) | -1.645 |
| P-Value | 1 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/22/2019 4:15:16 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: SVOCs|Total High-molecular-weight PAHs_SD(site)**
**Sample 2 Data: SVOCs|Total High-molecular-weight PAHs_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.25 | 6.319 |
| Maximum Detect | 24 | 32.92 |
| Mean of Detects | 6.768 | 11.5 |
| Median of Detects | 6.05 | 11.22 |
| SD of Detects | 3.557 | 4.919 |
| KM Mean | 6.67 | 11.5 |
| KM SD | 3.597 | 4.919 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -5.611 |
| Critical z (0.05) | -1.645 |
| P-Value | 1.00E-08 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/22/2019 4:18:26 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,7,8-PeCDD_SD(site)**
**Sample 2 Data: 1,2,3,7,8-PeCDD_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 2 | 11 |
| Number of Detect Data | 39 | 10 |
| Minimum Non-Detect | 3.60E-07 | 1.04E-06 |
| Maximum Non-Detect | 6.30E-06 | 2.38E-06 |
| Percent Non-detects | 4.88% | 52.38% |
| Minimum Detect | 4.26E-08 | 9.94E-07 |
| Maximum Detect | 2.77E-04 | 2.98E-06 |
| Mean of Detects | 1.67E-05 | 1.87E-06 |
| Median of Detects | 2.40E-06 | 1.66E-06 |
| SD of Detects | 4.88E-05 | 7.75E-07 |
| KM Mean | 1.60E-05 | 1.46E-06 |
| KM SD | 4.71E-05 | 6.54E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.742 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.997 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:47:38 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 2,3,4,7,8-PeCDF_SD(site)**
**Sample 2 Data: 2,3,4,7,8-PeCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 3 | 5 |
| Number of Detect Data | 38 | 16 |
| Minimum Non-Detect | 1.56E-08 | 9.31E-07 |
| Maximum Non-Detect | 5.80E-06 | 1.95E-06 |
| Percent Non-detects | 7.32% | 23.81% |
| Minimum Detect | 3.45E-07 | 1.08E-06 |
| Maximum Detect | 2.17E-04 | 3.20E-06 |
| Mean of Detects | 1.76E-05 | 1.90E-06 |
| Median of Detects | 2.93E-06 | 1.86E-06 |
| SD of Detects | 4.06E-05 | 6.51E-07 |
| KM Mean | 1.63E-05 | 1.72E-06 |
| KM SD | 3.88E-05 | 6.51E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.843 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.998 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

**Two-Sample Hypothesis Statistics – Sediment**
**Gehan**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:49:28 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: OCDF_SD(site)**
**Sample 2 Data: OCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 2 | 6 |
| Number of Detect Data | 39 | 15 |
| Minimum Non-Detect | 1.00E-05 | 3.51E-05 |
| Maximum Non-Detect | 5.10E-05 | 8.42E-05 |
| Percent Non-detects | 4.88% | 28.57% |
| Minimum Detect | 5.14E-07 | 3.17E-05 |
| Maximum Detect | 0.001 | 1.11E-04 |
| Mean of Detects | 8.92E-05 | 6.58E-05 |
| Median of Detects | 4.60E-05 | 5.60E-05 |
| SD of Detects | 1.73E-04 | 2.62E-05 |
| KM Mean | 8.56E-05 | 5.75E-05 |
| KM SD | 1.67E-04 | 2.56E-05 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -0.63 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.264 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:54:49 PM |
| From File | BKG&Site+SD_May2019_Input_c.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: ID0016|Total High-molecular-weight PAHs_SD(site)**
**Sample 2 Data: ID0016|Total High-molecular-weight PAHs_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 39 | 28 |
| Number of Missing Observations | 0 | 3 |
| Number of Non-Detects | 0 | 1 |
| Number of Detect Data | 39 | 27 |
| Minimum Non-Detect | N/A | 3.303 |
| Maximum Non-Detect | N/A | 3.303 |
| Percent Non-detects | 0.00% | 3.57% |
| Minimum Detect | 3.1 | 5.403 |
| Maximum Detect | 22 | 15.3 |
| Mean of Detects | 10.15 | 10.23 |
| Median of Detects | 9.86 | 10.3 |
| SD of Detects | 3.907 | 3.303 |
| KM Mean | 10.15 | 9.982 |
| KM SD | 3.907 | 3.433 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -0.0445 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.482 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

**Sample 1 Data: Cyanide_SD(site)**
**Sample 2 Data: Cyanide_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 20 | 27 |
| Number of Missing Observations | 1 | 4 |
| Number of Non-Detects | 5 | 8 |
| Number of Detect Data | 15 | 19 |
| Minimum Non-Detect | 0.14 | 0.378 |
| Maximum Non-Detect | 0.17 | 0.928 |
| Percent Non-detects | 25.00% | 29.63% |
| Minimum Detect | 0.15 | 0.34 |
| Maximum Detect | 4.9 | 1.248 |
| Mean of Detects | 0.833 | 0.645 |
| Median of Detects | 0.48 | 0.628 |
| SD of Detects | 1.196 | 0.258 |
| KM Mean | 0.66 | 0.581 |
| KM SD | 1.045 | 0.242 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -1.448 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.0738 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/30/2019 12:53:18 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Antimony_SD(site)**
**Sample 2 Data: Antimony_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Non-Detects | 1 | 1 |
| Number of Detect Data | 83 | 29 |
| Minimum Non-Detect | 0.2 | 0.364 |
| Maximum Non-Detect | 0.2 | 0.364 |
| Percent Non-detects | 1.19% | 3.33% |
| Minimum Detect | 0.05 | 0.334 |
| Maximum Detect | 43 | 1.304 |
| Mean of Detects | 1.216 | 0.594 |
| Median of Detects | 0.55 | 0.554 |
| SD of Detects | 4.671 | 0.204 |
| KM Mean | 1.203 | 0.586 |
| KM SD | 4.617 | 0.203 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.135 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.554 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/30/2019 1:35:25 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Thallium_SD(site)**
**Sample 2 Data: Thallium_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Non-Detects | 0 | 2 |
| Number of Detect Data | 84 | 28 |
| Minimum Non-Detect | N/A | 0.108 |
| Maximum Non-Detect | N/A | 0.149 |
| Percent Non-detects | 0.00% | 6.67% |
| Minimum Detect | 0.037 | 0.106 |
| Maximum Detect | 0.63 | 0.361 |
| Mean of Detects | 0.201 | 0.228 |
| Median of Detects | 0.19 | 0.231 |
| SD of Detects | 0.0852 | 0.0713 |
| KM Mean | 0.201 | 0.22 |
| KM SD | 0.0852 | 0.0733 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -1.603 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.0544 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:44:57 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: bis-(2-Ethylhexyl)phthalate_SD(site)**
**Sample 2 Data: bis-(2-Ethylhexyl)phthalate_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 34 | 30 |
| Number of Missing Observations | 51 | 1 |
| Number of Non-Detects | 0 | 1 |
| Number of Detect Data | 34 | 29 |
| Minimum Non-Detect | N/A | 2.245 |
| Maximum Non-Detect | N/A | 2.245 |
| Percent Non-detects | 0.00% | 3.33% |
| Minimum Detect | 0.21 | 0.775 |
| Maximum Detect | 10 | 3.345 |
| Mean of Detects | 1.509 | 1.405 |
| Median of Detects | 1.2 | 1.405 |
| SD of Detects | 1.652 | 0.545 |
| KM Mean | 1.509 | 1.401 |
| KM SD | 1.652 | 0.531 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -0.94 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.174 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:51:54 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(a)anthracene_SD(site)**
**Sample 2 Data: Benzo(a)anthracene_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.021 | 0.569 |
| Maximum Detect | 2.3 | 3.169 |
| Mean of Detects | 0.534 | 0.984 |
| Median of Detects | 0.475 | 0.919 |
| SD of Detects | 0.324 | 0.469 |
| KM Mean | 0.526 | 0.984 |
| KM SD | 0.326 | 0.469 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -6.076 |
| Critical z (0.05) | -1.645 |
| P-Value | 6.17E-10 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:53:10 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(a)pyrene_SD(site)**
**Sample 2 Data: Benzo(a)pyrene_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.028 | 0.572 |
| Maximum Detect | 2 | 3.052 |
| Mean of Detects | 0.599 | 1.028 |
| Median of Detects | 0.545 | 0.982 |
| SD of Detects | 0.311 | 0.452 |
| KM Mean | 0.59 | 1.028 |
| KM SD | 0.314 | 0.452 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -5.68 |
| Critical z (0.05) | -1.645 |
| P-Value | 6.74E-09 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:00:54 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:03:04 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(k)fluoranthene_SD(site)**
**Sample 2 Data: Benzo(k)fluoranthene_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 2 | 0 |
| Number of Detect Data | 67 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.042 | N/A |
| Percent Non-detects | 2.90% | 0.00% |
| Minimum Detect | 0.066 | 0.319 |
| Maximum Detect | 0.96 | 1.647 |
| Mean of Detects | 0.332 | 0.564 |
| Median of Detects | 0.31 | 0.542 |
| SD of Detects | 0.156 | 0.247 |
| KM Mean | 0.322 | 0.564 |
| KM SD | 0.162 | 0.247 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -5.573 |
| Critical z (0.05) | -1.645 |
| P-Value | 1.25E-08 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

**Two-Sample Hypothesis Statistics – Sediment**
**Gehan**

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:05:22 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Chrysene_OL_SD(site)**
**Sample 2 Data: Chrysene_OL_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 29 |
| Number of Missing Observations | 16 | 2 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 29 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.031 | 0.511 |
| Maximum Detect | 2.4 | 1.531 |
| Mean of Detects | 0.814 | 1.028 |
| Median of Detects | 0.78 | 1.041 |
| SD of Detects | 0.371 | 0.331 |
| KM Mean | 0.802 | 1.028 |
| KM SD | 0.378 | 0.331 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -2.93 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00169 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:07:15 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Dibenzo(a,h)anthracene_OL_SD(site)**
**Sample 2 Data: Dibenzo(a,h)anthracene_OL_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 29 |
| Number of Missing Observations | 16 | 2 |
| Number of Non-Detects | 4 | 4 |
| Number of Detect Data | 65 | 25 |
| Minimum Non-Detect | 0.0067 | 0.0641 |
| Maximum Non-Detect | 0.13 | 0.146 |
| Percent Non-detects | 5.80% | 13.79% |
| Minimum Detect | 0.024 | 0.0874 |
| Maximum Detect | 0.47 | 0.311 |
| Mean of Detects | 0.14 | 0.188 |
| Median of Detects | 0.14 | 0.181 |
| SD of Detects | 0.073 | 0.0614 |
| KM Mean | 0.134 | 0.172 |
| KM SD | 0.075 | 0.0688 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -2.452 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00711 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:09:00 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Indeno(1,2,3-cd)pyrene_SD(site)**
**Sample 2 Data: Indeno(1,2,3-cd)pyrene_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.022 | 0.422 |
| Maximum Detect | 1.4 | 1.802 |
| Mean of Detects | 0.516 | 0.829 |
| Median of Detects | 0.46 | 0.792 |
| SD of Detects | 0.276 | 0.302 |
| KM Mean | 0.509 | 0.829 |
| KM SD | 0.278 | 0.302 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -4.789 |
| Critical z (0.05) | -1.645 |
| P-Value | 8.38E-07 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

**Two-Sample Hypothesis Statistics – Sediment**
**Gehan**

**Sample 1 Data: 1,2,3,4,7,8-HxCDD_SD(site)**
**Sample 2 Data: 1,2,3,4,7,8-HxCDD_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 2 | 5 |
| Number of Detect Data | 39 | 16 |
| Minimum Non-Detect | 4.30E-07 | 1.53E-06 |
| Maximum Non-Detect | 7.60E-06 | 3.39E-06 |
| Percent Non-detects | 4.88% | 23.81% |
| Minimum Detect | 1.58E-07 | 1.76E-06 |
| Maximum Detect | 2.89E-04 | 6.09E-06 |
| Mean of Detects | 1.84E-05 | 3.31E-06 |
| Median of Detects | 2.57E-06 | 2.99E-06 |
| SD of Detects | 5.27E-05 | 1.39E-06 |
| KM Mean | 1.76E-05 | 2.94E-06 |
| KM SD | 5.09E-05 | 1.36E-06 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.615 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.731 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 3:52:52 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: Benzo(b)fluoranthene_SD(site)**
**Sample 2 Data: Benzo(b)fluoranthene_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 69 | 30 |
| Number of Missing Observations | 16 | 1 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 68 | 30 |
| Minimum Non-Detect | 0.0067 | N/A |
| Maximum Non-Detect | 0.0067 | N/A |
| Percent Non-detects | 1.45% | 0.00% |
| Minimum Detect | 0.043 | 0.708 |
| Maximum Detect | 2.6 | 3.318 |
| Mean of Detects | 0.903 | 1.347 |
| Median of Detects | 0.855 | 1.343 |
| SD of Detects | 0.431 | 0.518 |
| KM Mean | 0.89 | 1.347 |
| KM SD | 0.438 | 0.518 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | -4.256 |
| Critical z (0.05) | -1.645 |
| P-Value | 1.04E-05 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2
P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 3:57:09 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,6,7,8-HxCDD_SD(site)**
**Sample 2 Data: 1,2,3,6,7,8-HxCDD_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 0 | 5 |
| Number of Detect Data | 41 | 16 |
| Minimum Non-Detect | N/A | 4.20E-06 |
| Maximum Non-Detect | N/A | 8.08E-06 |
| Percent Non-detects | 0.00% | 23.81% |
| Minimum Detect | 2.65E-07 | 4.27E-06 |
| Maximum Detect | 5.48E-04 | 1.53E-05 |
| Mean of Detects | 3.32E-05 | 7.66E-06 |
| Median of Detects | 5.90E-06 | 6.68E-06 |
| SD of Detects | 9.71E-05 | 3.28E-06 |
| KM Mean | 3.32E-05 | 6.90E-06 |
| KM SD | 9.71E-05 | 3.10E-06 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.266 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.605 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:09:43 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,7,8,9-HxCDD_SD(site)**
**Sample 2 Data: 1,2,3,7,8,9-HxCDD_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 1 | 4 |
| Number of Detect Data | 40 | 17 |
| Minimum Non-Detect | 1.10E-06 | 4.87E-06 |
| Maximum Non-Detect | 1.10E-06 | 8.97E-06 |
| Percent Non-detects | 2.44% | 19.05% |
| Minimum Detect | 2.09E-07 | 4.33E-06 |
| Maximum Detect | 7.05E-04 | 1.45E-05 |
| Mean of Detects | 4.31E-05 | 8.04E-06 |
| Median of Detects | 6.06E-06 | 6.87E-06 |
| SD of Detects | 1.29E-04 | 3.47E-06 |
| KM Mean | 4.21E-05 | 7.44E-06 |
| KM SD | 1.26E-04 | 3.30E-06 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.379 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.648 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:17:20 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,7,8-PeCDF_SD(site)**
**Sample 2 Data: 1,2,3,7,8-PeCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 3 | 11 |
| Number of Detect Data | 38 | 10 |
| Minimum Non-Detect | 1.77E-08 | 5.39E-07 |
| Maximum Non-Detect | 2.90E-06 | 1.07E-06 |
| Percent Non-detects | 7.32% | 52.38% |
| Minimum Detect | 1.13E-07 | 7.36E-07 |
| Maximum Detect | 1.24E-04 | 2.20E-06 |
| Mean of Detects | 8.82E-06 | 1.14E-06 |
| Median of Detects | 1.30E-06 | 9.61E-07 |
| SD of Detects | 2.28E-05 | 4.96E-07 |
| KM Mean | 8.20E-06 | 8.48E-07 |
| KM SD | 2.18E-05 | 4.33E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.481 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.993 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:23:13 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,4,7,8-HxCDF_SD(site)**
**Sample 2 Data: 1,2,3,4,7,8-HxCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 2 | 7 |
| Number of Detect Data | 39 | 14 |
| Minimum Non-Detect | 6.90E-07 | 2.70E-06 |
| Maximum Non-Detect | 1.30E-05 | 4.63E-06 |
| Percent Non-detects | 4.88% | 33.33% |
| Minimum Detect | 9.02E-08 | 2.43E-06 |
| Maximum Detect | 4.70E-04 | 9.03E-06 |
| Mean of Detects | 3.09E-05 | 4.42E-06 |
| Median of Detects | 3.60E-06 | 3.39E-06 |
| SD of Detects | 8.63E-05 | 2.03E-06 |
| KM Mean | 2.95E-05 | 3.86E-06 |
| KM SD | 8.33E-05 | 1.79E-06 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.838 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.799 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:24:48 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 2,3,4,6,7,8-HxCDF_SD(site)**
**Sample 2 Data: 2,3,4,6,7,8-HxCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 2 | 7 |
| Number of Detect Data | 39 | 14 |
| Minimum Non-Detect | 3.00E-07 | 1.16E-06 |
| Maximum Non-Detect | 6.40E-06 | 2.49E-06 |
| Percent Non-detects | 4.88% | 33.33% |
| Minimum Detect | 7.37E-08 | 1.28E-06 |
| Maximum Detect | 2.85E-04 | 3.69E-06 |
| Mean of Detects | 1.97E-05 | 2.26E-06 |
| Median of Detects | 3.10E-06 | 1.91E-06 |
| SD of Detects | 5.13E-05 | 8.85E-07 |
| KM Mean | 1.88E-05 | 1.96E-06 |
| KM SD | 4.96E-05 | 8.31E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.335 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.99 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:28:27 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,4,6,7,8-HpCDF_SD(site)**
**Sample 2 Data: 1,2,3,4,6,7,8-HpCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 0 | 2 |
| Number of Detect Data | 41 | 19 |
| Minimum Non-Detect | N/A | 1.49E-05 |
| Maximum Non-Detect | N/A | 1.69E-05 |
| Percent Non-detects | 0.00% | 9.52% |
| Minimum Detect | 2.37E-07 | 1.35E-05 |
| Maximum Detect | 0.00108 | 4.52E-05 |
| Mean of Detects | 7.74E-05 | 2.52E-05 |
| Median of Detects | 2.33E-05 | 2.06E-05 |
| SD of Detects | 1.87E-04 | 1.02E-05 |
| KM Mean | 7.74E-05 | 2.42E-05 |
| KM SD | 1.87E-04 | 9.98E-06 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 0.828 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.796 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:33:12 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,4,7,8,9-HpCDF_OL_SD(site)**
**Sample 2 Data: 1,2,3,4,7,8,9-HpCDF_OL_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 20 |
| Number of Missing Observations | 44 | 11 |
| Number of Non-Detects | 4 | 13 |
| Number of Detect Data | 37 | 7 |
| Minimum Non-Detect | 9.50E-08 | 1.58E-06 |
| Maximum Non-Detect | 4.10E-06 | 3.61E-06 |
| Percent Non-detects | 9.76% | 65.00% |
| Minimum Detect | 8.00E-08 | 1.72E-06 |
| Maximum Detect | 1.51E-04 | 5.11E-06 |
| Mean of Detects | 1.04E-05 | 2.86E-06 |
| Median of Detects | 1.77E-06 | 2.14E-06 |
| SD of Detects | 2.81E-05 | 1.31E-06 |
| KM Mean | 9.43E-06 | 2.10E-06 |
| KM SD | 2.64E-05 | 9.22E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 1.262 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.896 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:37:47 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 2,3,7,8-TCDD_SD(site)**
**Sample 2 Data: 2,3,7,8-TCDD_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 7 | 10 |
| Number of Detect Data | 34 | 11 |
| Minimum Non-Detect | 1.31E-08 | 2.61E-07 |
| Maximum Non-Detect | 5.20E-07 | 5.77E-07 |
| Percent Non-detects | 17.07% | 47.62% |
| Minimum Detect | 5.93E-08 | 2.80E-07 |
| Maximum Detect | 3.82E-05 | 9.59E-07 |
| Mean of Detects | 3.20E-06 | 5.42E-07 |
| Median of Detects | 7.92E-07 | 5.09E-07 |
| SD of Detects | 7.43E-06 | 2.39E-07 |
| KM Mean | 2.66E-06 | 4.27E-07 |
| KM SD | 6.77E-06 | 2.06E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.482 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.993 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 5:28:02 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 1,2,3,6,7,8-HxCDF_SD(site)**
**Sample 2 Data: 1,2,3,6,7,8-HxCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 5 | 7 |
| Number of Detect Data | 36 | 14 |
| Minimum Non-Detect | 2.50E-08 | 1.47E-06 |
| Maximum Non-Detect | 7.60E-06 | 3.05E-06 |
| Percent Non-detects | 12.20% | 33.33% |
| Minimum Detect | 1.05E-07 | 1.46E-06 |
| Maximum Detect | 2.72E-04 | 4.55E-06 |
| Mean of Detects | 2.00E-05 | 2.46E-06 |
| Median of Detects | 4.37E-06 | 2.12E-06 |
| SD of Detects | 5.01E-05 | 9.50E-07 |
| KM Mean | 1.76E-05 | 2.19E-06 |
| KM SD | 4.67E-05 | 8.59E-07 |

Sample 1 vs Sample 2 Gehan Test

H0: Mean of Sample 1 >= Mean of background

| | |
|---|---|
| Gehan z Test Value | 2.524 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.994 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:32:38 PM |
| From File | BKG&Site+SD_May2019_Input_b.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.096 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: tPCB congener(site)**
**Sample 2 Data: tPCB congener(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 40 | 29 |
| Number of Missing Observations | 0 | 2 |
| Number of Distinct Observations | 23 | 24 |
| Minimum | 0 | 0.0081 |
| Maximum | 11.8 | 0.38 |
| Mean | 1.093 | 0.118 |
| Median | 0.24 | 0.099 |
| SD | 2.574 | 0.0956 |
| SE of Mean | 0.407 | 0.0178 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 0.0956

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1563 |
| Standardized WMW U-Stat | 1.976 |
| Mean (U) | 580 |
| SD(U) - Adj ties | 82.23 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.976 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.10
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/22/2019 4:36:55 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.002 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: OCDD(site)**
**Sample 2 Data: OCDD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Distinct Observations | 40 | 20 |
| Minimum | 3.38E-04 | 5.20E-04 |
| Maximum | 0.0147 | 0.008 |
| Mean | 0.00358 | 0.00342 |
| Median | 0.00281 | 0.00255 |
| SD | 0.00318 | 0.00246 |
| SE of Mean | 4.97E-04 | 5.37E-04 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 0.00246

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1054 |
| Standardized WMW U-Stat | -3.54 |
| Mean (U) | 430.5 |
| SD(U) - Adj ties | 67.23 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 2.00E-04 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2 + 0.00
P-Value < alpha (0.05)

**Sample 1 Data: Nickel(site)**
**Sample 2 Data: Nickel(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 85 | 31 |
| Number of Distinct Observations | 39 | 21 |
| Minimum | 0 | 0 |
| Maximum | 160 | 40 |
| Mean | 41.54 | 20.2 |
| Median | 29 | 21 |
| SD | 35.35 | 9.28 |
| SE of Mean | 3.834 | 1.667 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 8.635

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 5130 |
| Standardized WMW U-Stat | 0.98 |
| Mean (U) | 1318 |
| SD(U) - Adj ties | 160.2 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.836 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 8.64
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/30/2019 1:00:19 PM |
| From File | BKG&Site+SD_May2019_Input_a.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.983 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Arsenic(site)**
**Sample 2 Data: Arsenic(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Distinct Observations | 49 | 19 |
| Minimum | 0.79 | 1 |
| Maximum | 17 | 4.7 |
| Mean | 4.522 | 2.673 |
| Median | 3.95 | 2.45 |
| SD | 2.969 | 0.983 |
| SE of Mean | 0.324 | 0.179 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 0.983

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 4990 |
| Standardized WMW U-Stat | 1.027 |
| Mean (U) | 1260 |
| SD(U) - Adj ties | 155.4 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.848 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.98
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:09:39 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.356 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Beryllium(site)**
**Sample 2 Data: Beryllium(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Distinct Observations | 42 | 26 |
| Minimum | 0.15 | 0.29 |
| Maximum | 2.2 | 1.7 |
| Mean | 1.069 | 0.846 |
| Median | 1 | 0.84 |
| SD | 0.403 | 0.356 |
| SE of Mean | 0.044 | 0.065 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 0.356

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 4600 |
| Standardized WMW U-Stat | -1.484 |
| Mean (U) | 1260 |
| SD(U) - Adj ties | 155.3 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.0689 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.36
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:30:12 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 91.66 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Manganese(site)**
**Sample 2 Data: Manganese(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Distinct Observations | 39 | 20 |
| Minimum | 86 | 94 |
| Maximum | 590 | 440 |
| Mean | 274.1 | 232.8 |
| Median | 245 | 230 |
| SD | 126.5 | 91.66 |
| SE of Mean | 13.8 | 16.74 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 91.66

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 4434 |
| Standardized WMW U-Stat | -2.552 |
| Mean (U) | 1260 |
| SD(U) - Adj ties | 155.4 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.00535 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2 + 91.66
P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:37:54 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 8.581 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: Vanadium(site)**
**Sample 2 Data: Vanadium(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Distinct Observations | 51 | 19 |
| Minimum | 8.5 | 11 |
| Maximum | 440 | 44 |
| Mean | 60.14 | 24.23 |
| Median | 37 | 23.5 |
| SD | 69 | 8.581 |
| SE of Mean | 7.529 | 1.567 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 8.581

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 5168 |
| Standardized WMW U-Stat | 2.172 |
| Mean (U) | 1260 |
| SD(U) - Adj ties | 155.4 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.985 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 8.58
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:48:34 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 2:20:41 PM |
| From File | BKG&Site+SD_May2019_Input_f.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 225.9 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: TPH-C10-28(site)**
**Sample 2 Data: TPH-C10-28(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 20 | 23 |
| Number of Missing Observations | 1 | 0 |
| Number of Distinct Observations | 18 | 17 |
| Minimum | 190 | 53 |
| Maximum | 1350 | 1100 |
| Mean | 496.3 | 293.8 |
| Median | 360 | 210 |
| SD | 297 | 225.9 |
| SE of Mean | 66.4 | 47.1 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 225.9

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 394 |
| Standardized WMW U-Stat | -1.133 |
| Mean (U) | 230 |
| SD(U) - Adj ties | 41.03 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.129 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 225.90
P-Value >= alpha (0.05)

**Two-Sample Hypothesis Statistics – Sediment**
**Wilcoxon-Mann-Whitney**

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 3:55:27 PM |
| From File | BKG&Site+SD_May2019_Input_e.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: CHLORDANE (Technical)_SD(site)**
**Sample 2 Data: CHLORDANE (Technical)_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 15 | 19 |
| Number of Missing Observations | 2 | 0 |
| Number of Non-Detects | 1 | 1 |
| Number of Detect Data | 14 | 18 |
| Minimum Non-Detect | 1.50E-04 | 0.0285 |
| Maximum Non-Detect | 1.50E-04 | 0.0285 |
| Percent Non-detects | 6.67% | 5.26% |
| Minimum Detect | 0.022 | 0.0405 |
| Maximum Detect | 0.13 | 0.149 |
| Mean of Detects | 0.0565 | 0.0803 |
| Median of Detects | 0.05 | 0.083 |
| SD of Detects | 0.0259 | 0.0285 |

WMW test is meant for a Single Detection Limit Case
Use of Gehan or T-W test is suggested when multiple detection limits are present
All observations <= 0.0285 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 194 |
| WMW U-Stat | 74 |
| Mean (U) | 142.5 |
| SD(U) - Adj ties | 28.83 |
| WMW U-Stat Critical Value (0.05) | 95 |
| Standardized WMW U-Stat | -2.394 |
| Approximate P-Value | 0.00833 |

Conclusion with Alpha = 0.05
Reject H0, Conclude Sample 1 < Sample 2

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:14:22 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: 1,2,3,4,6,7,8-HpCDD(site)**
**Sample 2 Data: 1,2,3,4,6,7,8-HpCDD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Distinct Observations | 39 | 21 |
| Minimum | 8.42E-06 | 1.70E-05 |
| Maximum | 0.0041 | 2.60E-04 |
| Mean | 3.04E-04 | 1.03E-04 |
| Median | 1.25E-04 | 7.10E-05 |
| SD | 7.09E-04 | 7.73E-05 |
| SE of Mean | 1.11E-04 | 1.69E-05 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 7.7346E-5

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1184 |
| Standardized WMW U-Stat | -1.606 |
| Mean (U) | 430.5 |
| SD(U) - Adj ties | 67.23 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.0541 |

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.00

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:53:05 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: 2,3,7,8-TCDF_SD(site)**
**Sample 2 Data: 2,3,7,8-TCDF_SD(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 40 | 21 |
| Minimum Non-Detect | 1.18E-08 | N/A |
| Maximum Non-Detect | 1.18E-08 | N/A |
| Percent Non-detects | 2.44% | 0.00% |
| Minimum Detect | 1.27E-07 | 9.18E-07 |
| Maximum Detect | 5.67E-05 | 4.06E-06 |
| Mean of Detects | 5.39E-06 | 1.65E-06 |
| Median of Detects | 1.98E-06 | 1.34E-06 |
| SD of Detects | 1.06E-05 | 7.61E-07 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1361 |
| Standardized WMW U-Stat | 1.026 |
| Mean (U) | 430.5 |
| SD(U) - Adj ties | 67.23 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.848 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2
P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.16/2/2019 4:56:28 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median Plus Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median Plus Substantial Difference, S |

**Sample 1 Data: TCDD TEQ HH(site)**
**Sample 2 Data: TCDD TEQ HH(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 41 | 21 |
| Number of Missing Observations | 44 | 10 |
| Number of Distinct Observations | 41 | 21 |
| Minimum | 3.23E-07 | 8.12E-07 |
| Maximum | 7.07E-04 | 1.26E-05 |
| Mean | 4.52E-05 | 4.47E-06 |
| Median | 9.14E-06 | 2.97E-06 |
| SD | 1.24E-04 | 3.76E-06 |
| SE of Mean | 1.94E-05 | 8.21E-07 |

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2 + 3.7619E-6

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1372 |
| Standardized WMW U-Stat | 1.19 |
| Mean (U) | 430.5 |
| SD(U) - Adj ties | 67.23 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.883 |

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 0.00
P-Value >= alpha (0.05)

**Two-Sample Hypothesis Statistics – Sediment**
**T-Test**

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.15/30/2019 12:50:25 PM |
| From File | BKG&Site+SD_May2019_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference (S) | 3664 |
| Selected Null Hypothesis | Sample 1 Mean >= Sample 2 Mean + Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean < the Sample 2 Mean + S |

**Sample 1 Data: Aluminum_OL(site)**
**Sample 2 Data: Aluminum_OL(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 29 |
| Number of Missing Observations | 1 | 2 |
| Number of Distinct Observations | 48 | 25 |
| Minimum | 1900 | 1600 |
| Maximum | 18000 | 15000 |
| Mean | 8417 | 6855 |
| Median | 8000 | 6400 |
| SD | 3409 | 3664 |
| SE of Mean | 372 | 680.4 |

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 >= 3664.00

| Method | DF | t-Test Value | Critical t (0.05) | P-Value |
|---|---|---|---|---|
| Pooled (Equal Variance) | 111 | -2.809 | -1.659 | 0.003 |
| Welch-Satterthwaite (Unequal Va | 45.9 | -2.711 | -1.679 | 0.005 |

Pooled SD: 3475.226
Conclusion with Alpha = 0.050
Student t (Pooled): Reject H0, Conclude Sample 1 < Sample 2 + 3664.00
Welch-Satterthwaite: Reject H0, Conclude Sample 1 < Sample 2 + 3664.00

Test of Equality of Variances

| | |
|---|---|
| Variance of Sample 1 | 11621888 |
| Variance of Sample 2 | 13426847 |

| Numerator DF | Denominator DF | F-Test Value | P-Value |
|---|---|---|---|
| 28 | 83 | 1.155 | 0.602 |

Conclusion with Alpha = 0.05
Two variances appear to be equal

**Two-Sample Hypothesis Statistics – Sediment**
**T-Test**

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:03:08 PM |
| From File | BKG&Site+SD_May2019_Input_a.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference (S) | 23.67 |
| Selected Null Hypothesis | Sample 1 Mean >= Sample 2 Mean + Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean < the Sample 2 Mean + S |

**Sample 1 Data: Barium_OL(site)**
**Sample 2 Data: Barium_OL(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 29 |
| Number of Missing Observations | 1 | 2 |
| Number of Distinct Observations | 46 | 21 |
| Minimum | 17 | 17 |
| Maximum | 180 | 100 |
| Mean | 84.43 | 54.17 |
| Median | 84.5 | 54 |
| SD | 28.95 | 23.67 |
| SE of Mean | 3.158 | 4.396 |

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 >= 23.67

| Method | DF | t-Test Value | Critical t (0.05) | P-Value |
|---|---|---|---|---|
| Pooled (Equal Variance) | 111 | 1.104 | -1.659 | 0.864 |
| Welch-Satterthwaite (Unequal Va | 59.1 | 1.218 | -1.671 | 0.886 |

Pooled SD: 27.712
Conclusion with Alpha = 0.050
Student t (Pooled): Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 23.67
Welch-Satterthwaite: Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 23.67

Test of Equality of Variances

| | |
|---|---|
| Variance of Sample 1 | 838 |
| Variance of Sample 2 | 560.4 |

| Numerator DF | Denominator DF | F-Test Value | P-Value |
|---|---|---|---|
| 83 | 28 | 1.495 | 0.23 |

Conclusion with Alpha = 0.05
Two variances appear to be equal

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/30/2019 1:14:53 PM |
| From File | BKG&Site+SD_May2019_Input_a.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference (S) | 4.355 |
| Selected Null Hypothesis | Sample 1 Mean >= Sample 2 Mean + Substantial Difference, S (Form 2) |
| Alternative Hypothesis | Sample 1 Mean < the Sample 2 Mean + S |

**Sample 1 Data: Cobalt(site)**
**Sample 2 Data: Cobalt(bkg)**

Raw Statistics

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 84 | 30 |
| Number of Missing Observations | 1 | 1 |
| Number of Distinct Observations | 32 | 16 |
| Minimum | 4.8 | 4.4 |
| Maximum | 32 | 22 |
| Mean | 15.26 | 11.75 |
| Median | 15.5 | 12 |
| SD | 5.2 | 4.355 |
| SE of Mean | 0.567 | 0.795 |

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 >= 4.36

| Method | DF | t-Test Value | Critical t (0.05) | P-Value |
|---|---|---|---|---|
| Pooled (Equal Variance) | 112 | -0.801 | -1.659 | 0.212 |
| Welch-Satterthwaite (Unequal Va | 60.6 | -0.871 | -1.67 | 0.193 |

Pooled SD: 4.995
Conclusion with Alpha = 0.050
Student t (Pooled): Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 4.36
Welch-Satterthwaite: Do Not Reject H0, Conclude Sample 1 >= Sample 2 + 4.36

Test of Equality of Variances

| | |
|---|---|
| Variance of Sample 1 | 27.04 |
| Variance of Sample 2 | 18.97 |

| Numerator DF | Denominator DF | F-Test Value | P-Value |
|---|---|---|---|
| 83 | 29 | 1.425 | 0.283 |

Conclusion with Alpha = 0.05
Two variances appear to be equal

## ProUCL Output - Groundwater

### Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/24/2018 12:42:49 PM |
| From File | Upper_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Aluminum**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 70 |
| Maximum | 29000 |
| Mean of Raw Data | 5545 |
| Standard Deviation of Raw Data | 8765 |
| Khat | 0.499 |
| Theta hat | 11117 |
| Kstar | 0.416 |
| Theta star | 13335 |
| Mean of Log Transformed Data | 7.347 |
| Standard Deviation of Log Transformed Data | 1.967 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.796 |
| Shapiro Wilk Test Statistic | 0.656 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 2.4923E-4 |
| Lilliefors Test Statistic | 0.285 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.973 |
| A-D Test Statistic | 0.245 |
| A-D Critical (0.05) Value | 0.777 |
| K-S Test Statistic | 0.127 |
| K-S Critical(0.05) Value | 0.281 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.958 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.846 |
| Lilliefors Test Statistic | 0.154 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Barium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 15 |
| Maximum | 600 |
| Mean of Raw Data | 245.8 |
| Standard Deviation of Raw Data | 190.2 |
| Khat | 1.464 |
| Theta hat | 167.9 |
| Kstar | 1.092 |
| Theta star | 225.2 |
| Mean of Log Transformed Data | 5.126 |
| Standard Deviation of Log Transformed Data | 1.077 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.964 |
| Shapiro Wilk Test Statistic | 0.923 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.417 |
| Lilliefors Test Statistic | 0.17 |

| | |
|---|---|
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.983 |
| A-D Test Statistic | 0.161 |
| A-D Critical (0.05) Value | 0.74 |
| K-S Test Statistic | 0.0978 |
| K-S Critical(0.05) Value | 0.271 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.952 |
| Shapiro Wilk Test Statistic | 0.915 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.261 |
| Lilliefors Test Statistic | 0.157 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Chromium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 9 |
| Minimum | 0.53 |
| Maximum | 110 |
| Mean of Raw Data | 27.2 |
| Standard Deviation of Raw Data | 36.33 |
| Khat | 0.581 |
| Theta hat | 46.83 |
| Kstar | 0.473 |
| Theta star | 57.48 |
| Mean of Log Transformed Data | 2.235 |
| Standard Deviation of Log Transformed Data | 1.757 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.867 |
| Shapiro Wilk Test Statistic | 0.755 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.00419 |
| Lilliefors Test Statistic | 0.291 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| A-D Test Statistic | 0.376 |
| A-D Critical (0.05) Value | 0.771 |
| K-S Test Statistic | 0.199 |
| K-S Critical(0.05) Value | 0.279 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.941 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.654 |
| Lilliefors Test Statistic | 0.204 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Nickel**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 1.8 |
| Maximum | 92 |
| Mean of Raw Data | 24.07 |

| | |
|---|---|
| Standard Deviation of Raw Data | 30.98 |
| Khat | 0.775 |
| Theta hat | 31.04 |
| Kstar | 0.61 |
| Theta star | 39.49 |
| Mean of Log Transformed Data | 2.412 |
| Standard Deviation of Log Transformed Data | 1.346 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.862 |
| Shapiro Wilk Test Statistic | 0.745 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.0034 |
| Lilliefors Test Statistic | 0.29 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| A-D Test Statistic | 0.401 |
| A-D Critical (0.05) Value | 0.756 |
| K-S Test Statistic | 0.166 |
| K-S Critical(0.05) Value | 0.276 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.955 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.866 |
| Lilliefors Test Statistic | 0.14 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Vanadium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 1.7 |
| Maximum | 250 |
| Mean of Raw Data | 67.1 |
| Standard Deviation of Raw Data | 86.93 |
| Khat | 0.504 |
| Theta hat | 133.1 |
| Kstar | 0.42 |
| Theta star | 159.9 |
| Mean of Log Transformed Data | 2.948 |
| Standard Deviation of Log Transformed Data | 1.93 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.895 |
| Shapiro Wilk Test Statistic | 0.795 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.0148 |
| Lilliefors Test Statistic | 0.257 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Approximate Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| A-D Test Statistic | 0.486 |
| A-D Critical (0.05) Value | 0.777 |
| K-S Test Statistic | 0.242 |
| K-S Critical(0.05) Value | 0.281 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.962 |
| Shapiro Wilk Test Statistic | 0.897 |

| | |
|---|---|
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.325 |
| Lilliefors Test Statistic | 0.188 |
| Lilliefors Critical (0.05) Value | 0.262 |

**Data appear Lognormal at (0.05) Significance Level**

### Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/24/2018 12:45:00 PM |
| From File | Upper_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Beryllium**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 6 | 4 | 40.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 6 | 0.39 | 8.9 | 3.368 | 1.6 | 3.738 |
| Statistics (All: NDs treated as DL value) | 10 | 0.39 | 8.9 | 2.421 | 1 | 3.043 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 0.39 | 8.9 | 2.221 | 0.5 | 3.156 |
| Statistics (Normal ROS Imputed Data) | 10 | -2.587 | 8.9 | 1.89 | 1.038 | 3.535 |
| Statistics (Gamma ROS Imputed Data) | 10 | 0.01 | 8.9 | 2.108 | 0.624 | 3.235 |
| Statistics (Lognormal ROS Imputed Data) | 10 | 0.153 | 8.9 | 2.206 | 0.693 | 3.169 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.883 | 0.553 | 3.814 | 0.551 | 1.341 | 2.435 |
| Statistics (NDs = DL) | 1.038 | 0.793 | 2.332 | 0.33 | 1.039 | 3.144 |
| Statistics (NDs = DL/2) | 0.797 | 0.625 | 2.786 | 0.0532 | 1.188 | 22.32 |
| Statistics (Gamma ROS Estimates) | 0.385 | 0.336 | 5.479 | -0.975 | 2.519 | -2.584 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -0.0524 | 1.337 | -25.52 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.896 | 0.802 | 0.793 | 0.912 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.784 | 0.788 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.648 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.631 | 0.842 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.84 | 0.842 | Data Not Normal |
| Lilliefors (Detects Only) | 0.349 | 0.325 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.406 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.378 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.329 | 0.262 | Data Not Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.936 | 0.933 | 0.941 | 0.952 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.479 | 0.718 | |
| Kolmogorov-Smirnov (Detects Only) | 0.265 | 0.342 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 1.063 | 0.748 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.322 | 0.274 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 1.341 | 0.755 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.347 | 0.276 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.35 | 0.798 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.157 | 0.285 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.952 | 0.93 | 0.884 | 0.966 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.88 | 0.788 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.861 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.769 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.924 | 0.842 | Data Appear Lognormal |

| | | | |
|---|---|---|---|
| Lilliefors (Detects Only) | 0.191 | 0.325 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.247 | 0.262 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.335 | 0.262 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.167 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Lead**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 9 | 1 | 10.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 1 | 1 | 1 | 1 | N/A |
| Statistics (Non-Detects Only) | 9 | 7.6 | 46 | 15.46 | 12 | 12.04 |
| Statistics (All: NDs treated as DL value) | 10 | 1 | 46 | 14.01 | 11 | 12.24 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 0.5 | 46 | 13.96 | 11 | 12.3 |
| Statistics (Normal ROS Imputed Data) | 10 | -8.927 | 46 | 13.02 | 11 | 13.72 |
| Statistics (Gamma ROS Imputed Data) | 10 | 0.01 | 46 | 13.91 | 11 | 12.36 |
| Statistics (Lognormal ROS Imputed Data) | 10 | 3.607 | 46 | 14.27 | 11 | 11.95 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 3.086 | 2.131 | 5.009 | 2.567 | 0.555 | 0.216 |
| Statistics (NDs = DL) | 1.666 | 1.233 | 8.41 | 2.311 | 0.966 | 0.418 |
| Statistics (NDs = DL/2) | 1.409 | 1.053 | 9.905 | 2.241 | 1.156 | 0.516 |
| Statistics (Gamma ROS Estimates) | 0.763 | 0.601 | 18.23 | 1.85 | 2.328 | 1.258 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 2.439 | 0.663 | 0.272 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.791 | 0.838 | 0.841 | 0.879 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.649 | 0.829 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.734 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.741 | 0.842 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.815 | 0.842 | Data Not Normal |
| Lilliefors (Detects Only) | 0.359 | 0.274 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.333 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.331 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.301 | 0.262 | Data Not Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.9 | 0.938 | 0.943 | 0.956 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.874 | 0.727 | |
| Kolmogorov-Smirnov (Detects Only) | 0.318 | 0.281 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.616 | 0.738 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.234 | 0.271 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.701 | 0.741 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.259 | 0.272 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 1.241 | 0.757 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.368 | 0.276 | Data Not Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.909 | 0.897 | 0.859 | 0.954 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.839 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.843 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.778 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.938 | 0.842 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.279 | 0.274 | Data Not Lognormal |
| Lilliefors (NDs = DL) | 0.285 | 0.262 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.327 | 0.262 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.225 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Mercury**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 2 | 8 | 80.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 8 | 0.2 | 0.2 | 0.2 | 0.2 | 2.967E-17 |
| Statistics (Non-Detects Only) | 2 | 0.071 | 1 | 0.536 | 0.536 | 0.657 |
| Statistics (All: NDs treated as DL value) | 10 | 0.071 | 1 | 0.267 | 0.2 | 0.261 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 0.071 | 1 | 0.187 | 0.1 | 0.286 |
| Statistics (Normal ROS Imputed Data) | 10 | -0.536 | 1 | 0.149 | 0.104 | 0.444 |
| Statistics (Gamma ROS Imputed Data) | 10 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Lognormal ROS Imputed Data) | 10 | 0.0126 | 1 | 0.191 | 0.0783 | 0.298 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (NDs = DL) | 2.309 | 1.683 | 0.116 | -1.552 | 0.635 | -0.409 |
| Statistics (NDs = DL/2) | 1.303 | 0.979 | 0.144 | -2.107 | 0.748 | -0.355 |
| Statistics (Gamma ROS Estimates) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -2.422 | 1.265 | -0.522 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 1 | 0.651 | 0.594 | 0.991 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (NDs = DL) | 0.465 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.387 | 0.842 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.988 | 0.842 | Data Appear Normal |
| Lilliefors (Detects Only) | N/A | N/A | |
| Lilliefors (NDs = DL) | 0.502 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.52 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.111 | 0.262 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | 0.78 | 0.788 | 0.996 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | 2.28 | 0.735 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.477 | 0.269 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 3.015 | 0.743 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.533 | 0.272 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | N/A | 0.724 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | 0.266 | |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 1 | 0.761 | 0.646 | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (NDs = DL) | 0.635 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.458 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.988 | 0.842 | Data Appear Lognormal |
| Lilliefors (Detects Only) | N/A | N/A | |
| Lilliefors (NDs = DL) | 0.436 | 0.262 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.503 | 0.262 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.111 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Zinc**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 9 | 1 | 10.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 5 | 5 | 5 | 5 | N/A |
| Statistics (Non-Detects Only) | 9 | 5 | 320 | 77.44 | 23 | 107.8 |
| Statistics (All: NDs treated as DL value) | 10 | 5 | 320 | 70.2 | 19.5 | 104.1 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 2.5 | 320 | 69.95 | 19.5 | 104.3 |
| Statistics (Normal ROS Imputed Data) | 10 | -155.9 | 320 | 54.11 | 19.5 | 125.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Statistics (Gamma ROS Imputed Data) | 10 | 0.01 | 320 | 69.7 | 19.5 | 104.5 |
| Statistics (Lognormal ROS Imputed Data) | 10 | 1.043 | 320 | 69.8 | 19.5 | 104.4 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.712 | 0.549 | 108.8 | 3.503 | 1.398 | 0.399 |
| Statistics (NDs = DL) | 0.651 | 0.522 | 107.8 | 3.314 | 1.447 | 0.437 |
| Statistics (NDs = DL/2) | 0.614 | 0.496 | 114 | 3.244 | 1.551 | 0.478 |
| Statistics (Gamma ROS Estimates) | 0.421 | 0.361 | 165.7 | 2.692 | 2.883 | 1.071 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 3.157 | 1.713 | 0.543 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.841 | 0.822 | 0.825 | 0.916 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.715 | 0.829 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.686 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.691 | 0.842 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.869 | 0.842 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.338 | 0.274 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.335 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.334 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.278 | 0.262 | Data Not Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.985 | 0.983 | 0.985 | 0.989 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.493 | 0.754 | |
| Kolmogorov-Smirnov (Detects Only) | 0.222 | 0.29 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.585 | 0.765 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.226 | 0.278 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.457 | 0.768 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.212 | 0.279 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.305 | 0.792 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.157 | 0.284 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.98 | 0.972 | 0.989 | 0.989 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.949 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.928 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.969 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.978 | 0.842 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.159 | 0.274 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.149 | 0.262 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.128 | 0.262 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.109 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_SVOCs|bis-(2-Ethylhexyl)phthalate**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 3 | 7 | 70.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 7 | 1.9 | 2.1 | 1.943 | 1.9 | 0.0787 |
| Statistics (Non-Detects Only) | 3 | 2.2 | 24 | 10.13 | 4.2 | 12.05 |
| Statistics (All: NDs treated as DL value) | 10 | 1.9 | 24 | 4.4 | 1.95 | 6.923 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 0.95 | 24 | 3.72 | 0.975 | 7.201 |
| Statistics (Normal ROS Imputed Data) | 10 | -64.88 | 24 | -24.55 | -33.23 | 27.41 |
| Statistics (Gamma ROS Imputed Data) | 10 | 0.01 | 24 | 3.047 | 0.01 | 7.495 |
| Statistics (Lognormal ROS Imputed Data) | 10 | 0.00192 | 24 | 3.089 | 0.0659 | 7.477 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | N/A | N/A | N/A | N/A | N/A | N/A |
| Statistics (NDs = DL) | 1.187 | 0.898 | 3.706 | 1.005 | 0.801 | 0.798 |
| Statistics (NDs = DL/2) | 0.753 | 0.594 | 4.939 | 0.519 | 1.059 | 2.039 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Statistics (Gamma ROS Estimates) | 0.195 | 0.203 | 15.66 | -2.683 | 3.149 | -1.173 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.924 | 2.938 | -1.527 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.905 | 0.628 | 0.653 | 0.976 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.818 | 0.767 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.425 | 0.842 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.455 | 0.842 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.95 | 0.842 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.355 | 0.425 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.425 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.384 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.191 | 0.262 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | 0.834 | 0.889 | 0.977 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | 2.476 | 0.745 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.439 | 0.273 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.034 | 0.757 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.39 | 0.276 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 1.748 | 0.86 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.44 | 0.295 | Data Not Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.967 | 0.716 | 0.789 | 0.977 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.934 | 0.767 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.537 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.637 | 0.842 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.952 | 0.842 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.283 | 0.425 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.406 | 0.262 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.372 | 0.262 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.191 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/25/2018 1:44:49 PM |
| From File | Lower_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Aluminum**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 3100 |
| Maximum | 37000 |
| Mean of Raw Data | 14725 |
| Standard Deviation of Raw Data | 15292 |
| Khat | 1.382 |
| Theta hat | 10654 |
| Kstar | 0.512 |
| Theta star | 28749 |
| Mean of Log Transformed Data | 9.194 |
| Standard Deviation of Log Transformed Data | 1.043 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.908 |
| Shapiro Wilk Test Statistic | 0.833 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.321 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.997 |
| A-D Test Statistic | 0.271 |
| A-D Critical (0.05) Value | 0.663 |
| K-S Test Statistic | 0.227 |
| K-S Critical(0.05) Value | 0.4 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.994 |
| Shapiro Wilk Test Statistic | 0.992 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.174 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Barium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 320 |
| Maximum | 1000 |
| Mean of Raw Data | 657.5 |
| Standard Deviation of Raw Data | 280 |
| Khat | 6.549 |
| Theta hat | 100.4 |
| Kstar | 1.804 |
| Theta star | 364.5 |
| Mean of Log Transformed Data | 6.41 |
| Standard Deviation of Log Transformed Data | 0.476 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.989 |
| Shapiro Wilk Test Statistic | 0.989 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.19 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| A-D Test Statistic | 0.248 |
| A-D Critical (0.05) Value | 0.658 |
| K-S Test Statistic | 0.227 |
| K-S Critical(0.05) Value | 0.396 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.972 |
| Shapiro Wilk Test Statistic | 0.956 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.253 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Beryllium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |

| | |
|---|---|
| Number of Distinct Observations | 4 |
| Minimum | 3.4 |
| Maximum | 13 |
| Mean of Raw Data | 6.1 |
| Standard Deviation of Raw Data | 4.62 |
| Khat | 3.09 |
| Theta hat | 1.974 |
| Kstar | 0.939 |
| Theta star | 6.496 |
| Mean of Log Transformed Data | 1.638 |
| Standard Deviation of Log Transformed Data | 0.628 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.835 |
| Shapiro Wilk Test Statistic | 0.708 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.394 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data not Normal at (0.05) Significance Level**

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.948 |
| A-D Test Statistic | 0.677 |
| A-D Critical (0.05) Value | 0.659 |
| K-S Test Statistic | 0.386 |
| K-S Critical(0.05) Value | 0.397 |

**Data follow Appr. Gamma Distribution at (0.05) Significance Level**

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.874 |
| Shapiro Wilk Test Statistic | 0.772 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.348 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data appear Lognormal at (0.05) Significance Level**

**RA17_GW_Metals|Chromium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 28 |
| Maximum | 150 |
| Mean of Raw Data | 97.25 |
| Standard Deviation of Raw Data | 58.01 |
| Khat | 2.78 |
| Theta hat | 34.98 |
| Kstar | 0.862 |
| Theta star | 112.9 |
| Mean of Log Transformed Data | 4.387 |
| Standard Deviation of Log Transformed Data | 0.78 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.959 |
| Shapiro Wilk Test Statistic | 0.902 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.269 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data appear Normal at (0.05) Significance Level**

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.869 |
| A-D Test Statistic | 0.375 |
| A-D Critical (0.05) Value | 0.66 |
| K-S Test Statistic | 0.3 |
| K-S Critical(0.05) Value | 0.397 |

**Data appear Gamma Distributed at (0.05) Significance Level**

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.942 |
| Shapiro Wilk Test Statistic | 0.88 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.262 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data appear Lognormal at (0.05) Significance Level**

**RA17_GW_Metals|Copper**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 31 |
| Maximum | 190 |
| Mean of Raw Data | 117.8 |
| Standard Deviation of Raw Data | 66.59 |
| Khat | 2.818 |
| Theta hat | 41.78 |
| Kstar | 0.871 |
| Theta star | 135.2 |
| Mean of Log Transformed Data | 4.581 |
| Standard Deviation of Log Transformed Data | 0.797 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.988 |
| Shapiro Wilk Test Statistic | 0.982 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.204 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data appear Normal at (0.05) Significance Level**

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.916 |
| A-D Test Statistic | 0.356 |
| A-D Critical (0.05) Value | 0.66 |
| K-S Test Statistic | 0.285 |
| K-S Critical(0.05) Value | 0.397 |

**Data appear Gamma Distributed at (0.05) Significance Level**

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.927 |
| Shapiro Wilk Test Statistic | 0.869 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.31 |
| Lilliefors Critical (0.05) Value | 0.375 |

**Data appear Lognormal at (0.05) Significance Level**

**RA17_GW_Metals|Lead**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 50 |
| Maximum | 1300 |
| Mean of Raw Data | 393 |
| Standard Deviation of Raw Data | 605.8 |
| Khat | 0.698 |
| Theta hat | 563 |
| Kstar | 0.341 |
| Theta star | 1152 |
| Mean of Log Transformed Data | 5.108 |
| Standard Deviation of Log Transformed Data | 1.438 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.821 |

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.685 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.412 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.565 |
| A-D Critical (0.05) Value | 0.673 |
| K-S Test Statistic | 0.373 |
| K-S Critical(0.05) Value | 0.406 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.931 |
| Shapiro Wilk Test Statistic | 0.874 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.296 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Nickel**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 3 |
| Minimum | 42 |
| Maximum | 81 |
| Mean of Raw Data | 54 |
| Standard Deviation of Raw Data | 18.49 |
| Khat | 13.12 |
| Theta hat | 4.114 |
| Kstar | 3.448 |
| Theta star | 15.66 |
| Mean of Log Transformed Data | 3.95 |
| Standard Deviation of Log Transformed Data | 0.31 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.882 |
| Shapiro Wilk Test Statistic | 0.781 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.314 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.937 |
| A-D Test Statistic | 0.545 |
| A-D Critical (0.05) Value | 0.657 |
| K-S Test Statistic | 0.295 |
| K-S Critical(0.05) Value | 0.395 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.902 |
| Shapiro Wilk Test Statistic | 0.813 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.274 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Vanadium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |

| | |
|---|---|
| Minimum | 45 |
| Maximum | 200 |
| Mean of Raw Data | 120.8 |
| Standard Deviation of Raw Data | 68.18 |
| Khat | 3.595 |
| Theta hat | 33.59 |
| Kstar | 1.065 |
| Theta star | 113.3 |
| Mean of Log Transformed Data | 4.648 |
| Standard Deviation of Log Transformed Data | 0.656 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.994 |
| Shapiro Wilk Test Statistic | 0.98 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.185 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.968 |
| A-D Test Statistic | 0.232 |
| A-D Critical (0.05) Value | 0.659 |
| K-S Test Statistic | 0.226 |
| K-S Critical(0.05) Value | 0.396 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.962 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.21 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Zinc**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 110 |
| Maximum | 730 |
| Mean of Raw Data | 377.5 |
| Standard Deviation of Raw Data | 298.8 |
| Khat | 1.849 |
| Theta hat | 204.1 |
| Kstar | 0.629 |
| Theta star | 600.1 |
| Mean of Log Transformed Data | 5.639 |
| Standard Deviation of Log Transformed Data | 0.924 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.953 |
| Shapiro Wilk Test Statistic | 0.889 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.277 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.945 |
| A-D Test Statistic | 0.399 |
| A-D Critical (0.05) Value | 0.661 |
| K-S Test Statistic | 0.296 |
| K-S Critical(0.05) Value | 0.398 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.954 |
| Shapiro Wilk Test Statistic | 0.888 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.252 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

### Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.11/25/2018 2:23:03 PM |
| From File | Lower_Input_Diss.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

### RA17_GW_Metals|Zinc

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 4 |
| Number of Distinct Observations | 4 |
| Minimum | 6.6 |
| Maximum | 140 |
| Mean of Raw Data | 42.23 |
| Standard Deviation of Raw Data | 65.29 |
| Khat | 0.701 |
| Theta hat | 60.23 |
| Kstar | 0.342 |
| Theta star | 123.5 |
| Mean of Log Transformed Data | 2.881 |
| Standard Deviation of Log Transformed Data | 1.421 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.815 |
| Shapiro Wilk Test Statistic | 0.676 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.412 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| A-D Test Statistic | 0.638 |
| A-D Critical (0.05) Value | 0.672 |
| K-S Test Statistic | 0.374 |
| K-S Critical(0.05) Value | 0.406 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.9 |
| Shapiro Wilk Test Statistic | 0.813 |
| Shapiro Wilk Critical (0.05) Value | 0.748 |
| Approximate Shapiro Wilk P Value | N/A |
| Lilliefors Test Statistic | 0.298 |
| Lilliefors Critical (0.05) Value | 0.375 |

Data appear Lognormal at (0.05) Significance Level

### Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 10:59:33 PM |
| From File | Combined_Dissolved_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

### RA17_GW_Metals|Cadmium

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 4 | 0.098 | 2 | 0.627 | 0.205 | 0.917 |
| Statistics (All: NDs treated as DL value) | 14 | 0.098 | 2 | 0.893 | 1 | 0.474 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 0.098 | 2 | 0.536 | 0.5 | 0.444 |
| Statistics (Normal ROS Imputed Data) | 14 | -0.716 | 2 | 0.356 | 0.205 | 0.676 |
| Statistics (Gamma ROS Imputed Data) | 14 | 0.01 | 2 | 0.372 | 0.197 | 0.541 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 0.039 | 2 | 0.345 | 0.199 | 0.503 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.808 | 0.369 | 0.776 | -1.2 | 1.309 | -1.091 |
| Statistics (NDs = DL) | 2.326 | 1.875 | 0.384 | -0.343 | 0.844 | -2.461 |
| Statistics (NDs = DL/2) | 2.481 | 1.997 | 0.216 | -0.838 | 0.672 | -0.802 |
| Statistics (Gamma ROS Estimates) | 0.58 | 0.503 | 0.641 | -2.062 | 1.754 | -0.851 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.612 | 1.002 | -0.622 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.816 | 0.839 | 0.703 | 0.966 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.679 | 0.748 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.729 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.533 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.947 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.425 | 0.375 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.375 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.461 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.157 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.977 | 0.808 | 0.791 | 0.989 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.637 | 0.669 | |
| Kolmogorov-Smirnov (Detects Only) | 0.419 | 0.404 | Detected Data appear Approximate Gamma D |
| Anderson-Darling (NDs = DL) | 2.417 | 0.745 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.439 | 0.231 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.074 | 0.744 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.387 | 0.231 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.32 | 0.786 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.132 | 0.24 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.909 | 0.813 | 0.845 | 0.98 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.842 | 0.748 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.676 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.751 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.971 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.359 | 0.375 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.443 | 0.226 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.371 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.123 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Iron**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 13 | 1 | 7.14% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 50 | 50 | 50 | 50 | N/A |
| Statistics (Non-Detects Only) | 13 | 59 | 24000 | 3793 | 530 | 7200 |
| Statistics (All: NDs treated as DL value) | 14 | 50 | 24000 | 3526 | 505 | 6990 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 25 | 24000 | 3524 | 505 | 6991 |
| Statistics (Normal ROS Imputed Data) | 14 | -10149 | 24000 | 2797 | 505 | 7857 |
| Statistics (Gamma ROS Imputed Data) | 14 | 0.01 | 24000 | 3522 | 505 | 6992 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 8.033 | 24000 | 3523 | 505 | 6991 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.414 | 0.37 | 9155 | 6.662 | 1.869 | 0.281 |
| Statistics (NDs = DL) | 0.388 | 0.353 | 9079 | 6.465 | 1.941 | 0.3 |
| Statistics (NDs = DL/2) | 0.379 | 0.345 | 9299 | 6.416 | 2.018 | 0.315 |
| Statistics (Gamma ROS Estimates) | 0.299 | 0.282 | 11791 | 5.857 | 3.506 | 0.599 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 6.335 | 2.173 | 0.343 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.758 | 0.744 | 0.744 | 0.841 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.591 | 0.866 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.57 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.571 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.741 | 0.874 | Data Not Normal |
| Lilliefors (Detects Only) | 0.346 | 0.234 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.35 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.35 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.306 | 0.226 | Data Not Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.982 | 0.98 | 0.981 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.92 | 0.807 | |
| Kolmogorov-Smirnov (Detects Only) | 0.267 | 0.253 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.983 | 0.815 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.268 | 0.245 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.885 | 0.817 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.261 | 0.245 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.56 | 0.833 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.199 | 0.248 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.975 | 0.975 | 0.985 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.941 | 0.866 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.938 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.964 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.975 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.186 | 0.234 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.171 | 0.226 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.16 | 0.226 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.144 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 10:58:24 PM |
| From File | Combined_Dissolved_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Cobalt**

| **Raw Statistics** | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 12 |
| Minimum | 1.2 |
| Maximum | 65 |
| Mean of Raw Data | 12.86 |
| Standard Deviation of Raw Data | 19.88 |
| Khat | 0.639 |
| Theta hat | 20.14 |
| Kstar | 0.55 |
| Theta star | 23.41 |
| Mean of Log Transformed Data | 1.596 |

| | |
|---|---|
| Standard Deviation of Log Transformed Data | 1.366 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.796 |
| Shapiro Wilk Test Statistic | 0.641 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 4.7499E-5 |
| Lilliefors Test Statistic | 0.367 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.963 |
| A-D Test Statistic | 1.259 |
| A-D Critical (0.05) Value | 0.781 |
| K-S Test Statistic | 0.268 |
| K-S Critical(0.05) Value | 0.239 |

Data not Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.941 |
| Shapiro Wilk Test Statistic | 0.869 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.053 |
| Lilliefors Test Statistic | 0.172 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Approximate_Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Manganese**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 120 |
| Maximum | 15000 |
| Mean of Raw Data | 1904 |
| Standard Deviation of Raw Data | 3831 |
| Khat | 0.722 |
| Theta hat | 2636 |
| Kstar | 0.615 |
| Theta star | 3095 |
| Mean of Log Transformed Data | 6.719 |
| Standard Deviation of Log Transformed Data | 1.174 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.643 |
| Shapiro Wilk Test Statistic | 0.445 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 3.7523E-7 |
| Lilliefors Test Statistic | 0.377 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.868 |
| A-D Test Statistic | 1.232 |
| A-D Critical (0.05) Value | 0.773 |
| K-S Test Statistic | 0.293 |
| K-S Critical(0.05) Value | 0.238 |

Data not Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.958 |
| Shapiro Wilk Test Statistic | 0.936 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.282 |
| Lilliefors Test Statistic | 0.19 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

### RA17_GW_Metals|Nickel

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 1.3 |
| Maximum | 46 |
| Mean of Raw Data | 9 |
| Standard Deviation of Raw Data | 11.82 |
| Khat | 1.102 |
| Theta hat | 8.169 |
| Kstar | 0.913 |
| Theta star | 9.855 |
| Mean of Log Transformed Data | 1.679 |
| Standard Deviation of Log Transformed Data | 0.999 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.783 |
| Shapiro Wilk Test Statistic | 0.635 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 3.3628E-5 |
| Lilliefors Test Statistic | 0.316 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.944 |
| A-D Test Statistic | 0.585 |
| A-D Critical (0.05) Value | 0.758 |
| K-S Test Statistic | 0.201 |
| K-S Critical(0.05) Value | 0.235 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.982 |
| Shapiro Wilk Test Statistic | 0.963 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.753 |
| Lilliefors Test Statistic | 0.125 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 10:28:28 AM |
| From File | Combined_Total_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

### RA17_GW_Metals|Arsenic

| Raw Statistics | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 13 |
| Minimum | 0.53 |
| Maximum | 29 |
| Mean of Raw Data | 9.255 |
| Standard Deviation of Raw Data | 8.453 |
| Khat | 1.076 |
| Theta hat | 8.602 |
| Kstar | 0.893 |
| Theta star | 10.36 |
| Mean of Log Transformed Data | 1.693 |
| Standard Deviation of Log Transformed Data | 1.231 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.945 |
| Shapiro Wilk Test Statistic | 0.888 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.0833 |
| Lilliefors Test Statistic | 0.161 |

| | |
|---|---|
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.987 |
| A-D Test Statistic | 0.184 |
| A-D Critical (0.05) Value | 0.759 |
| K-S Test Statistic | 0.0923 |
| K-S Critical(0.05) Value | 0.235 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.973 |
| Shapiro Wilk Test Statistic | 0.937 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.426 |
| Lilliefors Test Statistic | 0.138 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Cobalt**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 1.6 |
| Maximum | 130 |
| Mean of Raw Data | 30.96 |
| Standard Deviation of Raw Data | 37.26 |
| Khat | 0.761 |
| Theta hat | 40.69 |
| Kstar | 0.646 |
| Theta star | 47.97 |
| Mean of Log Transformed Data | 2.648 |
| Standard Deviation of Log Transformed Data | 1.448 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.877 |
| Shapiro Wilk Test Statistic | 0.776 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.00199 |
| Lilliefors Test Statistic | 0.285 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.993 |
| A-D Test Statistic | 0.328 |
| A-D Critical (0.05) Value | 0.77 |
| K-S Test Statistic | 0.151 |
| K-S Critical(0.05) Value | 0.237 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.432 |
| Lilliefors Test Statistic | 0.153 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Iron**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 510 |
| Maximum | 180000 |
| Mean of Raw Data | 63265 |
| Standard Deviation of Raw Data | 52449 |

| | |
|---|---|
| Khat | 0.948 |
| Theta hat | 66763 |
| Kstar | 0.792 |
| Theta star | 79863 |
| Mean of Log Transformed Data | 10.44 |
| Standard Deviation of Log Transformed Data | 1.58 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.959 |
| Shapiro Wilk Test Statistic | 0.916 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.202 |
| Lilliefors Test Statistic | 0.205 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.98 |
| A-D Test Statistic | 0.428 |
| A-D Critical (0.05) Value | 0.762 |
| K-S Test Statistic | 0.215 |
| K-S Critical(0.05) Value | 0.236 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.897 |
| Shapiro Wilk Test Statistic | 0.817 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.00629 |
| Lilliefors Test Statistic | 0.271 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Manganese**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 120 |
| Maximum | 15000 |
| Mean of Raw Data | 2304 |
| Standard Deviation of Raw Data | 3773 |
| Khat | 0.845 |
| Theta hat | 2727 |
| Kstar | 0.712 |
| Theta star | 3239 |
| Mean of Log Transformed Data | 7.045 |
| Standard Deviation of Log Transformed Data | 1.195 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.702 |
| Shapiro Wilk Test Statistic | 0.524 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 2.1434E-6 |
| Lilliefors Test Statistic | 0.345 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.892 |
| A-D Test Statistic | 0.647 |
| A-D Critical (0.05) Value | 0.767 |
| K-S Test Statistic | 0.188 |
| K-S Critical(0.05) Value | 0.237 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| Shapiro Wilk Test Statistic | 0.968 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |

| | |
|---|---|
| Approximate Shapiro Wilk P Value | 0.724 |
| Lilliefors Test Statistic | 0.147 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**Goodness-of-Fit Test Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 10:29:45 AM |
| From File | Combined_Total_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Cadmium**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 8 | 6 | 42.86% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 6 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 8 | 0.081 | 5.1 | 1.439 | 0.645 | 1.696 |
| Statistics (All: NDs treated as DL value) | 14 | 0.081 | 5.1 | 1.251 | 1 | 1.265 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 0.081 | 5.1 | 1.037 | 0.5 | 1.335 |
| Statistics (Normal ROS Imputed Data) | 14 | -0.865 | 5.1 | 1.041 | 0.645 | 1.454 |
| Statistics (Gamma ROS Imputed Data) | 14 | 0.01 | 5.1 | 1.009 | 0.55 | 1.381 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 0.081 | 5.1 | 0.998 | 0.55 | 1.365 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 0.863 | 0.623 | 1.667 | -0.317 | 1.358 | -4.282 |
| Statistics (NDs = DL) | 1.377 | 1.13 | 0.908 | -0.181 | 1.01 | -5.572 |
| Statistics (NDs = DL/2) | 1.109 | 0.919 | 0.934 | -0.478 | 1.015 | -2.123 |
| Statistics (Gamma ROS Estimates) | 0.59 | 0.511 | 1.71 | -1.042 | 1.872 | -1.798 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -0.68 | 1.21 | -1.779 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.886 | 0.823 | 0.769 | 0.912 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.794 | 0.818 | Data Not Normal |
| Shapiro-Wilk (NDs = DL) | 0.703 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.615 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.853 | 0.874 | Data Not Normal |
| Lilliefors (Detects Only) | 0.285 | 0.283 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.364 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.374 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.207 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.995 | 0.942 | 0.936 | 0.992 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.236 | 0.741 | |
| Kolmogorov-Smirnov (Detects Only) | 0.196 | 0.303 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.683 | 0.753 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.27 | 0.233 | Detected Data appear Approximate Gamma D |
| Anderson-Darling (NDs = DL/2) | 1.353 | 0.758 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.321 | 0.235 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.181 | 0.785 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.114 | 0.24 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.988 | 0.942 | 0.927 | 0.99 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.973 | 0.818 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.907 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.88 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.973 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.168 | 0.283 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.215 | 0.226 | Data Appear Lognormal |

| | | | |
|---|---|---|---|
| Lilliefors (NDs = DL/2) | 0.273 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.0986 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Thallium**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 5 | 9 | 64.29% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 9 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 5 | 0.072 | 0.15 | 0.12 | 0.13 | 0.0292 |
| Statistics (All: NDs treated as DL value) | 14 | 0.072 | 1 | 0.686 | 1 | 0.438 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 0.072 | 0.5 | 0.364 | 0.5 | 0.189 |
| Statistics (Normal ROS Imputed Data) | 14 | 0.072 | 0.166 | 0.12 | 0.125 | 0.028 |
| Statistics (Gamma ROS Imputed Data) | 14 | 0.072 | 0.169 | 0.121 | 0.124 | 0.0277 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 0.072 | 0.179 | 0.121 | 0.124 | 0.0304 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 17.5 | 7.132 | 0.00688 | -2.146 | 0.283 | -0.132 |
| Statistics (NDs = DL) | 1.428 | 1.17 | 0.48 | -0.766 | 1.078 | -1.407 |
| Statistics (NDs = DL/2) | 2.624 | 2.109 | 0.139 | -1.212 | 0.739 | -0.61 |
| Statistics (Gamma ROS Estimates) | 18.81 | 14.83 | 0.00641 | -2.142 | 0.247 | -0.115 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -2.146 | 0.265 | -0.124 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.918 | 0.81 | 0.821 | 0.984 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.865 | 0.762 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.633 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.653 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.961 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.295 | 0.343 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.406 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.406 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.137 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.885 | 0.658 | 0.71 | 0.98 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.586 | 0.679 | |
| Kolmogorov-Smirnov (Detects Only) | 0.326 | 0.357 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 2.535 | 0.752 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.417 | 0.233 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.377 | 0.744 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.414 | 0.231 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.286 | 0.734 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.152 | 0.228 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.884 | 0.831 | 0.839 | 0.984 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.803 | 0.762 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.673 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.69 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.962 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.336 | 0.343 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.404 | 0.226 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.401 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.143 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Petroleum|Diesel Range Organics (C10-C20)**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 480 | 520 | 488 | 480 | 14.76 |
| Statistics (Non-Detects Only) | 4 | 190 | 470 | 290 | 250 | 123.6 |
| Statistics (All: NDs treated as DL value) | 14 | 190 | 520 | 431.4 | 480 | 110.9 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 190 | 470 | 257.1 | 240 | 63.45 |
| Statistics (Normal ROS Imputed Data) | 14 | 110.8 | 470 | 290 | 290 | 102.7 |
| Statistics (Gamma ROS Imputed Data) | 14 | 123.8 | 490.7 | 289.9 | 282.9 | 104.5 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 152.6 | 489.3 | 287.6 | 273.2 | 99.16 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 8.551 | 2.304 | 33.91 | 5.61 | 0.385 | 0.0687 |
| Statistics (NDs = DL) | 11.85 | 9.356 | 36.42 | 6.024 | 0.33 | 0.0547 |
| Statistics (NDs = DL/2) | 24.63 | 19.4 | 10.44 | 5.529 | 0.194 | 0.0351 |
| Statistics (Gamma ROS Estimates) | 8.283 | 6.556 | 34.99 | 5.608 | 0.37 | 0.0661 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 5.61 | 0.329 | 0.0587 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.908 | 0.803 | 0.677 | 0.973 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.837 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.646 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.501 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.944 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.346 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.422 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.411 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.214 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.959 | 0.745 | 0.723 | 0.977 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.417 | 0.658 | |
| Kolmogorov-Smirnov (Detects Only) | 0.329 | 0.395 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 2.717 | 0.734 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.439 | 0.229 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.773 | 0.734 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.38 | 0.228 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.325 | 0.736 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.196 | 0.229 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.946 | 0.786 | 0.734 | 0.976 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.908 | 0.748 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.623 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.585 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.952 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.301 | 0.375 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.437 | 0.226 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.364 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.214 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_VOCs|Methyl tert-Butyl Ether (MTBE)**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 1 | 1 | 1 | 1 | 0 |
| Statistics (Non-Detects Only) | 4 | 0.21 | 0.34 | 0.285 | 0.295 | 0.0656 |
| Statistics (All: NDs treated as DL value) | 14 | 0.21 | 1 | 0.796 | 1 | 0.337 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 0.21 | 0.5 | 0.439 | 0.5 | 0.106 |
| Statistics (Normal ROS Imputed Data) | 14 | 0.171 | 0.399 | 0.285 | 0.285 | 0.067 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Statistics (Gamma ROS Imputed Data) | 14 | 0.18 | 0.407 | 0.286 | 0.283 | 0.0667 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 0.184 | 0.424 | 0.287 | 0.279 | 0.0697 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 24.12 | 6.196 | 0.0118 | -1.276 | 0.239 | -0.187 |
| Statistics (NDs = DL) | 3.833 | 3.059 | 0.208 | -0.365 | 0.609 | -1.671 |
| Statistics (NDs = DL/2) | 14.26 | 11.25 | 0.0308 | -0.86 | 0.296 | -0.345 |
| Statistics (Gamma ROS Estimates) | 19.26 | 15.18 | 0.0148 | -1.278 | 0.24 | -0.188 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | -1.276 | 0.245 | -0.192 |

## Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.932 | 0.787 | 0.8 | 0.99 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.845 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.606 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.635 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.972 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.299 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.442 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.434 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.137 | 0.226 | Data Appear Normal |

## Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.907 | 0.679 | 0.74 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.462 | 0.657 | |
| Kolmogorov-Smirnov (Detects Only) | 0.331 | 0.394 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 2.827 | 0.741 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.451 | 0.23 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.575 | 0.734 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.438 | 0.228 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.238 | 0.734 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.147 | 0.228 | Data Appear Gamma Distributed |

## Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.937 | 0.798 | 0.795 | 0.99 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.857 | 0.748 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.627 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.632 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.972 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.296 | 0.375 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.44 | 0.226 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.427 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.137 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 10:26:52 AM |
| From File | Upper_Input_LN_Total.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Aluminum**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 4.248 |
| Maximum | 10.28 |
| Mean of Raw Data | 7.347 |
| Standard Deviation of Raw Data | 1.967 |
| Khat | 14.11 |
| Theta hat | 0.521 |
| Kstar | 9.942 |
| Theta star | 0.739 |
| Mean of Log Transformed Data | 1.958 |
| Standard Deviation of Log Transformed Data | 0.29 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.984 |
| Shapiro Wilk Test Statistic | 0.958 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.846 |
| Lilliefors Test Statistic | 0.154 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.969 |
| A-D Test Statistic | 0.325 |
| A-D Critical (0.05) Value | 0.725 |
| K-S Test Statistic | 0.171 |
| K-S Critical(0.05) Value | 0.266 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.971 |
| Shapiro Wilk Test Statistic | 0.932 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.538 |
| Lilliefors Test Statistic | 0.16 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Chromium**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 9 |
| Minimum | -0.635 |
| Maximum | 4.7 |
| Mean of Raw Data | 2.235 |
| Standard Deviation of Raw Data | 1.757 |

Data contains values <= 0
Data not gamma or lognormal

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.976 |
| Shapiro Wilk Test Statistic | 0.941 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.654 |
| Lilliefors Test Statistic | 0.204 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Normal at (0.05) Significance Level

**RA17_GW_Metals|Nickel**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 0.588 |
| Maximum | 4.522 |
| Mean of Raw Data | 2.412 |
| Standard Deviation of Raw Data | 1.346 |
| Khat | 3.015 |
| Theta hat | 0.8 |
| Kstar | 2.177 |
| Theta star | 1.108 |
| Mean of Log Transformed Data | 0.706 |
| Standard Deviation of Log Transformed Data | 0.669 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.986 |
| Shapiro Wilk Test Statistic | 0.955 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.866 |
| Lilliefors Test Statistic | 0.14 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.973 |
| A-D Test Statistic | 0.203 |
| A-D Critical (0.05) Value | 0.732 |
| K-S Test Statistic | 0.142 |
| K-S Critical(0.05) Value | 0.268 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| Shapiro Wilk Test Statistic | 0.945 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.69 |
| Lilliefors Test Statistic | 0.174 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

RA17_GW_Metals|Vanadium

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 10 |
| Number of Distinct Observations | 10 |
| Minimum | 0.531 |
| Maximum | 5.521 |
| Mean of Raw Data | 2.948 |
| Standard Deviation of Raw Data | 1.93 |
| Khat | 1.942 |
| Theta hat | 1.518 |
| Kstar | 1.426 |
| Theta star | 2.068 |
| Mean of Log Transformed Data | 0.802 |
| Standard Deviation of Log Transformed Data | 0.869 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.962 |
| Shapiro Wilk Test Statistic | 0.897 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.325 |
| Lilliefors Test Statistic | 0.188 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.916 |
| A-D Test Statistic | 0.469 |
| A-D Critical (0.05) Value | 0.736 |
| K-S Test Statistic | 0.193 |
| K-S Critical(0.05) Value | 0.27 |

Data appear Gamma Distributed at (0.05) Significance Level

### Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.952 |
| Shapiro Wilk Test Statistic | 0.885 |
| Shapiro Wilk Critical (0.05) Value | 0.842 |
| Approximate Shapiro Wilk P Value | 0.215 |
| Lilliefors Test Statistic | 0.194 |
| Lilliefors Critical (0.05) Value | 0.262 |

Data appear Lognormal at (0.05) Significance Level

### Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 10:33:30 AM |
| From File | Upper_Input_LN_Total.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

## RA17_GW_Metals|Beryllium

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 6 | 4 | 40.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 4 | 0 | 0 | 0 | 0 | 0 |
| Statistics (Non-Detects Only) | 6 | -0.942 | 2.186 | 0.551 | 0.47 | 1.341 |
| Statistics (All: NDs treated as DL value) | 10 | -0.942 | 2.186 | 0.33 | 0 | 1.039 |
| Statistics (All: NDs treated as DL/2 value) | 10 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 10 | -1.879 | 2.186 | -0.0524 | -0.394 | 1.337 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal RO! |
|---|---|---|---|---|
| Correlation Coefficient R | 0.952 | 0.93 | 0.93 | 0.966 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.88 | 0.788 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.861 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.861 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.924 | 0.842 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.191 | 0.325 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.247 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.247 | 0.262 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.167 | 0.262 | Data Appear Normal |

### Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma RO |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

Note: Substitution methods such as DL or DL/2 are not recommended.

## RA17_GW_Metals|Lead

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 9 | 1 | 10.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 0 | 0 | 0 | 0 | N/A |
| Statistics (Non-Detects Only) | 9 | 2.028 | 3.829 | 2.567 | 2.485 | 0.555 |
| Statistics (All: NDs treated as DL value) | 10 | 0 | 3.829 | 2.311 | 2.394 | 0.966 |
| Statistics (All: NDs treated as DL/2 value) | 10 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 10 | 1.283 | 3.829 | 2.439 | 2.394 | 0.663 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.909 | 0.897 | 0.897 | 0.954 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.839 | 0.829 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.843 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.843 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.938 | 0.842 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.279 | 0.274 | Data Not Normal |
| Lilliefors (NDs = DL) | 0.285 | 0.262 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.285 | 0.262 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.225 | 0.262 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.482 | 0.721 | |
| Kolmogorov-Smirnov (Detects Only) | 0.254 | 0.279 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.944 | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.898 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | N/A | N/A | |
| Shapiro-Wilk (NDs = DL/2) | N/A | N/A | |
| Shapiro-Wilk (Lognormal ROS Estimates) | N/A | N/A | |
| Lilliefors (Detects Only) | 0.243 | 0.274 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | N/A | N/A | |
| Lilliefors (NDs = DL/2) | N/A | N/A | |
| Lilliefors (Lognormal ROS Estimates) | N/A | N/A | |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_Metals|Zinc**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 10 | 0 | 10 | 9 | 1 | 10.00% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 1.609 | 1.609 | 1.609 | 1.609 | N/A |
| Statistics (Non-Detects Only) | 9 | 1.609 | 5.768 | 3.503 | 3.135 | 1.398 |
| Statistics (All: NDs treated as DL value) | 10 | 1.609 | 5.768 | 3.314 | 2.954 | 1.447 |
| Statistics (All: NDs treated as DL/2 value) | 10 | 0.805 | 5.768 | 3.233 | 2.954 | 1.57 |
| Statistics (Normal ROS Imputed Data) | 10 | 0.0423 | 5.768 | 3.157 | 2.954 | 1.713 |
| Statistics (Gamma ROS Imputed Data) | 10 | 0.729 | 5.768 | 3.225 | 2.954 | 1.583 |
| Statistics (Lognormal ROS Imputed Data) | 10 | 1.168 | 5.768 | 3.269 | 2.954 | 1.51 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 6.917 | 4.686 | 0.506 | 1.18 | 0.415 | 0.352 |
| Statistics (NDs = DL) | 5.791 | 4.12 | 0.572 | 1.109 | 0.45 | 0.406 |
| Statistics (NDs = DL/2) | 3.903 | 2.799 | 0.828 | 1.04 | 0.59 | 0.568 |
| Statistics (Gamma ROS Estimates) | 3.702 | 2.658 | 0.871 | 1.03 | 0.614 | 0.596 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 1.077 | 0.508 | 0.472 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.98 | 0.972 | 0.99 | 0.989 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.949 | 0.829 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.928 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.973 | 0.842 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.978 | 0.842 | Data Appear Normal |

| | | | |
|---|---|---|---|
| Lilliefors (Detects Only) | 0.159 | 0.274 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.149 | 0.262 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.125 | 0.262 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.109 | 0.262 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma RO |
|---|---|---|---|---|
| Correlation Coefficient R | 0.984 | 0.983 | 0.977 | 0.975 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.213 | 0.722 | |
| Kolmogorov-Smirnov (Detects Only) | 0.152 | 0.28 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.26 | 0.729 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.147 | 0.267 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.202 | 0.73 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.143 | 0.268 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.219 | 0.73 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.142 | 0.268 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.988 | 0.981 | 0.963 | 0.985 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.968 | 0.829 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.943 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.932 | 0.842 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.963 | 0.842 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.155 | 0.274 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.148 | 0.262 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.164 | 0.262 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.144 | 0.262 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 11:10:30 PM |
| From File | Combined_Dissolved_LN_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Cobalt**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 12 |
| Minimum | 0.182 |
| Maximum | 4.174 |
| Mean of Raw Data | 1.596 |
| Standard Deviation of Raw Data | 1.366 |
| Khat | 1.278 |
| Theta hat | 1.249 |
| Kstar | 1.052 |
| Theta star | 1.518 |
| Mean of Log Transformed Data | 0.0277 |
| Standard Deviation of Log Transformed Data | 1.073 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.941 |
| Shapiro Wilk Test Statistic | 0.869 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.053 |
| Lilliefors Test Statistic | 0.172 |
| Lilliefors Critical (0.05) Value | 0.226 |

**Data appear Approximate Normal at (0.05) Significance Level**

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.962 |
| A-D Test Statistic | 0.305 |
| A-D Critical (0.05) Value | 0.755 |
| K-S Test Statistic | 0.127 |

| | |
|---|---|
| K-S Critical(0.05) Value | 0.234 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.972 |
| Shapiro Wilk Test Statistic | 0.924 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.338 |
| Lilliefors Test Statistic | 0.158 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Manganese**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 4.787 |
| Maximum | 9.616 |
| Mean of Raw Data | 6.719 |
| Standard Deviation of Raw Data | 1.174 |
| Khat | 36.75 |
| Theta hat | 0.183 |
| Kstar | 28.92 |
| Theta star | 0.232 |
| Mean of Log Transformed Data | 1.891 |
| Standard Deviation of Log Transformed Data | 0.171 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.958 |
| Shapiro Wilk Test Statistic | 0.936 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.282 |
| Lilliefors Test Statistic | 0.19 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Normal at (0.05) Significance Level

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.969 |
| A-D Test Statistic | 0.333 |
| A-D Critical (0.05) Value | 0.733 |
| K-S Test Statistic | 0.165 |
| K-S Critical(0.05) Value | 0.228 |

Data appear Gamma Distributed at (0.05) Significance Level

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.974 |
| Shapiro Wilk Test Statistic | 0.965 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.649 |
| Lilliefors Test Statistic | 0.159 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

**RA17_GW_Metals|Nickel**

**Raw Statistics**

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 0.262 |
| Maximum | 3.829 |
| Mean of Raw Data | 1.679 |
| Standard Deviation of Raw Data | 0.999 |
| Khat | 2.445 |
| Theta hat | 0.687 |
| Kstar | 1.969 |
| Theta star | 0.853 |
| Mean of Log Transformed Data | 0.3 |
| Standard Deviation of Log Transformed Data | 0.763 |

**Normal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.982 |

| | |
|---|---|
| Shapiro Wilk Test Statistic | 0.963 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.753 |
| Lilliefors Test Statistic | 0.125 |
| Lilliefors Critical (0.05) Value | 0.226 |

**Data appear Normal at (0.05) Significance Level**

**Gamma GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.985 |
| A-D Test Statistic | 0.275 |
| A-D Critical (0.05) Value | 0.744 |
| K-S Test Statistic | 0.128 |
| K-S Critical(0.05) Value | 0.231 |

**Data appear Gamma Distributed at (0.05) Significance Level**

**Lognormal GOF Test Results**

| | |
|---|---|
| Correlation Coefficient R | 0.961 |
| Shapiro Wilk Test Statistic | 0.923 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.243 |
| Lilliefors Test Statistic | 0.175 |
| Lilliefors Critical (0.05) Value | 0.226 |

**Data appear Lognormal at (0.05) Significance Level**

**Goodness-of-Fit Test Statistics for Data Sets with Non-Detects**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 11:08:32 PM |
| From File | Combined_Dissolved_LN_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

**RA17_GW_Metals|Cadmium**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 0 | 0 | 0 | 0 | 0 |
| Statistics (Non-Detects Only) | 4 | -2.323 | 0.693 | -1.2 | -1.585 | 1.309 |
| Statistics (All: NDs treated as DL value) | 14 | -2.323 | 0.693 | -0.343 | 0 | 0.844 |
| Statistics (All: NDs treated as DL/2 value) | 14 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 14 | -3.243 | 0.693 | -1.612 | -1.613 | 1.002 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.909 | 0.813 | 0.813 | 0.98 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.842 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.676 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.676 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.971 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.359 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.443 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.443 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.123 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

RA17_GW_Metals|Iron

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 13 | 1 | 7.14% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 1 | 3.912 | 3.912 | 3.912 | 3.912 | N/A |
| Statistics (Non-Detects Only) | 13 | 4.078 | 10.09 | 6.662 | 6.273 | 1.869 |
| Statistics (All: NDs treated as DL value) | 14 | 3.912 | 10.09 | 6.465 | 6.223 | 1.941 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 1.956 | 10.09 | 6.325 | 6.223 | 2.193 |
| Statistics (Normal ROS Imputed Data) | 14 | 2.084 | 10.09 | 6.335 | 6.223 | 2.173 |
| Statistics (Gamma ROS Imputed Data) | 14 | 2.75 | 10.09 | 6.382 | 6.223 | 2.078 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 3.243 | 10.09 | 6.417 | 6.223 | 2.015 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 14.17 | 10.95 | 0.47 | 1.861 | 0.278 | 0.149 |
| Statistics (NDs = DL) | 12.29 | 9.702 | 0.526 | 1.825 | 0.298 | 0.163 |
| Statistics (NDs = DL/2) | 7.419 | 5.877 | 0.853 | 1.776 | 0.415 | 0.234 |
| Statistics (Gamma ROS Estimates) | 9.511 | 7.52 | 0.671 | 1.8 | 0.35 | 0.195 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 1.812 | 0.323 | 0.179 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.975 | 0.975 | 0.986 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.941 | 0.866 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.938 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.975 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.975 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.186 | 0.234 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.171 | 0.226 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.142 | 0.226 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.144 | 0.226 | Data Appear Normal |

### Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.985 | 0.986 | 0.975 | 0.987 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.26 | 0.734 | |
| Kolmogorov-Smirnov (Detects Only) | 0.156 | 0.236 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 0.253 | 0.734 | |
| Kolmogorov-Smirnov (NDs = DL) | 0.135 | 0.229 | Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 0.318 | 0.736 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.168 | 0.229 | Data Appear Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.195 | 0.735 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.132 | 0.229 | Data Appear Gamma Distributed |

### Lognormal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.987 | 0.987 | 0.939 | 0.989 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.965 | 0.866 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.96 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.896 | 0.874 | Data Appear Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.975 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.138 | 0.234 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.116 | 0.226 | Data Appear Lognormal |
| Lilliefors (NDs = DL/2) | 0.199 | 0.226 | Data Appear Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.134 | 0.226 | Data Appear Lognormal |

Note: Substitution methods such as DL or DL/2 are not recommended.

### Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:05:28 AM |
| From File | Combined_Total_LN_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

## RA17_GW_Metals|Cobalt

### Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 0.47 |
| Maximum | 4.868 |
| Mean of Raw Data | 2.648 |
| Standard Deviation of Raw Data | 1.448 |
| Khat | 2.476 |
| Theta hat | 1.069 |
| Kstar | 1.993 |
| Theta star | 1.328 |
| Mean of Log Transformed Data | 0.758 |
| Standard Deviation of Log Transformed Data | 0.769 |

### Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.975 |
| Shapiro Wilk Test Statistic | 0.934 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.432 |
| Lilliefors Test Statistic | 0.153 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Normal at (0.05) Significance Level

### Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.925 |
| A-D Test Statistic | 0.696 |
| A-D Critical (0.05) Value | 0.744 |
| K-S Test Statistic | 0.225 |
| K-S Critical(0.05) Value | 0.231 |

Data appear Gamma Distributed at (0.05) Significance Level

### Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.933 |
| Shapiro Wilk Test Statistic | 0.859 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.0349 |
| Lilliefors Test Statistic | 0.251 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data not Lognormal at (0.05) Significance Level

## RA17_GW_Metals|Manganese

### Raw Statistics

| | |
|---|---|
| Number of Valid Observations | 14 |
| Number of Distinct Observations | 14 |
| Minimum | 4.787 |
| Maximum | 9.616 |
| Mean of Raw Data | 7.045 |
| Standard Deviation of Raw Data | 1.195 |
| Khat | 36.43 |
| Theta hat | 0.193 |
| Kstar | 28.67 |
| Theta star | 0.246 |
| Mean of Log Transformed Data | 1.939 |
| Standard Deviation of Log Transformed Data | 0.174 |

### Normal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| Shapiro Wilk Test Statistic | 0.968 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.724 |
| Lilliefors Test Statistic | 0.147 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Normal at (0.05) Significance Level

### Gamma GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.977 |
| A-D Test Statistic | 0.308 |
| A-D Critical (0.05) Value | 0.733 |
| K-S Test Statistic | 0.162 |

| | |
|---|---|
| K-S Critical(0.05) Value | 0.228 |

Data appear Gamma Distributed at (0.05) Significance Level

### Lognormal GOF Test Results

| | |
|---|---|
| Correlation Coefficient R | 0.973 |
| Shapiro Wilk Test Statistic | 0.96 |
| Shapiro Wilk Critical (0.05) Value | 0.874 |
| Approximate Shapiro Wilk P Value | 0.604 |
| Lilliefors Test Statistic | 0.176 |
| Lilliefors Critical (0.05) Value | 0.226 |

Data appear Lognormal at (0.05) Significance Level

## Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:07:23 AM |
| From File | Combined_Total_LN_Input.xls |
| Full Precision | OFF |
| Confidence Coefficient | 0.95 |

### RA17_GW_Metals|Cadmium

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 8 | 6 | 42.86% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 6 | 0 | 0 | 0 | 0 | 0 |
| Statistics (Non-Detects Only) | 8 | -2.513 | 1.629 | -0.317 | -0.449 | 1.358 |
| Statistics (All: NDs treated as DL value) | 14 | -2.513 | 1.629 | -0.181 | 0 | 1.01 |
| Statistics (All: NDs treated as DL/2 value) | 14 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 14 | -2.513 | 1.629 | -0.68 | -0.598 | 1.21 |

#### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.988 | 0.942 | 0.942 | 0.99 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.973 | 0.818 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.907 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.907 | 0.874 | Data Appear Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.973 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.168 | 0.283 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.215 | 0.226 | Data Appear Normal |
| Lilliefors (NDs = DL/2) | 0.215 | 0.226 | Data Appear Normal |
| Lilliefors (Normal ROS Estimates) | 0.0986 | 0.226 | Data Appear Normal |

#### Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

### RA17_GW_Metals|Thallium

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 5 | 9 | 64.29% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 9 | 0 | 0 | 0 | 0 | 0 |
| Statistics (Non-Detects Only) | 5 | -2.631 | -1.897 | -2.146 | -2.04 | 0.283 |
| Statistics (All: NDs treated as DL value) | 14 | -2.631 | 0 | -0.766 | 0 | 1.078 |
| Statistics (All: NDs treated as DL/2 value) | 14 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 14 | -2.631 | -1.72 | -2.146 | -2.091 | 0.265 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.884 | 0.831 | 0.831 | 0.984 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.803 | 0.762 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.673 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.673 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.962 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.336 | 0.343 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.404 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.404 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.143 | 0.226 | Data Appear Normal |

### Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

### RA17_GW_Petroleum|Diesel Range Organics (C10-C20)

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 6.174 | 6.254 | 6.19 | 6.174 | 0.0296 |
| Statistics (Non-Detects Only) | 4 | 5.247 | 6.153 | 5.61 | 5.521 | 0.385 |
| Statistics (All: NDs treated as DL value) | 14 | 5.247 | 6.254 | 6.024 | 6.174 | 0.33 |
| Statistics (All: NDs treated as DL/2 value) | 14 | 3.087 | 6.153 | 3.814 | 3.092 | 1.194 |
| Statistics (Normal ROS Imputed Data) | 14 | 5.028 | 6.193 | 5.61 | 5.61 | 0.329 |
| Statistics (Gamma ROS Imputed Data) | 14 | 5.035 | 6.204 | 5.61 | 5.606 | 0.33 |
| Statistics (Lognormal ROS Imputed Data) | 14 | 5.055 | 6.205 | 5.609 | 5.601 | 0.327 |

| | K hat | K Star | Theta hat | Log Mean | Log Stdv | Log CV |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 290.2 | 72.72 | 0.0193 | 1.723 | 0.0674 | 0.0391 |
| Statistics (NDs = DL) | 339.8 | 267 | 0.0177 | 1.794 | 0.0571 | 0.0318 |
| Statistics (NDs = DL/2) | 12.87 | 10.16 | 0.296 | 1.299 | 0.28 | 0.215 |
| Statistics (Gamma ROS Estimates) | 313.5 | 246.4 | 0.0179 | 1.723 | 0.0585 | 0.034 |
| Statistics (Lognormal ROS Estimates) | -- | -- | -- | 1.723 | 0.0578 | 0.0336 |

### Normal GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.946 | 0.786 | 0.8 | 0.976 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.908 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.623 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.63 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.952 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.301 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.437 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.432 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.214 | 0.226 | Data Appear Normal |

### Gamma GOF Test Results

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.955 | 0.776 | 0.844 | 0.977 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | 0.359 | 0.657 | |
| Kolmogorov-Smirnov (Detects Only) | 0.302 | 0.394 | Detected Data Appear Gamma Distributed |
| Anderson-Darling (NDs = DL) | 2.764 | 0.733 | |

| | | | |
|---|---|---|---|
| Kolmogorov-Smirnov (NDs = DL) | 0.444 | 0.228 | Data Not Gamma Distributed |
| Anderson-Darling (NDs = DL/2) | 2.779 | 0.734 | |
| Kolmogorov-Smirnov (NDs = DL/2) | 0.438 | 0.229 | Data Not Gamma Distributed |
| Anderson-Darling (Gamma ROS Estimates) | 0.371 | 0.733 | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | 0.212 | 0.228 | Data Appear Gamma Distributed |

**Lognormal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Log ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.952 | 0.784 | 0.797 | 0.977 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.919 | 0.748 | Data Appear Lognormal |
| Shapiro-Wilk (NDs = DL) | 0.62 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (NDs = DL/2) | 0.623 | 0.874 | Data Not Lognormal |
| Shapiro-Wilk (Lognormal ROS Estimates) | 0.953 | 0.874 | Data Appear Lognormal |
| Lilliefors (Detects Only) | 0.292 | 0.375 | Data Appear Lognormal |
| Lilliefors (NDs = DL) | 0.439 | 0.226 | Data Not Lognormal |
| Lilliefors (NDs = DL/2) | 0.429 | 0.226 | Data Not Lognormal |
| Lilliefors (Lognormal ROS Estimates) | 0.214 | 0.226 | Data Appear Lognormal |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

**RA17_GW_VOCs|Methyl tert-Butyl Ether (MTBE)**

| | Num Obs | Num Miss | Num Valid | Detects | NDs | % NDs |
|---|---|---|---|---|---|---|
| Raw Statistics | 14 | 0 | 14 | 4 | 10 | 71.43% |

| | Number | Minimum | Maximum | Mean | Median | SD |
|---|---|---|---|---|---|---|
| Statistics (Non-Detects Only) | 10 | 0 | 0 | 0 | 0 | 0 |
| Statistics (Non-Detects Only) | 4 | -1.561 | -1.079 | -1.276 | -1.233 | 0.239 |
| Statistics (All: NDs treated as DL value) | 14 | -1.561 | 0 | -0.365 | 0 | 0.609 |
| Statistics (All: NDs treated as DL/2 value) | 14 | N/A | N/A | N/A | N/A | N/A |
| Statistics (Normal ROS Imputed Data) | 14 | -1.694 | -0.858 | -1.276 | -1.276 | 0.245 |

**Normal GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Normal ROS |
|---|---|---|---|---|
| Correlation Coefficient R | 0.937 | 0.798 | 0.798 | 0.99 |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Shapiro-Wilk (Detects Only) | 0.857 | 0.748 | Data Appear Normal |
| Shapiro-Wilk (NDs = DL) | 0.627 | 0.874 | Data Not Normal |
| Shapiro-Wilk (NDs = DL/2) | 0.627 | 0.874 | Data Not Normal |
| Shapiro-Wilk (Normal ROS Estimates) | 0.972 | 0.874 | Data Appear Normal |
| Lilliefors (Detects Only) | 0.296 | 0.375 | Data Appear Normal |
| Lilliefors (NDs = DL) | 0.44 | 0.226 | Data Not Normal |
| Lilliefors (NDs = DL/2) | 0.44 | 0.226 | Data Not Normal |
| Lilliefors (Normal ROS Estimates) | 0.137 | 0.226 | Data Appear Normal |

**Gamma GOF Test Results**

| | No NDs | NDs = DL | NDs = DL/2 | Gamma ROS |
|---|---|---|---|---|
| Correlation Coefficient R | N/A | N/A | N/A | N/A |

| | Test value | Crit. (0.05) | Conclusion with Alpha(0.05) |
|---|---|---|---|
| Anderson-Darling (Detects Only) | N/A | N/A | |
| Kolmogorov-Smirnov (Detects Only) | N/A | N/A | |
| Anderson-Darling (NDs = DL) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL) | N/A | N/A | |
| Anderson-Darling (NDs = DL/2) | N/A | N/A | |
| Kolmogorov-Smirnov (NDs = DL/2) | N/A | N/A | |
| Anderson-Darling (Gamma ROS Estimates) | N/A | N/A | |
| Kolmogorov-Smirnov (Gamma ROS Est.) | N/A | N/A | |

**Note: Substitution methods such as DL or DL/2 are not recommended.**

## Outlier Tests for Selected Uncensored Variables

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 10:46:02 AM |
| From File | Upper_Input_LN_Total.xls |
| Full Precision | OFF |

### Dixon's Outlier Test for RA17_GW_Metals|Aluminum

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 10.2750511089686 is a Potenti**

Test Statistic: 0.236

For 10% significance level, 10.2750511089686 is not ar
For 5% significance level, 10.2750511089686 is not an
For 1% significance level, 10.2750511089686 is not an

**2. Observation Value 4.24849524204936 is a Potentia**

Test Statistic: 0.130

For 10% significance level, 4.24849524204936 is not ar
For 5% significance level, 4.24849524204936 is not an
For 1% significance level, 4.24849524204936 is not an

### Dixon's Outlier Test for RA17_GW_Metals|Chromium

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 4.70048036579242 is a Potenti**

Test Statistic: 0.106

For 10% significance level, 4.70048036579242 is not ar
For 5% significance level, 4.70048036579242 is not an
For 1% significance level, 4.70048036579242 is not an

**2. Observation Value -0.63487827243597 is a Potenti**

Test Statistic: 0.270

For 10% significance level, -0.63487827243597 is not a
For 5% significance level, -0.63487827243597 is not an
For 1% significance level, -0.63487827243597 is not an

### Dixon's Outlier Test for RA17_GW_Metals|Nickel

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 4.52178857704904 is a Potenti**

Test Statistic: 0.088

For 10% significance level, 4.52178857704904 is not ar
For 5% significance level, 4.52178857704904 is not an
For 1% significance level, 4.52178857704904 is not an

**2. Observation Value 0.587786664902119 is a Potent**

Test Statistic: 0.091

For 10% significance level, 0.587786664902119 is not a
For 5% significance level, 0.587786664902119 is not ar
For 1% significance level, 0.587786664902119 is not ar

## Outlier Tests for Selected Uncensored Variables

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 10:47:34 AM |
| From File | Upper_Input_LN_Total.xls |
| Full Precision | OFF |

### Dixon's Outlier Test for RA17_GW_Metals|Beryllium

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 2.18605127673809 is a Potenti**

Test Statistic: 0.065

For 10% significance level, 2.18605127673809 is not ar
For 5% significance level, 2.18605127673809 is not an
For 1% significance level, 2.18605127673809 is not an

**2. Observation Value -0.941608539858445 is a Poten**

Test Statistic: 0.025

For 10% significance level, -0.941608539858445 is not
For 5% significance level, -0.941608539858445 is not a
For 1% significance level, -0.941608539858445 is not a

### Dixon's Outlier Test for RA17_GW_Metals|Lead

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 3.8286413964891 is a Potentia**

Test Statistic: 0.463

For 10% significance level, 3.8286413964891 is an outli
For 5% significance level, 3.8286413964891 is not an o
For 1% significance level, 3.8286413964891 is not an o

**2. Observation Value 0 is a Potential Outlier (Lower Ta**

Test Statistic: 0.677

For 10% significance level, 0 is an outlier.
For 5% significance level, 0 is an outlier.
For 1% significance level, 0 is an outlier.

### Dixon's Outlier Test for RA17_GW_Metals|Zinc

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 5.76832099579377 is a Potenti**

Test Statistic: 0.125

For 10% significance level, 5.76832099579377 is not ar
For 5% significance level, 5.76832099579377 is not an
For 1% significance level, 5.76832099579377 is not an

**2. Observation Value 1.6094379124341 is a Potential**

Test Statistic: 0.000

For 10% significance level, 1.6094379124341 is not an
For 5% significance level, 1.6094379124341 is not an o
For 1% significance level, 1.6094379124341 is not an o

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 10:49:20 AM |
| From File | Upper_Input_LN_Total.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for Lead-minus outlier**

Number of Observations = 9
10% critical value: 0.441
5% critical value: 0.512
1% critical value: 0.635

**1. Observation Value 3.8286413964891 is a Potentia**

Test Statistic: 0.486

For 10% significance level, 3.8286413964891 is an outli
For 5% significance level, 3.8286413964891 is not an o
For 1% significance level, 3.8286413964891 is not an o

**2. Observation Value 2.02814824729229 is a Potentia**

Test Statistic: 0.091

For 10% significance level, 2.02814824729229 is not ar
For 5% significance level, 2.02814824729229 is not an
For 1% significance level, 2.02814824729229 is not an

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 11:17:04 AM |
| From File | UpperInput_total.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Barium**

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 600 is a Potential Outlier (Uppe**

Test Statistic: 0.173

For 10% significance level, 600 is not an outlier.
For 5% significance level, 600 is not an outlier.
For 1% significance level, 600 is not an outlier.

**2. Observation Value 15 is a Potential Outlier (Lower**

Test Statistic: 0.131

For 10% significance level, 15 is not an outlier.
For 5% significance level, 15 is not an outlier.
For 1% significance level, 15 is not an outlier.

**Dixon's Outlier Test for RA17_GW_Metals|Vanadium**

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

**1. Observation Value 250 is a Potential Outlier (Uppe**

Test Statistic: 0.323

For 10% significance level, 250 is not an outlier.
For 5% significance level, 250 is not an outlier.
For 1% significance level, 250 is not an outlier.

**2. Observation Value 1.7 is a Potential Outlier (Lower**

Test Statistic: 0.002

For 10% significance level, 1.7 is not an outlier.
For 5% significance level, 1.7 is not an outlier.
For 1% significance level, 1.7 is not an outlier.

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 11:24:52 PM |
| From File | Combined_Dissolved_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Cadmium**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 2 is a Potential Outlier (Upper T**

Test Statistic: 0.559

For 10% significance level, 2 is an outlier.
For 5% significance level, 2 is an outlier.
For 1% significance level, 2 is not an outlier.

**2. Observation Value 0.098 is a Potential Outlier (Low**

Test Statistic: 0.124

For 10% significance level, 0.098 is not an outlier.
For 5% significance level, 0.098 is not an outlier.
For 1% significance level, 0.098 is not an outlier.

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/15/2018 11:22:50 PM |
| From File | Combined_Dissolved_LN_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Cobalt**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 4.17438726989564 is a Potenti**

Test Statistic: 0.137

For 10% significance level, 4.17438726989564 is not ar
For 5% significance level, 4.17438726989564 is not an
For 1% significance level, 4.17438726989564 is not an

**2. Observation Value 0.182321556793955 is a Potent**

Test Statistic: 0.023

For 10% significance level, 0.182321556793955 is not a
For 5% significance level, 0.182321556793955 is not ar
For 1% significance level, 0.182321556793955 is not ar

**Dixon's Outlier Test for RA17_GW_Metals|Iron**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 10.0858091093301 is a Potenti**

Test Statistic: 0.262

For 10% significance level, 10.0858091093301 is not ar
For 5% significance level, 10.0858091093301 is not an
For 1% significance level, 10.0858091093301 is not an

**2. Observation Value 3.91202300542815 is a Potentia**

Test Statistic: 0.100

For 10% significance level, 3.91202300542815 is not ar
For 5% significance level, 3.91202300542815 is not an
For 1% significance level, 3.91202300542815 is not an

**Dixon's Outlier Test for RA17_GW_Metals|Manganese**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 9.61580548008435 is a Potenti**

Test Statistic: 0.471

For 10% significance level, 9.61580548008435 is not ar
For 5% significance level, 9.61580548008435 is not an
For 1% significance level, 9.61580548008435 is not an

**2. Observation Value 4.78749174278205 is a Potentia**

Test Statistic: 0.287

For 10% significance level, 4.78749174278205 is not ar
For 5% significance level, 4.78749174278205 is not an
For 1% significance level, 4.78749174278205 is not an

**Dixon's Outlier Test for RA17_GW_Metals|Nickel**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 3.8286413964891 is a Potentia**

Test Statistic: 0.441

For 10% significance level, 3.8286413964891 is not an
For 5% significance level, 3.8286413964891 is not an o
For 1% significance level, 3.8286413964891 is not an o

**2. Observation Value 0.262364264467491 is a Potent**

Test Statistic: 0.152

For 10% significance level, 0.262364264467491 is not a
For 5% significance level, 0.262364264467491 is not ar
For 1% significance level, 0.262364264467491 is not ar

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 10:33:25 AM |
| From File | Combined_Total_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Arsenic**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 29 is a Potential Outlier (Upper**

Test Statistic: 0.373

For 10% significance level, 29 is not an outlier.
For 5% significance level, 29 is not an outlier.
For 1% significance level, 29 is not an outlier.

**2. Observation Value 0.53 is a Potential Outlier (Lowe**

Test Statistic: 0.090

For 10% significance level, 0.53 is not an outlier.
For 5% significance level, 0.53 is not an outlier.
For 1% significance level, 0.53 is not an outlier.

**Dixon's Outlier Test for RA17_GW_Metals|Iron**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 180000 is a Potential Outlier (U**

Test Statistic: 0.424

For 10% significance level, 180000 is not an outlier.
For 5% significance level, 180000 is not an outlier.
For 1% significance level, 180000 is not an outlier.

**2. Observation Value 510 is a Potential Outlier (Lower**

Test Statistic: 0.132

For 10% significance level, 510 is not an outlier.
For 5% significance level, 510 is not an outlier.
For 1% significance level, 510 is not an outlier.

**Outlier Tests for Selected Uncensored Variables**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:12:59 AM |
| From File | Combined_Total_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Thallium**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 1 is a Potential Outlier (Upper T**

Test Statistic: 0.000

For 10% significance level, 1 is not an outlier.
For 5% significance level, 1 is not an outlier.
For 1% significance level, 1 is not an outlier.

**2. Observation Value 0.072 is a Potential Outlier (Low**

Test Statistic: 0.063

For 10% significance level, 0.072 is not an outlier.
For 5% significance level, 0.072 is not an outlier.
For 1% significance level, 0.072 is not an outlier.

**er Test for RA17_GW_Petroleum|Diesel Range Organi**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 520 is a Potential Outlier (Uppe**

Test Statistic: 0.115

For 10% significance level, 520 is not an outlier.
For 5% significance level, 520 is not an outlier.
For 1% significance level, 520 is not an outlier.

**2. Observation Value 190 is a Potential Outlier (Lower**

Test Statistic: 0.233

For 10% significance level, 190 is not an outlier.
For 5% significance level, 190 is not an outlier.
For 1% significance level, 190 is not an outlier.

**)utlier Test for RA17_GW_VOCs|Methyl tert-Butyl Ethe**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 1 is a Potential Outlier (Upper T**

Test Statistic: 0.000

For 10% significance level, 1 is not an outlier.
For 5% significance level, 1 is not an outlier.
For 1% significance level, 1 is not an outlier.

**2. Observation Value 0.21 is a Potential Outlier (Lowe**

Test Statistic: 0.165

For 10% significance level, 0.21 is not an outlier.
For 5% significance level, 0.21 is not an outlier.
For 1% significance level, 0.21 is not an outlier.

**Outlier Tests for Selected Uncensored Variables**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:09:35 AM |
| From File | Combined_Total_LN_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for RA17_GW_Metals|Cobalt**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 4.86753445045558 is a Potenti**

Test Statistic: 0.192

For 10% significance level, 4.86753445045558 is not ar
For 5% significance level, 4.86753445045558 is not an
For 1% significance level, 4.86753445045558 is not an

**2. Observation Value 0.470003629245736 is a Potent**

Test Statistic: 0.100

For 10% significance level, 0.470003629245736 is not a
For 5% significance level, 0.470003629245736 is not ar
For 1% significance level, 0.470003629245736 is not ar

**Dixon's Outlier Test for RA17_GW_Metals|Manganese**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 9.61580548008435 is a Potenti**

Test Statistic: 0.460

For 10% significance level, 9.61580548008435 is not ar
For 5% significance level, 9.61580548008435 is not an
For 1% significance level, 9.61580548008435 is not an

**2. Observation Value 4.78749174278205 is a Potentia**

Test Statistic: 0.353

For 10% significance level, 4.78749174278205 is not ar
For 5% significance level, 4.78749174278205 is not an
For 1% significance level, 4.78749174278205 is not an

**Dixon's Outlier Test for RA17_GW_Metals|Cadmium**

Number of Observations = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641

**1. Observation Value 1.62924053973028 is a Potenti**

Test Statistic: 0.468

For 10% significance level, 1.62924053973028 is not ar
For 5% significance level, 1.62924053973028 is not an
For 1% significance level, 1.62924053973028 is not an

**2. Observation Value -2.5133061243097 is a Potentia**

Test Statistic: 0.618

For 10% significance level, -2.5133061243097 is an out
For 5% significance level, -2.5133061243097 is an outli
For 1% significance level, -2.5133061243097 is not an c

**Outlier Tests for Selected Uncensored Variables**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:12:02 AM |
| From File | Combined_Total_LN_Input.xls |
| Full Precision | OFF |

**Dixon's Outlier Test for Cd_minus_outlier**

Number of Observations = 13
10% critical value: 0.467
5% critical value: 0.521
1% critical value: 0.615

**1. Observation Value 1.62924053973028 is a Potenti**

Test Statistic: 0.468

For 10% significance level, 1.62924053973028 is an ou
For 5% significance level, 1.62924053973028 is not an
For 1% significance level, 1.62924053973028 is not an

**2. Observation Value -1.66073120682165 is a Potenti**

Test Statistic: 0.412

For 10% significance level, -1.66073120682165 is not a
For 5% significance level, -1.66073120682165 is not an
For 1% significance level, -1.66073120682165 is not an

## Background Statistics for Uncensored Full Data Sets

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 2:43:04 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Groundwater\UpperInput |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Aluminum**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 10 |
| Minimum | 70 | First Quartile | 402.5 |
| Second Largest | 8100 | Median | 2200 |
| Maximum | 29000 | Third Quartile | 6525 |
| Mean | 5545 | SD | 8765 |
| Coefficient of Variation | 1.581 | Skewness | 2.529 |
| Mean of logged Data | 7.347 | SD of logged Data | 1.967 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.656 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.285 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 31059 | 90% Percentile (z) | 16777 |
| 95% UPL (t) | 22396 | 95% Percentile (z) | 19962 |
| 95% USL | 24618 | 99% Percentile (z) | 25935 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.245 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.777 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.127 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.281 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.499 | k star (bias corrected MLE) | 0.416 |
| Theta hat (MLE) | 11117 | Theta star (bias corrected MLE) | 13335 |
| nu hat (MLE) | 9.976 | nu star (bias corrected) | 8.316 |
| MLE Mean (bias corrected) | 5545 | MLE Sd (bias corrected) | 8599 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 26477 | 90% Percentile | 15554 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 29604 | 95% Percentile | 22731 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 54920 | 99% Percentile | 40708 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 70312 | | |
| 95% WH USL | 32491 | 95% HW USL | 37645 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.958 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.154 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 476347 | 90% Percentile (z) | 19304 |
| 95% UPL (t) | 68136 | 95% Percentile (z) | 39452 |
| 95% USL | 112192 | 99% Percentile (z) | 150789 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with 95% Coverage | 29000 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| | | ›roximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 29000 | 95% BCA Bootstrap UTL with 95% Coverage | 29000 |
| 95% UPL | 29000 | 90% Percentile | 10190 |
| 90% Chebyshev UPL | 33123 | 95% Percentile | 19595 |
| 95% Chebyshev UPL | 45614 | 99% Percentile | 27119 |
| 95% USL | 29000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 2:44:45 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Groundwater\UpperInput |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Barium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 10 |
| Minimum | 15 | First Quartile | 107.3 |
| Second Largest | 510 | Median | 200 |
| Maximum | 600 | Third Quartile | 327.5 |
| Mean | 245.8 | SD | 190.2 |
| Coefficient of Variation | 0.774 | Skewness | 0.853 |
| Mean of logged Data | 5.126 | SD of logged Data | 1.077 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.923 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.17 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Normal at 5% Significance Level |

**Data appear Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 799.5 | 90% Percentile (z) | 489.6 |
| 95% UPL (t) | 611.5 | 95% Percentile (z) | 558.7 |
| 95% USL | 659.7 | 99% Percentile (z) | 688.3 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.161 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.74 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0978 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.271 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.464 | k star (bias corrected MLE) | 1.092 |
| Theta hat (MLE) | 167.9 | Theta star (bias corrected MLE) | 225.2 |
| nu hat (MLE) | 29.29 | nu star (bias corrected) | 21.83 |
| MLE Mean (bias corrected) | 245.8 | MLE Sd (bias corrected) | 235.3 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 795.1 | 90% Percentile | 553.9 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 862.1 | 95% Percentile | 714 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 1345 | 99% Percentile | 1083 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 1572 | | |
| 95% WH USL | 918.1 | 95% HW USL | 1015 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.915 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.157 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 3865 | 90% Percentile (z) | 668.8 |
| 95% UPL (t) | 1333 | 95% Percentile (z) | 988.9 |
| 95% USL | 1752 | 99% Percentile (z) | 2060 |

**Nonparametric Distribution Free Background Statistics**

Data appear Normal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with 95% Coverage | 600 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |

| | | | |
|---|---|---|---|
| | | ›roximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 600 | 95% BCA Bootstrap UTL with 95% Coverage | 600 |
| 95% UPL | 600 | 90% Percentile | 519 |
| 90% Chebyshev UPL | 844.3 | 95% Percentile | 559.5 |
| 95% Chebyshev UPL | 1115 | 99% Percentile | 591.9 |
| 95% USL | 600 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 2:51:45 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Groundwater\UpperInput |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Chromium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 9 |
| Minimum | 0.53 | First Quartile | 2.275 |
| Second Largest | 72 | Median | 15.4 |
| Maximum | 110 | Third Quartile | 27 |
| Mean | 27.2 | SD | 36.33 |
| Coefficient of Variation | 1.336 | Skewness | 1.689 |
| Mean of logged Data | 2.235 | SD of logged Data | 1.757 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.755 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.291 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 133 | 90% Percentile (z) | 73.77 |
| 95% UPL (t) | 97.06 | 95% Percentile (z) | 86.97 |
| 95% USL | 106.3 | 99% Percentile (z) | 111.7 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.376 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.771 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.199 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.279 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.581 | k star (bias corrected MLE) | 0.473 |
| Theta hat (MLE) | 46.83 | Theta star (bias corrected MLE) | 57.48 |
| nu hat (MLE) | 11.62 | nu star (bias corrected) | 9.466 |
| MLE Mean (bias corrected) | 27.2 | MLE Sd (bias corrected) | 39.54 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 125.5 | 90% Percentile | 74.43 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 139.4 | 95% Percentile | 106.6 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 253.2 | 99% Percentile | 186 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 318.6 | | |
| 95% WH USL | 152.7 | 95% HW USL | 175.2 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.941 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.204 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 1554 | 90% Percentile (z) | 88.76 |
| 95% UPL (t) | 273.7 | 95% Percentile (z) | 168 |
| 95% USL | 427.2 | 99% Percentile (z) | 556.3 |

**Nonparametric Distribution Free Background Statistics**
Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with 95% Coverage | 110 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| | | ›roximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 110 | 95% BCA Bootstrap UTL with 95% Coverage | 110 |
| 95% UPL | 110 | 90% Percentile | 75.8 |
| 90% Chebyshev UPL | 141.5 | 95% Percentile | 92.9 |
| 95% Chebyshev UPL | 193.3 | 99% Percentile | 106.6 |
| 95% USL | 110 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Nickel**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 10 |
| Minimum | 1.8 | First Quartile | 4.025 |
| Second Largest | 67 | Median | 10.95 |
| Maximum | 92 | Third Quartile | 26.75 |
| Mean | 24.07 | SD | 30.98 |
| Coefficient of Variation | 1.287 | Skewness | 1.641 |
| Mean of logged Data | 2.412 | SD of logged Data | 1.346 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.745 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.29 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 114.2 | 90% Percentile (z) | 63.77 |
| 95% UPL (t) | 83.63 | 95% Percentile (z) | 75.02 |
| 95% USL | 91.48 | 99% Percentile (z) | 96.13 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.401 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.756 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.166 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.276 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.775 | k star (bias corrected MLE) | 0.61 |
| Theta hat (MLE) | 31.04 | Theta star (bias corrected MLE) | 39.49 |
| nu hat (MLE) | 15.51 | nu star (bias corrected) | 12.19 |
| MLE Mean (bias corrected) | 24.07 | MLE Sd (bias corrected) | 30.83 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 99.01 | 90% Percentile | 62.38 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 105.3 | 95% Percentile | 86.12 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 189.6 | 99% Percentile | 143.5 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 222.1 | | |
| 95% WH USL | 118.6 | 95% HW USL | 129.2 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.955 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.14 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 562 | 90% Percentile (z) | 62.67 |
| 95% UPL (t) | 148.5 | 95% Percentile (z) | 102.2 |
| 95% USL | 209 | 99% Percentile (z) | 255.8 |

**Nonparametric Distribution Free Background Statistics**
Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with 95% Coverage | 92 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| | | ›roximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 92 | 95% BCA Bootstrap UTL with 95% Coverage | 92 |
| 95% UPL | 92 | 90% Percentile | 69.5 |
| 90% Chebyshev UPL | 121.5 | 95% Percentile | 80.75 |
| 95% Chebyshev UPL | 165.7 | 99% Percentile | 89.75 |
| 95% USL | 92 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Vanadium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 10 |
| Minimum | 1.7 | First Quartile | 3.875 |
| Second Largest | 170 | Median | 19.7 |
| Maximum | 250 | Third Quartile | 109.5 |
| Mean | 67.1 | SD | 86.93 |
| Coefficient of Variation | 1.295 | Skewness | 1.282 |
| Mean of logged Data | 2.948 | SD of logged Data | 1.93 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.795 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.257 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Normal at 5% Significance Level |

Data appear Approximate Normal at 5% Significance Level

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 320.1 | 90% Percentile (z) | 178.5 |
| 95% UPL (t) | 234.2 | 95% Percentile (z) | 210.1 |
| 95% USL | 256.3 | 99% Percentile (z) | 269.3 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.486 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.777 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.242 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.281 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.504 | k star (bias corrected MLE) | 0.42 |
| Theta hat (MLE) | 133.1 | Theta star (bias corrected MLE) | 159.9 |
| nu hat (MLE) | 10.09 | nu star (bias corrected) | 8.393 |
| MLE Mean (bias corrected) | 67.1 | MLE Sd (bias corrected) | 103.6 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 328.6 | 90% Percentile | 187.9 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 370.8 | 95% Percentile | 274.2 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 682.8 | 99% Percentile | 490.1 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 884.6 | | |
| 95% WH USL | 403.4 | 95% HW USL | 472.1 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.897 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.188 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

Data appear Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 5253 | 90% Percentile (z) | 226.3 |
| 95% UPL (t) | 779.7 | 95% Percentile (z) | 456.2 |
| 95% USL | 1272 | 99% Percentile (z) | 1700 |

**Nonparametric Distribution Free Background Statistics**

Data appear Approximate Normal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with 95% Coverage | 250 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| | | ›roximate Sample Size needed to achieve specified CC | 59 |

| | | | | | |
|---|---|---|---|---|---|
| 95% Percentile Bootstrap UTL with | 95% Coverage | 250 | 95% BCA Bootstrap UTL with | 95% Coverage | 250 |
| | 95% UPL | 250 | | 90% Percentile | 178 |
| | 90% Chebyshev UPL | 340.6 | | 95% Percentile | 214 |
| | 95% Chebyshev UPL | 464.5 | | 99% Percentile | 242.8 |
| | 95% USL | 250 | | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 2:57:03 PM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Groundwater\UpperInput |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Lead**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 9 | Number of Distinct Observations | 8 |
| | | Number of Missing Observations | 1 |
| Minimum | 7.6 | First Quartile | 9.2 |
| Second Largest | 20 | Median | 12 |
| Maximum | 46 | Third Quartile | 13 |
| Mean | 15.46 | SD | 12.04 |
| Coefficient of Variation | 0.779 | Skewness | 2.511 |
| Mean of logged Data | 2.567 | SD of logged Data | 0.555 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 3.031 | d2max (for USL) | 2.11 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.649 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.829 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.359 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.274 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 51.94 | 90% Percentile (z) | 30.88 |
| | 95% UPL (t) | 39.05 | 95% Percentile (z) | 35.26 |
| | 95% USL | 40.85 | 99% Percentile (z) | 43.46 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.874 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.727 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.318 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.281 | Data Not Gamma Distributed at 5% Significance Level |

**Data Not Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 3.086 | k star (bias corrected MLE) | 2.131 |
| Theta hat (MLE) | 5.009 | Theta star (bias corrected MLE) | 7.252 |
| nu hat (MLE) | 55.54 | nu star (bias corrected) | 38.36 |
| MLE Mean (bias corrected) | 15.46 | MLE Sd (bias corrected) | 10.59 |

**Background Statistics Assuming Gamma Distribution**

| | | | | |
|---|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | | 38.33 | 90% Percentile | 29.62 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | | 38.35 | 95% Percentile | 35.94 |
| 95% WH Approx. Gamma UTL with | 95% Coverage | 59.62 | 99% Percentile | 49.9 |
| 95% HW Approx. Gamma UTL with | 95% Coverage | 61.51 | | |
| | 95% WH USL | 40.93 | 95% HW USL | 41.1 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.839 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.829 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.279 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.274 | Data Not Lognormal at 5% Significance Level |

**Data appear Approximate Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | | |
|---|---|---|---|---|
| 95% UTL with | 95% Coverage | 70.13 | 90% Percentile (z) | 26.55 |
| | 95% UPL (t) | 38.69 | 95% Percentile (z) | 32.48 |
| | 95% USL | 42.04 | 99% Percentile (z) | 47.42 |

**Nonparametric Distribution Free Background Statistics**
Data appear Approximate Lognormal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 9 | 95% UTL with 95% Coverage | 46 |
| Approx, f used to compute achieved CC | 0.474 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.37 |
| | | ›roximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 46 | 95% BCA Bootstrap UTL with 95% Coverage | 46 |
| 95% UPL | 46 | 90% Percentile | 25.2 |
| 90% Chebyshev UPL | 53.52 | 95% Percentile | 35.6 |
| 95% Chebyshev UPL | 70.77 | 99% Percentile | 43.92 |
| 95% USL | 46 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.12/28/2018 2:47:03 PM |
| From File | UpperInput_total.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| erent or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Beryllium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 6 | | |
| Number of Detects | 6 | Number of Non-Detects | 4 |
| Number of Distinct Detects | 5 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.39 | Minimum Non-Detect | 1 |
| Maximum Detect | 8.9 | Maximum Non-Detect | 1 |
| Variance Detected | 13.97 | Percent Non-Detects | 40% |
| Mean Detected | 3.368 | SD Detected | 3.738 |
| Mean of Detected Logged Data | 0.551 | SD of Detected Logged Data | 1.341 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.784 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.788 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.349 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.325 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 2.183 | KM SD | 3.016 |
| 95% UTL95% Coverage | 10.96 | 95% KM UPL (t) | 7.981 |
| 90% KM Percentile (z) | 6.048 | 95% KM Percentile (z) | 7.144 |
| 99% KM Percentile (z) | 9.199 | 95% KM USL | 8.746 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 2.221 | SD | 3.156 |
| 95% UTL95% Coverage | 11.41 | 95% UPL (t) | 8.288 |
| 90% Percentile (z) | 6.265 | 95% Percentile (z) | 7.411 |
| 99% Percentile (z) | 9.562 | 95% USL | 9.088 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.479 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.718 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.265 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.342 | Detected data appear Gamma Distributed at 5% Significance Level |

Detected data appear Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.883 | k star (bias corrected MLE) | 0.553 |
| Theta hat (MLE) | 3.814 | Theta star (bias corrected MLE) | 6.095 |
| nu hat (MLE) | 10.6 | nu star (bias corrected) | 6.632 |
| MLE Mean (bias corrected) | 3.368 | | |
| MLE Sd (bias corrected) | 4.531 | 95% Percentile of Chisquare (2kstar) | 4.097 |

**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 | 2.108 |
| Maximum | 8.9 | Median | 0.624 |
| SD | 3.235 | CV | 1.534 |
| k hat (MLE) | 0.385 | k star (bias corrected MLE) | 0.336 |
| Theta hat (MLE) | 5.479 | Theta star (bias corrected MLE) | 6.274 |
| nu hat (MLE) | 7.696 | nu star (bias corrected) | 6.721 |
| MLE Mean (bias corrected) | 2.108 | MLE Sd (bias corrected) | 3.637 |
| 95% Percentile of Chisquare (2kstar) | 2.962 | 90% Percentile | 6.125 |
| 95% Percentile | 9.294 | 99% Percentile | 17.42 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 23.73 | 32.53 | 95% Approx. Gamma UPL | 10.95 | 12.76 |
| 95% Gamma USL | 13.62 | 16.57 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 2.183 | SD (KM) | 3.016 |
| Variance (KM) | 9.095 | SE of Mean (KM) | 1.045 |
| k hat (KM) | 0.524 | k star (KM) | 0.433 |
| nu hat (KM) | 10.48 | nu star (KM) | 8.669 |
| theta hat (KM) | 4.166 | theta star (KM) | 5.036 |
| 80% gamma percentile (KM) | 3.552 | 90% gamma percentile (KM) | 6.076 |
| 95% gamma percentile (KM) | 8.82 | 99% gamma percentile (KM) | 15.66 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 15.92 | 17.68 | 95% Approx. Gamma UPL | 8.338 | 8.504 |
| 95% KM Gamma Percentile | 6.759 | 6.741 | 95% Gamma USL | 9.978 | 10.4 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.88 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.788 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.191 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.325 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 2.206 | Mean in Log Scale | -0.0524 |
| SD in Original Scale | 3.169 | SD in Log Scale | 1.337 |
| 95% UTL95% Coverage | 46.5 | 95% BCA UTL95% Coverage | 8.9 |
| 95% Bootstrap (%) UTL95% Coverage | 8.9 | 95% UPL (t) | 12.4 |
| 90% Percentile (z) | 5.264 | 95% Percentile (z) | 8.556 |
| 99% Percentile (z) | 21.28 | 95% USL | 17.41 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -0.0313 | 95% KM UTL (Lognormal)95% Coverage | 30.66 |
| KM SD of Logged Data | 1.187 | 95% KM UPL (Lognormal) | 9.488 |
| 95% KM Percentile Lognormal (z) | 6.824 | 95% KM USL (Lognormal) | 12.82 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 2.221 | Mean in Log Scale | 0.0532 |
| SD in Original Scale | 3.156 | SD in Log Scale | 1.188 |
| 95% UTL95% Coverage | 33.51 | 95% UPL (t) | 10.36 |
| 90% Percentile (z) | 4.835 | 95% Percentile (z) | 7.445 |
| 99% Percentile (z) | 16.73 | 95% USL | 13.99 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**
**Data appear to follow a Discernible Distribution at 5% Significance Level**

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with95% Coverage | 8.9 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| ›roximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 8.9 |
| 95% USL | 8.9 | 95% KM Chebyshev UPL | 15.97 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Zinc**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Missing Observations | 0 |

| | | | |
|---|---|---|---|
| Number of Distinct Observations | 9 | | |
| Number of Detects | 9 | Number of Non-Detects | 1 |
| Number of Distinct Detects | 9 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 5 | Minimum Non-Detect | 5 |
| Maximum Detect | 320 | Maximum Non-Detect | 5 |
| Variance Detected | 11612 | Percent Non-Detects | 10% |
| Mean Detected | 77.44 | SD Detected | 107.8 |
| Mean of Detected Logged Data | 3.503 | SD of Detected Logged Data | 1.398 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.911 | d2max (for USL) | 2.176 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.715 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.829 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.338 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.274 | Data Not Normal at 5% Significance Level |

Data Not Normal at 5% Significance Level

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 70.2 | KM SD | 98.8 |
| 95% UTL95% Coverage | 357.8 | 95% KM UPL (t) | 260.2 |
| 90% KM Percentile (z) | 196.8 | 95% KM Percentile (z) | 232.7 |
| 99% KM Percentile (z) | 300 | 95% KM USL | 285.2 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 69.95 | SD | 104.3 |
| 95% UTL95% Coverage | 373.6 | 95% UPL (t) | 270.5 |
| 90% Percentile (z) | 203.6 | 95% Percentile (z) | 241.5 |
| 99% Percentile (z) | 312.6 | 95% USL | 297 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.493 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.754 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.222 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.29 | 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) | 0.712 | k star (bias corrected MLE) | 0.549 |
| Theta hat (MLE) | 108.8 | Theta star (bias corrected MLE) | 141.1 |
| nu hat (MLE) | 12.82 | nu star (bias corrected) | 9.878 |
| MLE Mean (bias corrected) | 77.44 | | |
| MLE Sd (bias corrected) | 104.5 | 95% Percentile of Chisquare (2kstar) | 4.078 |

**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 | 69.7 |
| Maximum | 320 | Median | 19.5 |
| SD | 104.5 | CV | 1.499 |
| k hat (MLE) | 0.421 | k star (bias corrected MLE) | 0.361 |
| Theta hat (MLE) | 165.7 | Theta star (bias corrected MLE) | 193.1 |
| nu hat (MLE) | 8.411 | nu star (bias corrected) | 7.221 |
| MLE Mean (bias corrected) | 69.7 | MLE Sd (bias corrected) | 116 |
| 95% Percentile of Chisquare (2kstar) | 3.107 | 90% Percentile | 200.3 |
| 95% Percentile | 299.9 | 99% Percentile | 553.3 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 707.7 | 972.4 | 95% Approx. Gamma UPL | 339.8 | 400.9 |
| 95% Gamma USL | 417.5 | 513 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 70.2 | SD (KM) | 98.8 |
| Variance (KM) | 9762 | SE of Mean (KM) | 33.14 |
| k hat (KM) | 0.505 | k star (KM) | 0.42 |
| nu hat (KM) | 10.1 | nu star (KM) | 8.401 |
| theta hat (KM) | 139.1 | theta star (KM) | 167.1 |
| 80% gamma percentile (KM) | 113.9 | 90% gamma percentile (KM) | 196.5 |
| 95% gamma percentile (KM) | 286.8 | 99% gamma percentile (KM) | 512.5 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 549.7 | 634 | 95% Approx. Gamma UPL | 281.5 | 293.9 |
| 95% KM Gamma Percentile | 226.2 | 229.9 | 95% Gamma USL | 339.1 | 363.2 |

**Lognormal GOF Test on Detected Observations Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.949 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.829 | Detected Data appear Lognormal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.159 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.274 | Detected Data appear Lognormal at 5% Significance Level | |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 69.8 | Mean in Log Scale | 3.157 |
| SD in Original Scale | 104.4 | SD in Log Scale | 1.713 |
| 95% UTL95% Coverage | 3438 | 95% BCA UTL95% Coverage | 320 |
| 95% Bootstrap (%) UTL95% Coverage | 320 | 95% UPL (t) | 632.5 |
| 90% Percentile (z) | 211 | 95% Percentile (z) | 393.1 |
| 99% Percentile (z) | 1263 | 95% USL | 976.4 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | 3.314 | 95% KM UTL (Lognormal)95% Coverage | 1496 |
| KM SD of Logged Data | 1.373 | 95% KM UPL (Lognormal) | 385 |
| 95% KM Percentile Lognormal (z) | 262.9 | 95% KM USL (Lognormal) | 545.2 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 69.95 | Mean in Log Scale | 3.244 |
| SD in Original Scale | 104.3 | SD in Log Scale | 1.551 |
| 95% UTL95% Coverage | 2342 | 95% UPL (t) | 505.6 |
| 90% Percentile (z) | 187.1 | 95% Percentile (z) | 328.7 |
| 99% Percentile (z) | 945.7 | 95% USL | 749.1 |

**DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.**

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 10 | 95% UTL with95% Coverage | 320 |
| Approx, f used to compute achieved CC | 0.526 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.401 |
| ›roximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 320 |
| 95% USL | 320 | 95% KM Chebyshev UPL | 521.9 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Data Sets with Non-Detects**

**User Selected Options**

| | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 10:11:30 AM |
| From File | Combined_Dissolved_Input_rev_a.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| ‹erent or Future K Observations | 1 |
| ‹umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Iron**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 14 | | |
| Number of Detects | 13 | Number of Non-Detects | 1 |
| Number of Distinct Detects | 13 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 59 | Minimum Non-Detect | 50 |
| Maximum Detect | 24000 | Maximum Non-Detect | 50 |
| Variance Detected | 51841629 | Percent Non-Detects | 7.143% |
| Mean Detected | 3793 | SD Detected | 7200 |
| Mean of Detected Logged Data | 6.662 | SD of Detected Logged Data | 1.869 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test on Detects Only**

| | | | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.591 | **Shapiro Wilk GOF Test** | |
| 5% Shapiro Wilk Critical Value | 0.866 | Data Not Normal at 5% Significance Level | |
| Lilliefors Test Statistic | 0.346 | **Lilliefors GOF Test** | |
| 5% Lilliefors Critical Value | 0.234 | Data Not Normal at 5% Significance Level | |

**Data Not Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 3526 | KM SD | 6735 |
| 95% UTL95% Coverage | 21132 | 95% KM UPL (t) | 15872 |

| | | | |
|---|---|---|---|
| 90% KM Percentile (z) | 12157 | 95% KM Percentile (z) | 14604 |
| 99% KM Percentile (z) | 19194 | 95% KM USL | 19500 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 3524 | SD | 6991 |
| 95% UTL95% Coverage | 21797 | 95% UPL (t) | 16338 |
| 90% Percentile (z) | 12483 | 95% Percentile (z) | 15022 |
| 99% Percentile (z) | 19786 | 95% USL | 20103 |

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.92 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.807 | Data Not Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.267 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.253 | Data Not Gamma Distributed at 5% Significance Level |

Data Not Gamma Distributed at 5% Significance Level

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.414 | k star (bias corrected MLE) | 0.37 |
| Theta hat (MLE) | 9155 | Theta star (bias corrected MLE) | 10252 |
| nu hat (MLE) | 10.77 | nu star (bias corrected) | 9.619 |
| MLE Mean (bias corrected) | 3793 | | |
| MLE Sd (bias corrected) | 6236 | 95% Percentile of Chisquare (2kstar) | 3.158 |

**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 | 3522 |
| Maximum | 24000 | Median | 505 |
| SD | 6992 | CV | 1.985 |
| k hat (MLE) | 0.299 | k star (bias corrected MLE) | 0.282 |
| Theta hat (MLE) | 11791 | Theta star (bias corrected MLE) | 12475 |
| nu hat (MLE) | 8.364 | nu star (bias corrected) | 7.905 |
| MLE Mean (bias corrected) | 3522 | MLE Sd (bias corrected) | 6629 |
| 95% Percentile of Chisquare (2kstar) | 2.633 | 90% Percentile | 10459 |
| 95% Percentile | 16425 | 99% Percentile | 32051 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 30987 | 38687 | 95% Approx. Gamma UPL | 15861 | 17331 |
| 95% Gamma USL | 25566 | 30664 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 3526 | SD (KM) | 6735 |
| Variance (KM) | 45364920 | SE of Mean (KM) | 1874 |
| k hat (KM) | 0.274 | k star (KM) | 0.263 |
| nu hat (KM) | 7.672 | nu star (KM) | 7.361 |
| theta hat (KM) | 12867 | theta star (KM) | 13410 |
| 80% gamma percentile (KM) | 5208 | 90% gamma percentile (KM) | 10541 |
| 95% gamma percentile (KM) | 16809 | 99% gamma percentile (KM) | 33379 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 27448 | 31226 | 95% Approx. Gamma UPL | 14396 | 14698 |
| 95% KM Gamma Percentile | 12040 | 11973 | 95% Gamma USL | 22793 | 25084 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.941 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.866 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.186 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.234 | Detected Data appear Lognormal at 5% Significance Level |

**Detected Data appear Lognormal at 5% Significance Level**

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3523 | Mean in Log Scale | 6.335 |
| SD in Original Scale | 6991 | SD in Log Scale | 2.173 |
| 95% UTL95% Coverage | 165286 | 95% BCA UTL95% Coverage | 24000 |
| 95% Bootstrap (%) UTL95% Coverage | 24000 | 95% UPL (t) | 30283 |
| 90% Percentile (z) | 9133 | 95% Percentile (z) | 20115 |
| 99% Percentile (z) | 88459 | 95% USL | 97612 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | 6.465 | 95% KM UTL (Lognormal)95% Coverage | 85257 |
| KM SD of Logged Data | 1.87 | 95% KM UPL (Lognormal) | 19793 |
| 95% KM Percentile Lognormal (z) | 13920 | 95% KM USL (Lognormal) | 54189 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 3524 | Mean in Log Scale | 6.416 |
| SD in Original Scale | 6991 | SD in Log Scale | 2.018 |
| 95% UTL95% Coverage | 119477 | 95% UPL (t) | 24710 |
| 90% Percentile (z) | 8119 | 95% Percentile (z) | 16900 |
| 99% Percentile (z) | 66862 | 95% USL | 73263 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with95% Coverage | 24000 |
| Approx, f used to compute achieved CC | 0.737 | ɔximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| ɔroximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 24000 |
| 95% USL | 24000 | 95% KM Chebyshev UPL | 33915 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**Background Statistics for Uncensored Full Data Sets**

| **User Selected Options** | |
|---|---|
| Date/Time of Computation | ProUCL 5.13/16/2018 11:16:09 AM |
| From File | C:\Users\welschm\Documents\Current Projects\Benning Road\background\Groundwater\Combined_ |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| New or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**RA17_GW_Metals|Arsenic**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Distinct Observations | 13 |
| Minimum | 0.53 | First Quartile | 2.65 |
| Second Largest | 19 | Median | 7.15 |
| Maximum | 29 | Third Quartile | 13.5 |
| Mean | 9.255 | SD | 8.453 |
| Coefficient of Variation | 0.913 | Skewness | 1.089 |
| Mean of logged Data | 1.693 | SD of logged Data | 1.231 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.888 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.161 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data appear Normal at 5% Significance Level |

**Data appear Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 31.35 | 90% Percentile (z) | 20.09 |
| 95% UPL (t) | 24.75 | 95% Percentile (z) | 23.16 |
| 95% USL | 29.3 | 99% Percentile (z) | 28.92 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.184 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.759 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.0923 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.235 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.076 | k star (bias corrected MLE) | 0.893 |
| Theta hat (MLE) | 8.602 | Theta star (bias corrected MLE) | 10.36 |
| nu hat (MLE) | 30.13 | nu star (bias corrected) | 25 |
| MLE Mean (bias corrected) | 9.255 | MLE Sd (bias corrected) | 9.794 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 31.43 | 90% Percentile | 21.91 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 33.97 | 95% Percentile | 28.86 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 50.46 | 99% Percentile | 45.14 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 58.43 | | |
| 95% WH USL | 43.91 | 95% HW USL | 49.76 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.937 | **Shapiro Wilk Lognormal GOF Test** |

| | | |
|---|---|---|
| 5% Shapiro Wilk Critical Value | 0.874 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.138 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 135.7 | 90% Percentile (z) | 26.32 |
| 95% UPL (t) | 51.9 | 95% Percentile (z) | 41.17 |
| 95% USL | 100.7 | 99% Percentile (z) | 95.24 |

**Nonparametric Distribution Free Background Statistics**

**Data appear Normal at 5% Significance Level**

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with 95% Coverage | 29 |
| Approx, f used to compute achieved CC | 0.737 | ɔximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| | | ɔroximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 29 | 95% BCA Bootstrap UTL with 95% Coverage | 29 |
| 95% UPL | 29 | 90% Percentile | 19 |
| 90% Chebyshev UPL | 35.5 | 95% Percentile | 22.5 |
| 95% Chebyshev UPL | 47.39 | 99% Percentile | 27.7 |
| 95% USL | 29 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Cobalt**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Distinct Observations | 14 |
| Minimum | 1.6 | First Quartile | 4.15 |
| Second Largest | 85 | Median | 21 |
| Maximum | 130 | Third Quartile | 30.75 |
| Mean | 30.96 | SD | 37.26 |
| Coefficient of Variation | 1.203 | Skewness | 1.794 |
| Mean of logged Data | 2.648 | SD of logged Data | 1.448 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.776 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.285 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 128.4 | 90% Percentile (z) | 78.72 |
| 95% UPL (t) | 99.27 | 95% Percentile (z) | 92.26 |
| 95% USL | 119.3 | 99% Percentile (z) | 117.7 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.328 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.77 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.151 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.237 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.761 | k star (bias corrected MLE) | 0.646 |
| Theta hat (MLE) | 40.69 | Theta star (bias corrected MLE) | 47.97 |
| nu hat (MLE) | 21.31 | nu star (bias corrected) | 18.07 |
| MLE Mean (bias corrected) | 30.96 | MLE Sd (bias corrected) | 38.54 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 118.4 | 90% Percentile | 79.21 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 127.8 | 95% Percentile | 108.5 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 201.4 | 99% Percentile | 179 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 235.9 | | |
| 95% WH USL | 172.5 | 95% HW USL | 197 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.934 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.153 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 622.2 | 90% Percentile (z) | 90.34 |
| 95% UPL (t) | 200.8 | 95% Percentile (z) | 152.9 |
| 95% USL | 438 | 99% Percentile (z) | 410.2 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with 95% Coverage | 130 |
| Approx, f used to compute achieved CC | 0.737 | ɔximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| | | ɔroximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 130 | 95% BCA Bootstrap UTL with 95% Coverage | 130 |
| 95% UPL | 130 | 90% Percentile | 77.5 |
| 90% Chebyshev UPL | 146.7 | 95% Percentile | 100.8 |
| 95% Chebyshev UPL | 199.1 | 99% Percentile | 124.2 |
| 95% USL | 130 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Iron**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Distinct Observations | 14 |
| Minimum | 510 | First Quartile | 31000 |
| Second Largest | 140000 | Median | 46000 |
| Maximum | 180000 | Third Quartile | 93000 |
| Mean | 63265 | SD | 52449 |
| Coefficient of Variation | 0.829 | Skewness | 0.957 |
| Mean of logged Data | 10.44 | SD of logged Data | 1.58 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.916 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.205 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data appear Normal at 5% Significance Level |

**Data appear Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 200367 | 90% Percentile (z) | 130481 |
| 95% UPL (t) | 159409 | 95% Percentile (z) | 149536 |
| 95% USL | 187657 | 99% Percentile (z) | 185280 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.428 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.762 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.215 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.236 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.948 | k star (bias corrected MLE) | 0.792 |
| Theta hat (MLE) | 66763 | Theta star (bias corrected MLE) | 79863 |
| nu hat (MLE) | 26.53 | nu star (bias corrected) | 22.18 |
| MLE Mean (bias corrected) | 63265 | MLE Sd (bias corrected) | 71081 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 222971 | 90% Percentile | 154199 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 254376 | 95% Percentile | 205954 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 360627 | 99% Percentile | 328272 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 448064 | | |
| 95% WH USL | 313158 | 95% HW USL | 379048 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.817 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.271 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data Not Lognormal at 5% Significance Level |

Data Not Lognormal at 5% Significance Level

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 2130661 | 90% Percentile (z) | 259571 |
| 95% UPL (t) | 620431 | 95% Percentile (z) | 460824 |

| | | | |
|---|---|---|---|
| 95% USL | 1452876 | 99% Percentile (z) | 1352515 |

**Nonparametric Distribution Free Background Statistics**

Data appear Normal at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with 95% Coverage | 180000 |
| Approx, f used to compute achieved CC | 0.737 | ɔximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| | | ɔroximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 180000 | 95% BCA Bootstrap UTL with 95% Coverage | 180000 |
| 95% UPL | 180000 | 90% Percentile | 131000 |
| 90% Chebyshev UPL | 226136 | 95% Percentile | 154000 |
| 95% Chebyshev UPL | 299910 | 99% Percentile | 174800 |
| 95% USL | 180000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Manganese**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Distinct Observations | 14 |
| Minimum | 120 | First Quartile | 782.5 |
| Second Largest | 3100 | Median | 1050 |
| Maximum | 15000 | Third Quartile | 2400 |
| Mean | 2304 | SD | 3773 |
| Coefficient of Variation | 1.637 | Skewness | 3.354 |
| Mean of logged Data | 7.045 | SD of logged Data | 1.195 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.524 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.345 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 12166 | 90% Percentile (z) | 7139 |
| 95% UPL (t) | 9220 | 95% Percentile (z) | 8510 |
| 95% USL | 11252 | 99% Percentile (z) | 11081 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.647 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.767 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.188 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.237 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.845 | k star (bias corrected MLE) | 0.712 |
| Theta hat (MLE) | 2727 | Theta star (bias corrected MLE) | 3239 |
| nu hat (MLE) | 23.66 | nu star (bias corrected) | 19.92 |
| MLE Mean (bias corrected) | 2304 | MLE Sd (bias corrected) | 2732 |

**Background Statistics Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Wilson Hilferty (WH) Approx. Gamma UPL | 8114 | 90% Percentile | 5762 |
| 95% Hawkins Wixley (HW) Approx. Gamma UPL | 8269 | 95% Percentile | 7797 |
| 95% WH Approx. Gamma UTL with 95% Coverage | 13563 | 99% Percentile | 12649 |
| 95% HW Approx. Gamma UTL with 95% Coverage | 14710 | | |
| 95% WH USL | 11671 | 95% HW USL | 12410 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.968 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.874 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.147 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.226 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Background Statistics assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% UTL with 95% Coverage | 26088 | 90% Percentile (z) | 5307 |
| 95% UPL (t) | 10259 | 95% Percentile (z) | 8192 |
| 95% USL | 19528 | 99% Percentile (z) | 18499 |

**Nonparametric Distribution Free Background Statistics**

Data appear Gamma Distributed at 5% Significance Level

**Nonparametric Upper Limits for Background Threshold Values**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with 95% Coverage | 15000 |
| Approx, f used to compute achieved CC | 0.737 | oximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| | | proximate Sample Size needed to achieve specified CC | 59 |
| 95% Percentile Bootstrap UTL with 95% Coverage | 15000 | 95% BCA Bootstrap UTL with 95% Coverage | 15000 |
| 95% UPL | 15000 | 90% Percentile | 2980 |
| 90% Chebyshev UPL | 14020 | 95% Percentile | 7265 |
| 95% Chebyshev UPL | 19326 | 99% Percentile | 13453 |
| 95% USL | 15000 | | |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

| | |
|---|---|
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Coverage | 95% |
| erent or Future K Observations | 1 |
| umber of Bootstrap Operations | 2000 |

**Cd_wo_outlier**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 8 | | |
| Number of Detects | 8 | Number of Non-Detects | 6 |
| Number of Distinct Detects | 7 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.081 | Minimum Non-Detect | 1 |
| Maximum Detect | 5.1 | Maximum Non-Detect | 1 |
| Variance Detected | 2.876 | Percent Non-Detects | 42.86% |
| Mean Detected | 1.439 | SD Detected | 1.696 |
| Mean of Detected Logged Data | -0.317 | SD of Detected Logged Data | 1.358 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.794 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.818 | Data Not Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.285 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.283 | Data Not Normal at 5% Significance Level |

**Data Not Normal at 5% Significance Level**

**Kaplan Meier (KM) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 1.003 | KM SD | 1.31 |
| 95% UTL95% Coverage | 4.429 | 95% KM UPL (t) | 3.405 |
| 90% KM Percentile (z) | 2.683 | 95% KM Percentile (z) | 3.159 |
| 99% KM Percentile (z) | 4.052 | 95% KM USL | 4.111 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 1.037 | SD | 1.335 |
| 95% UTL95% Coverage | 4.525 | 95% UPL (t) | 3.483 |
| 90% Percentile (z) | 2.747 | 95% Percentile (z) | 3.232 |
| 99% Percentile (z) | 4.141 | 95% USL | 4.202 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.236 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.741 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.196 | **Kolmogorov-Smirnov GOF** |
| 5% K-S Critical Value | 0.303 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics on Detected Data Only**

| | | | |
|---|---|---|---|
| k hat (MLE) | 0.863 | k star (bias corrected MLE) | 0.623 |
| Theta hat (MLE) | 1.667 | Theta star (bias corrected MLE) | 2.311 |
| nu hat (MLE) | 13.81 | nu star (bias corrected) | 9.963 |
| MLE Mean (bias corrected) | 1.439 | | |
| MLE Sd (bias corrected) | 1.823 | 95% Percentile of Chisquare (2kstar) | 4.422 |

**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 | 1.009 |
| Maximum | 5.1 | Median | 0.55 |

| | | | |
|---|---|---|---|
| SD | 1.381 | CV | 1.37 |
| k hat (MLE) | 0.59 | k star (bias corrected MLE) | 0.511 |
| Theta hat (MLE) | 1.71 | Theta star (bias corrected MLE) | 1.973 |
| nu hat (MLE) | 16.52 | nu star (bias corrected) | 14.31 |
| MLE Mean (bias corrected) | 1.009 | MLE Sd (bias corrected) | 1.411 |
| 95% Percentile of Chisquare (2kstar) | 3.896 | 90% Percentile | 2.716 |
| 95% Percentile | 3.844 | 99% Percentile | 6.612 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 7.322 | 9.03 | 95% Approx. Gamma UPL | 4.158 | 4.64 |
| 95% Gamma USL | 6.211 | 7.43 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 1.003 | SD (KM) | 1.31 |
| Variance (KM) | 1.717 | SE of Mean (KM) | 0.381 |
| k hat (KM) | 0.586 | k star (KM) | 0.508 |
| nu hat (KM) | 16.41 | nu star (KM) | 14.23 |
| theta hat (KM) | 1.712 | theta star (KM) | 1.974 |
| 80% gamma percentile (KM) | 1.649 | 90% gamma percentile (KM) | 2.705 |
| 95% gamma percentile (KM) | 3.832 | 99% gamma percentile (KM) | 6.598 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 5.619 | 6.186 | 95% Approx. Gamma UPL | 3.409 | 3.523 |
| 95% KM Gamma Percentile | 2.981 | 3.037 | 95% Gamma USL | 4.854 | 5.237 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.973 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.818 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.168 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.283 | Detected Data appear Lognormal at 5% Significance Level |

Detected Data appear Lognormal at 5% Significance Level

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.998 | Mean in Log Scale | -0.68 |
| SD in Original Scale | 1.365 | SD in Log Scale | 1.21 |
| 95% UTL95% Coverage | 11.97 | 95% BCA UTL95% Coverage | 5.1 |
| 95% Bootstrap (%) UTL95% Coverage | 5.1 | 95% UPL (t) | 4.654 |
| 90% Percentile (z) | 2.388 | 95% Percentile (z) | 3.706 |
| 99% Percentile (z) | 8.452 | 95% USL | 8.929 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -0.667 | 95% KM UTL (Lognormal)95% Coverage | 11.08 |
| KM SD of Logged Data | 1.175 | 95% KM UPL (Lognormal) | 4.425 |
| 95% KM Percentile Lognormal (z) | 3.547 | 95% KM USL (Lognormal) | 8.334 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 1.037 | Mean in Log Scale | -0.478 |
| SD in Original Scale | 1.335 | SD in Log Scale | 1.015 |
| 95% UTL95% Coverage | 8.807 | 95% UPL (t) | 3.986 |
| 90% Percentile (z) | 2.277 | 95% Percentile (z) | 3.292 |
| 99% Percentile (z) | 6.577 | 95% USL | 6.886 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with95% Coverage | 5.1 |
| Approx, f used to compute achieved CC | 0.737 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| ›roximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 5.1 |
| 95% USL | 5.1 | 95% KM Chebyshev UPL | 6.916 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

**RA17_GW_Metals|Thallium**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 14 | Number of Missing Observations | 0 |
| Number of Distinct Observations | 5 | | |
| Number of Detects | 5 | Number of Non-Detects | 9 |
| Number of Distinct Detects | 4 | Number of Distinct Non-Detects | 1 |
| Minimum Detect | 0.072 | Minimum Non-Detect | 1 |
| Maximum Detect | 0.15 | Maximum Non-Detect | 1 |
| Variance Detected | 8.5080E-4 | Percent Non-Detects | 64.29% |

| | | | |
|---|---|---|---|
| Mean Detected | 0.12 | SD Detected | 0.0292 |
| Mean of Detected Logged Data | -2.146 | SD of Detected Logged Data | 0.283 |

**Critical Values for Background Threshold Values (BTVs)**

| | | | |
|---|---|---|---|
| Tolerance Factor K (For UTL) | 2.614 | d2max (for USL) | 2.372 |

**Normal GOF Test on Detects Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.865 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.295 | **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) Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| KM Mean | 0.12 | KM SD | 0.0261 |
| 95% UTL95% Coverage | 0.189 | 95% KM UPL (t) | 0.168 |
| 90% KM Percentile (z) | 0.154 | 95% KM Percentile (z) | 0.163 |
| 99% KM Percentile (z) | 0.181 | 95% KM USL | 0.182 |

**DL/2 Substitution Background Statistics Assuming Normal Distribution**

| | | | |
|---|---|---|---|
| Mean | 0.364 | SD | 0.189 |
| 95% UTL95% Coverage | 0.86 | 95% UPL (t) | 0.712 |
| 90% Percentile (z) | 0.607 | 95% Percentile (z) | 0.676 |
| 99% Percentile (z) | 0.805 | 95% USL | 0.814 |

**DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons**

**Gamma GOF Tests on Detected Observations Only**

| | | |
|---|---|---|
| A-D Test Statistic | 0.586 | **Anderson-Darling GOF Test** |
| 5% A-D Critical Value | 0.679 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.326 | **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) | 17.5 | k star (bias corrected MLE) | 7.132 |
| Theta hat (MLE) | 0.00688 | Theta star (bias corrected MLE) | 0.0169 |
| nu hat (MLE) | 175 | nu star (bias corrected) | 71.32 |
| MLE Mean (bias corrected) | 0.12 | | |
| MLE Sd (bias corrected) | 0.0451 | 95% Percentile of Chisquare (2kstar) | 24.03 |

**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 | 0.072 | Mean | 0.121 |
| Maximum | 0.169 | Median | 0.124 |
| SD | 0.0277 | CV | 0.23 |
| k hat (MLE) | 18.81 | k star (bias corrected MLE) | 14.83 |
| Theta hat (MLE) | 0.00641 | Theta star (bias corrected MLE) | 0.00814 |
| nu hat (MLE) | 526.7 | nu star (bias corrected) | 415.2 |
| MLE Mean (bias corrected) | 0.121 | MLE Sd (bias corrected) | 0.0313 |

| | | | |
|---|---|---|---|
| 95% Percentile of Chisquare (2kstar) | 43.36 | 90% Percentile | 0.162 |
| 95% Percentile | 0.176 | 99% Percentile | 0.205 |

**The following statistics are computed using Gamma ROS Statistics on Imputed Data**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.21 | 0.213 | 95% Approx. Gamma UPL | 0.179 | 0.18 |
| 95% Gamma USL | 0.2 | 0.202 | | | |

**Estimates of Gamma Parameters using KM Estimates**

| | | | |
|---|---|---|---|
| Mean (KM) | 0.12 | SD (KM) | 0.0261 |
| Variance (KM) | 6.8064E-4 | SE of Mean (KM) | 0.013 |
| k hat (KM) | 21.3 | k star (KM) | 16.78 |
| nu hat (KM) | 596.3 | nu star (KM) | 469.9 |
| theta hat (KM) | 0.00565 | theta star (KM) | 0.00717 |
| 80% gamma percentile (KM) | 0.144 | 90% gamma percentile (KM) | 0.159 |
| 95% gamma percentile (KM) | 0.172 | 99% gamma percentile (KM) | 0.199 |

**The following statistics are computed using gamma distribution and KM estimates**
**Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods**

| | WH | HW | | WH | HW |
|---|---|---|---|---|---|
| % Approx. Gamma UTL with 95% Coverage | 0.209 | 0.213 | 95% Approx. Gamma UPL | 0.178 | 0.18 |
| 95% KM Gamma Percentile | 0.171 | 0.173 | 95% Gamma USL | 0.199 | 0.202 |

**Lognormal GOF Test on Detected Observations Only**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.803 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.762 | Detected Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.336 | **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

**Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.121 | Mean in Log Scale | -2.146 |
| SD in Original Scale | 0.0304 | SD in Log Scale | 0.265 |
| 95% UTL95% Coverage | 0.234 | 95% BCA UTL95% Coverage | 0.179 |
| 95% Bootstrap (%) UTL95% Coverage | 0.179 | 95% UPL (t) | 0.19 |
| 90% Percentile (z) | 0.164 | 95% Percentile (z) | 0.181 |
| 99% Percentile (z) | 0.217 | 95% USL | 0.219 |

**Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| KM Mean of Logged Data | -2.146 | 95% KM UTL (Lognormal)95% Coverage | 0.227 |
| KM SD of Logged Data | 0.253 | 95% KM UPL (Lognormal) | 0.186 |
| 95% KM Percentile Lognormal (z) | 0.177 | 95% KM USL (Lognormal) | 0.213 |

**Background DL/2 Statistics Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| Mean in Original Scale | 0.364 | Mean in Log Scale | -1.212 |
| SD in Original Scale | 0.189 | SD in Log Scale | 0.739 |
| 95% UTL95% Coverage | 2.055 | 95% UPL (t) | 1.154 |
| 90% Percentile (z) | 0.767 | 95% Percentile (z) | 1.004 |
| 99% Percentile (z) | 1.661 | 95% USL | 1.718 |

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

**Nonparametric Distribution Free Background Statistics**

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

**Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)**

| | | | |
|---|---|---|---|
| Order of Statistic, r | 14 | 95% UTL with95% Coverage | 1 |
| Approx, f used to compute achieved CC | 0.737 | ›ximate Actual Confidence Coefficient achieved by UTL | 0.512 |
| ›roximate Sample Size needed to achieve specified CC | 59 | 95% UPL | 1 |
| 95% USL | 1 | 95% KM Chebyshev UPL | 0.238 |

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers
and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data
represents a background data set and when many onsite observations need to be compared with the BTV.

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 10:19:05 AM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|CobaltDissolved**
**Sample 2 Data: RA17_GW_Metals|CobaltBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 14 |
| Number of Non-Detects | 2 | 0 |
| Number of Detect Data | 29 | 14 |
| Minimum Non-Detect | 0.5 | N/A |
| Maximum Non-Detect | 0.86 | N/A |
| Percent Non-detects | 6.45% | 0.00% |
| Minimum Detect | 0.2 | 21.2 |
| Maximum Detect | 80 | 85 |
| Mean of Detects | 16.7 | 32.86 |
| Median of Detects | 5.3 | 23.85 |
| SD of Detects | 23.92 | 19.88 |
| KM Mean | 15.65 | 32.86 |
| KM SD | 23.09 | 19.88 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.583 |
| Critical z (0.05) | -1.645 |
| P-Value | 1.6990E-4 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**
**P-Value < alpha (0.05)**

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 12:21:21 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|IronDissolved**
**Sample 2 Data: RA17_GW_Metals|IronBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 14 |
| Number of Non-Detects | 7 | 1 |
| Number of Detect Data | 24 | 13 |
| Minimum Non-Detect | 50 | 7250 |
| Maximum Non-Detect | 50 | 7250 |
| Percent Non-detects | 22.58% | 7.14% |
| Minimum Detect | 170 | 7259 |
| Maximum Detect | 38000 | 31200 |
| Mean of Detects | 7183 | 10993 |
| Median of Detects | 4100 | 7730 |
| SD of Detects | 9962 | 7200 |
| KM Mean | 5572 | 10726 |
| KM SD | 9084 | 6735 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.126 |
| Critical z (0.05) | -1.645 |
| P-Value | 8.8597E-4 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 12:29:22 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|CadmiumTotal**
**Sample 2 Data: RA17_GW_Metals|CadmiumTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 13 |
| Number of Non-Detects | 15 | 6 |
| Number of Detect Data | 16 | 7 |
| Minimum Non-Detect | 1 | 2.7 |
| Maximum Non-Detect | 1 | 2.7 |
| Percent Non-detects | 48.39% | 46.15% |
| Minimum Detect | 0.17 | 1.89 |
| Maximum Detect | 7.6 | 6.8 |
| Mean of Detects | 2.189 | 3.333 |

| | | |
|---|---|---|
| Median of Detects | 1.9 | 2.44 |
| SD of Detects | 1.939 | 1.733 |
| KM Mean | 1.374 | 2.813 |
| KM SD | 1.603 | 1.311 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -2.081 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.0187 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 3:54:28 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median = Sample 2 Mean/Median (Two Sided Alternative) |
| Alternative Hypothesis | Sample 1 Mean/Median <> Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Cobalt**

**Sample 2 Data: RA17_GW_Metals|CobaltTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 31 | 14 |
| Number of Distinct Observations | 27 | 14 |
| Minimum | 1.2 | 38.6 |
| Maximum | 2200 | 167 |
| Mean | 118 | 67.96 |
| Median | 8 | 58 |
| SD | 391.1 | 37.26 |
| SE of Mean | 70.24 | 9.959 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 = Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 648.5 |
| WMW U-Stat | 152.5 |
| Standardized WMW U-Stat | -1.582 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Lower Approximate U-Stat Critical Value (0.025) | -1.96 |
| Upper Approximate U-Stat Critical Value (0.975) | 1.96 |

| | |
|---|---|
| P-Value (Adjusted for Ties) | 0.114 |

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 = Sample 2

P-Value >= alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/23/2018 3:49:58 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Manganese**
**Sample 2 Data: RA17_GW_Metals|ManganeseBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 31 | 14 |
| Number of Distinct Observations | 27 | 14 |
| Minimum | 280 | 3920 |
| Maximum | 3400 | 18800 |
| Mean | 1075 | 5704 |
| Median | 880 | 4605 |
| SD | 771.3 | 3831 |
| SE of Mean | 138.5 | 1024 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 496 |
| Standardized WMW U-Stat | -5.333 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 4.8263E-8 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/23/2018 3:08:17 PM |
| From File | WorkSheet.xls |

| | |
|---|---|
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median = Sample 2 Mean/Median (2 Sided Alternative |
| Alternative Hypothesis | Sample 1 Mean/Median <> Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Nickel**
**Sample 2 Data: RA17_GW_Metals|NickelBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 14 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 30 | 14 |
| Minimum Non-Detect | 1 | N/A |
| Maximum Non-Detect | 1 | N/A |
| Percent Non-detects | 3.23% | 0.00% |
| Minimum Detect | 0.33 | 13.3 |
| Maximum Detect | 81 | 58 |
| Mean of Detects | 19.66 | 21 |
| Median of Detects | 11 | 17.05 |
| SD of Detects | 21.66 | 11.82 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 = Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 664 |
| WMW U-Stat | 168 |
| Standardized WMW U-Stat | -1.205 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Lower Approximate U-Stat Critical Value (0.025) | -1.96 |
| Upper Approximate U-Stat Critical Value (0.975) | 1.96 |
| P-Value (Adjusted for Ties) | 0.228 |

**Conclusion with Alpha = 0.05**

**Do Not Reject H0, Conclude Sample 1 = Sample 2**

**P-Value >= alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 12:25:04 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|NickelDissolved**
**Sample 2 Data: RA17_GW_Metals|NickelBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 14 |
| Number of Non-Detects | 1 | 0 |
| Number of Detect Data | 30 | 14 |
| Minimum Non-Detect | 1 | N/A |
| Maximum Non-Detect | 1 | N/A |
| Percent Non-detects | 3.23% | 0.00% |
| Minimum Detect | 0.33 | 13.3 |
| Maximum Detect | 81 | 58 |
| Mean of Detects | 19.66 | 21 |
| Median of Detects | 11 | 17.05 |
| SD of Detects | 21.66 | 11.82 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 664 |
| Standardized WMW U-Stat | -1.217 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.112 |

**Conclusion with Alpha = 0.05**

**Do Not Reject H0, Conclude Sample 1 >= Sample 2**

**P-Value >= alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 12:27:01 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|ArsenicTotal**

**Sample 2 Data: RA17_GW_Metals|ArsenicTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 31 | 14 |
| Number of Non-Detects | 3 | 0 |
| Number of Detect Data | 28 | 14 |
| Minimum Non-Detect | 1 | N/A |
| Maximum Non-Detect | 1 | N/A |
| Percent Non-detects | 9.68% | 0.00% |
| Minimum Detect | 0.99 | 9.03 |
| Maximum Detect | 160 | 37.5 |

| | | |
|---|---|---|
| Mean of Detects | 19.98 | 17.76 |
| Median of Detects | 8.45 | 15.65 |
| SD of Detects | 31.95 | 8.453 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 637 |
| Standardized WMW U-Stat | -1.876 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.0303 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/23/2018 12:31:19 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|CobaltTotal**

**Sample 2 Data: RA17_GW_Metals|CobaltTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 31 | 14 |
| Number of Distinct Observations | 27 | 14 |
| Minimum | 1.2 | 38.6 |
| Maximum | 2200 | 167 |
| Mean | 118 | 67.96 |
| Median | 8 | 58 |
| SD | 391.1 | 37.26 |
| SE of Mean | 70.24 | 9.959 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 648.5 |
| Standardized WMW U-Stat | -1.594 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |

| | |
|---|---|
| P-Value (Adjusted for Ties) | 0.0555 |

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 >= Sample 2

P-Value >= alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/23/2018 12:32:34 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|IronTotal**

**Sample 2 Data: RA17_GW_Metals|IronTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 31 | 14 |
| Number of Distinct Observations | 31 | 14 |
| Minimum | 660 | 52510 |
| Maximum | 690000 | 232000 |
| Mean | 107741 | 115265 |
| Median | 60000 | 98000 |
| SD | 136450 | 52449 |
| SE of Mean | 24507 | 14018 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 635.5 |
| Standardized WMW U-Stat | -1.912 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.79 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 0.0279 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

### Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/23/2018 12:34:04 PM |
| From File | Lower.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |

| | |
|---|---|
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|ManganeseTotal**
**Sample 2 Data: RA17_GW_Metals|ManganeseTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 31 | 14 |
| Number of Distinct Observations | 25 | 14 |
| Minimum | 330 | 3920 |
| Maximum | 4800 | 18800 |
| Mean | 1421 | 6104 |
| Median | 1100 | 4850 |
| SD | 1056 | 3773 |
| SE of Mean | 189.6 | 1008 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 502.5 |
| Standardized WMW U-Stat | -5.174 |
| Mean (U) | 217 |
| SD(U) - Adj ties | 40.78 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 1.1440E-7 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/21/2018 11:36:52 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|CobaltDissolved**
**Sample 2 Data: RA17_GW_Metals|CobaltBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 14 |
| Number of Non-Detects | 5 | 0 |
| Number of Detect Data | 51 | 14 |
| Minimum Non-Detect | 0.5 | N/A |
| Maximum Non-Detect | 1.5 | N/A |
| Percent Non-detects | 8.93% | 0.00% |
| Minimum Detect | 0.25 | 21.2 |
| Maximum Detect | 71 | 85 |
| Mean of Detects | 13.84 | 32.86 |
| Median of Detects | 6.8 | 23.85 |
| SD of Detects | 18.73 | 19.88 |
| KM Mean | 12.64 | 32.86 |
| KM SD | 18.11 | 19.88 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.948 |
| Critical z (0.05) | -1.645 |
| P-Value | 3.9389E-5 |

**Conclusion with Alpha = 0.05**
**Reject H0, Conclude Sample 1 < Sample 2**
**P-Value < alpha (0.05)**

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| User Selected Options | |
|---|---|
| Date/Time of Computation | ProUCL 5.18/21/2018 11:38:43 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|IronDissolved**

**Sample 2 Data: RA17_GW_Metals|IronBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 14 |
| Number of Non-Detects | 24 | 1 |
| Number of Detect Data | 32 | 13 |
| Minimum Non-Detect | 50 | 7250 |
| Maximum Non-Detect | 77 | 7250 |
| Percent Non-detects | 42.86% | 7.14% |
| Minimum Detect | 6.1 | 7259 |
| Maximum Detect | 150000 | 31200 |
| Mean of Detects | 6114 | 10993 |
| Median of Detects | 450 | 7730 |
| SD of Detects | 26402 | 7200 |
| KM Mean | 3503 | 10726 |
| KM SD | 19874 | 6735 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -5.114 |
| Critical z (0.05) | -1.645 |
| P-Value | 1.5743E-7 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/20/2018 5:02:52 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Beryllium**
**Sample 2 Data: RA17_GW_Metals|BerylliumBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 10 |
| Number of Non-Detects | 8 | 4 |
| Number of Detect Data | 48 | 6 |
| Minimum Non-Detect | 1 | 4.7 |
| Maximum Non-Detect | 10 | 4.7 |
| Percent Non-detects | 14.29% | 40.00% |
| Minimum Detect | 0.041 | 4.09 |
| Maximum Detect | 40 | 12.6 |
| Mean of Detects | 3.28 | 7.068 |

| | | |
|---|---|---|
| Median of Detects | 0.285 | 5.3 |
| SD of Detects | 8.076 | 3.738 |
| KM Mean | 2.857 | 5.883 |
| KM SD | 7.475 | 3.016 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -2.433 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00749 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/21/2018 12:13:43 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|CadmiumTotal**

**Sample 2 Data: RA17_GW_Metals|CadmiumTotalBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 13 |
| Number of Non-Detects | 27 | 6 |
| Number of Detect Data | 29 | 7 |
| Minimum Non-Detect | 1 | 2.7 |
| Maximum Non-Detect | 10 | 2.7 |
| Percent Non-detects | 48.21% | 46.15% |
| Minimum Detect | 0.14 | 1.89 |
| Maximum Detect | 6.5 | 6.8 |
| Mean of Detects | 1.694 | 3.333 |
| Median of Detects | 0.82 | 2.44 |
| SD of Detects | 1.974 | 1.733 |
| KM Mean | 1.123 | 2.813 |
| KM SD | 1.543 | 1.311 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -2.722 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00325 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/20/2018 5:05:47 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Chromium**

**Sample 2 Data: RA17_GW_Metals|ChromiumBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 10 |
| Number of Non-Detects | 12 | 0 |
| Number of Detect Data | 44 | 10 |
| Minimum Non-Detect | 2 | N/A |
| Maximum Non-Detect | 20 | N/A |
| Percent Non-detects | 21.43% | 0.00% |
| Minimum Detect | 0.72 | 36.53 |
| Maximum Detect | 650 | 146 |
| Mean of Detects | 74.48 | 63.2 |
| Median of Detects | 8.65 | 51.4 |
| SD of Detects | 159.4 | 36.33 |
| KM Mean | 58.91 | 63.2 |
| KM SD | 142.8 | 36.33 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.2 |
| Critical z (0.05) | -1.645 |
| P-Value | 6.8765E-4 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

### Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/20/2018 5:16:22 PM |
| From File | WorkSheet.xls |
| Full Precision | OFF |

| | |
|---|---|
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Lead**
**Sample 2 Data: RA17_GW_Metals|LeadBackground+S**

**Raw Statistics**

| #VALUE! | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 9 |
| Number of Non-Detects | 13 | 0 |
| Number of Detect Data | 43 | 9 |
| Minimum Non-Detect | 1 | N/A |
| Maximum Non-Detect | 10 | N/A |
| Percent Non-detects | 23.21% | 0.00% |
| Minimum Detect | 0.28 | 18.6 |
| Maximum Detect | 220 | 57 |
| Mean of Detects | 32.05 | 26.46 |
| Median of Detects | 5.7 | 23 |
| SD of Detects | 60.09 | 12.04 |
| KM Mean | 24.75 | 26.46 |
| KM SD | 53.71 | 12.04 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.083 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00102 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/20/2018 9:12:54 PM |
| From File | Upper.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|Zinc**
**Sample 2 Data: RA17_GW_Metals|ZincBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 10 |
| Number of Non-Detects | 15 | 1 |

| | | |
|---|---|---|
| Number of Detect Data | 41 | 9 |
| Minimum Non-Detect | 5 | 115 |
| Maximum Non-Detect | 50 | 115 |
| Percent Non-detects | 26.79% | 10.00% |
| Minimum Detect | 3.8 | 115 |
| Maximum Detect | 870 | 430 |
| Mean of Detects | 137.8 | 187.4 |
| Median of Detects | 40 | 133 |
| SD of Detects | 224.1 | 107.8 |
| KM Mean | 102.2 | 180.2 |
| KM SD | 198.3 | 98.8 |

**Sample 1 vs Sample 2 Gehan Test**

**H0: Mean of Sample 1 >= Mean of background**

| | |
|---|---|
| Gehan z Test Value | -3.018 |
| Critical z (0.05) | -1.645 |
| P-Value | 0.00127 |

**Conclusion with Alpha = 0.05**

**Reject H0, Conclude Sample 1 < Sample 2**

**P-Value < alpha (0.05)**

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/21/2018 11:42:31 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Substantial Difference | 0.000 |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|ManganeseDissolved**
**Sample 2 Data: RA17_GW_Metals|ManganeseBackground+S**

**Raw Statistics**

| | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Observations | 56 | 14 |
| Number of Distinct Observations | 44 | 14 |
| Minimum | 3.5 | 3920 |
| Maximum | 5000 | 18800 |
| Mean | 1253 | 5704 |
| Median | 825 | 4605 |
| SD | 1269 | 3831 |
| SE of Mean | 169.5 | 1024 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1621 |
| Standardized WMW U-Stat | -5.405 |
| Mean (U) | 392 |
| SD(U) - Adj ties | 68.09 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 3.2464E-8 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

**Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.18/21/2018 11:44:03 AM |
| From File | WorkSheet.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Selected Null Hypothesis | Sample 1 Mean/Median >= Sample 2 Mean/Median (Form 2) |
| Alternative Hypothesis | Sample 1 Mean/Median < Sample 2 Mean/Median |

**Sample 1 Data: RA17_GW_Metals|NickelDissolved**

**Sample 2 Data: RA17_GW_Metals|NickelBackground+S**

**Raw Statistics**

| #VALUE! | Sample 1 | Sample 2 |
|---|---|---|
| Number of Valid Data | 56 | 14 |
| Number of Non-Detects | 6 | 0 |
| Number of Detect Data | 50 | 14 |
| Minimum Non-Detect | 1 | N/A |
| Maximum Non-Detect | 1 | N/A |
| Percent Non-detects | 10.71% | 0.00% |
| Minimum Detect | 0.28 | 13.3 |
| Maximum Detect | 85 | 58 |
| Mean of Detects | 9.514 | 21 |
| Median of Detects | 4.05 | 17.05 |
| SD of Detects | 14.8 | 11.82 |

**Wilcoxon-Mann-Whitney (WMW) Test**

**H0: Mean/Median of Sample 1 >= Mean/Median of Sample 2**

| | |
|---|---|
| Sample 1 Rank Sum W-Stat | 1685 |
| Standardized WMW U-Stat | -4.474 |
| Mean (U) | 392 |
| SD(U) - Adj ties | 68.1 |
| Approximate U-Stat Critical Value (0.05) | -1.645 |
| P-Value (Adjusted for Ties) | 3.8311E-6 |

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 < Sample 2

P-Value < alpha (0.05)

# Attachment J

# Sensitivity Analysis

# 1 Introduction

A sensitivity analysis was conducted (using the statistical software R) for the treatment of non-detect (ND) values in the Site-specific background soil and sediment datasets to better understand the influence NDs may have upon outlier identification and subsequent BTV calculations. For some constituents with low detection frequency, the approach of using the full Reporting Limit (RL) for NDs has the effect of including many values at the same or similar value in the dataset, which may increase the skew of the background dataset and influence the outlier test result. The initial sensitivity analysis focused on the outlier identification for two constituents in soil: benzo(a)pyrene and naphthalene. However, following discussion with DOEE, the sensitivity analysis was expanded to include:

- Additional soil and sediment constituents with a range of detection frequencies including constituents for which there is overlap among detected concentrations and reporting limits.
- An evaluation of distributions and BTVs of these constituents.

The following soil and sediment constituents were selected for additional sensitivity analysis:

**Soil**

- Thallium (surface and subsurface combined)
- PCB, Total Aroclors (surface and subsurface combined)
- Diesel Range Organics (surface and subsurface combined)
- Oil Range Organics (surface and subsurface combined)
- Dibenzo(a,h)anthracene (surface and subsurface combined)
- Naphthalene (surface and subsurface combined)
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin (surface and subsurface combined)
- Benzo(a)anthracene (subsurface only)
- Benzo(a)pyrene (subsurface only)

**Surface Sediment (0-0.5 ft)**

- 2,3,7,8-Tetrachlorodibenzo-p-dioxin
- 4,4'-DDT
- PCB, Total Aroclors

- Cyanide

In general, constituents in background sediment had higher detection frequencies than in soil. Therefore, a few more constituents were selected for soil than for sediment to adequately capture the full range of detection frequency and overlap among detected and reporting limit concentrations. The following sections describe the methodology used for the sensitivity analysis and the results.

# 2 Methodology

The sensitivity analysis consisted of four steps summarized as follows:

1. ND values were replaced in each dataset with simulated values.

2. The default outlier test in ProUCL was conducted on each simulated dataset and a summary of outlier scenarios was tabulated.

3. The distribution of each simulated dataset was determined using the goodness-of-fit statistics.

4. The background threshold value (BTV) was calculated for each outlier scenario.

The first step in the sensitivity analysis is to replace ND values in each dataset (which were represented at the full value of the RL for each sample) with a range of values between the RL and zero for each run of the analysis. To define this range of values, a Monte Carlo sampling approach was conducted, where a uniform distribution (min = 0, max = 1) was randomly sampled for each ND. The random number was multiplied by the reporting limit for each ND to determine the simulated value for that data point. This has the effect of randomly replacing each ND with a value ranging from its reporting limit down to 0 for each sampling run. A total of 10,000 sampling runs were conducted for each constituent producing a total of 10,000 simulated datasets per constituent.

Outlier tests were then conducted on each of the 10,000 sampling runs described above for each constituent. Either the Dixon's or Rosner's outlier tests, which are included in ProUCL and R, was conducted to determine the number of outliers for each dataset. The Dixon's test was used on datasets with 20 or fewer samples, while Rosner's test was used on datasets with more than 20 samples. The statistical software R was used for this analysis and we ensured that the R version of these outlier tests matched the output of ProUCL. Following the tally of high-end and low-end outliers for each simulation of each dataset, the frequency of each unique combination of high- and low-end outlier counts was calculated as a percentage of all simulations. Scenarios with less than 3% frequency were not investigated further. A simulated dataset was randomly chosen for each unique combination, and the sample identification of the outliers in the simulated datasets were recorded, as well as whether the outlier was a simulated value itself.

Outlier values were removed from the observed (i.e., not simulated) datasets and distribution testing and BTV calculations were conducted on these “reduced” datasets (i.e., observed datasets after removing outliers identified from the simulations). ProUCL’s goodness-of-fit test and BTV statistics were used to identify the distributions and BTVs of each reduced dataset as described in the Background Evaluation Appendix.

# 3 Results

This section presents the results of the sensitivity analysis for the selected soil and sediment constituents. Summary statistics of observed and simulated datasets are presented in **Table 1** (soil) and **Table 2** (sediment). Supporting graphics and ProUCL BTV output are presented in attachments.

### 3.1.1 Replacement of Non-detect Values

In soil, the simulated datasets generally increased the variability of the lower end of the dataset, which is illustrated in the boxplots comparing observed and simulated datasets (see attached index plots and boxplots). Summary statistics from the full dataset underlie the various components of the simulated dataset boxplot. No outliers were included in the simulated boxplot for the sake of easy visualization. The observed dataset has a smaller spread (portrayed by the narrow box) versus the larger spread of the simulated dataset (i.e., wider box and longer whiskers). In some cases, the simulated datasets had higher variability (e.g., thallium), but most cases, the standard deviations of simulated datasets are slightly lower than the observed datasets (**Table 1**).

In sediment, the index plots and boxplots of simulated and observed datasets illustrate that the simulated datasets had an increase in variability at the lower end of the dataset. Similar to soil, the standard deviations of the observed sediment datasets are slightly higher than or similar to the simulated datasets (**Table 2**).

### 3.1.2 Outlier Tests

In general, scenarios with low-end outliers were more frequent than those with high-end outliers, as would be expected from the experimental set-up of this simulation because NDs were being reduced from their RL value. In most cases with low-end outliers, at least one outlier value was a simulated ND. For datasets that originally contained potential high-end outliers, such as total PCBs, Diesel Range Organics, and thallium in soil, the simulations identified high-end outliers that occurred in greater than 3% of the total simulated runs. The identification of high-end outliers in the simulations indicates that the Monte Carlo simulation was not completely biased towards low-end outliers.

There were multiple unique outlier combinations for all constituents, except benzo(a)pyrene in soil, and the observed dataset outlier scenario (i.e., ND values set at RL) was not the most frequent scenario for most of the constituents. For example, the 'original' scenario for thallium with one high-end outlier and one low-end outlier occurred 4% of the time in comparison to no outlier scenario (40%) and one low-end outlier scenario (27%). This is understandable, given that the highest value for soil Thallium is an ND.

In sediment, the most frequent scenario for each constituent was no outliers identified based on the simulated datasets. This is consistent with the 'original' outlier scenarios (based on the observed dataset) for 2,3,7,8-TCDD and cyanide. But several outliers were identified for 4,4'-DDT and one high-end outlier for total PCBs in the observed dataset outlier scenarios in comparison to only low-end simulated outliers likely due to the decrease in ND values in the simulated datasets for these constituents.

#### 3.1.3 Distributions of Simulations

In soil, a normal distribution was identified in most of the reduced datasets (i.e., observed dataset with outliers removed), and only one simulation had a non-parametric distribution (no outlier scenario for soil Diesel Range Organics: occurred 12.1% of Monte Carlo runs). In sediment, all simulated datasets are gamma distributed. The outcomes of distributions for both soil and sediment are consistent with the outcome presented in Appendix W.

#### 3.1.4 BTV Calculations

Despite differences in the frequency of unique outlier combinations for both soil and sediment, the estimated BTVs from the various outlier outcome scenarios were relatively similar to each other (Tables 1 and 2). In soil, the 'no outlier' scenarios generally yielded higher BTVs, sometimes over an order of magnitude (e.g., Diesel Range Organics). BTVs for sediment constituents were similar across all unique outlier combinations, including 'no outlier' datasets. In each case, soil (when not considering the 'no outlier' scenarios) and sediment BTVs calculated on reduced datasets for each outlier scenario were similar to the observed dataset BTVs presented in Appendix W.

# 4 Summary

The ND values in the selected background soil and sediment datasets were replaced with randomly selected values between 0 and the RL (for each data point) for 10,000 iterations to generate 10,000 simulated datasets. Outlier tests conducted for the 10,000 simulated datasets resulted in multiple unique high- and low-end outlier combinations for most constituents except benzo(a)pyrene in soil. BTVs calculated based on the reduced datasets (observed dataset with outlier values removed) were similar across different outlier combination scenarios, except for cases in soil datasets where 'no outliers' were identified (e.g., DRO), which resulted in higher BTVs. Given the different combinations of outliers removed and similarities of calculated BTVs for the reduced datasets, it appears that the use of RL values for NDs in the observed datasets does not have a material impact on BTV estimation for the datasets examined.

Table 1
Summary of Sensitivity Analysis for Soil Constituents

| | Background Dataset [b] | | | | | | | | | | Background Dataset with Simulated Values for NDs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Reporting Limits (mg/kg) | | Detected Concentrations (mg/kg) | | | | Distribution of Dataset (including NDs) | Outlier Value (mg/kg) | Sample Identification of Outlier Value | Simulated Outlier Test Results | | | | | Summary of Simulated Datasets (mg/kg) | | | | Distribution w/o Outliers (ProUCL) | BTV Statistic (mg/kg) | |
| **COPC** | **FOD** | Min | Max | Min | Mean | Max | St Dev | | | | Number Low | Number High | Percent of Outcome (%) | Outlier Value | Sample Identification of Outlier Values | Min | Mean | Max | St Dev | | Original [b] | Simulated Outlier Outcome [c] |
| Thallium (Surface and Subsurface) | 32 : 40 | 0.093 | 0.64 | 0.016 | 0.097 | 0.21 | 0.046 | Lognormal | 0.016 [a]<br>0.64 | SOBACK02 (3 - 4 ft)<br>SOBACK18 (3 - 4 ft) | 0 | 0 | 40% | N/A | N/A | 0.016 | 0.094 | 0.21 | 0.049 | Normal | 0.18 | 0.185 |
| | | | | | | | | | | | 1 | 0 | 27% | 0.016 | SOBACK02 (3 - 4 ft) | 0.016 | 0.093 | 0.21 | 0.044 | Normal | | 0.184 |
| | | | | | | | | | | | 2 | 0 | 12% | 0.0038<br>0.00073 | SOBACK12 (0 - 1 ft)<br>SOBACK18 (3 - 4 ft) | 0.001 | 0.087 | 0.21 | 0.049 | Normal | | 0.184 |
| | | | | | | | | | | | 3 | 0 | 5% | 0.016<br>0.0136<br>0.0036 | SOBACK02 (3 - 4 ft)<br>SOBACK12 (0 - 1 ft)<br>SOBACK14 (0 - 1 ft) | 0.004 | 0.093 | 0.21 | 0.048 | Normal | | 0.185 |
| | | | | | | | | | | | 2 | 1 | 5% | 0.48<br>0.016<br>0.0049 | SOBACK18 (3 - 4 ft)<br>SOBACK02 (3 - 4 ft)<br>SOBACK14 (0 - 1 ft) | 0.005 | 0.10 | 0.48 | 0.076 | Normal | | 0.184 |
| | | | | | | | | | | | 1 | 1 | 4% | 0.59<br>0.016 | SOBACK18 (3 - 4 ft)<br>SOBACK02 (3 - 4 ft) | 0.016 | 0.10 | 0.59 | 0.090 | Normal | | 0.184 |
| | | | | | | | | | | | 3 | 1 | 3% | 0.51<br>0.017<br>0.016<br>0.0099 | SOBACK18 (3 - 4 ft)<br>SU-BK-01 (3 - 4 ft)<br>SOBACK02 (3 - 4 ft)<br>SOBACK12 (0 - 1 ft) | 0.010 | 0.10 | 0.51 | 0.081 | Normal | | 0.185 |
| PCB, Total Aroclors (Surface and Subsurface) | 6:40 | 0.00084 | 0.0061 | 0.0059 | 0.077 | 0.39 | 0.15 | No distribution | 0.39 | SOBACK18 (0 - 1 ft) | 0 | 1 | 73% | 0.39 | SOBACK18/ DPBACK13 (0 - 1 ft) | 0.00004 | 0.013 | 0.39 | 0.0614 | Normal | 0.015 | 0.015 |
| | | | | | | | | | | | 1 | 1 | 18% | 0.39<br>4.16e-05 | SOBACK18 (0 - 1 ft)<br>SOBACK11 (3 - 4 ft) | 0.00004 | 0.013 | 0.39 | 0.0613 | Normal | | 0.015 |
| | | | | | | | | | | | 0 | 0 | 5% | N/A | N/A | 0.00001 | 0.013 | 0.39 | 0.0614 | Lognormal | | 0.020 |
| | | | | | | | | | | | 2 | 1 | 4% | 0.39<br>5.0e-06<br>1.0e-06 | SOBACK18 (0 - 1 ft)<br>SU-BK-01 (3 - 4 ft)<br>SOBACK08 (3 - 4 ft) | 0.000001 | 0.013 | 0.39 | 0.0614 | Normal | | 0.016 |
| Diesel Range Organics (C10-C20) (Surface and Subsurface) | 14 : 40 | 17 | 24 | 6.7 | 40 | 230 | 66 | No distribution | 230<br>150<br>40 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK18 (3 - 4 ft) | 1 | 2 | 23% | 230<br>150<br>0.67 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK01 (0 - 1 ft) | 0.67 | 21.6 | 230 | 40.8 | Gamma | 20 | 24.8 |
| | | | | | | | | | | | 2 | 2 | 19% | 230<br>150<br>0.67<br>0.023 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK08 (3 - 4 ft)<br>SOBACK10 (3 - 4 ft) | 0.023 | 20.6 | 230 | 41.0 | Gamma | | 24.6 |
| | | | | | | | | | | | 0 | 2 | 18% | 230<br>150 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft) | 2.85 | 21.8 | 230 | 40.6 | Gamma | | 24.9 |
| | | | | | | | | | | | 3 | 2 | 13% | 230<br>150<br>1.75<br>0.22<br>0.085 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK14 (0 - 1 ft)<br>SOBACK01 (0 - 1 ft)<br>SOBACK06 (0 - 1 ft) | 0.085 | 21.0 | 230 | 40.9 | Gamma | | 24.6 |
| | | | | | | | | | | | 0 | 0 | 12% | N/A | N/A | 0.44 | 19.4 | 230 | 41.3 | Non-parametric | | 230 |
| | | | | | | | | | | | 4 | 2 | 7% | 230<br>150<br>1.2<br>1.1<br>0.83<br>0.12 | SOBACK04 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK15 (3 - 4 ft)<br>SOBACK16 (3 - 4 ft)<br>SOBACK16 (0 - 1 ft)<br>SOBACK06 (0 - 1 ft) | 0.12 | 20.3 | 230 | 41.1 | Gamma | | 24.7 |
| Oil Range Organics (C20-C36) (Surface and Subsurface) | 27 : 40 | 17 | 24 | 7.4 | 99 | 860 | 169 | No distribution | -- | -- | 0 | 0 | 88% | N/A | N/A | 0.69 | 70.2 | 860 | 144.3 | Lognormal | 372 | 371.9 |
| | | | | | | | | | | | 1 | 0 | 11% | 0.022 | SOBACK02 (0 - 1 ft) | 0.022 | 69.7 | 860 | 144.5 | Lognormal | | 380.3 |
| Dibenzo(a,h)anthracene (Surface and Subsurface) | 17 : 40 | 0.0037 | 0.0082 | 0.002 | 0.15 | 1.8 | 0.44 | No distribution | 1.8 | SOBACK04 (3 - 4 ft) | 0 | 2 | 57% | 1.8<br>0.48 | SOBACK04 (3 - 4 ft)<br>SOBACK17 (0 - 1 ft) | 0.00034 | 0.067 | 1.8 | 0.29126 | Gamma | 0.079 | 0.041 |
| | | | | | | | | | | | 0 | 1 | 17% | 1.8 | SOBACK04 (3 - 4 ft) | 0.00004 | 0.067 | 1.8 | 0.29125 | Lognormal | | 0.079 |
| | | | | | | | | | | | 1 | 2 | 17% | 1.8<br>0.48<br>5.5e-06 | SOBACK04 (3 - 4 ft)<br>SOBACK17 (0 - 1 ft)<br>SOBACK11 (3 - 4 ft) | 0.00001 | 0.067 | 1.8 | 0.29125 | Gamma | | 0.040 |
| | | | | | | | | | | | 0 | 0 | 4% | N/A | N/A | 0.00006 | 0.067 | 1.8 | 0.29128 | Lognormal | | 0.163 |

Table 1
Summary of Sensitivity Analysis for Soil Constituents

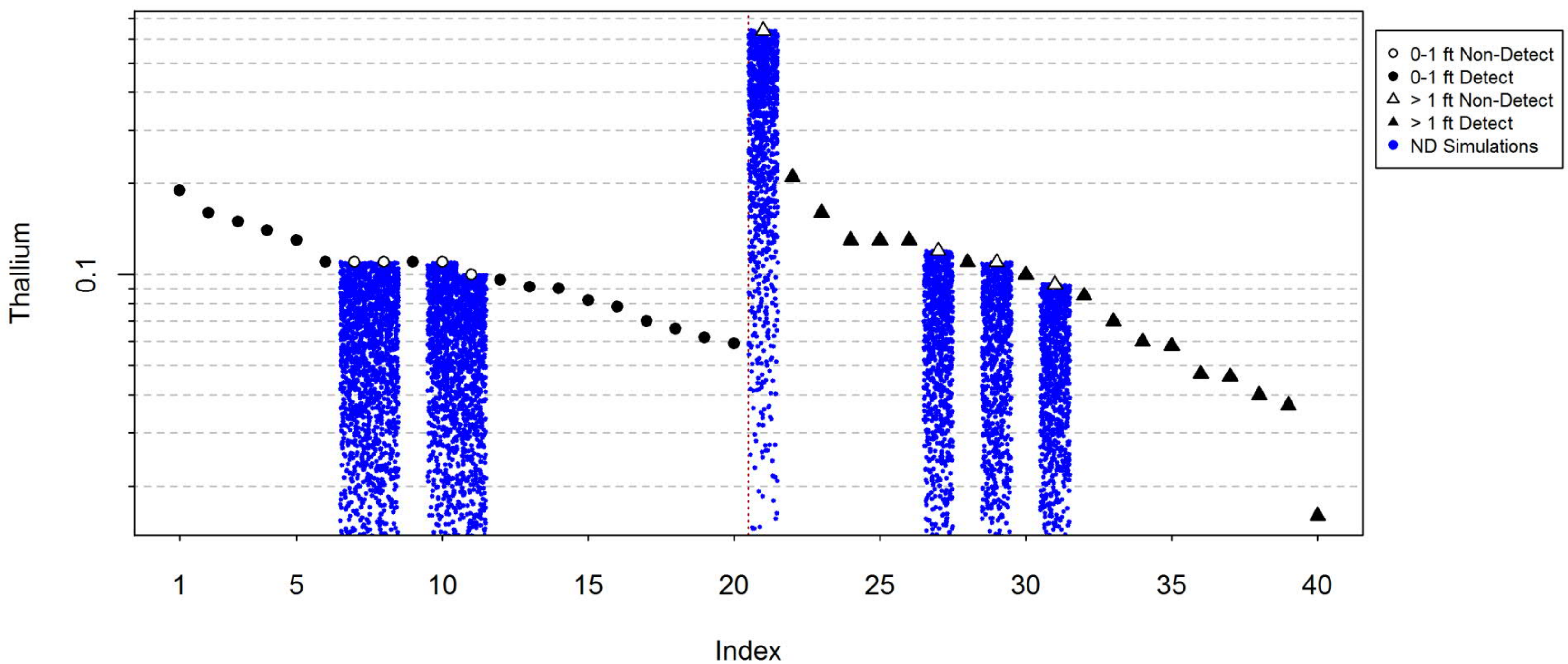
| | Background Dataset [b] | | | | | | | | | | | Background Dataset with Simulated Values for NDs | | | | | | | | | | BTV Statistic (mg/kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Reporting Limits (mg/kg) | | Detected Concentrations (mg/kg) | | | | Distribution of Dataset (including NDs) | Outlier Value (mg/kg) | Sample Identification of Outlier Value | Simulated Outlier Test Results | | | | | Summary of Simulated Datasets (mg/kg) | | | | Distribution w/o Outliers (ProUCL) | | |
| **COPC** | **FOD** | Min | Max | Min | Mean | Max | St Dev | | | | Number Low | Number High | Percent of Outcome (%) | Outlier Value | Sample Identification of Outlier Values | Min | Mean | Max | St Dev | | Original [b] | Simulated Outlier Outcome [c] |
| Naphthalene (Surface and Subsurface) | 15 : 40 | 0.0037 | 0.041 | 0.0011 | 0.2 | 2.8 | 0.72 | No distribution | 2.8 | SOBACK04 (3-4 ft) | 0 | 2 | 43% | 2.8<br>0.13 | SOBACK04 (3 - 4 ft)<br>SOBACK17 (0 - 1 ft) | 0.0003 | 0.079 | 2.8 | 0.44175 | Gamma | 0.03 | 0.015 |
| | | | | | | | | | | | 1 | 2 | 23% | 2.8<br>0.13<br>8.98e-06 | SOBACK04 (3 - 4 ft)<br>SOBACK17 (0 - 1 ft)<br>SOBACK10 (3 - 4 ft) | 0.00001 | 0.079 | 2.8 | 0.44180 | Gamma | | 0.015 |
| | | | | | | | | | | | 0 | 1 | 21% | 2.8 | SOBACK04 (3 - 4 ft) | 0.00006 | 0.079 | 2.8 | 0.44181 | Lognormal | | 0.03 |
| | | | | | | | | | | | 2 | 2 | 7% | 2.8<br>0.13<br>0.00019<br>6.3e-05 | SOBACK04 (3 - 4 ft)<br>SOBACK17 (0 - 1 ft)<br>SOBACK06 (0 - 1 ft)<br>SOBACK08 (3 - 4 ft) | 0.00006 | 0.08 | 2.8 | 0.44 | Gamma | | 0.016 |
| 2,3,7,8-Tetrachlorodibenzo-p-dioxin (Surface and Subsurface) | 6 : 40 | 7.7E-08 | 9.3E-07 | 8.3E-08 | 7.6E-07 | 2.3E-06 | 8.4E-07 | Gamma | -- | -- | 0 | 0 | 70% | N/A | N/A | 7.7E-09 | 2.6E-07 | 2.3E-06 | 4.0E-07 | Normal | 1.0017E-6 | 1.0017E-06 |
| | | | | | | | | | | | 1 | 0 | 23% | 2.01E-10 | SOBACK08/ DPBACK12 (3 - 4 ft) | 2.0E-10 | 2.6E-07 | 2.3E-06 | 3.9E-07 | Normal | | 1.0182E-06 |
| | | | | | | | | | | | 2 | 0 | 5% | 4.4e-09<br>3e-09 | SOBACK10 (3 - 4 ft)<br>SOBACK17 (3 - 4 ft) | 3.0E-09 | 2.8E-07 | 2.3E-06 | 3.9E-07 | Normal | | 1.0365E-06 |
| Benzo(a)anthracene (subsurface only) | 9 : 20 | 0.0037 | 0.0082 | 0.0016 | 1.3 | 11 | 3.7 | No distribution | 11 | SOBACK04 (3 - 4 ft) | 0 | 5 | 97% | 11<br>0.096<br>0.064<br>0.036<br>0.015 | SOBACK04 (3 - 4 ft)<br>SOBACK13 (3 - 4 ft)<br>SU-BK-02 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft)<br>SOBACK18 (3 - 4 ft) | 0.0002 | 0.56 | 11.0 | 2.5 | Normal | 0.077 | 0.008 |
| | | | | | | | | | | | 0 | 4 | 2% | 11<br>0.096<br>0.064<br>0.036 | SOBACK04 (3 - 4 ft)<br>SOBACK13 (3 - 4 ft)<br>SU-BK-02 (3 - 4 ft)<br>SOBACK05 (3 - 4 ft) | 3.6E-06 | 0.56 | 11.0 | 2.5 | Normal | | 0.013 |
| Benzo(a)pyrene (subsurface only) | 6 : 20 | 0.0037 | 0.0082 | 0.011 | 1.5 | 8.7 | 3.5 | No distribution | 8.7 | SOBACK04 (3 - 4 ft) | 0 | 3 | 96% | 8.7<br>0.095<br>0.068 | SOBACK04 (3 - 4 ft)<br>SOBACK13 (3 - 4 ft)<br>SU-BK-02 (3 - 4 ft) | 7.8E-06 | 0.45 | 8.7 | 1.9 | Normal | 0.072 | 0.017 |

Notes:
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
Outlier values in red are simulated values. Gray highlighted rows correspond with the outcome presented in Appendix W Background Evaluation.
[a] Low tail outlier.
[b] Summary statistics, distribution, outlier test, and BTV presented in Appendix W Background Evaluation.
[c] BTVs selected according to methods presented in Appendix W. The 95 UTL with 95% coverage was selected based on the distribution of detected concentrations in the background dataset.

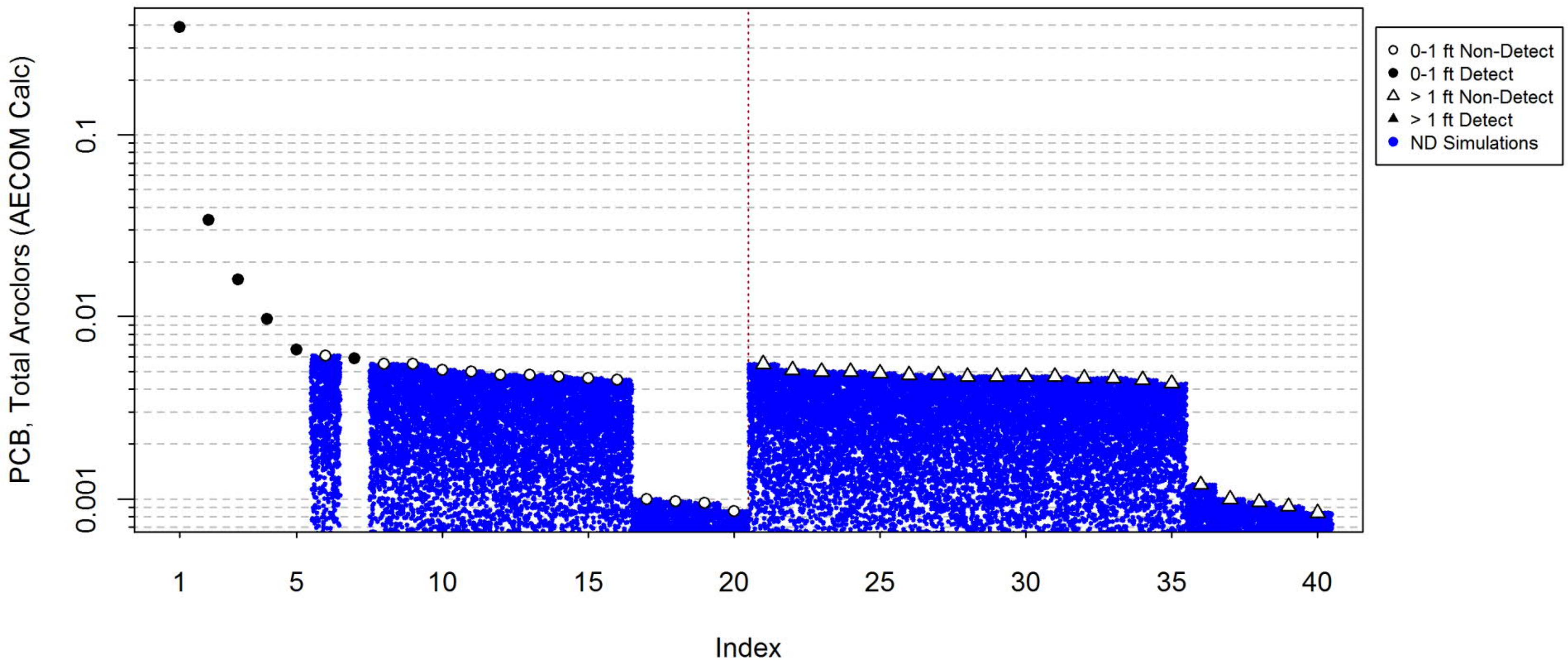
Table 2
Summary of Sensitivity Analysis for Sediment Constituents

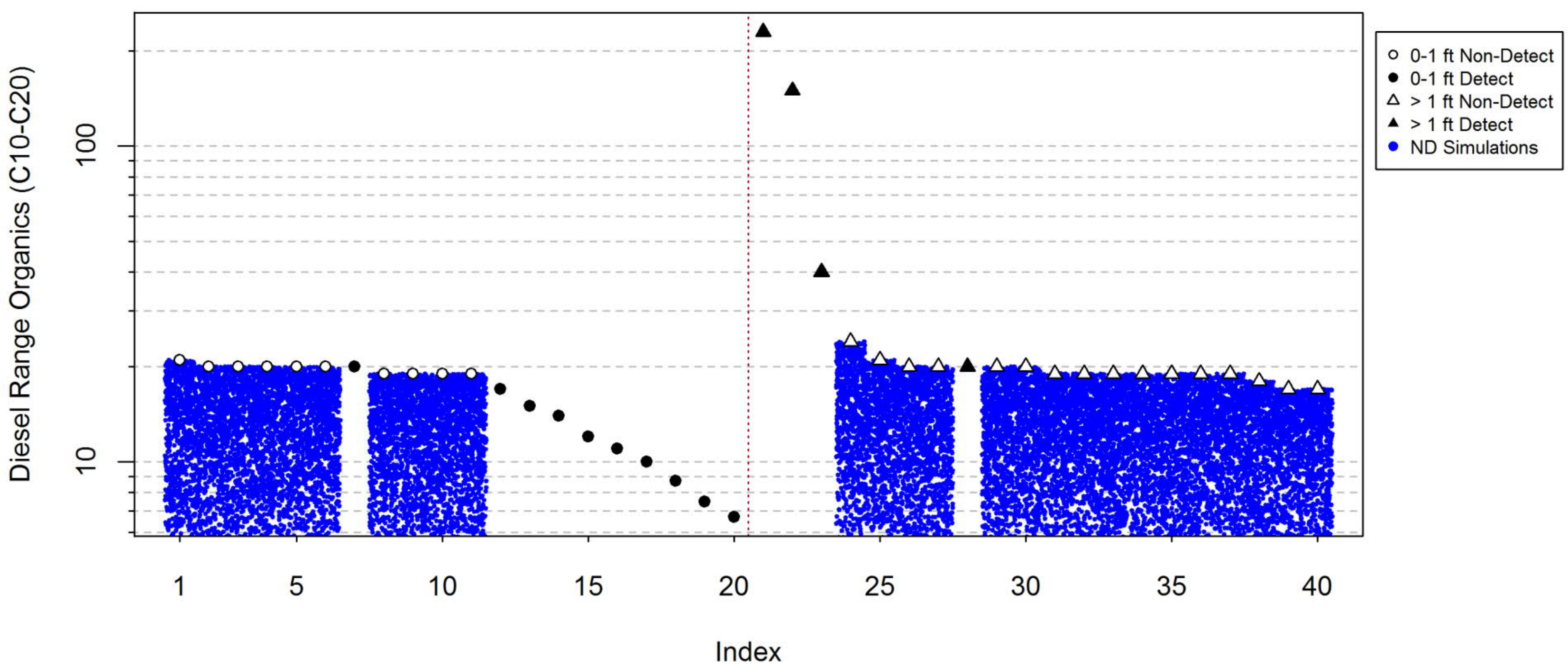
| | Background Dataset [a] | | | | | | | | | | Background Dataset with Simulated Values for NDs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Reporting Limits (mg/kg) | | Detected Concentrations (mg/kg) | | | | | | | Simulated Outlier Test Results | | | | | Summary of Simulated Datasets (mg/kg) | | | | | BTV Statistic (mg/kg) | |
| **COPC** | **FOD** | Min | Max | Min | Mean | Max | St Dev | **Distribution of Dataset (including NDs)** | **Outlier Value (mg/kg)** | **Sample Identification of Outlier Value** | Number Low | Number High | Percent of Outcome (%) | Outlier Value | Sample Identification of Outlier Values | Min | Mean | Max | St Dev | **Distribution w/o Outliers (ProUCL)** | Original [a] | Simulated Outlier Outcome [b] |
| 2,3,7,8-TCDD | 13 : 32 | 2.0E-08 | 3.4E-07 | 2.1E-08 | 2.6E-07 | 7.2E-07 | 2.4E-07 | Gamma Lognormal | -- | -- | 0 | 0 | 78.4% | N/A | N/A | 3.0E-09 | 1.5E-07 | 7.2E-07 | 1.8E-07 | Gamma | 5.3E-07 | 5.9E-07 |
| | | | | | | | | | | | 1 | 0 | 18.5% | 1.03E-09 | SEDBACK16 (0 - 0.33 ft) | 1.0E-09 | 1.6E-07 | 7.2E-07 | 1.8E-07 | Gamma | | 6.1E-07 |
| 4,4'-DDT | 38 : 46 | 3.8E-05 | 8.5E-04 | 4.4E-05 | 0.00127 | 0.0056 | 0.00135 | Gamma | 0.0056<br>0.005<br>0.0039<br>0.0032<br>0.0025<br>0.0024 | SEDBACK6<br>SEDBACK4<br>SEDBACK16<br>SEDBACK5<br>R7-13<br>R7-28 | 0 | 0 | 84.6% | N/A | N/A | 1.9E-05 | 1.1E-03 | 5.6E-03 | 1.3E-03 | Gamma | 0.0022 | 0.0049 |
| | | | | | | | | | | | 1 | 0 | 13.5% | 2.73E-07 | SEDBACK1 (0 - 0.5 ft) | 2.7E-07 | 1.1E-03 | 5.6E-03 | 1.3E-03 | Gamma | | 0.0049 |
| Total PCB Aroclors | 37 : 47 | 4.5E-04 | 0.0054 | 0.0013 | 0.050 | 0.19 | 0.044 | Gamma | 0.19 | R7-01 | 0 | 0 | 86.7% | N/A | N/A | 8.2E-05 | 4.0E-02 | 1.9E-01 | 4.4E-02 | Gamma | 0.18 | 0.19 |
| | | | | | | | | | | | 1 | 0 | 10.9% | 5.57E-07 | R7-18 (0 - 0.5 ft) | 5.6E-07 | 4.0E-02 | 1.9E-01 | 4.4E-02 | Gamma | | 0.19 |
| Cyanide | 22 : 41 | 0.091 | 0.67 | 0.082 | 0.38 | 0.99 | 0.25 | No distribution | -- | -- | 0 | 0 | 58.1% | N/A | N/A | 0.0042 | 0.28 | 0.99 | 0.24 | Gamma | 0.8 | 0.85 |
| | | | | | | | | | | | 1 | 0 | 28.4% | 4.32E-04 | R7-20 (0 - 0.5 ft) | 0.0004 | 0.27 | 0.99 | 0.23 | Gamma | | 0.84 |
| | | | | | | | | | | | 2 | 0 | 9.4% | 0.00634<br>0.00304 | R7-11 (0 - 0.5 ft)<br>R7-23 (0 - 0.5 ft) | 0.0030 | 0.29 | 0.99 | 0.24 | Gamma | | 0.86 |
| | | | | | | | | | | | 3 | 0 | 3.1% | 0.00608<br>0.00504<br>0.00385 | R6-14 (0 - 0.5 ft)<br>R7-10 (0 - 0.5 ft)<br>R7-19 (0 - 0.5 ft) | 0.0039 | 0.28 | 0.99 | 0.24 | Gamma | | 0.86 |

Notes:
FOD - Frequency of Detection. The number of detected concentrations: the total number of samples.
Outlier values in red are simulated values. Gray highlighted rows correspond with the outcome presented in Appendix W Background Evaluation.
[a] Summary statistics, distribution, outlier test, and BTV presented in Appendix W Background Evaluation.
[b] BTVs selected according to methods presented in Appendix W. The 95 UTL with 95% coverage was selected based on the distribution of detected concentrations in the background dataset.

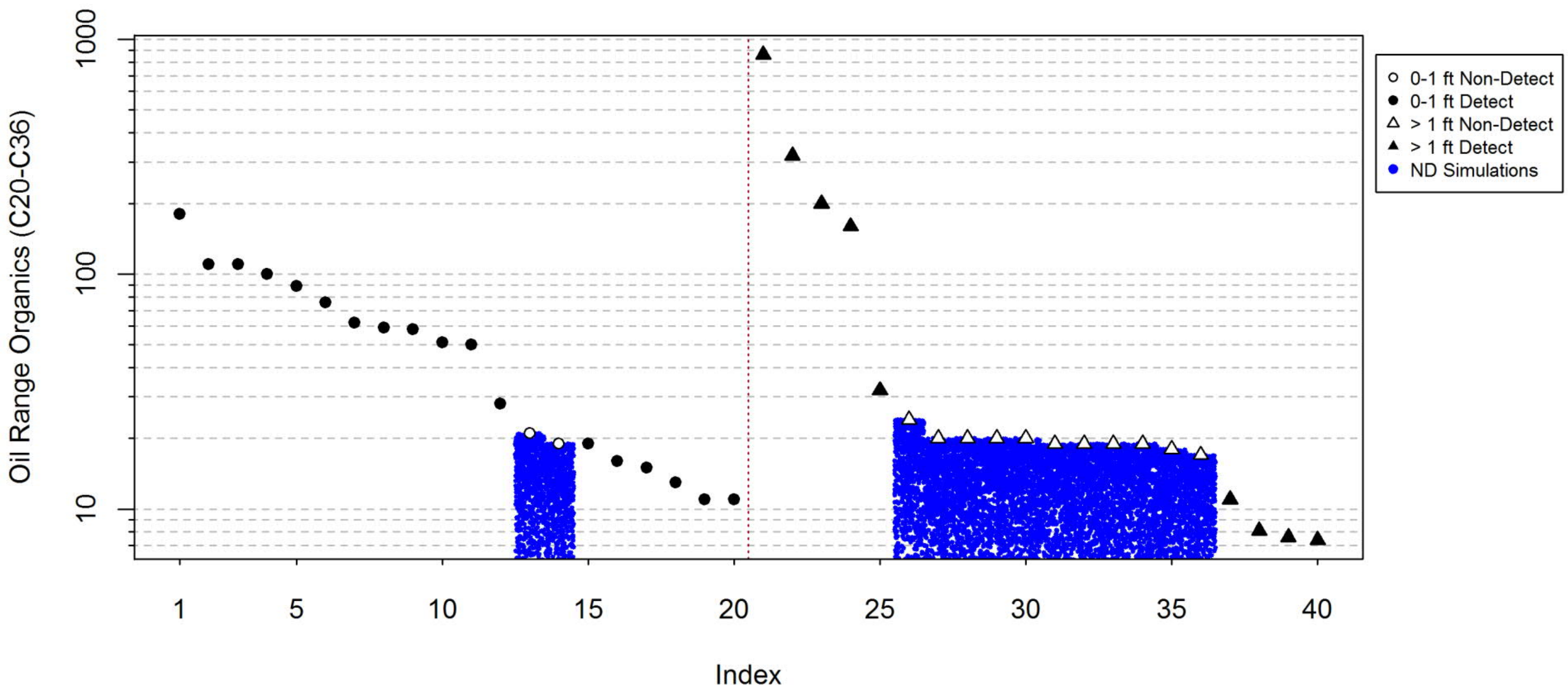

Thallium
0.1
1
5
10
15
20
25
30
35
40
Index
0-1 ft Non-Detect
0-1 ft Detect
> 1 ft Non-Detect
> 1 ft Detect
ND Simulations

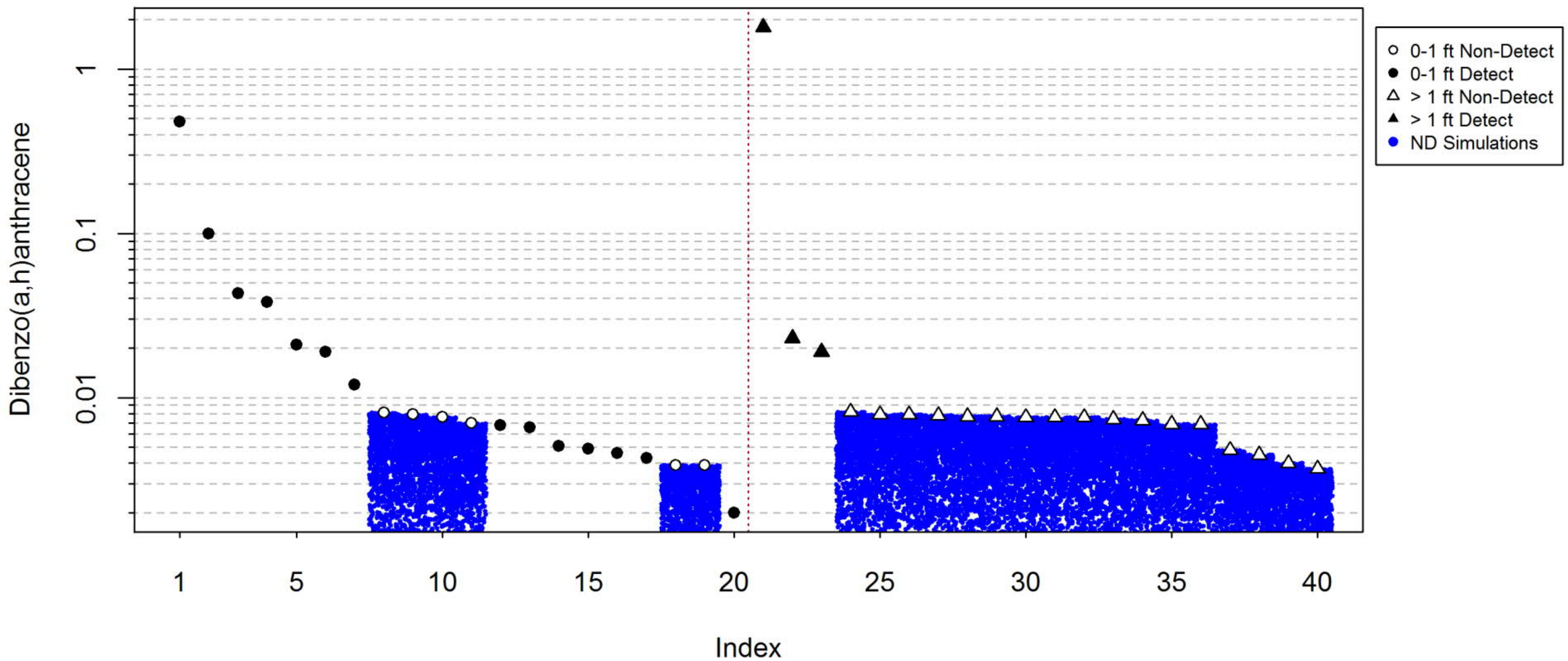
Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Index Plots of Constituents in Soil

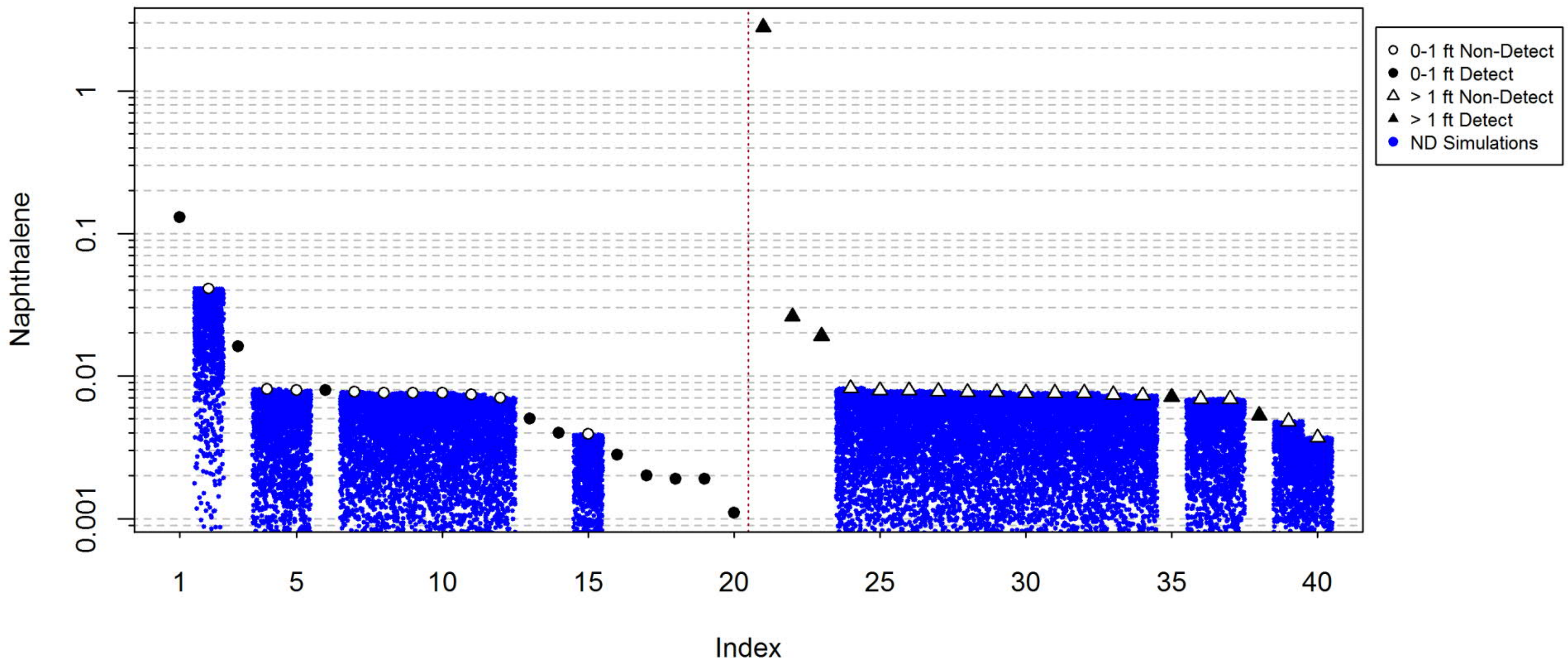


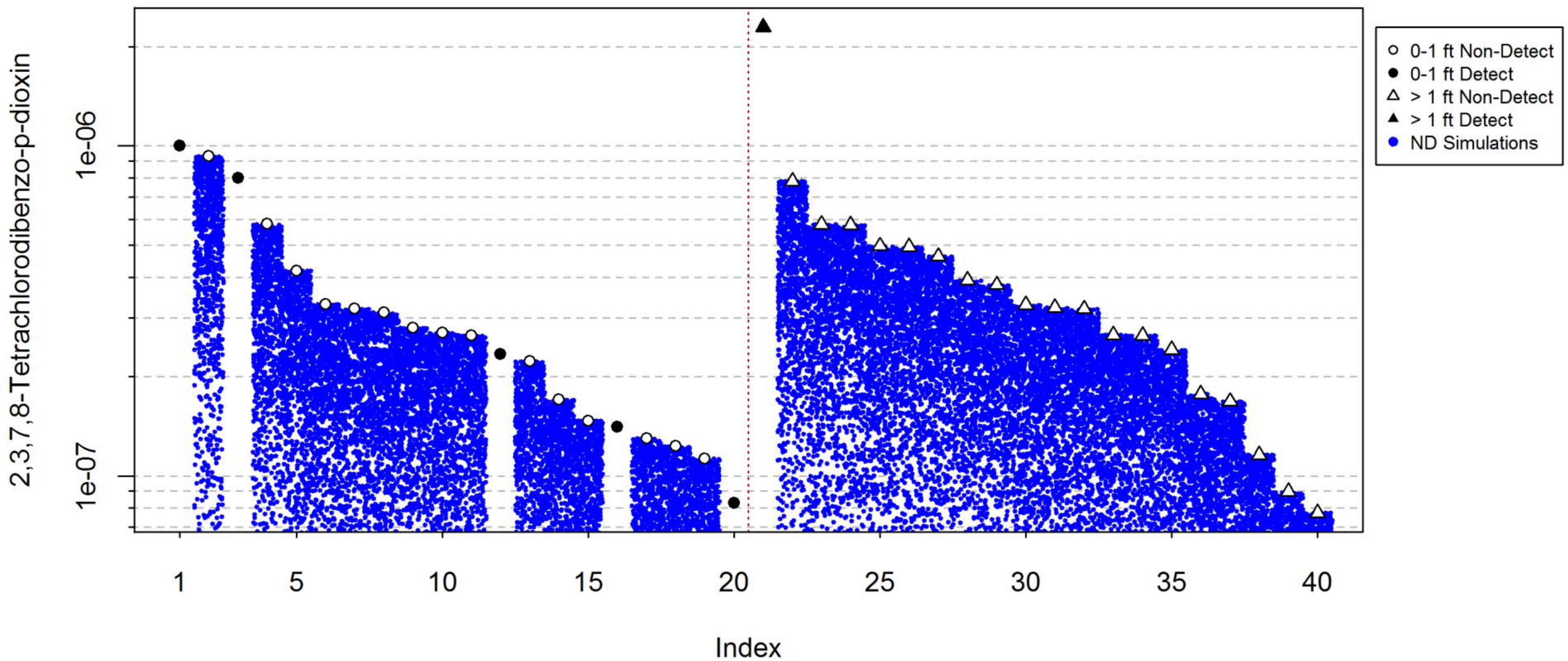

Diesel Range Organics (C10-C20)
100
10
1
5
10
15
20
25
30
35
40
Index
0-1 ft Non-Detect
0-1 ft Detect
> 1 ft Non-Detect
> 1 ft Detect
ND Simulations

Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Index Plots of Constituents in Soil

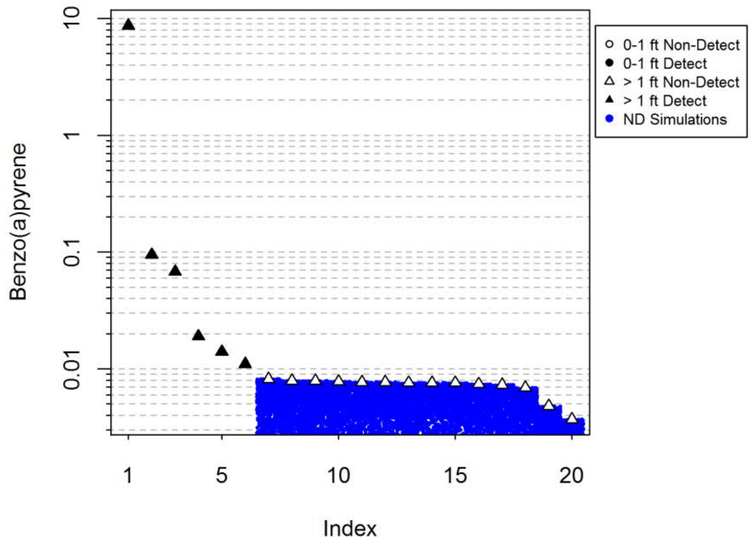


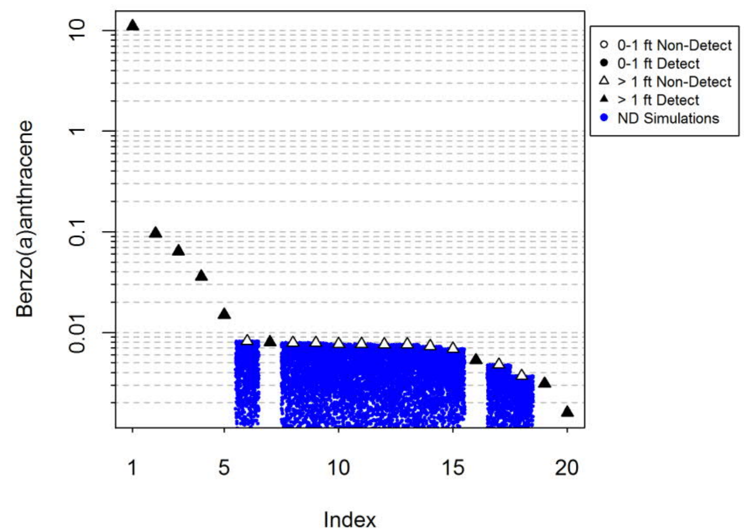

Dibenzo(a,h)anthracene
0.01
0.1
1
1
5
10
15
20
25
30
35
40
Index
0-1 ft Non-Detect
0-1 ft Detect
> 1 ft Non-Detect
> 1 ft Detect
ND Simulations

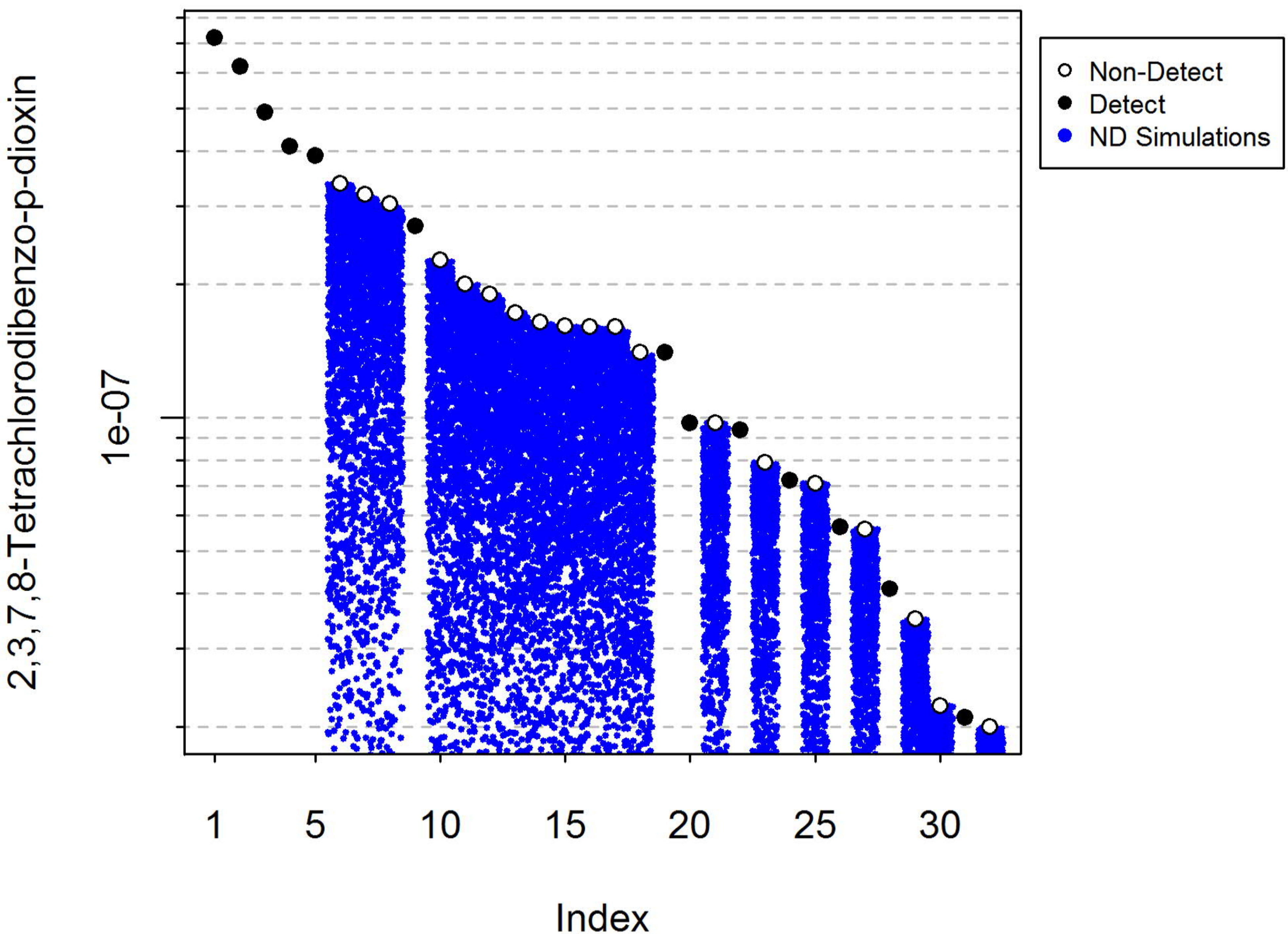

Naphthalene
0.001
0.01
0.1
1
1
5
10
15
20
25
30
35
40
Index
0-1 ft Non-Detect
0-1 ft Detect
> 1 ft Non-Detect
> 1 ft Detect
ND Simulations

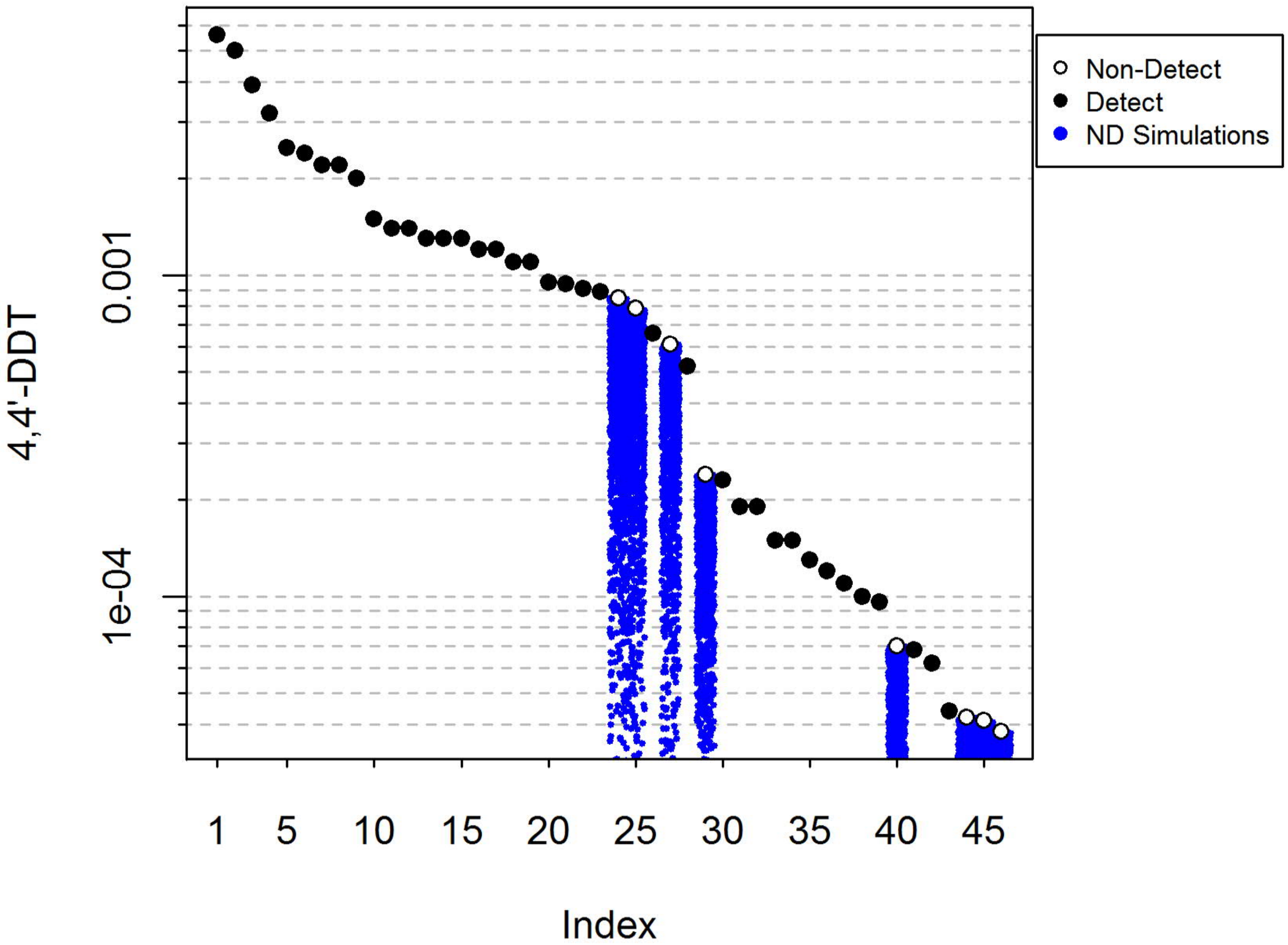

2,3,7,8-Tetrachlorodibenzo-p-dioxin
1e-06
1e-07
1
5
10
15
20
25
30
35
40
Index
0-1 ft Non-Detect
0-1 ft Detect
> 1 ft Non-Detect
> 1 ft Detect
ND Simulations

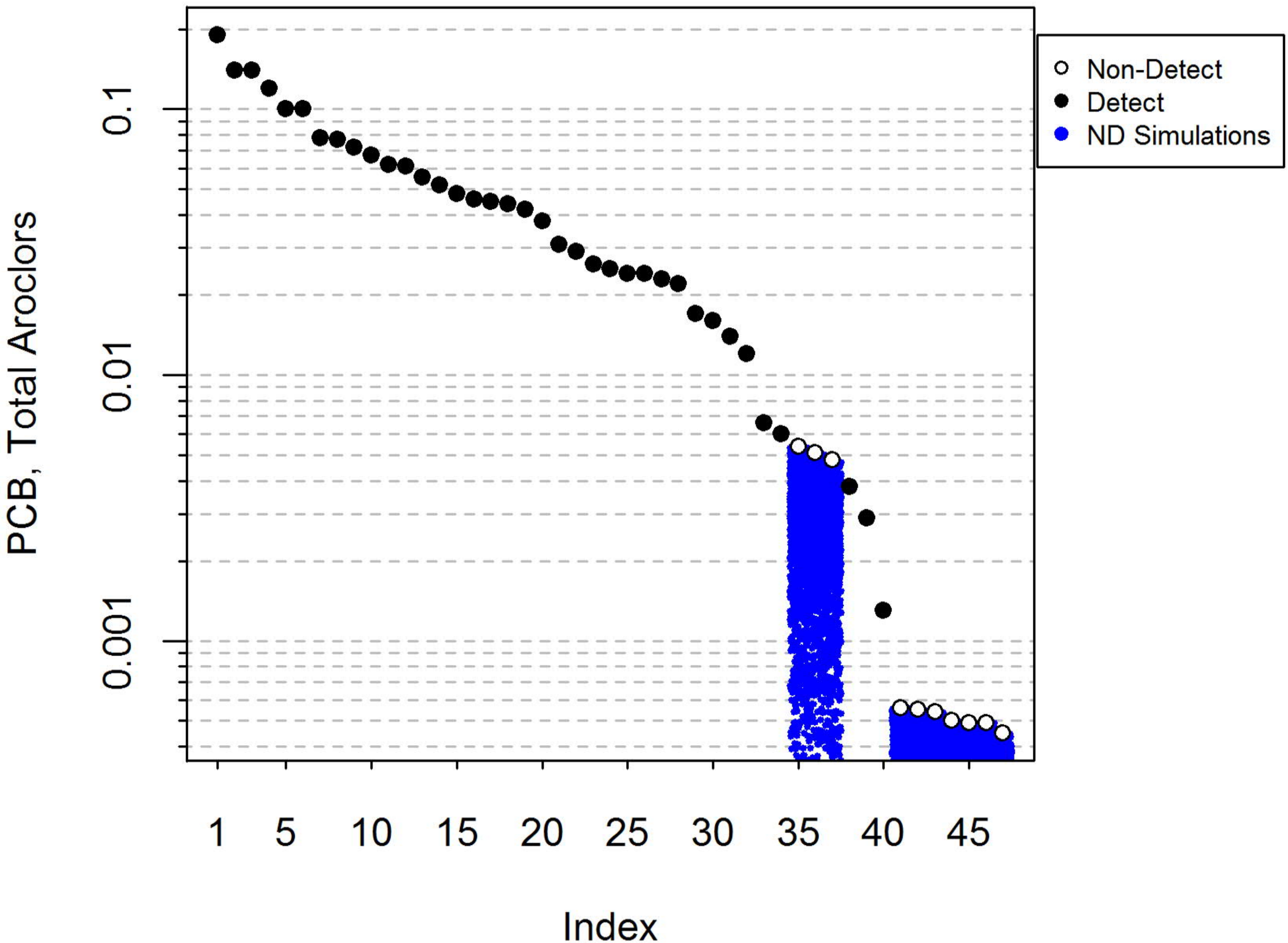
Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Index Plots of Constituents in Soil

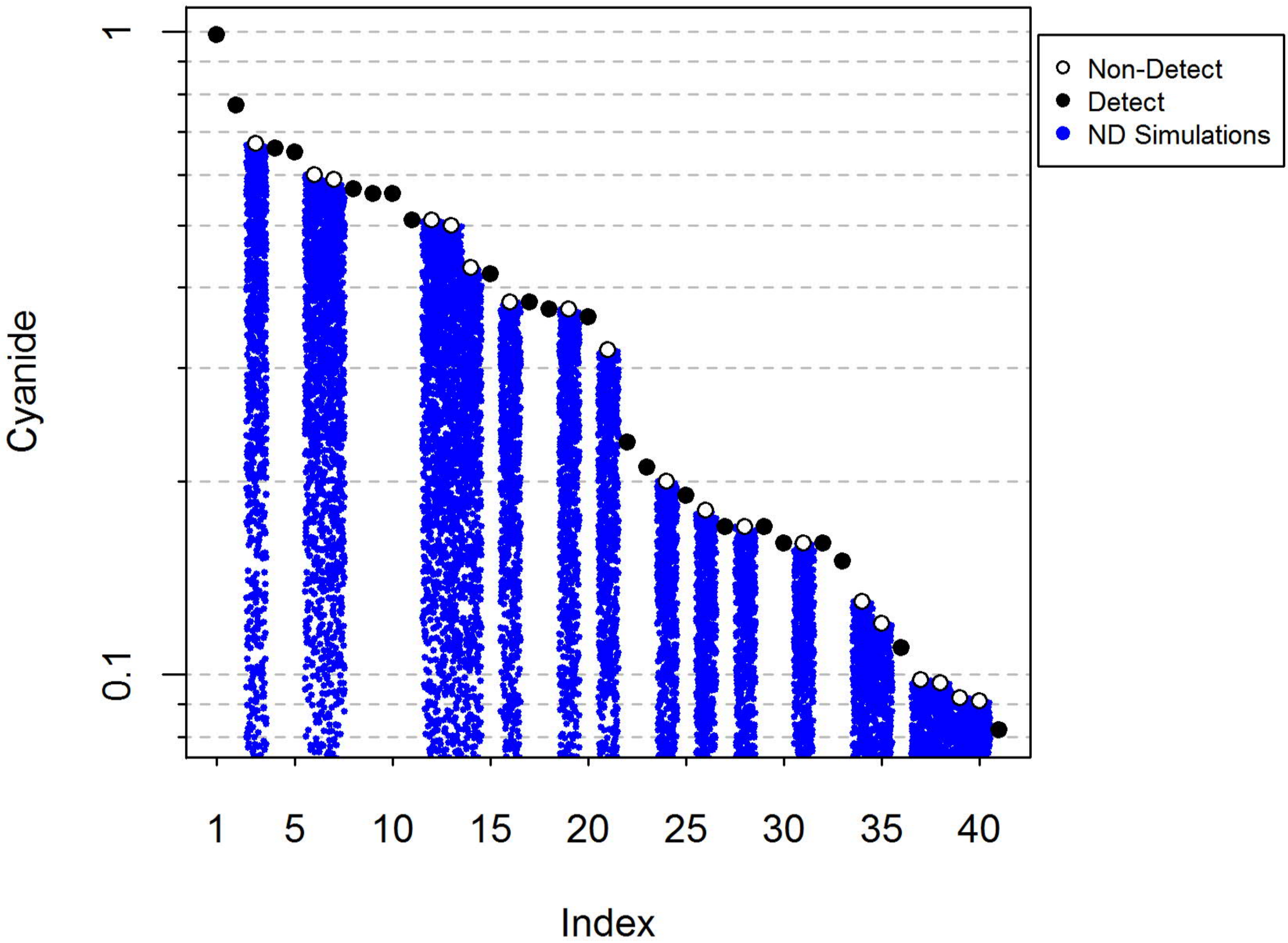


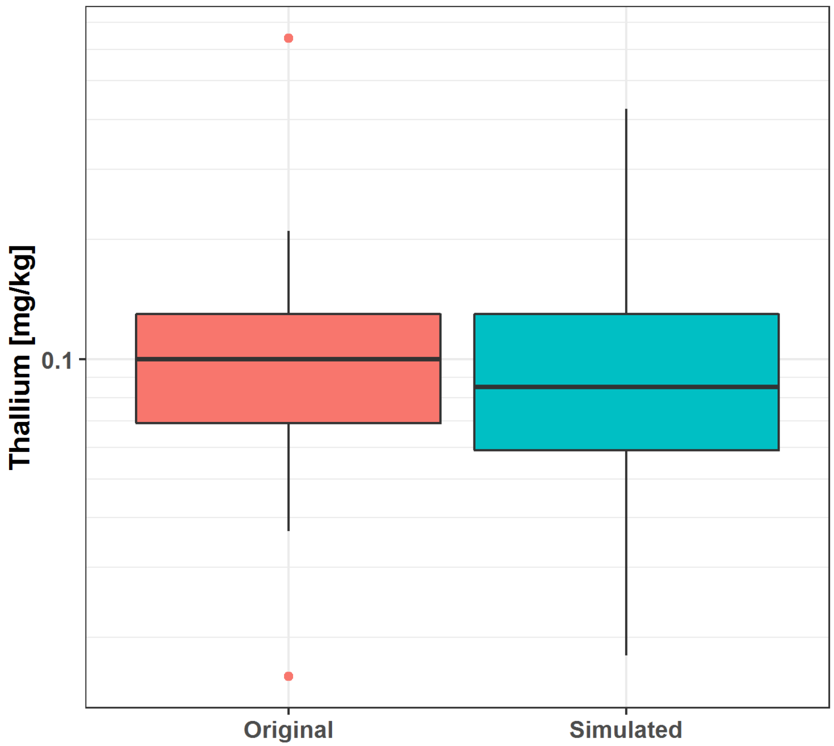



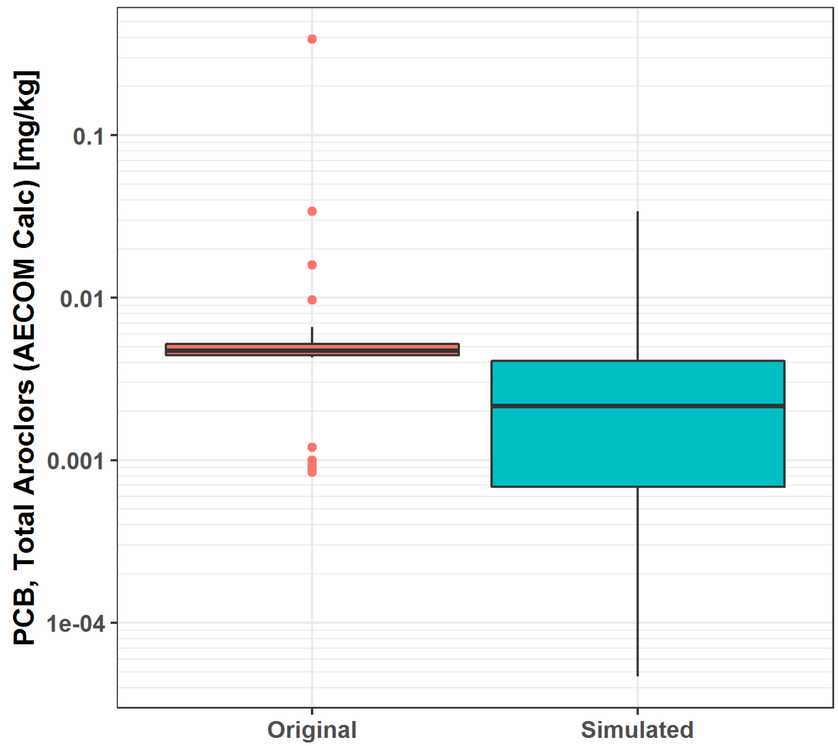

2,3,7,8-Tetrachlorodibenzo-p-dioxin
1e-07
Index
1
5
10
15
20
25
30
Non-Detect
Detect
ND Simulations


4,4'-DDT
0.001
1e-04
1
5
10
15
20
25
30
35
40
45
Index
Non-Detect
Detect
ND Simulations

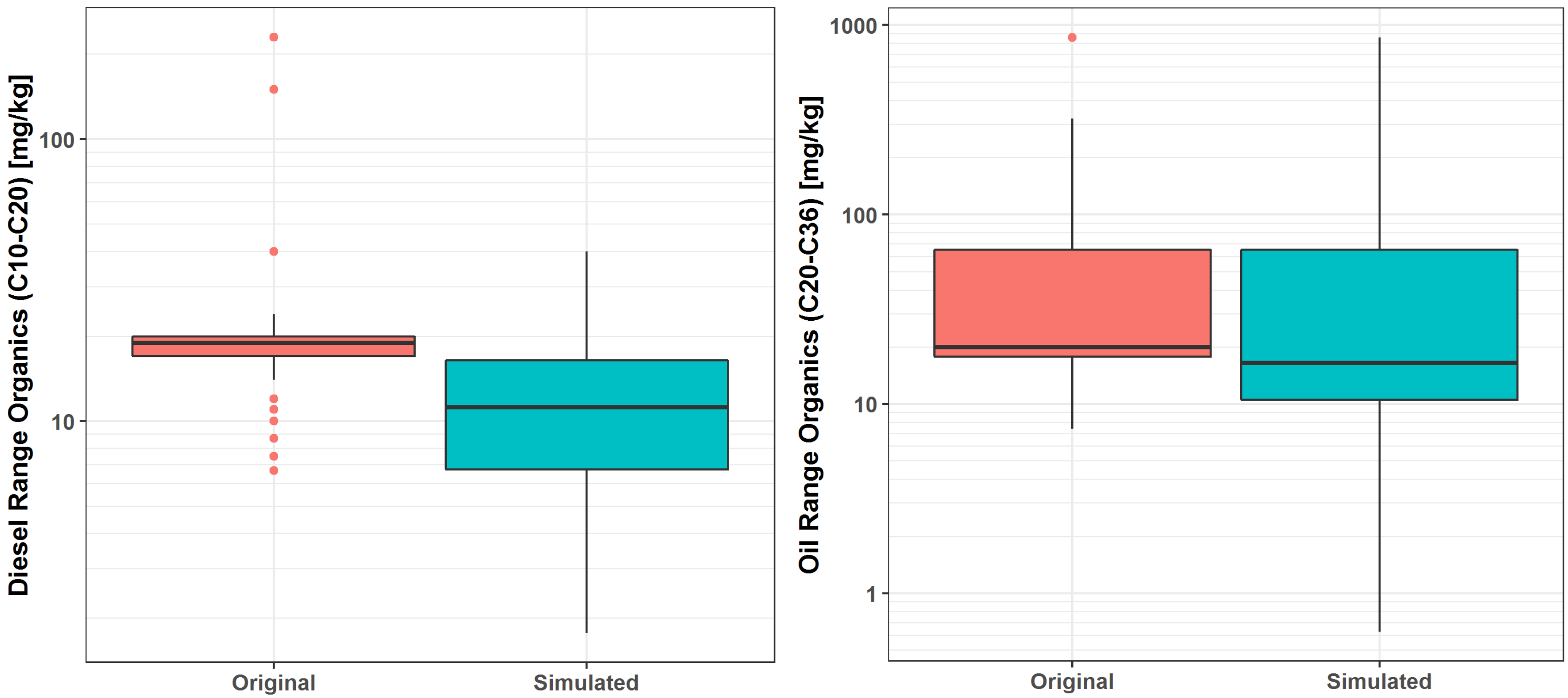

PCB, Total Aroclors
0.1
0.01
0.001
Index
1
5
10
15
20
25
30
35
40
45
Non-Detect
Detect
ND Simulations

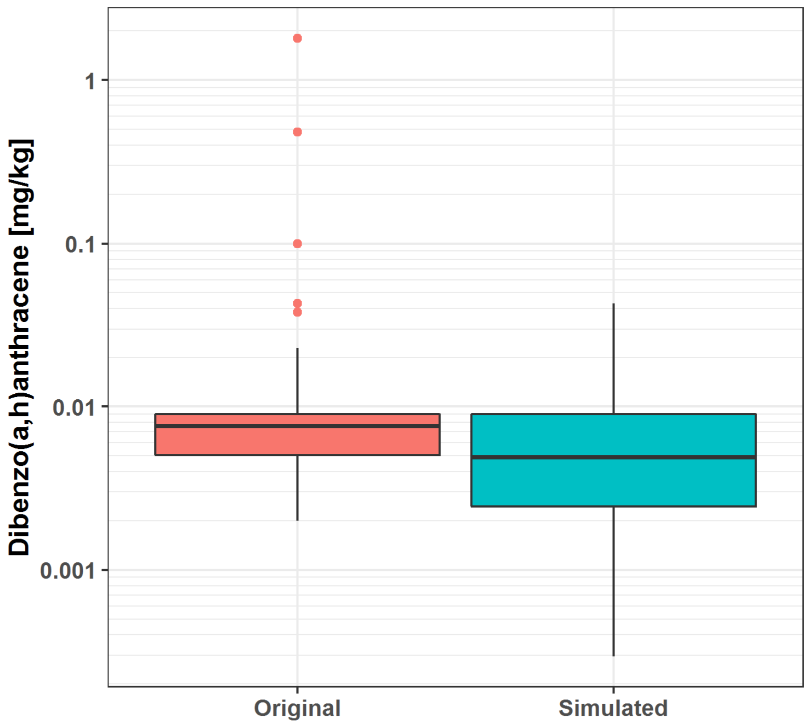

Cyanide
Index
1
0.1
1
5
10
15
20
25
30
35
40
Non-Detect
Detect
ND Simulations

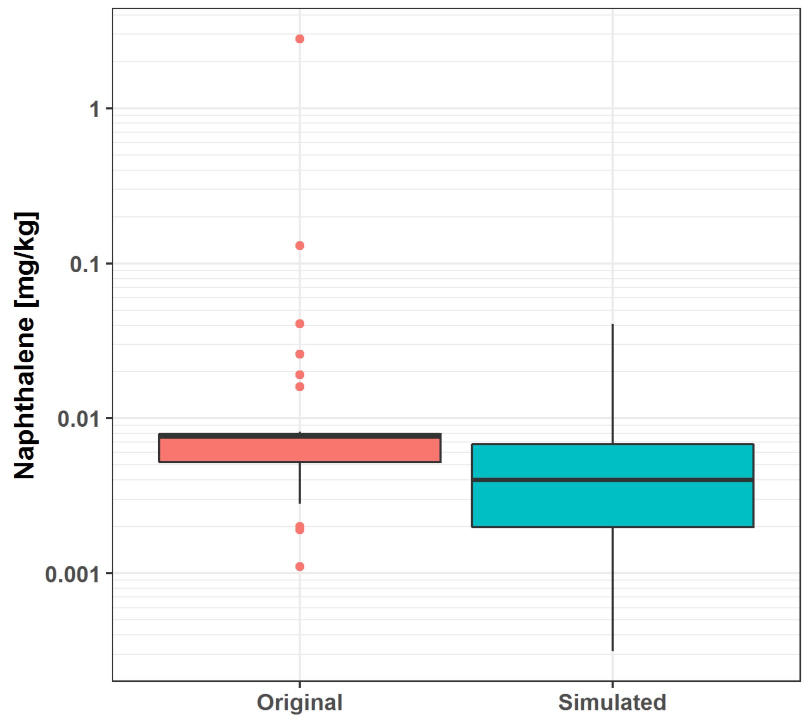

Thallium [mg/kg]
0.1
Original
Simulated


PCB, Total Aroclors (AECOM Calc) [mg/kg]
0.1
0.01
0.001
1e-04
Original
Simulated

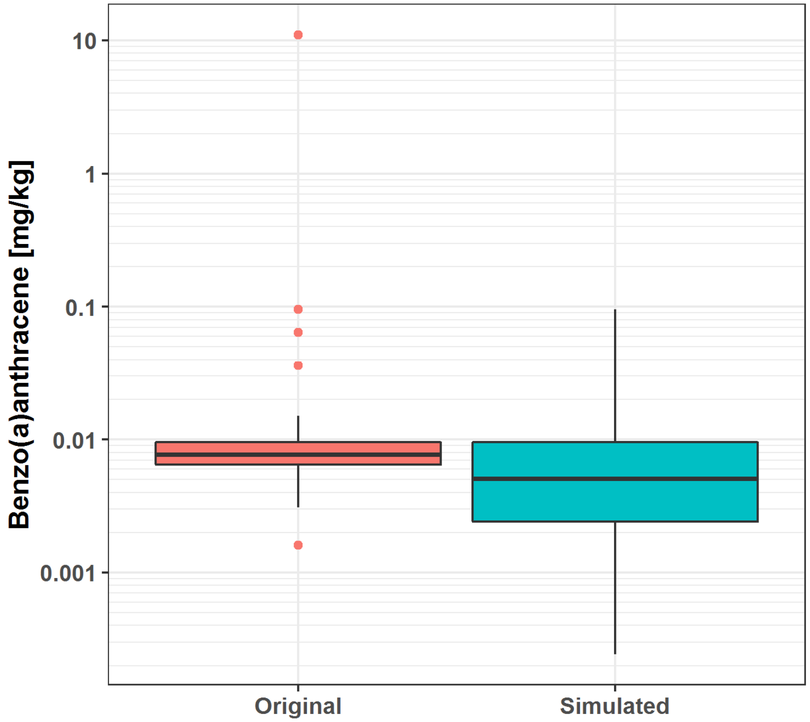
Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Boxplots of Constituents in Soil

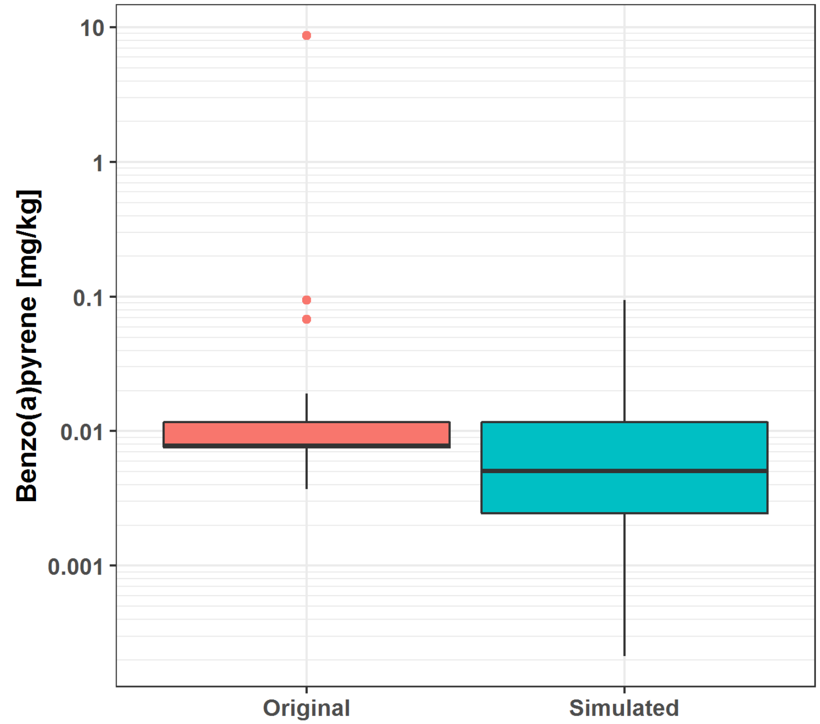


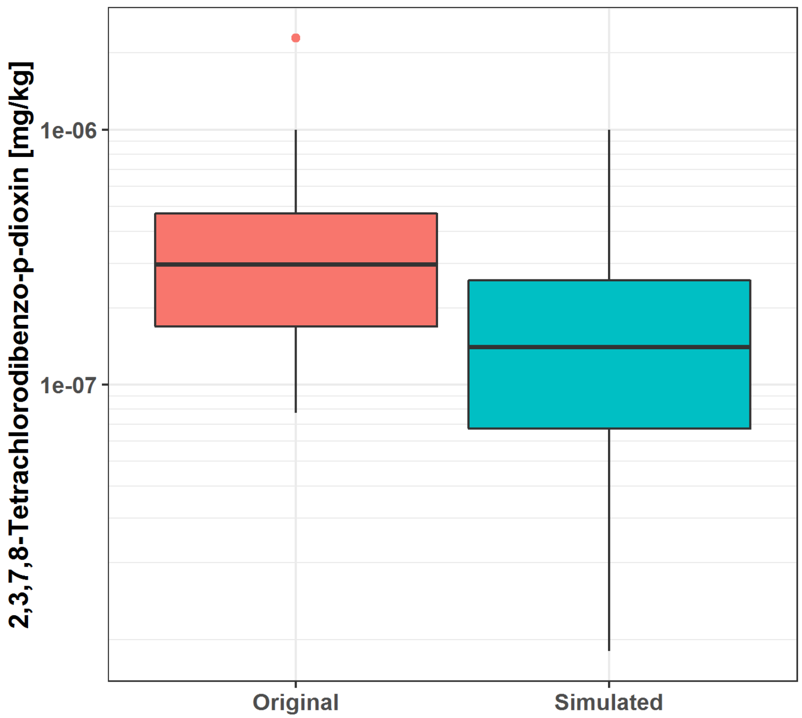

Dibenzo(a,h)anthracene [mg/kg]
1
0.1
0.01
0.001
Original
Simulated


Naphthalene [mg/kg]
1
0.1
0.01
0.001
Original
Simulated

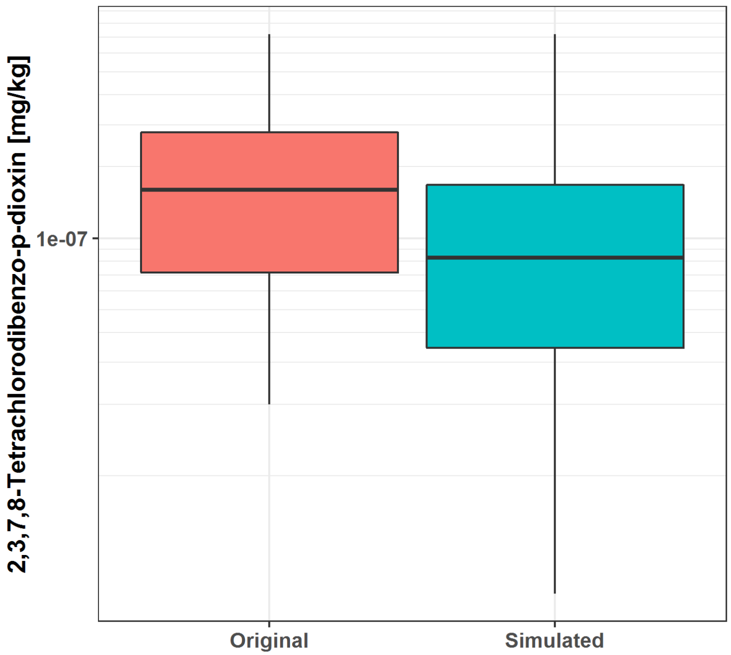
Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Boxplots of Constituents in Soil

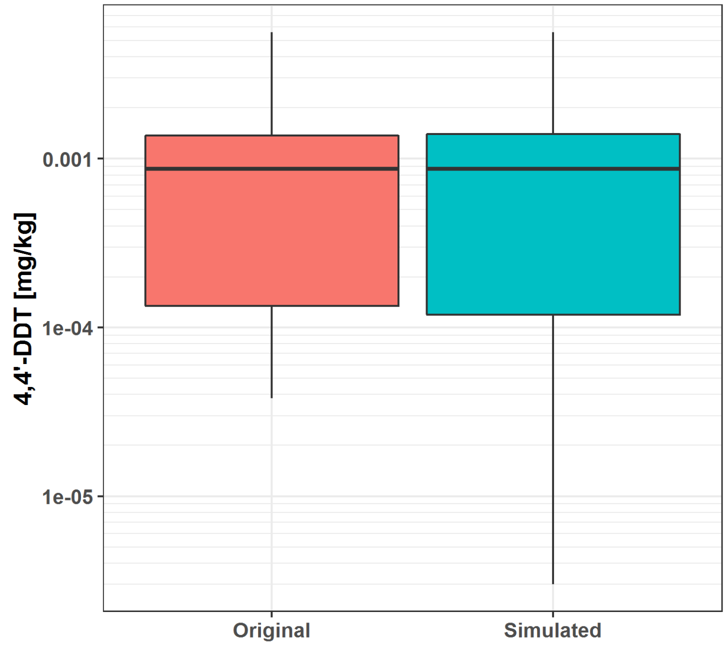



2,3,7,8-Tetrachlorodibenzo-p-dioxin [mg/kg]
1e-06
1e-07
Original
Simulated

Appendix W Background Evaluation
Attachment J Sensitivity Analysis
Boxplots of Constituents in Sediment



Appendix W Background Evaluation
Attachment J Sensitivity Analysis
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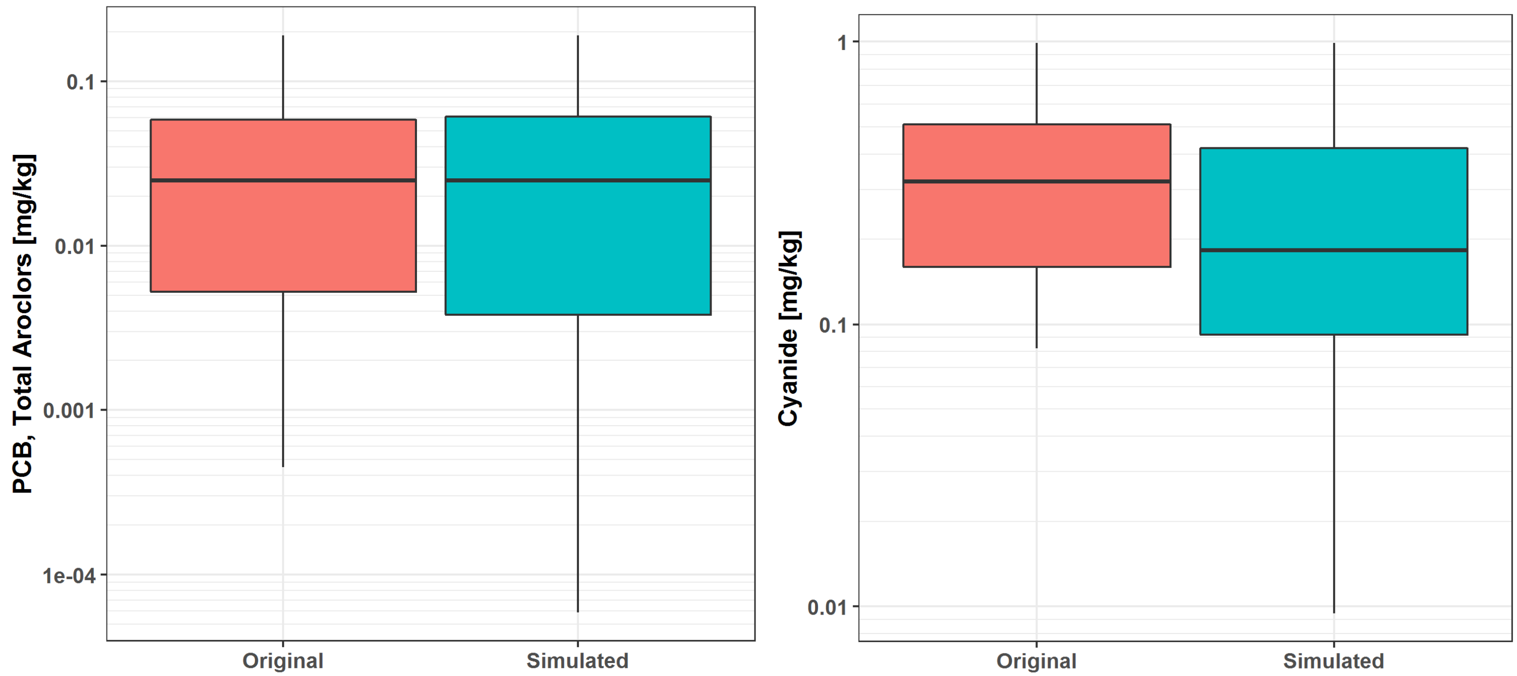


## Attachment K

## Calculation of Up-river Sediment Transport Distance

# Contents

# 1 Introduction

This attachment presents the calculations that Pepco used to estimate the maximum expected up-river sediment transport from the Waterside Investigation Area (WIA). The WIA is shown in **Figure 1** as a pink outline.

The steps used for this calculation included:

1. Assess the environmental conditions, transport pattern, and potential for sediment-bound contaminants to be transported up-river from the WIA. Highest tidal currents moving up river occur when downstream river flows are at a minimum and tidal stages are maximum.

2. Calculate the tidal current speed and directions using the 1-Dimensional HEC-RAS model under the following conditions:

   - Extreme tidal stage at Anacostia and Potomac River confluence https://tidesandcurrents.noaa.gov/datums.html?id=859490]

   - Low river flow conditions for northwest branch tributary flows [https://waterdata.usgs.gov/md/nwis/uv?site_no=01649500] and northeast branch tributary flows [https://waterdata.usgs.gov/nwis/uv?site_no=01650500] measured during 2016 to 2018.

3. Calculate the maximum distance that contaminated silt and clay sediment particles would be carried upstream by the tide using the minimum river flow conditions and highest tidal stage described in the preceding paragraph.

# 2 Model Description and Input Parameters

## 2.1 Model Description

HEC-RAS version 4.1 is a computer model that models the hydraulics of flow through natural rivers and other channels. The program was developed in FORTRAN code by the United States Army Corps of Engineers (USACE) in order to manage the rivers, harbors, and other public works under its jurisdiction; it has found wide acceptance by many others since its public release in 1995. This model was selected by AECOM given the model's specific applicability to complex river systems such as the Anacostia River. The Hydrologic Engineering Center (HEC) in Davis, California, developed the River Analysis System (RAS) to aid in channel flow analysis and floodplain determination. It includes numerous data entry capabilities, hydraulic analysis components, data storage and management capabilities, and graphing and reporting capabilities.

The basic computational procedure of HEC-RAS for steady flow is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction and contraction / expansion. For unsteady flow, HEC-RAS solves the full, dynamic, 1-D Saint Venant Equation using an implicit, finite difference method. The unsteady flow equation solver was adapted from Dr. Robert L. Barkau's UNET package. HEC-RAS is equipped to model a network of channels, a dendritic system or a single river reach. Certain simplifications must be made in order to model some complex flow situations using the HEC-RAS one-dimensional approach. It is capable of modeling subcritical, supercritical, and mixed flow regime flow along with the effects of bridges, culverts, weirs, and structures. Additional information on the model can be found in *USACE. Hydrologic Engineering Center. HEC-RAS. River Analysis System. Hydraulic Reference Manual. Version 4.1*.

## 2.2 Model Input parameters

- Tidal Stage: Highest tidal stage of 11.05 ft above the mean low-low water (MLLW) as provided in the current 19-year tidal datum analysis by NOAA (see **Table 1**). This water level was recorded on 10/17/1942 (see **Table 1**). It is the highest water level recorded in the past 77 years and thus represents an extreme high tide condition.

- River Flow: Superimposed 31-day period [two spring and two neap tidal cycles]. (**Figure 2** and **Table 1**). The down-river flow was calculated as the sum of the flows recorded at the U.S. Geological Survey gauging stations on the Northeast and Northwest Branches for a minimum flow period during 2016-2018. The combined down-river flow for a 31-day period (two spring and two neap cycles) exhibiting minimum flow is shown in Figure 2. This 31-day period was selected based on a review of the three years of data and shows the least variability. The model was run dynamically over the 31 -day period using the flow data presented in the chart below.
    - First the model was run over the entire 31-day period which results in an average flow of approximately 90 cfs, which included two storm peaks after Day 15.
    - As the storm peaks have the effect of increasing the down-river flows, an additional analysis was completed to exclude the storm peaks after Day 15, so conditions only represent the minimum base flows. This additional run was over the 15-day period (one spring and one neap cycle) before the storm peaks and included an average flow of 42 cfs.

  For comparison, the combined average and peak flows in the NE and NW branches are approximately 6,346 cfs and over 12,000 cfs, respectively. Based on 81 years of flow records the lowest flow recorded was 25.9 cfs. It is not possible to run this lowest flow condition due to model limitations. The two flow conditions described above are close to the minimum flow condition and as discussed in Section 2.3 and did not result in significantly different results.

- Cross Sections and bridges used in the HEC RAS Model are shown in **Figure 3**.

**Table 1. NOAA Tidal Datum Analysis (01/01/1983 - 12/31/2001)**

| Datum | Value | Description |
|---|---|---|
| MHHW | 1.62 | Mean Higher-High Water |
| MHW | 1.39 | Mean High Water |
| MTL | 0.00 | Mean Tide Level |
| MSL | 0.00 | Mean Sea Level |
| DTL | 0.04 | Mean Diurnal Tide Level |
| MLW | -1.40 | Mean Low Water |
| MLLW | -1.55 | Mean Lower-Low Water |
| NAVD88 | -0.15 | North American Vertical Datum of 1988 |
| STND | -6.10 | Station Datum |
| GT | 3.17 | Great Diurnal Range |
| MN | 2.79 | Mean Range of Tide |
| DHQ | 0.23 | Mean Diurnal High Water Inequality |

| Datum | Value | Description |
|---|---|---|
| DLQ | 0.15 | Mean Diurnal Low Water Inequality |
| HWI | 0.48 | Greenwich High Water Interval (in hours) |
| LWI | 7.61 | Greenwich Low Water Interval (in hours) |
| Max Tide | 9.50 | Highest Observed Tide |
| Max Tide Date & Time | 10/17/1942 06:30 | Highest Observed Tide Date & Time |
| Min Tide | -6.60 | Lowest Observed Tide |
| Min Tide Date & Time | 02/26/1967 04:24 | Lowest Observed Tide Date & Time |
| HAT | 2.26 | Highest Astronomical Tide |
| HAT Date & Time | 05/05/1985 12:54 | HAT Date and Time |
| LAT | -2.16 | Lowest Astronomical Tide |
| LAT Date & Time | 01/22/1996 09:00 | LAT Date and Time |

Source: https://tidesandcurrents.noaa.gov/datums.html?id=8594900

**NOTICE**: All data values are relative to the MSL.
**Elevations on Mean Sea Level**
**Station**: 8594900, Washington D.C., DC
**Status**: Accepted (April 17, 2003)
**Units**: Feet
**Control Station**:
**T.M.:** 75
**Epoch**: 1983-2001
**Datum**: MSL

### 2.3 Calculation of distance of up-river sediment transport from Pepco WIA

Flood and Ebb Tidal Currents calculated using HEC-RAS model for four cross-section in the area from 922 ft south of north end of the River Cove to SEDBACK 20, the nearest up-river location included in the site-specific background data set, are presented in Figures 4 to 7. Additional analysis was conducted based on 15-day low flow period and the results are presented in **Figures 8** to **11** and **Table 2**. The cross sections are:

- Cross section 29 -922 ft South of North end of Pepco Cove.
- Cross section 30 -1278 ft north from north end of Pepco Cove.
- Cross section 31 -1850 ft south of SEDBACK 20.
- Cross section 32 - near SEDBACK 20).

The flood current (negative values on the bottom half of the time-series and box and whisker plot) that represents the median of the bottom half or 1st quartile was used in the calculation of the travel distance over flood current duration of 6-hours. The median flood current velocities used in the calculation for cross sections 29 to 32 are presented in **Table 2**.

**Table 2. HEC-RAS calculated f**lood tide up-river velocity (ft/s)

| HEC-RAS Cross Section # | Location (ft) | Flood tide up-river flow velocity (ft/s) – 31 day | Flood tide up-river flow velocity (ft/s) – 15 day |
|---|---|---|---|
| 29 | 922 ft South of North end of Pepco Cove | -0.12 | -0.12 |
| 30 | 1278 ft north from north end of Pepco Cove | -0.08 | -0.09 |
| 31 | 1850 ft south of SEDBACK 20 | -0.13 | -0.16 |
| 32 | Near SEDBACK 20 | -0.07 | -0.07 |
| | Average velocity (ft/s) | -0.10 | -0.11 |

**Travel Distance for 31-day Low Flow:**

**The distance travelled = (average median flood current velocity (ft/s) X 3600 s X 6 hours) = 0.1 ft/s X 3600 s X 6 = 2,115 ft.**

**Travel Distance for 15-day Low flow:**

**The distance travelled = (average median flood current velocity (ft/s) X 3600 s X 6 hours) = 0.11 ft/s X 3600 s X 6 = 2,376 ft**

**Distance from north end of the Cove to SEDBACK 20 is approximately 4,716 ft.**

# 3 Conclusions

The analysis presented shows that the background location SEDBACK 20 and background locations up-river of SEDBACK 20 will not be influenced by site-related contaminants as a result of tidal exchanges.

The upriver travel distance calculated under both the 31-day and 15-day low flow analysis is less than half the distance to SEDBACK 20 location, providing a factor of safety of over 2. This analysis also indicates that when the average flow in 31-day analysis was reduced to half the flow in the 15-day analysis, it increased the transport distance only slightly, by approximately 12%.

The analysis used low down-river flow conditions and the extreme tide stage. There is a very low likelihood of this extreme high tide condition and this low down-river flow condition to occur at the same time. This hypothetical condition therefore represents a reasonable worst-case condition for the calculation of the maximum up-river sediment transport distance. The upriver travel distance calculated using these conditions is less than half the distance to SEDBACK 20 location, providing an additional factor of safety of over 2. The high-degree of conservatism_resulting from worst-case input conditions and the additional factor of safety would more than compensate for any uncertainties. Therefore, this analysis provides confidence that the inclusion of SEDBACK 20 in the calculation of Background Threshold Value is appropriate.


**Figure 1. Study area (Anacostia River). Pepco Site area of interest is shown with a pink outline.**

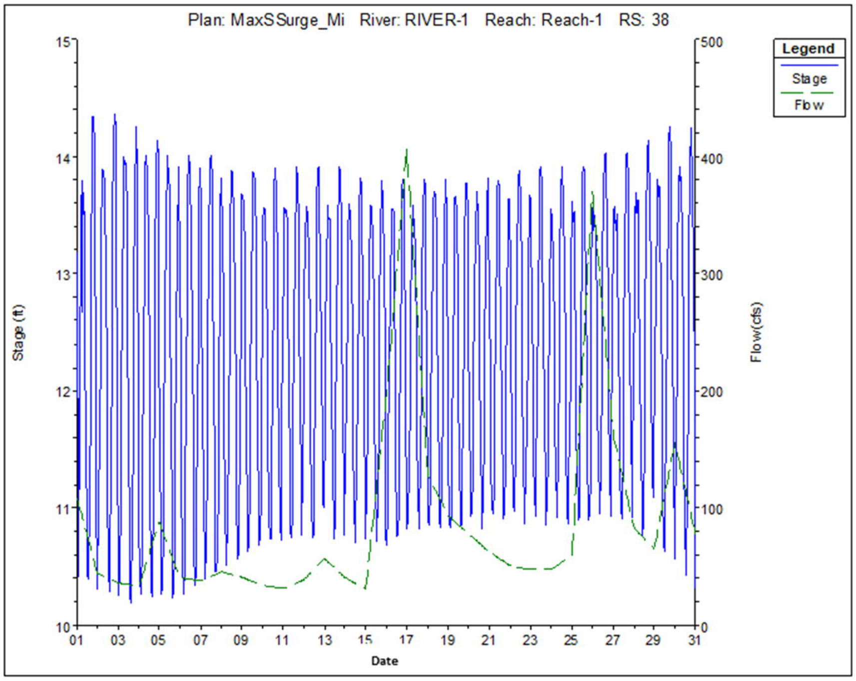



**Figure 2. Up-river low tributary flow and tidal boundary conditions at Anacostia Potomac river confluence.**

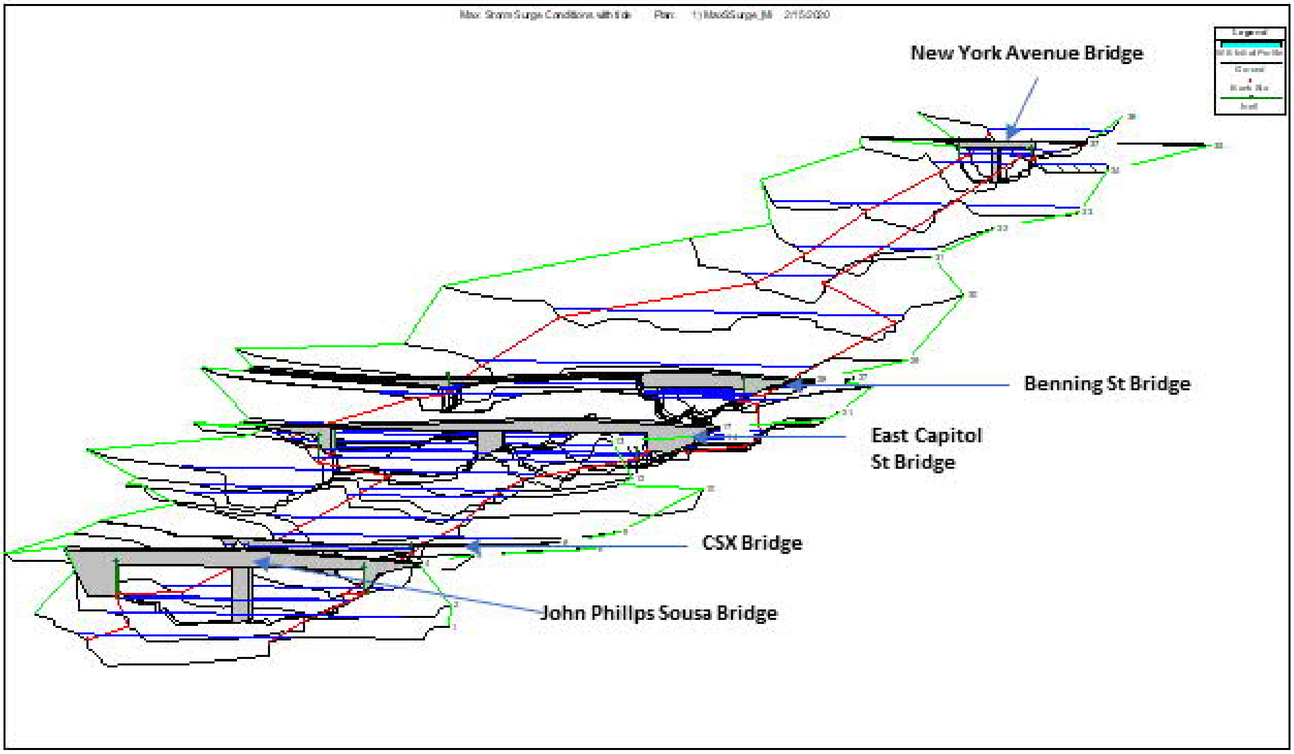
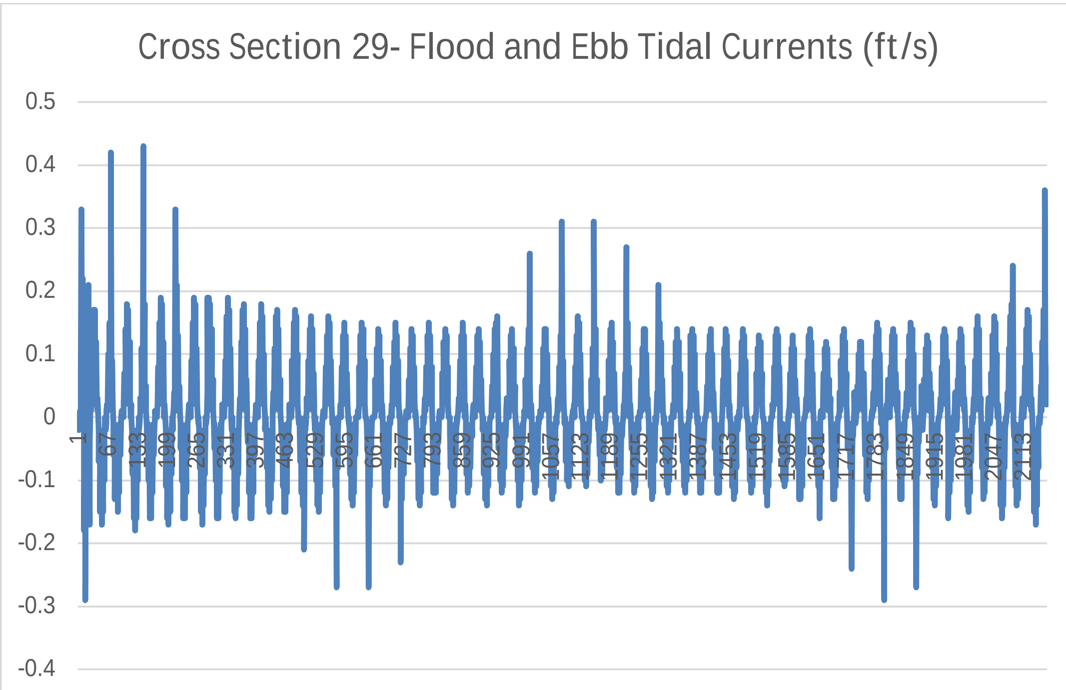



**Figure 3. Cross Sectional View of the HEC Ras Model input.**



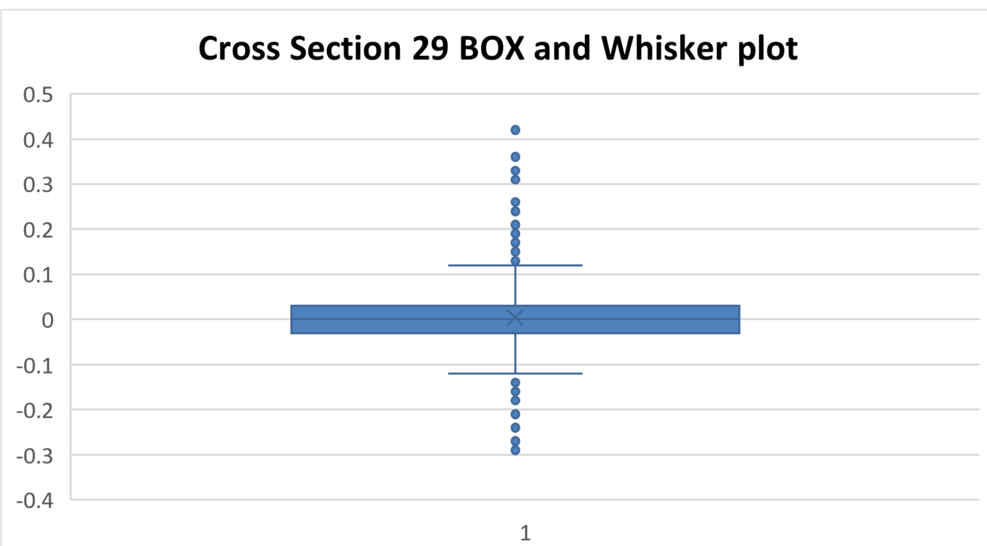
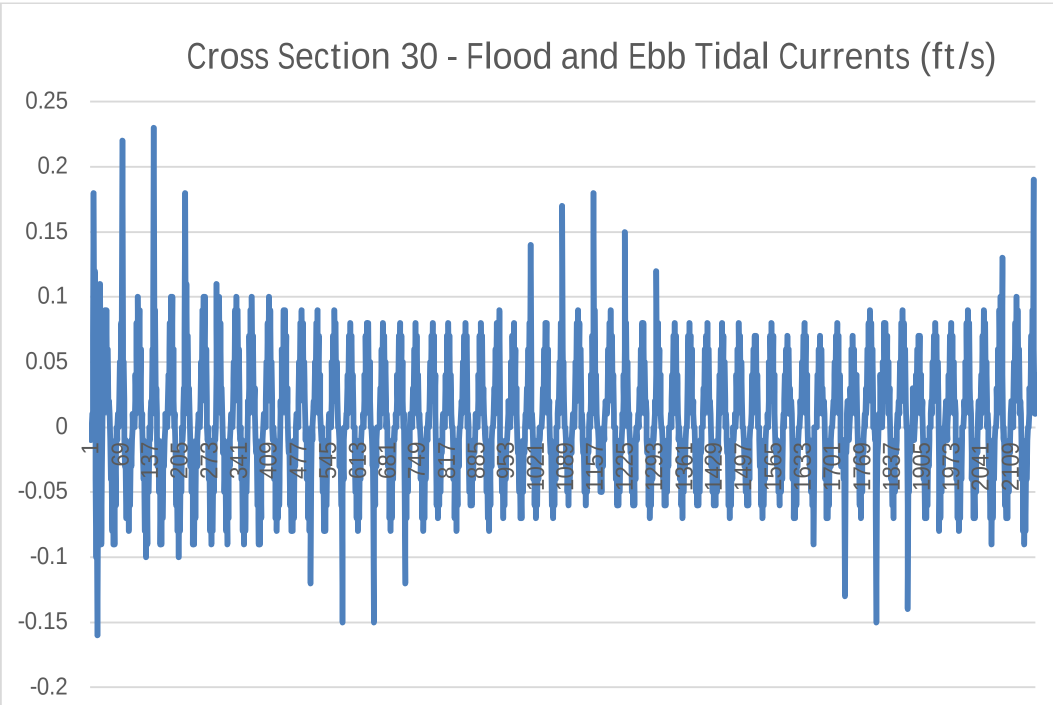




**Figure 4. Cross section 29 Flood and Ebb Tidal Currents (922 ft South of North end of Pepco Cove).**



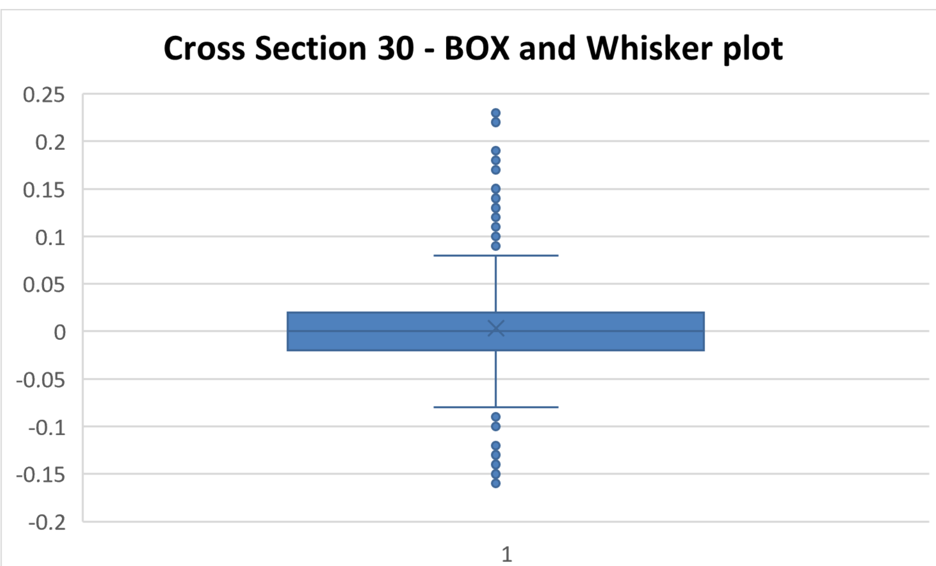




**Figure 5. Cross section 30 Flood and Ebb Tidal Currents (1278 ft north from north end of Pepco Cove).**

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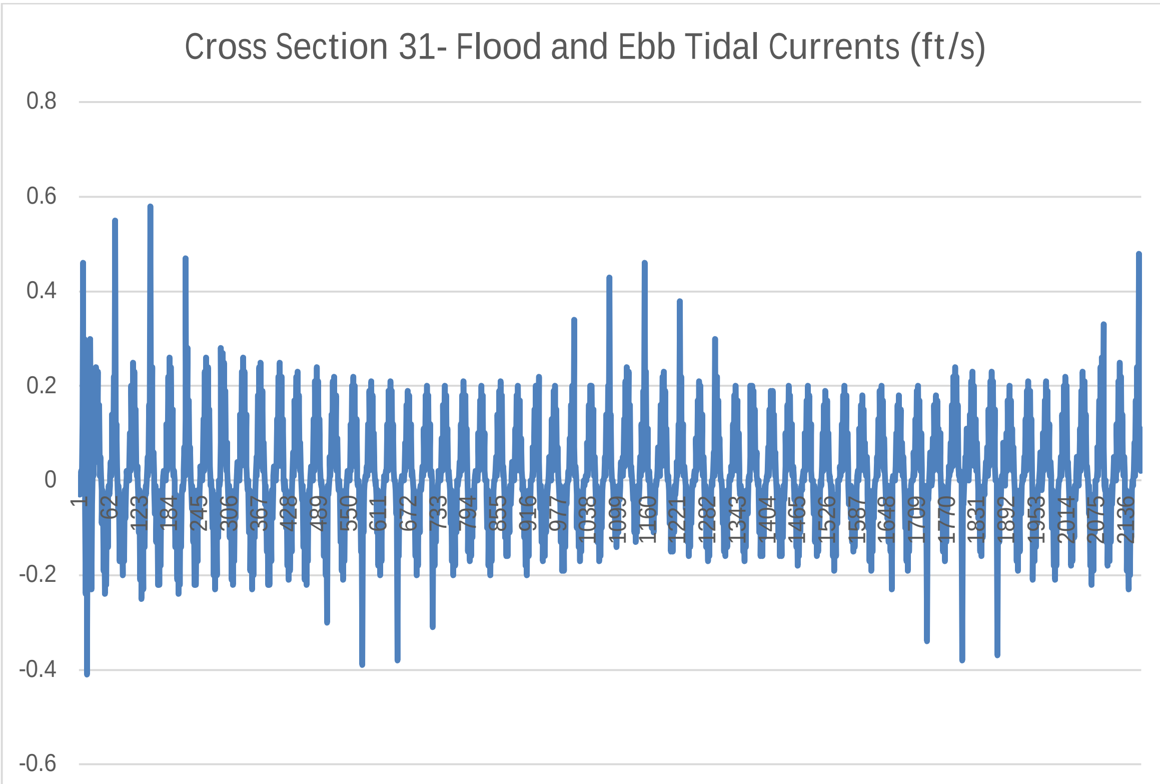


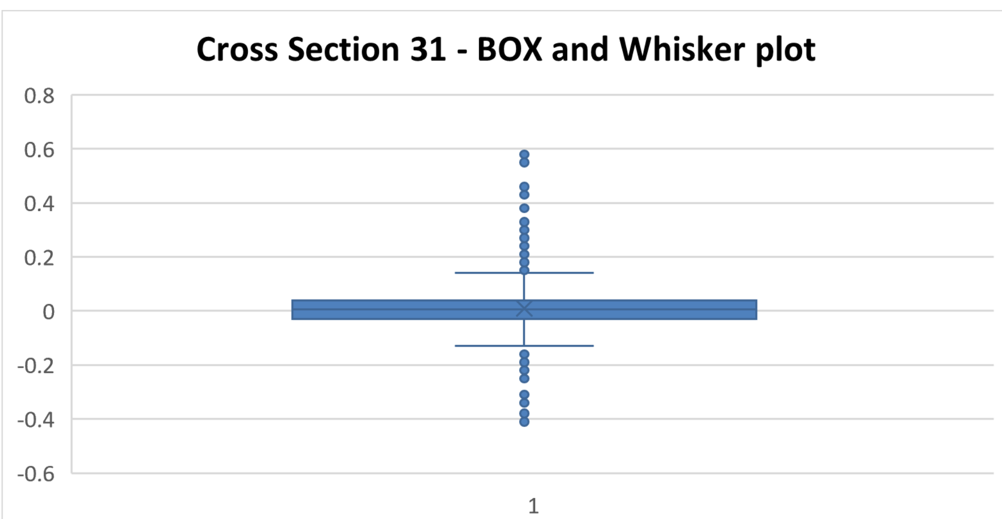




**Figure 6. Cross section 31 Flood and Ebb Tidal Currents (1850 ft south of SEDBACK 20).**

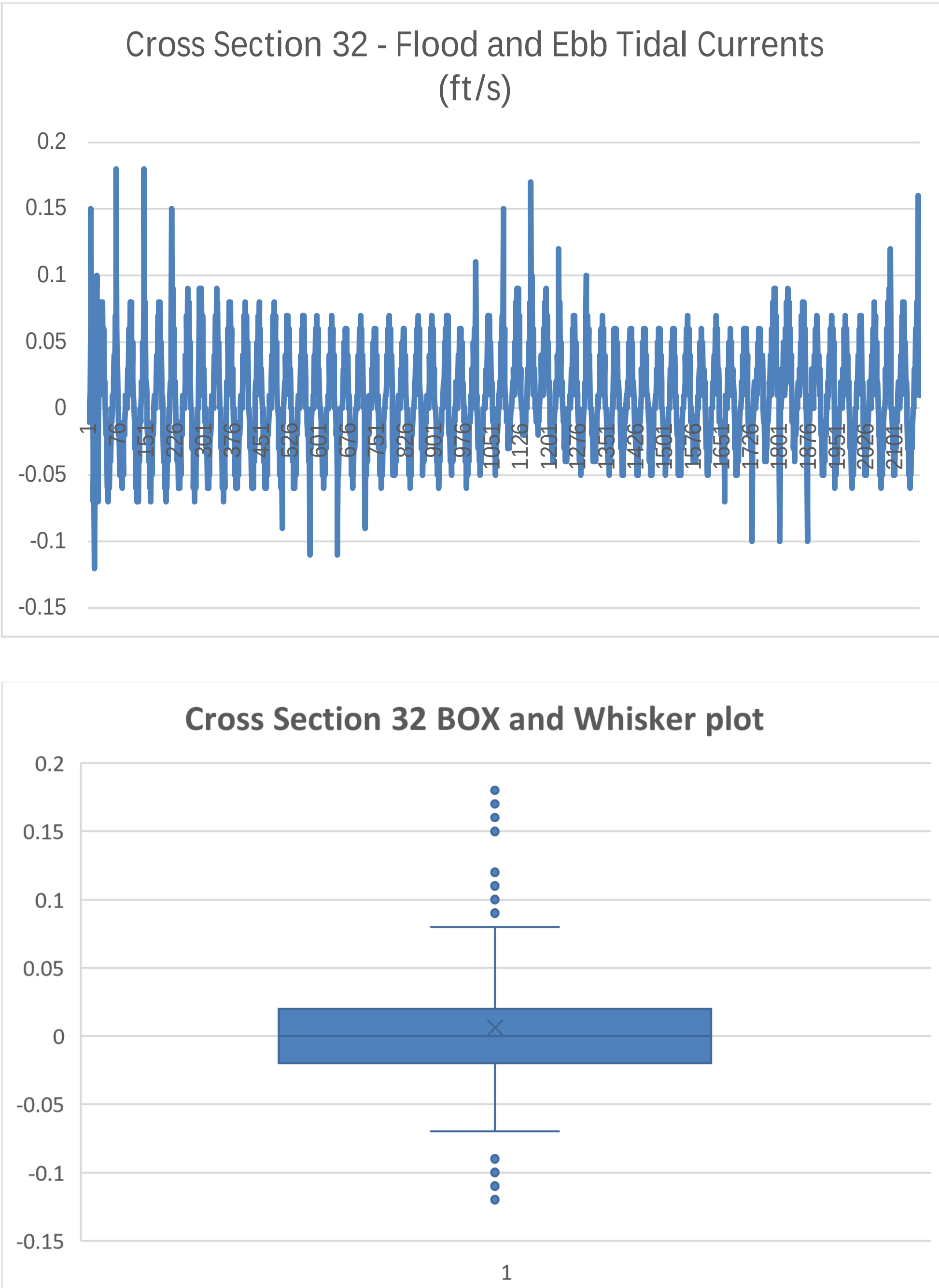
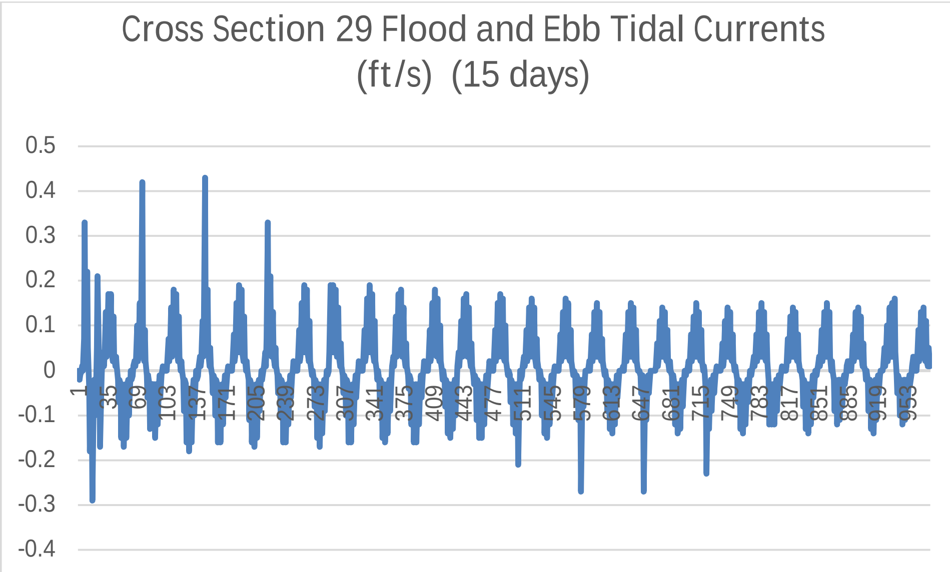



**Figure 7. Cross section 32 Flood and Ebb Tidal Currents (near SEDBACK 20).**



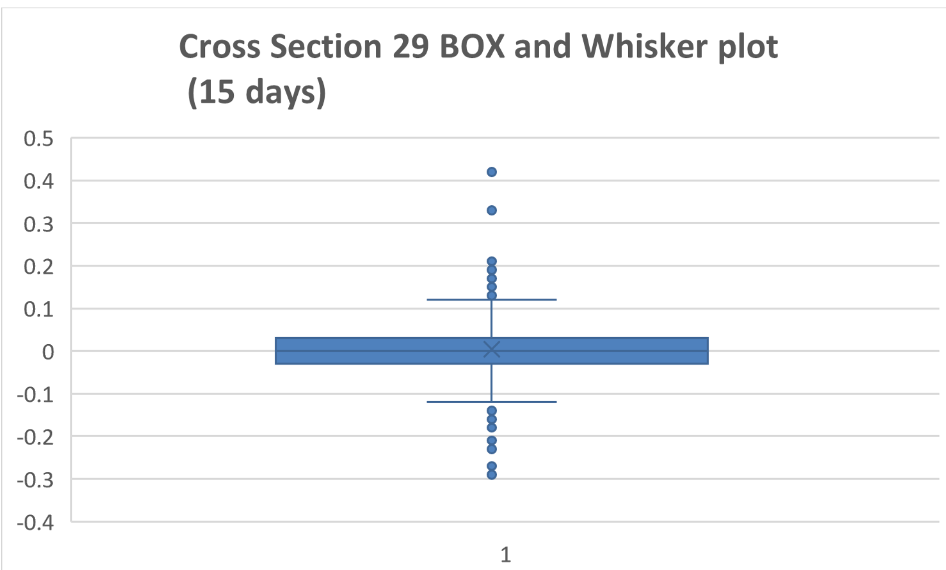
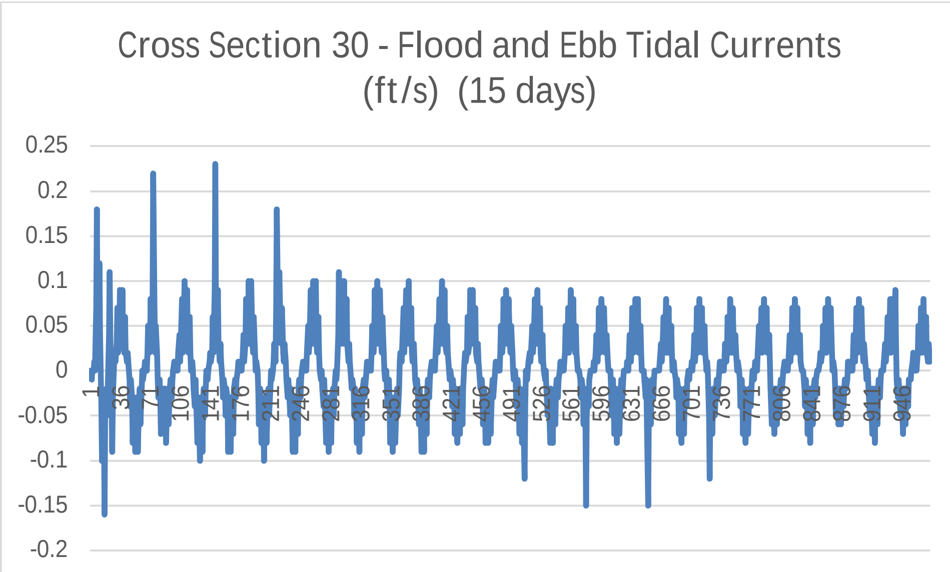




**Figure 8. Cross section 29 Flood and Ebb Tidal Currents (922 ft South of North end of Pepco Cove) 15 days low flow.**



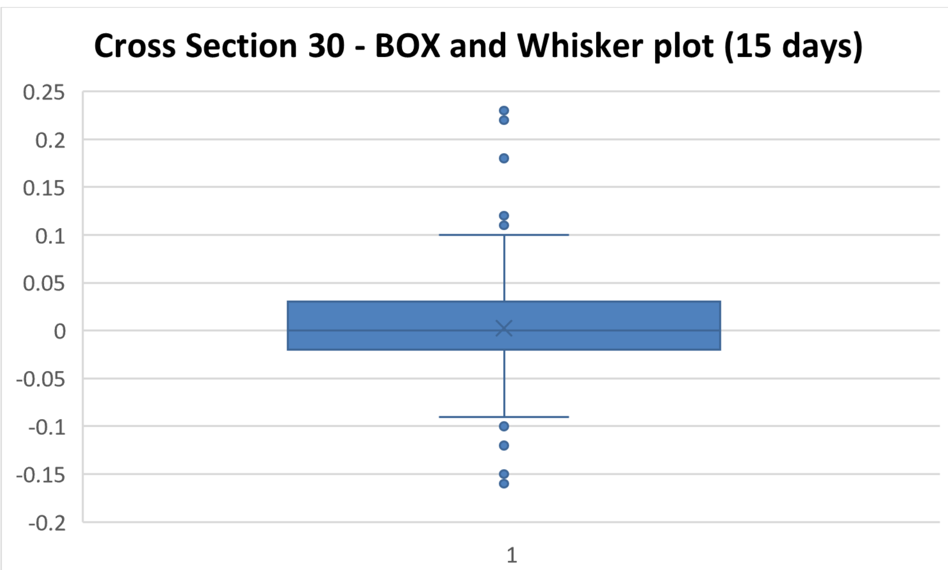
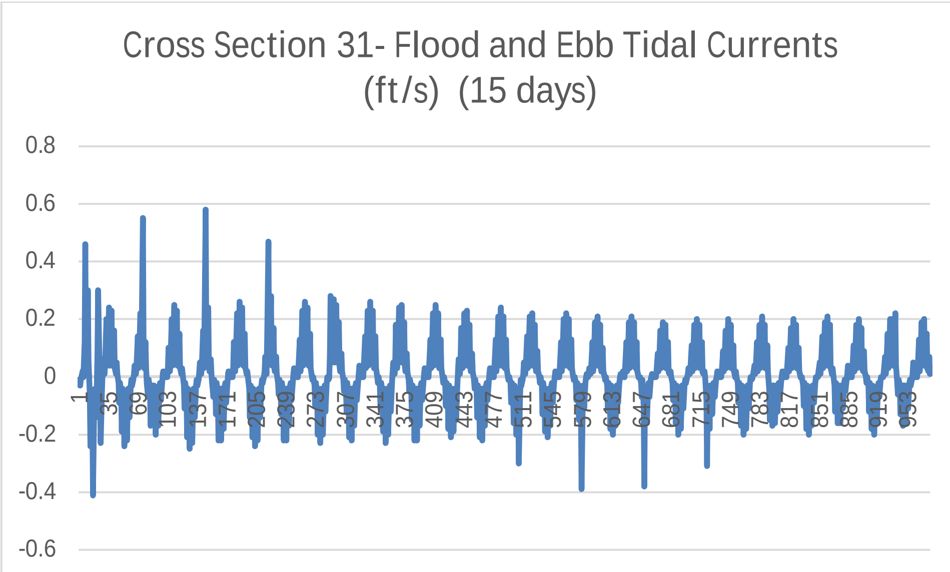




**Figure 9. Cross section 30 Flood and Ebb Tidal Currents (1278 ft north from north end of Pepco Cove) 15 days low flow.**



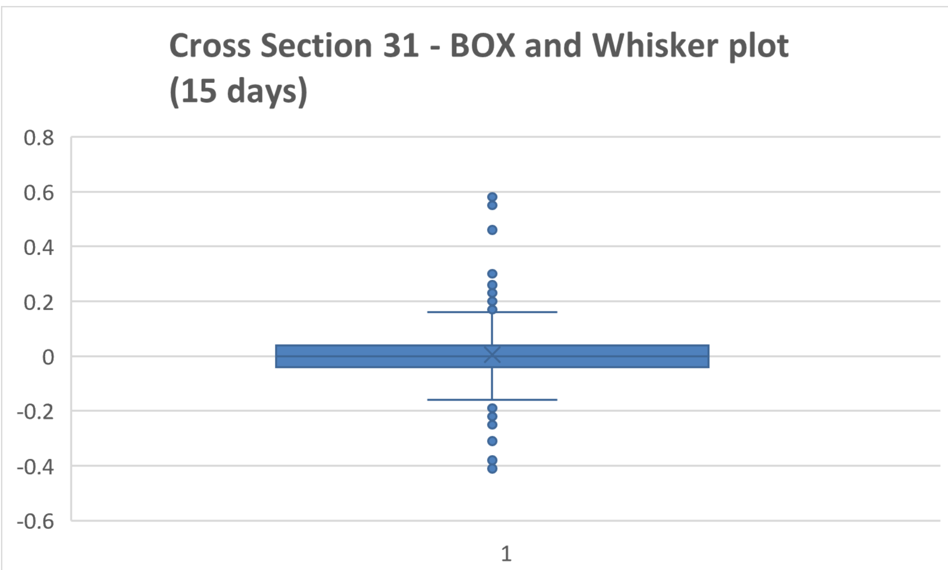
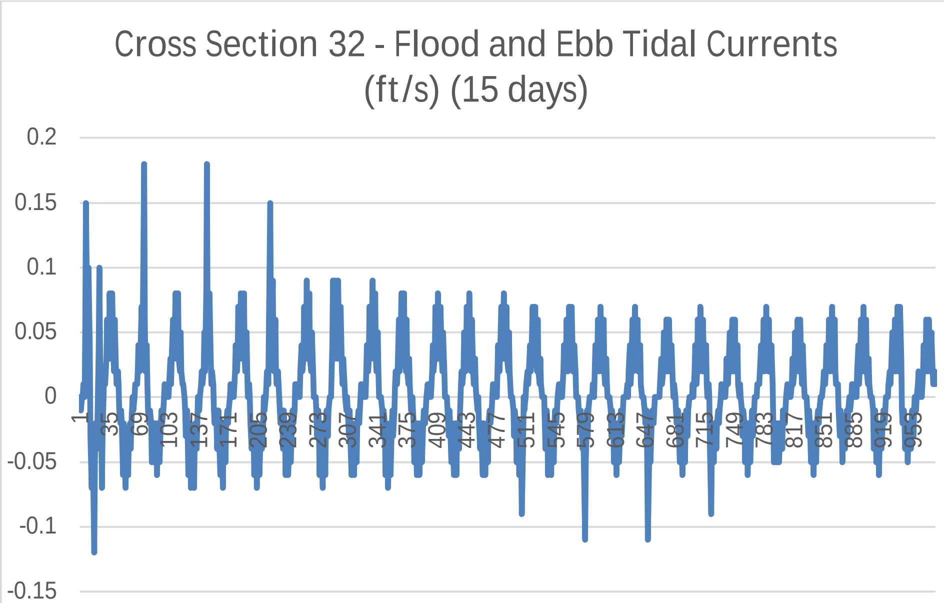




**Figure 10. Cross section 31 Flood and Ebb Tidal Currents (1850 ft south of SEDBACK 20) 15 days low flow.**



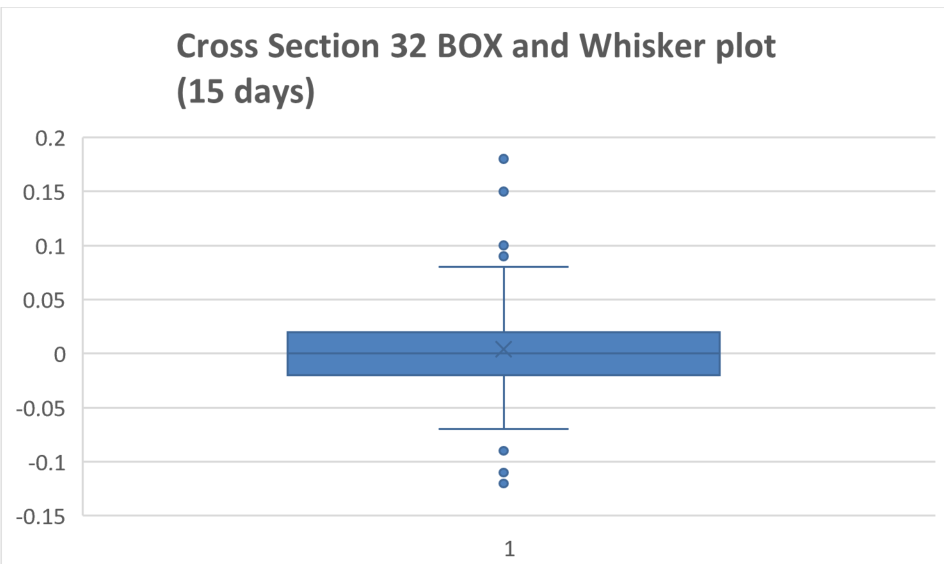




**Figure 11. Cross section 32 Flood and Ebb Tidal Currents (near SEDBACK 20) 15 days low flow..**