



MEMORANDUM

TO: Richard Conforti (MDEQ) REF. NO.: 012636

FROM: Mike Tomka/Wesley Dyck/Daniela Araujo/kf/84 DATE: January 18, 2013

CC: Jack Schinderle/John McCabe/Joe Rogers/
William Yocum (MDEQ)/
Grant Trigger/Dave Favero (RACER)/
Anthony Finch/John O'Neill (OBG)

RE: **Calculated Site-Specific Background Values for Inorganics in Groundwater - Revised
RACER Trust Coldwater Road Industrial Land (former Peregrine Plant)
Genesee Township, Michigan**

1.0 INTRODUCTION

On behalf of the Revitalizing Auto Communities Environmental Response (RACER) Trust, Conestoga-Rovers & Associates (CRA) has calculated Site-specific Background Values (BVs), also referred to as Background Threshold Values, for inorganics in groundwater for the Coldwater Road Industrial Land (Former Peregrine Plant) in Genesee Township, Michigan.

The evaluation was undertaken to develop BVs for inorganics in groundwater for use at the Coldwater Road Industrial Land (13270). Appropriate background groundwater data from the Coldwater Road Industrial Land and Coldwater Road Landfill Site were utilized to calculate the BVs. The remainder of this memorandum presents the details on the calculation of the BVs for inorganics in groundwater.

The calculation of BVs is discussed in the Michigan Department of Environmental Quality (MDEQ) document *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria* (Michigan, 2002, referred to as the "S³TM"). However, in an email dated December 13, 2012 (see Attachment A), the MDEQ requested that the BVs be developed using an upper tolerance limit (UTL) with 95% confidence and 95% coverage. Site-specific BVs have been developed consistent with the MDEQ request including utilizing the ProUCL Technical Guide (USEPA, 2010), and using the current version (4.1.01) of the ProUCL software package.

2.0 SCOPE OF BACKGROUND DATA

Samples suitable for generating Site-specific BVs for inorganics in groundwater were collected from five shallow wells and three drift (deep) aquifer wells (Figure 1).

A total of nine background samples were collected from the shallow wells between May 2011 and March 2012.

A total of ten background samples were collected from the deep wells between May 2011 and March 2012.

Both total and dissolved concentrations of inorganics (metals) were reported and Site-specific BVs were calculated separately for each. For six dissolved metals (chromium, copper, iron, manganese, nickel and zinc), additional samples were available for calculating background values. The additional samples were collected between 1995 and 2012, resulting in a sample populations ranging from 59 to 124 samples.

The background data collected by CRA and O'Brien & Gere (OBG) which was utilized for the generation of Site-specific BVs are provided in Tables 1 and 2, respectively. The S³TM recommends a minimum of nine background samples for establishing Site-specific BVs ("Statistical Guidesheet 10" in Michigan, 2002). The number of background samples collected therefore meets or exceeds the requirements of the guidance.

3.0 STATISTICAL METHODS

Guidance for collecting and analyzing groundwater background samples in order to calculate Facility-Specific Background Concentrations (Site-specific BVs) for assessing compliance with Part 201 requirements is detailed in Chapter 4 of "Statistical Methods" (Tab 7, Section 4.3) of the S³TM. This guidance is also referred to in "Statistical Guidesheets 10, 1, 2 and 6" of the S³TM. Site-specific BVs are suitable for background comparisons performed on a point-by-point basis. However, as noted above in the introduction, more current statistical methods are recommended and implemented in USEPA's ProUCL software. Nonetheless, the requirements of the Michigan Part 201 guidance need to be considered in the Site-specific background calculations.

The general approach of USEPA (2010) in determining Site-specific BVs is to estimate an upper bound on the background population using a method appropriate for the observed data distribution (i.e., normal, gamma-distributed, lognormal or none of these). Statistical limits such as upper tolerance limits (UTLs) or upper prediction limit (UPLs) may be used. Such values take into consideration sampling variability (both in background sampling and in on-site sampling), and provide Site-specific BVs which are expected to rarely be exceeded in samples collected from groundwater consistent with background conditions (e.g., no more frequently than 1 in 20 samples, if a 95 percent value is selected).

As directed in the December 13, 2012 email, an upper tolerance limit with a 95 percent confidence and 95 percent coverage has been used in the Site-specific background calculations.

Statistical calculations were computed using USEPA's statistical software ProUCL (version 4.1.01). Chapter 3 of USEPA (2010) describes statistical methodologies for calculating Site-specific BVs. The selection of an appropriate method varies by characteristics of individual data, in particular (i) the observed data distribution, (ii) the percentage of non-detect values present, and (iii) the presence of statistical outliers.

ProUCL tests data distributions and the presence of non-detects in calculating Site-specific BVs. Based on the characteristics of each individual data set, a specific Site-specific background statistical method must be selected. For the background data sets considered in the evaluation, the following methods for calculating Site-specific BVs were identified by ProUCL (as indicated in the tabulated results):

- 95 percent UTL with 95 percent Coverage: a 95 percent Student's-t upper tolerance limit, used when a normal data distribution is present with few or no non-detects (see Section 3.4.1 of USEPA, 2010).

- 95 percent Wilson Hilferty (WH) Approximate Gamma UTL with 95% Coverage: a 95 percent approximate gamma upper tolerance limit, used when a gamma distribution (somewhat skewed, compared to a normal distribution) is encountered (see Section 3.4.5.3 of USEPA, 2010).
- 95 percent KM UTL with 95 percent Coverage: a 95 percent Student's-t upper tolerance limit using the Kaplan-Meier (KM) method to accommodate non-detect results, used when non-detects are present and/or non-normal data distributions are present (see Section 5.4.2.1 of USEPA, 2010).

For further discussion of specific BV calculation methodologies, please refer to Chapter 3 of the USEPA (2010).

A number of assumptions for background data set must be statistically assessed before the comparisons are performed. The following memorandum sections provide the required details for the statistical calculations.

3.1 NON-DETECTS IN THE BACKGROUND DATA SET

The calculation of BVs when non-detect data are present is considered in Chapter 5 of USEPA (2010). In particular, the Kaplan-Meier (KM) method for estimation of sample means and standard deviations when single or multiple detection limits are present is recommended (USEPA, 2010; Helsel, 2005). The KM method is described in Section 4.6 of USEPA (2010).

3.2 ASSESSMENT OF DATA CHARACTERISTICS AND ASSUMPTIONS

The selection of appropriate background value calculation methods varies with the characteristics of each data set (Michigan, 2002; USEPA, 2010). In selecting a BTV method, one must assess: (i) the observed data distribution, (ii) the percentage of non-detect values present, and (iii) the presence of statistical outliers. Methods for assessing these characteristics are provided in ProUCL.

ProUCL assesses each data set for the following distribution patterns (in priority order): normal, gamma-distributed, then lognormal. If a data set is found to be described by one of these distributions, then a BV calculation method for the observed data distribution is used. If, however, a particular data set does not follow one of these distributions, it is identified as not having an identifiable distribution and non-parametric (rank-based) statistical methods are used for subsequent calculations.

Once a data distribution has been established for a data set, an assessment of statistical outliers (extreme low or high values appearing atypical of the remaining data) is carried out considering the observed data distribution. In the current evaluation, any suspected statistical outliers were tested using Dixon's test (for up to 25 data points) or Rosner's test (for greater than 25 observations), both methods being included in ProUCL. Details of these methods are found in Section 4.4 of USEPA (2006). The appropriate treatment of outliers in background data sets is discussed in Section 2.2 of Tab 7 in the S³TM (Michigan, 2002). In the current assessment, the few outliers identified in the background data sets are considered to be "Facility-Specific Background samples collected off of the property of interest", and since no additional evidence was available to indicate that these observations were not representative of background conditions (e.g., demonstrable sample contamination or laboratory errors), they were retained in the development of BVs.

In the case that ProUCL and Dixon's test detect a possible presence of outliers, no data will be eliminated from the BV calculations, since the samples were collected from background areas and the data therefore believed to be associated with "local" conditions.

3.3 CALCULATION OF SITE-SPECIFIC BACKGROUND CONCENTRATIONS

As noted previously, BVs were calculated using the methods available in ProUCL. Specifically, 95% UTLs were utilized as the BVs, considering the observed data distributions and percentage of non-detect data present.

4.0 RESULTS AND CONCLUSIONS

Background threshold values (BVs) used as screening criteria for the Sites have been established for 19 metals (for both total and dissolved), as presented on Table 3. The calculated Site-specific BVs are representative of background conditions at the Coldwater Road Site. The BVs consist of the following:

- Shallow Water-Bearing Unit:
 - BVs were calculated in ProUCL for 11 total metal analytes and 11 dissolved metals using distribution-specific or non-parametric methods.
 - However, eight total metal analytes and eight dissolved metals were infrequently detected (i.e., in fewer than 20 percent of the samples obtained), and could not be subjected to statistical analysis using ProUCL. In these cases, BVs were established based on the maximum detected value or target detection limit (for data sets containing no detected values), which is considered a non-parametric statistical tolerance limit with less than 95 percent confidence (due to the number of background samples available).
- Deep Aquifer:
 - BVs were calculated using ProUCL for 12 total metal analytes and 10 dissolved metals.
 - Non-parametric UTLs were used as BVs for Seven total metal analytes and nine dissolved metals due to high percentages of non-detect results.

The calculated BVs are appropriate for point-by-point comparisons of on-Site data. Where on-Site concentrations of metals are above both the BV and the applicable generic industrial criterion, follow-up assessment may be necessary. In such cases, professional judgment is to be used to determine whether or not this is a *marginal* exceedance of the BV (per the footnote on page 7.85 of the S³TM).

The MDEQ email dated December 13, 2012 stated that for this Site, dissolved inorganics are most appropriate. Future sample collection at the Site for inorganic analysis will be for the dissolved fraction only. However, sample results to date include both total and dissolved, therefore, the BVs developed, both for total and dissolved inorganics will be used to evaluate existing data.

It is noted that the non-parametric tolerance limits (used when the background data set contained few or no detected values) do not achieve full 95th percentile coverage (due to the number of samples available) and therefore Site data at or slightly above such values may still be consistent with background conditions.

5.0 REFERENCES

- Helsel, D. R. 2005. Nondetects and Data Analysis. Statistics for Censored Environmental Data. John Wiley and Sons, N.Y.
- Michigan, 2002. Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria. Michigan Department of Environmental Quality, Environmental Response Division
- USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency Washington DC. EPA 530-R-09-007.
- USEPA, May 2010. ProUCL Version 4.1.00 Technical Guide (Draft). United States Environmental Protection Agency, Office of Research and Development, Washington DC. EPA/600/R-07/041.

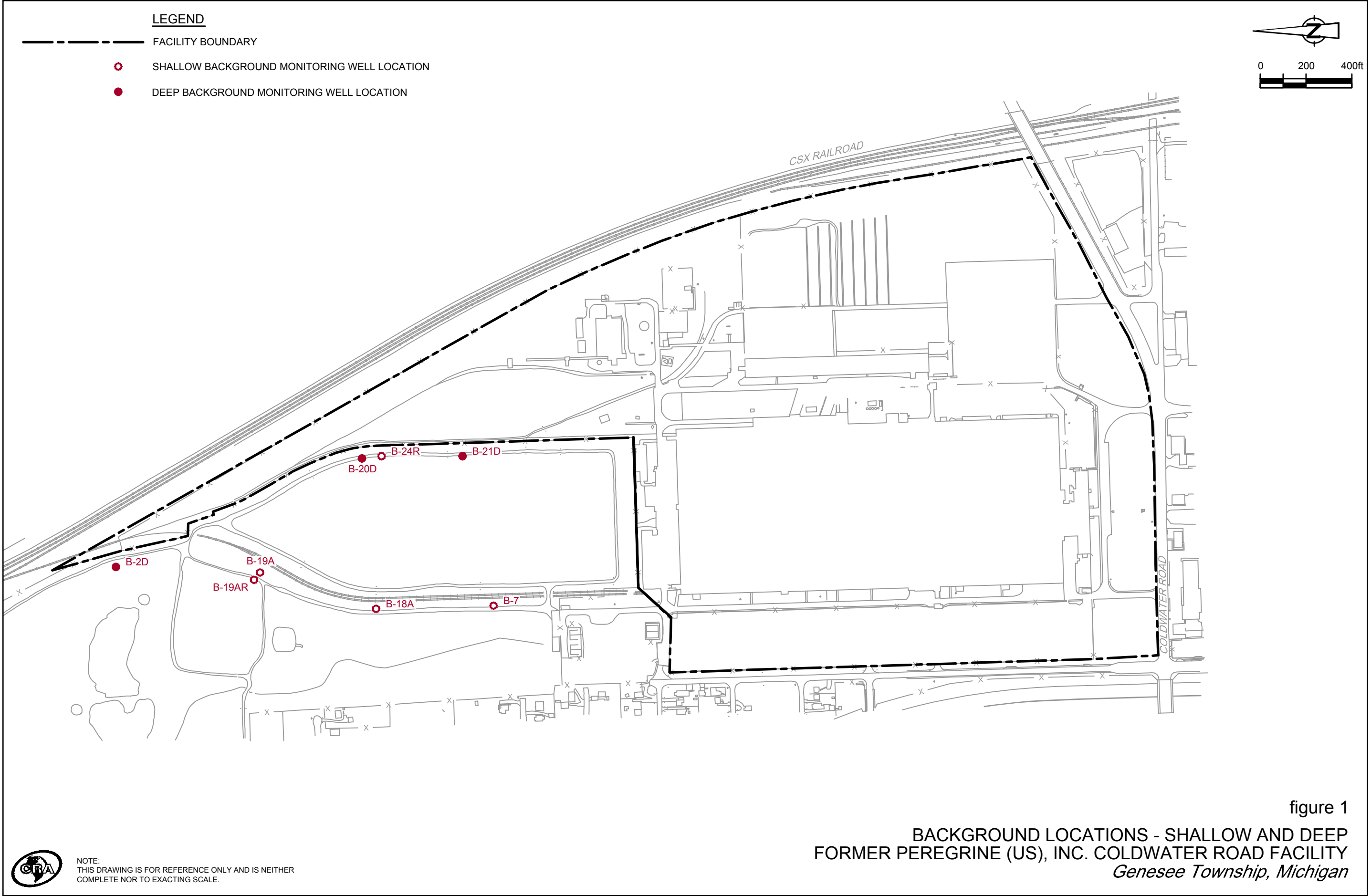


TABLE 1

**CONCENTRATIONS OF TOTAL INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

<i>Total Metals in Shallow Water Bearing Unit</i>										
<i>Sample Location:</i>	<i>B-7</i>	<i>B-7</i>	<i>B-18A</i>	<i>B-18A</i>	<i>B-19A</i>	<i>B-19A</i>	<i>B-19A</i>	<i>B-19A</i>	<i>B-19AR</i>	<i>B-19AR</i>
<i>Sample ID:</i>	<i>GW-12636-0915-SSH-022</i>	<i>GW-12636-120511-JY-405</i>	<i>GW-12636-091411-JY-020</i>	<i>GW-12636-120511-JY-406</i>	<i>GW-12636-051211-SSH-106</i>	<i>GW-12636-091411-JY-016/017</i>	<i>GW-12636-120611-JY-412</i>	<i>GW-12636-0915-SSH-023</i>	<i>GW-12636-120811-JY-420</i>	
<i>Sample Date:</i>	<i>9/15/2011</i>	<i>12/5/2011</i>	<i>9/14/2011</i>	<i>12/5/2011</i>	<i>5/12/2011</i>	<i>9/14/2011</i>	<i>12/6/2011</i>	<i>9/15/2011</i>	<i>12/8/2011</i>	
<i>Analyte</i>	<i>Units</i>					<i>orig./dupl.</i>				
Aluminum	mg/L	0.26	0.71	0.05 U	0.05 U	0.2 U	0.05 U/0.05 U	0.05 U	4	9.2
Antimony	mg/L	0.002 U	0.0002 J	0.002 U	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.005 U	0.005 U	0.0038 J	0.0066	0.005 U	0.005 U/0.005 U	0.005 U	0.0035 J	0.0086
Barium	mg/L	0.054 J	0.057 J	0.033 J	0.034 J	0.0671 J	0.068 J/0.067 J	0.072 J	0.072 J	0.13
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.005 U	0.008	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.0078	0.03
Cobalt	mg/L	0.007 U	0.007 U	0.007 U	0.0034 J	0.007 U	0.007 U/0.007 U	0.007 U	0.0027 J	0.0056 J
Copper	mg/L	0.0025 U	0.0039	0.002 U	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.0045 U	0.0096
Iron	mg/L	0.3	0.84	0.1 U	0.65	0.0927 J	0.1 U/0.1 U	0.1 U	5.1	12
Lead	mg/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U/0.003 U	0.003 U	0.0029 J	0.0023 J
Manganese	mg/L	0.03	0.016	0.015	0.26	0.0065 J	0.0057 J/0.0032 J	0.015 U	0.12	0.26
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.0044 J	0.0043 J	0.02 U	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.01 J	0.023
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.005 U	0.005 U
Silver	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.00053	0.0002 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.00058 J	0.001 U	0.001 U
Vanadium	mg/L	0.004 U	0.0014 J	0.004 U	0.004 U	0.004 U	0.004 U/0.004 U	0.004 U	0.0096	0.023
Zinc	mg/L	0.02 U	0.01 J	0.02 U	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.035 U	0.039 U

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

0.05 U/0.05 U - field duplicate.

TABLE 1

**CONCENTRATIONS OF TOTAL INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

<i>Total Metals in Deep Aquifer</i>											
<i>Sample Location:</i>	<i>B-2D</i>	<i>B-2D</i>	<i>B-2D</i>	<i>B-2D</i>	<i>B-20D</i>	<i>B-20D</i>	<i>B-20D</i>	<i>B-21D</i>	<i>B-21D</i>	<i>B-21D</i>	
<i>Sample ID:</i>	GW-12636-051211-SSH-107	GW-12636-091411-JY-019	GW-12636-120711-JY-418/419	GW-12636-032812-JY-004	GW-12636-0915-SSH-025	GW-12636-120811-JY-421	GW-12636-032812-JY-005	GW-12636-0915-SSH-024	GW-12636-120811-JY-422	GW-12636-032812-JY-006/007	
<i>Sample Date:</i>	5/12/2011	9/14/2011	12/7/2011 orig/dupl.	3/28/2012	9/15/2011	12/8/2011	3/28/2012	9/15/2011	12/8/2011	3/28/2012 orig/dupl.	
<i>Analyte</i>	<i>Units</i>										
Aluminum	mg/L	0.498	0.26	1.6/1.7	0.67	1.1	0.52	0.53	0.17	3.7	0.79/0.87
Antimony	mg/L	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.002 U	0.002 U	0.00025 J	0.002 U	0.002 U	0.00013 J/0.00014 J
Arsenic	mg/L	0.004 J	0.013	0.0038 J/0.005 U	0.005 U	0.04	0.039	0.038	0.054	0.045	0.052/0.054
Barium	mg/L	0.0833 J	0.31	0.084 J/0.093 J	0.082 J	0.05 J	0.053 J	0.05 J	0.16	0.18	0.17/0.17
Beryllium	mg/L	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U
Chromium	mg/L	0.005 U	0.005 U	0.0031 J/0.003 J	0.005 U	0.005 U	0.005 U	0.005 U	0.0025 J	0.0067	0.005 U/0.0029 J
Cobalt	mg/L	0.007 U	0.007 U	0.007 U/0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.0018 J	0.003 J	0.007 U/0.007 U
Copper	mg/L	0.0091	0.0021 U	0.004/0.0043	0.0032	0.0037 U	0.0026 U	0.0025	0.002 U	0.0073	0.0024/0.0029
Iron	mg/L	3.23	2.2	1.9/2.2	0.99	3.4	2.5	2.7	4.4	7	2.1/2.1
Lead	mg/L	0.003 U	0.003 U	0.003 U/0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.0022 J	0.003 U	0.003 U/0.003 U
Manganese	mg/L	0.167	0.13	0.052/0.057	0.039	0.08	0.064	0.064	0.15	0.18	0.052/0.053
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U
Nickel	mg/L	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0055 J	0.0065 J	0.02 U/0.0035 J
Selenium	mg/L	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U
Silver	mg/L	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.000094 J
Thallium	mg/L	0.001 U	0.0021 U	0.001 U/0.001 U	0.00019 J	0.001 U	0.001 U	0.00028 J	0.001 U	0.001 U	0.00018 J/0.001 U
Vanadium	mg/L	0.004 U	0.004 U	0.0041/0.0032 J	0.0013 J	0.004 U	0.0025 J	0.0013 J	0.0047	0.01	0.0018 J/0.0025 J
Zinc	mg/L	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.039 U	0.039	0.02 U/0.02 U

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

1.6/1.7 - field duplicate.

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

Sample location:		B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	
Date:		6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996	5/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/16/2001	10/18/2001	5/16/2002	11/7/2002	6/4/2003	11/13/2003	6/30/2004	12/9/2004	6/8/2005
Dissolved metal																							
Aluminum	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Antimony	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arsenic	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Barium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Beryllium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cadmium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chromium	(mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Cobalt	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Copper	(mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	(mg/L)	-	-	-	-	-	-	-	-	0.01	-	0.26	-	0.05	-	0.33	-	0.25	-	0.19	-	0.18	0.17
Lead	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Manganese	(mg/L)	-	-	-	-	-	-	-	-	0.424	-	0.313	-	-	-	-	-	<0.005	-	<0.005	-	0.074	0.031
Mercury	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nickel	(mg/L)	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02	0.014	<0.005	0.008	0.01	0.008	<0.005/0.006	0.02	0.007	0.005	<0.005	0.005	<0.005	<0.005	0.009	0.007	0.009
Selenium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Silver	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thallium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vanadium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zinc	(mg/L)	<0.02	<0.02	0.022	0.02	0.06	0.05	0.01	0.02	0.03	<0.01	0.03	<0.01/0.01	0.01	<0.01	<0.01	0.01	0.005	<0.005	0.005	0.007	0.014	0.013

ii) Deep Aquifer

Sample location:		B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	
Date:		6/21/1995	8/31/1995	6/19/1996	8/21/1996	11/13/1996	5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	11/7/2002	6/3/2003	11/13/2003	6/30/2004	12/10/2004	6/8/2005
Dissolved metal																							
Aluminum	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Antimony	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Arsenic	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Barium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Beryllium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cadmium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chromium	(mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	
Cobalt	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Copper	(mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	
Iron	(mg/L)	-	-	-	-	-	-	0.28	-	<0.01	-	0.07	-	0.04	-	0.23/0.21	-	0.14/0.14	-	0.11	-	0.76	
Lead	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Manganese	(mg/L)	-	-	-	-	-	-	0.577	-	0.017	-	0.021	-	-	-	-	-	0.006/0.006	-	0.007	-	0.145	
Mercury	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nickel	(mg/L)	<0.03	<0.04	<0.02	<0.02	<0.02	0.028	0.039	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005/<0.005	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	
Selenium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Silver	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thallium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Vanadium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zinc	(mg/L)	<0.02	<0.02	<0.02	0.05	0.03	0.03	<0.01	<0.01	0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	0.007	0.01	

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

Sample location:		B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A
Date:		12/7/2005	6/29/2006	11/29/2006	6/7/2007	11/14/2007	6/25/2008	11/17/2008	6/24/2009	11/17/2009	6/17/2010	11/8/2010	6/22/2011	9/15/2011	11/16/2011	12/5/2011	6/27/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996
<u>Dissolved metal</u>																							
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.05 U	--	0.05 U	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	0.00014 J	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.051 J	--	0.053 J	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Chromium	(mg/L)	0.01	0.005	<0.005	0.011	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	0.017	0.01	0.005 U	<0.005	0.0035 J	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.007 U	--	0.007 U	--	--	--	--	--	--	--
Copper	(mg/L)	<0.004	<0.004	<0.004	0.027	0.006	0.003	0.003	0.003	<0.004	<0.004	<0.004	<0.004	0.0027 U	0.006	0.0031	<0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron	(mg/L)	0.15	0.19	--	0.13	--	0.35	--	0.067	--	<0.02	--	0.22	0.1 U	--	0.1 U	<0.02	--	--	--	--	--	--
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.003 U	--	0.003 U	--	--	--	--	--	--	--
Manganese	(mg/L)	0.05	0.15	--	0.042	--	0.01	--	0.036	--	0.047	--	0.006	0.0036 J	--	0.0085 J	0.058	--	--	--	--	--	--
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	--	--	--	--	--	--	--
Nickel	(mg/L)	0.006	0.009	0.009	0.005	0.016	0.006	0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.02 U	0.008	0.02 U	<0.005	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.004 U	--	0.004 U	--	--	--	--	--	--	--
Zinc	(mg/L)	0.02	0.018	0.011	0.014	0.02	<0.005	0.017	0.014	<0.005	<0.005	<0.005	0.006	0.02 U	0.011	0.02 U	<0.005	0.15	<0.02	<0.02	<0.02	0.06	0.07

ii) Deep Aquifer

Sample location:		B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D
Date:		12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/14/2007	6/25/2008	11/20/2008	6/25/2009	11/16/2009	6/16/2010	11/10/2010	6/21/2011	9/14/2011	11/15/2011	12/7/2011	3/28/2012	6/27/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996
<u>Dissolved metal</u>																							
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.05 U	--	0.044 J/0.055	0.05 U	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	0.002 U/0.002 U	0.002 U	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.014	--	0.005 U/0.005 U	0.005 U	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.33	--	0.075 J/0.079 J	0.08 J	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U/0.001 U	0.001 U	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U/0.001 U	0.001 U	--	--	--	--	--	--
Chromium	(mg/L)	0.009	<0.005/<0.005	<0.005	0.008	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.009	0.005 U	<0.005	0.005 U/0.0022 J	0.005 U	<0.005	<0.02	<0.02	0.032	<0.02	<0.02
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.007 U	--	0.007 U/0.007 U	0.007 U	--	--	--	--	--	--
Copper	(mg/L)	<0.004	<0.004/<0.004	<0.004	0.002	0.001	0.001	<0.001	0.203	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.002 U/0.002 U	0.002 U	<0.004	<0.02	0.02	0.028	<0.02	<0.02
Iron	(mg/L)	0.14	0.11/0.12	--	0.11	--	0.35	--	0.022	--	0.04	--	0.25	1.4	--	0.1 U/0.091 J	0.1 U	<0.02	--	--	--	--	--
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.003 U	--	0.003 U/0.003 U	0.003 U	--	--	--	--	--	--
Manganese	(mg/L)	0.12	0.07/0.07	--	0.104	--	0.032	--	0.077	--	0.083	--	0.055	0.08	--	0.0064 J/0.0074 J	0.0036 J	0.025	--	--	--	--	--
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U/0.0002 U	0.0002 U	--	--	--	--	--	--
Nickel	(mg/L)	<0.005	<0.005/<0.005	<0.005	0.001	0.004	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U/0.02 U	0.02 U	<0.005	<0.03	<0.04	0.054	<0.02	<0.02
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U/0.005 U	0.005 U	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U/0.0002 U	0.0002 U	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.00014 J/0.0004 J	0.00017 J	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	0.004 U	--	0.004 U/0.00087 J	0.004 U	--	--	--	--	--	--
Zinc	(mg/L)	<0.01	0.008/0.008	0.018	0.006	0.009	0.007	<0.005	0.113	0.006	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U/0.02 U	0.02 U	<0.005	<0.02	<0.02	0.12	<0.02	0.04

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

<i>Sample location:</i>		B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A
<i>Date:</i>		5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/16/2001	10/17/2001	5/16/2002	11/7/2002	6/4/2003	11/13/2003	6/29/2004	12/9/2004	6/8/2005	12/8/2005	6/27/2006	11/30/2006	6/4/2007	11/14/2007	6/25/2008
<i>Dissolved metal</i>																								
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	(mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.005	0.005	0.009	0.001	<0.005
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	(mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.004	<0.004	0.003	0.002	0.002
Iron	(mg/L)	--	0.38	--	0.24	--	0.18	--	<0.01/0.04	--	0.35	--	0.19	--	0.16	--	0.9	0.17	0.39	0.17	--	0.11	--	0.31
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	(mg/L)	--	0.062	--	0.128	--	0.155	--	--	--	--	--	0.026	--	<0.005	--	0.363	0.08	0.17	0.05	--	0.022	--	<0.005
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	(mg/L)	0.013	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	0.015/0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.009	0.006	<0.005	<0.005	<0.005	0.003	0.006	<0.005
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	(mg/L)	0.01	0.01	0.02	0.01	0.02	0.06	0.03	<0.01/<0.01	0.01	<0.01	0.01	<0.005	0.005	<0.005	0.01	0.012	0.016	0.01	0.046	0.009	0.014	0.011	0.011

ii) Deep Aquifer

<i>Sample location:</i>		B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D
<i>Date:</i>		11/13/1996	5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	11/7/2002	6/3/2003	11/13/2003	6/29/2004	12/10/2004	6/7/2005	12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/13/2007
<i>Dissolved metal</i>																								
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	(mg/L)	<0.02	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.011	0.007	0.006	0.01	0.003
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	(mg/L)	<0.02	<0.01	0.02	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	<0.004	<0.004	0.022	0.001
Iron	(mg/L)	--	--	0.26	--	<0.01/0.17	--	0.13	--	0.02	--	0.3	--	0.25	--	0.2	--	2.11	2.14	0.12	2.12	--	0.61	--
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	(mg/L)	--	--	0.035	--	0.018/0.008	--	0.06	--	--	--	--	--	0.074	--	0.015	--	0.092	0.066	0.12	0.06	--	0.16	--
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	(mg/L)	<0.02	0.015	0.041	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.011	0.011	0.005	0.026	<0.005	0.006	0.019	0.013
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	(mg/L)	0.04	0.01	<0.01	<0.01	0.01/0.01	0.01	0.06	<0.01	<0.01	<0.01	<0.01	0.01	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.01	0.005	<0.005	0.124	0.009

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

Sample location:		B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A
Date:		11/18/2008	6/24/2009	11/18/2009	6/17/2010	11/10/2010	6/21/2011	9/14/2011	11/15/2011	12/5/2011	3/28/2012	6/27/2012	5/4/1998	5/16/2001	5/16/2002	6/4/2003	11/13/2003	6/29/2004	12/9/2004	12/7/2011
Dissolved metal																				
Aluminum	(mg/L)	--	--	--	--	--	--	0.05 U	--	0.05 U	0.05 U	--	--	--	--	--	--	--	--	0.05 U
Antimony	(mg/L)	--	--	--	--	--	--	0.002 U	--	0.002 U	0.002 U	--	--	--	--	--	--	--	--	0.002 U
Arsenic	(mg/L)	--	--	--	--	--	--	0.005 U	--	0.0066	0.0072	--	--	--	--	--	--	--	--	0.005 U
Barium	(mg/L)	--	--	--	--	--	--	0.033 J	--	0.035 J	0.035 J	--	--	--	--	--	--	--	--	0.071 J
Beryllium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--	0.001 U
Cadmium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--	0.001 U
Chromium	(mg/L)	<0.005	<0.005	<0.005	<0.005	0.012	0.01	0.005 U	<0.005	0.005 U	0.005 U	<0.005/<0.005	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005/<0.005	--
Cobalt	(mg/L)	--	--	--	--	--	--	0.007 U	--	0.003 J	0.007 U	--	--	--	--	--	--	--	--	0.007 U
Copper	(mg/L)	<0.001	0.001	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.002 U	0.002 U	<0.004/<0.004	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005/<0.005	--
Iron	(mg/L)	--	<0.02	--	<0.02	--	0.24	0.1 U	--	0.61	0.4	0.03/0.04	--	--	--	--	0.02	--	0.24/0.17	--
Lead	(mg/L)	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U	--	--	--	--	--	--	--	--	0.003 U
Manganese	(mg/L)	--	<0.005	--	<0.005	--	<0.005	0.025	--	0.26	0.098	0.026/0.027	--	--	--	--	<0.005	--	0.011/<0.005	--
Mercury	(mg/L)	--	--	--	--	--	--	0.00019 J	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--	0.0002 U
Nickel	(mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.0042 J	<0.005	0.02 U	0.02 U	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005/<0.005	--
Selenium	(mg/L)	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U	--	--	--	--	--	--	--	--	0.005 U
Silver	(mg/L)	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--	0.0002 U
Thallium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.00021 J	--	--	--	--	--	--	--	--	0.00027 J
Vanadium	(mg/L)	--	--	--	--	--	--	0.004 U	--	0.004 U	0.004 U	--	--	--	--	--	--	--	--	0.004 U
Zinc	(mg/L)	<0.005	0.015	0.045	0.008	<0.005	0.012	0.02 U	<0.005	0.02 U	0.02 U	<0.005/0.005	0.03	<0.01	0.01	<0.005	<0.005	0.008	0.009/0.007	--

ii) Deep Aquifer

Sample location:		B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
Date:		6/25/2008	11/18/2008	6/24/2009	11/18/2009	6/16/2010	11/9/2010	6/22/2011	9/15/2011	11/16/2011	12/8/2011	3/28/2012	6/25/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996	5/6/1997
<u>Dissolved metal</u>																				
Aluminum	(mg/L)	--	--	--	--	--	--	--	0.085	--	0.034 J	0.019 J	--	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	0.002 U	--	0.002 U	0.00017 J	--	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	0.036	--	0.036	0.035	--	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	0.042 J	--	0.049 J	0.048 J	--	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--
Chromium	(mg/L)	<0.005	<0.005	<0.005/<0.005	<0.005	<0.005	0.011	0.009	0.005 U	<0.005/<0.005	0.005 U	0.005 U	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Cobalt	(mg/L)	--	--	--	--	--	--	--	0.007 U	--	0.007 U	0.007 U	--	--	--	--	--	--	--	--
Copper	(mg/L)	0.002	0.004	<0.001/<0.001	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004/<0.004	0.002 U	0.002 U	<0.004	<0.02	0.021	<0.02	<0.02	<0.02	<0.02	<0.01
Iron	(mg/L)	2.4	--	1.72/1.64	--	1.93	--	2.55	1.8	--	1.5	1.6	1.7	--	--	--	--	--	--	--
Lead	(mg/L)	--	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U	--	--	--	--	--	--	--	--
Manganese	(mg/L)	0.055	--	0.056/0.056	--	0.049	--	0.054	0.047	--	0.049	0.047	0.053	--	--	--	--	--	--	--
Mercury	(mg/L)	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--
Nickel	(mg/L)	<0.005	0.006	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005/<0.005	0.02 U	0.02 U	<0.005	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02	0.008
Selenium	(mg/L)	--	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U	--	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	0.001 U	--	0.00015 J	0.00022 J	--	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	0.004 U	--	0.00072 J	0.004 U	--	--	--	--	--	--	--	--
Zinc	(mg/L)	0.007	0.022	<0.005/<0.005	0.005	<0.005	<0.005	0.013	0.02 U	0.005/0.006	0.02 U	0.02 U	<0.005	0.061	<0.02	<0.02	<0.02	0.05	0.04	<0.01

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

Sample location:		B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-24
Date:		6/7/2005	12/8/2005	6/29/2006	11/30/2006	6/7/2007	11/13/2007	6/25/2008	11/18/2008	6/24/2009	11/19/2009	6/15/2010	11/10/2010	6/22/2011	9/15/2011	11/16/2011	12/7/2011	12/8/2011	3/28/2012	6/27/2012	8/21/1996
Dissolved metal																					
Aluminum	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	3.4	0.05 U	-	
Antimony	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002 U	-	-	0.002 U	0.0004 J	-	
Arsenic	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005 U	-	-	0.005 U	0.005 U	-	
Barium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.045 J	-	-	0.077 J	0.027 J	-	
Beryllium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001 U	-	-	0.001 U	0.001 U	-	
Cadmium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001 U	-	-	0.001 U	0.001 U	-	
Chromium	(mg/L)	<0.005	0.01/0.01	<0.005	0.005	0.006	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	0.005	0.005 U	<0.005	0.005 U	0.011	0.005 U	<0.005	
Cobalt	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.007 U	-	-	0.007 U	0.007 U	-	
Copper	(mg/L)	<0.005	<0.004/<0.004	<0.004	<0.004	0.004	0.007	0.003	0.001	0.002	<0.004	<0.004	<0.004	<0.004	0.0052	<0.004	0.002 U	0.0045	0.002 U	<0.004	
Iron	(mg/L)	1.32	0.16/0.15	0.24	-	0.07	-	0.38	-	0.036	-	<0.02	-	0.24	0.23	-	0.1 U	4.4	0.1 U	<0.02	
Lead	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003 U	-	-	0.003 U	0.003 U	-	
Manganese	(mg/L)	0.228	<0.02/<0.02	0.21	-	0.021	-	0.009	-	<0.005	-	<0.005	-	<0.005	0.0071 J	-	0.015 U	0.094	0.0016 J	<0.005	
Mercury	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002 U	-	-	0.0002 U	0.0002 U	-	
Nickel	(mg/L)	0.007	<0.005/<0.005	0.012	<0.005	0.004	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.02 U	<0.005	0.02 U	0.0079 J	0.02 U	<0.005	
Selenium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005 U	-	-	0.005 U	0.005 U	-	
Silver	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002 U	-	-	0.0002 U	0.0002 U	-	
Thallium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.001 U	-	-	0.00025 J	0.00084 J	-	
Vanadium	(mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	0.004 U	-	-	0.0089	0.004 U	-	
Zinc	(mg/L)	<0.005	0.02/<0.01	0.021	<0.005	0.009	0.011	0.016	0.014	<0.005	0.007	<0.005	<0.005	<0.005	0.02 U	0.005	0.02 U	0.02 U	0.02 U	<0.005	

ii) Deep Aquifer

Sample location:		B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
Date:		11/6/1997	5/4/1998	11/5/1998	4/26/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	6/3/2003	11/13/2003	6/30/2004	12/10/2004	6/8/2005	12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/14/2007	6/26/2008
Dissolved metal																					
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	(mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.01	0.002	<0.005
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	(mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.006	<0.004	0.002	0.001	0.001
Iron	(mg/L)	0.24	--	0.24	--	--	<0.01	--	0.2	--	--	0.1	--	1.33	1.35	1.07	0.43	--	1.2	--	1.39
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	(mg/L)	0.027	--	0.043	--	--	--	--	--	--	--	<0.005	--	0.044	0.072	0.06	0.06	--	0.049	--	0.04
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	(mg/L)	0.03	<0.005	<0.005	<0.005	<0.005	0.011	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	0.008	0.005	<0.005	0.005	0.005	<0.005
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	(mg/L)	<0.01	0.02	0.01	0.01	<0.01	<0.01	0.01/0.01	<0.01	<0.01	0.006	0.009	0.007	0.007	0.006	<0.01	0.013	<0.005	0.007	0.008	<0.005

TABLE 2

**CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

i) Shallow Water Bearing Unit

Sample location:		B-24	B-24	B-24	B-24	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	
Date:		11/13/1996	5/6/1997	5/4/1998	11/5/1998	6/7/2005	12/8/2005	6/28/2006	11/30/2006	6/4/2007	11/13/2007	6/26/2008	11/18/2008	6/24/2009	11/18/2009	6/16/2010	11/9/2010	6/21/2011	11/16/2011	6/26/2012
<u>Dissolved metal</u>																				
Aluminum	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	(mg/L)	<0.02	<0.01	<0.01	<0.01	0.008	0.011	0.006	0.006	0.009	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.01/0.008	<0.005	<0.005
Cobalt	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	(mg/L)	<0.02	<0.01	<0.01	<0.01	<0.005	<0.004	<0.004	<0.004	0.002	0.001	0.001	<0.001	<0.001	<0.004	<0.004	<0.004	<0.004/<0.004	<0.004	<0.004
Iron	(mg/L)	--	--	--	0.06	10.6	3.18	3.76	--	2.4	--	3.49	--	4	--	1.88	--	1.13/1.07	--	1.2
Lead	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	(mg/L)	--	--	--	0.12	0.448	0.21	0.21	--	0.194	--	0.175	--	0.155	--	0.222	--	0.255/0.255	--	0.242
Mercury	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	(mg/L)	<0.02	0.031	0.008	0.009	<0.005	<0.005	<0.005	<0.005	0.002	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006/0.006	<0.005	<0.005
Selenium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	(mg/L)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	(mg/L)	0.05	0.01	0.02	0.02	<0.005	0.01	<0.005	<0.005	0.019	0.007	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005/<0.005	<0.005	<0.005

ii) Deep Aquifer

Sample location:		B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
Date:		11/19/2008	6/25/2009	11/19/2009	6/17/2010	11/10/2010	6/22/2011	9/15/2011	11/16/2011	12/8/2011	3/28/2012	6/26/2012
<u>Dissolved metal</u>												
Aluminum	(mg/L)	--	--	--	--	--	--	0.05 U	--	0.1	0.05 U/0.05 U	--
Antimony	(mg/L)	--	--	--	--	--	--	0.002 U	--	0.002 U	0.002 U/0.002 U	--
Arsenic	(mg/L)	--	--	--	--	--	--	0.048	--	0.042	0.048/0.045	--
Barium	(mg/L)	--	--	--	--	--	--	0.15	--	0.16	0.17/0.17	--
Beryllium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U/0.001 U	--
Cadmium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U/0.001 U	--
Chromium	(mg/L)	<0.005	<0.005	<0.005/<0.005	<0.005	0.011	0.01	0.005 U	<0.005	0.005 U	0.005 U/0.005 U	<0.005
Cobalt	(mg/L)	--	--	--	--	--	--	0.007 U	--	0.007 U	0.007 U/0.007 U	--
Copper	(mg/L)	<0.001	<0.001	<0.004/<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.001 J	0.002 U/0.002 U	<0.004
Iron	(mg/L)	--	1.21	--	0.98	--	1.54	1	--	1.2	0.9/0.87	0.64
Lead	(mg/L)	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U/0.003 U	--
Manganese	(mg/L)	--	0.034	--	0.034	--	0.033	0.035	--	0.05	0.035/0.034	0.042
Mercury	(mg/L)	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U/0.0002 U	--
Nickel	(mg/L)	0.005	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U	0.02 U/0.02 U	<0.005
Selenium	(mg/L)	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U/0.005 U	--
Silver	(mg/L)	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U/0.0002 U	--
Thallium	(mg/L)	--	--	--	--	--	--	0.001 U	--	0.001 U	0.00014 J/0.001 U	--
Vanadium	(mg/L)	--	--	--	--	--	--	0.004 U	--	0.004 U	0.004 U/0.004 U	--
Zinc	(mg/L)	<0.005	<0.005	0.006/<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02	0.02 U/0.02 U	<0.005

TABLE 3

**FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

<i>Analyte</i>	<i>Unit</i>	<i>Total Metals in Shallow Water Bearing Unit</i>						<i>Facility-Specific Background</i>	
		<i>Number of Samples</i>	<i>Percent ND</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Distribution</i> ¹	<i>Outliers</i>	<i>Method</i>	<i>Value</i>
Aluminum	mg/L	9	56%	0.05 U	9.2	--	--	95% KM UTL ²	10.5
Antimony	mg/L	9	89%	0.0002 J	0.002 U	--	--	NP UTL	0.002 U
Arsenic	mg/L	9	56%	0.005 U	0.0086	--	--	95% KM UTL ²	0.01
Barium	mg/L	9	0%	0.033 J	0.13	Normal	1	95% UTL ²	0.15
Beryllium	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium	mg/L	9	67%	0.005 U	0.03	--	--	95% KM UTL ²	0.031
Cobalt	mg/L	9	67%	0.0027 J	0.0056 J	--	--	95% KM UTL ²	0.008
Copper	mg/L	9	78%	0.002 U	0.0096	--	--	95% KM UTL ²	0.01
Iron	mg/L	9	33%	0.1 U	12	Gamma	0	95% WH Approx. Gamma UTL ²	32.58
Lead	mg/L	9	78%	0.003 U	0.0029 J	--	--	95% KM UTL ²	0.0035
Manganese	mg/L	9	11%	0.00445	0.26	Gamma	0	95% WH Approx. Gamma UTL ²	0.963
Mercury	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel	mg/L	9	56%	0.0043 J	0.023	--	--	95% KM UTL ²	0.026
Selenium	mg/L	9	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver	mg/L	9	89%	0.0002 U	0.00053	--	--	NP UTL	0.00053
Thallium	mg/L	9	89%	0.00058 J	0.001 U	--	--	NP UTL	0.001 U
Vanadium	mg/L	9	67%	0.0014 J	0.023	--	--	95% KM UTL ²	0.026
Zinc	mg/L	9	89%	0.02 U	0.039 U	--	--	NP UTL	0.039 U

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

¹ Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).² With 95% Coverage.

TABLE 3

**FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

Analyte	Unit	<i>Dissolved Metals in Shallow Water Bearing Unit</i>							<i>Facility-Specific Background</i>	
		<i>Number of</i>	<i>Percent</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Distribution</i> ¹	<i>Outliers</i>		<i>Method</i>	<i>Value</i>
		<i>Samples</i>	<i>ND</i>							
Aluminum (dissolved)	mg/L	9	78%	0.05 U	3.4	--	--		95% KM UTL ²	3.52
Antimony (dissolved)	mg/L	9	78%	0.00014 J	0.002 U	--	--		95% KM UTL ²	0.002 U ³
Arsenic (dissolved)	mg/L	9	78%	0.005 U	0.0072	--	--		95% KM UTL ²	0.0072
Barium (dissolved)	mg/L	9	0%	0.027 J	0.077 J	Normal	0		95% UTL ²	0.1
Beryllium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--		NP UTL	0.001 U
Cadmium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--		NP UTL	0.001 U
Chromium (dissolved)	mg/L	124	76%	0.001	0.017	--	--		95% KM UTL ²	0.010
Cobalt (dissolved)	mg/L	9	89%	0.003 J	0.007 U	--	--		NP UTL	0.007 U
Copper (dissolved)	mg/L	124	81%	<0.001	0.027	--	--		95% KM UTL ²	0.0074
Iron (dissolved)	mg/L	63	17%	<0.02	10.6	Not Normal	1		95% KM UTL ²	4.0
Lead (dissolved)	mg/L	9	100%	0.003 U	0.003 U	--	--		NP UTL	0.003 U
Manganese (dissolved)	mg/L	59	24%	0.0016 J	0.448	Gamma	0	95% WH Approx. Gamma UTL ²		0.547
Mercury (dissolved)	mg/L	9	89%	0.00019 J	0.0002 U	--	--		NP UTL	0.0002 U
Nickel (dissolved)	mg/L	124	65%	0.002	0.062	--	--		95% KM UTL ²	0.0185
Selenium (dissolved)	mg/L	9	100%	0.005 U	0.005 U	--	--		NP UTL	0.005 U
Silver (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--		NP UTL	0.0002 U
Thallium (dissolved)	mg/L	9	56%	0.00021 J	0.00084 J	--	--		95% KM UTL ²	0.0012
Vanadium (dissolved)	mg/L	9	89%	0.004 U	0.0089	--	--		NP UTL	0.0089
Zinc (dissolved)	mg/L	124	41%	<0.005	0.15	Not Normal	1		95% KM UTL ²	0.051

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

¹ Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).² With 95% Coverage.³ Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

TABLE 3

**FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

<i>Analyte</i>	<i>Unit</i>	<i>Total Metals in Deep Aquifer</i>						<i>Facility-Specific Background</i>	
		<i>Number of Samples</i>	<i>Percent ND</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Distribution</i> ¹	<i>Outliers</i>	<i>Method</i>	<i>Value</i>
Aluminum	mg/L	10	0%	0.17	3.7	Gamma	0	95% WH Approx. Gamma UTL ²	5.3
Antimony	mg/L	10	80%	0.000135	0.002 U	--	--	95% KM UTL ²	0.002 U ³
Arsenic	mg/L	10	10%	0.005 U	0.054	Normal	0	MLE 95% UTL ²	0.102
Barium	mg/L	10	0%	0.05 J	0.31	Gamma	0	95% WH Approx. Gamma UTL ²	0.47
Beryllium	mg/L	10	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium	mg/L	10	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium	mg/L	10	60%	0.005 U	0.0067	--	--	95% KM UTL ²	0.007
Cobalt	mg/L	10	80%	0.0018 J	0.007 U	--	--	95% KM UTL ²	0.007 U ³
Copper	mg/L	10	40%	0.002 U	0.0091	Normal	0	MLE 95% UTL ²	0.015
Iron	mg/L	10	0%	0.99	7	Normal	1	95% UTL ²	7.9
Lead	mg/L	10	90%	0.0022 J	0.003 U	--	--	NP UTL	0.003 U
Manganese	mg/L	10	0%	0.039	0.18	Normal	0	95% UTL ²	0.252
Mercury	mg/L	10	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel	mg/L	10	70%	0.0035	0.02 U	--	--	95% KM UTL ²	0.02 U ³
Selenium	mg/L	10	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver	mg/L	10	90%	0.000094	0.0002 U	--	--	NP UTL	0.0002 U
Thallium	mg/L	10	70%	0.00018	0.0021 U	--	--	95% KM UTL ²	0.001 U ³
Vanadium	mg/L	10	30%	0.0013 J	0.01	Gamma	0	95% WH Approx. Gamma UTL ²	0.015
Zinc	mg/L	10	90%	0.02 U	0.039	--	--	NP UPL	0.039

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

¹ Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).² With 95% Coverage.³ Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

TABLE 3

**FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN**

Analyte	Unit	<i>Dissolved Metals in Deep Aquifer</i>						<i>Facility-Specific Background</i>	
		Number of Samples	Percent ND	Minimum	Maximum	Distribution ¹	Outliers	Method	Value
Aluminum (dissolved)	mg/L	9	44%	0.019 J	0.1	Normal	0	95% UTL ²	0.133
Antimony (dissolved)	mg/L	9	89%	0.00017 J	0.002 U	--	--	NP UTL	0.002 U ³
Arsenic (dissolved)	mg/L	9	22%	ND(0.005)	0.048	Normal	0	MLE 95% UTL ²	0.089
Barium (dissolved)	mg/L	9	0%	0.042 J	0.33	Gamma	0	95% WH Approx. Gamma UTL ²	0.553
Beryllium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium (dissolved)	mg/L	117	82%	0.001	0.032	--	--	95% KM UTL ²	0.011
Cobalt (dissolved)	mg/L	9	100%	0.007 U	0.007 U	--	--	NP UTL	0.007 U
Copper (dissolved)	mg/L	117	85%	<0.001	0.203	--	--	95% KM UTL ²	0.04
Iron (dissolved)	mg/L	58	7%	<0.01	2.55	Gamma	0	95% WH Approx. Gamma UTL ²	3.62
Lead (dissolved)	mg/L	9	100%	0.003 U	0.003 U	--	--	NP UTL	0.003 U
Manganese (dissolved)	mg/L	52	2%	<0.005	0.577	Lognormal	1	Log ROS 95% UTL ²	0.292
Mercury (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel (dissolved)	mg/L	117	76%	0.001	0.054	--	--	95% KM UTL ²	0.022
Selenium (dissolved)	mg/L	9	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Thallium (dissolved)	mg/L	9	44%	0.00014	0.001 U	Normal	0	95% UTL ²	0.001 U
Vanadium (dissolved)	mg/L	9	78%	0.00072 J	0.004 U	--	--	NP UTL	0.004 U
Zinc (dissolved)	mg/L	117	59%	ND(0.005)	0.124	--	--	95% KM UTL ²	0.0521

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

¹ Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).² With 95% Coverage.³ Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

ATTACHMENT A

Tomka, Mike

From: Conforti, Rich (DEQ) [CONFORTIR@michigan.gov]
Sent: Thursday, December 13, 2012 4:30 PM
To: Tomka, Mike
Cc: Grant Trigger; Dave Favero; Anthony Finch; John O'Neill; Dyck, Wesley; Yocum, William (DEQ); Araujo, Daniela; Chatfield, Richard; Project Email Hold; Rogers, Joseph (DEQ); McCabe, John (DEQ); Schinderle, Jack (DEQ)
Subject: RE: Calculated Site-Specific Background Values for Inorganics in Groundwater, RACER Trust, Coldwater Road Sites--COR-012636--

Mike,

We have completed our review of the November 21, 2012, Memorandum (Memo) concerning Site-specific Background values (BV) for inorganics in groundwater and have the following comments.

It is the DEQ's contention that the BVs presented in Table 3 of the Memo, calculated using the 99% upper prediction limits (UPL) statistical method, should be recalculated using an upper tolerance limit (UTL) with 95% confidence and 95% coverage. This 95% UTL is the method that is recommended in Section 7.5 of USEPA's Unified Guidance (USEPA 2010). The 95% UTL method is more conservative than the proposed 99% UPL (i.e. less potential for false negative or Type II error) which is appropriate given the use of the background statistic to determine if any of the naturally occurring inorganics are present above background and/or are migrating off-site.

It is also the DEQ's contention that the BVs calculated for dissolved inorganics are the most appropriate for use at the former Peregrine site. This is due to the fact that groundwater in both the shallow and deep aquifers is historically turbid, with turbidity values typically much higher than 5 NTU despite significant efforts to ensure turbidity is minimized during sampling. The larger data set used to generate the BVs for several of the significant inorganic constituents also supports this position. In light of this, site groundwater samples should be analyzed for dissolved inorganic constituents for purposes of comparison to the proposed BVs.

In addition, please be advised that these calculated BVs apply only to the former Peregrine site. Site specific background inorganic values have already been developed for the purposes of detection monitoring at the hazardous waste landfill and corrective action at the former wastewater treatment plant, for the Coldwater Rd. Landfill site to the north of the former Peregrine site.

Please revise the Memo to reflect the recalculated BVs and resubmit the Memo to the DEQ for final review and approval.

Thank you

Richard A. Conforti, Jr., P.E.
 Environmental Engineer
 DEQ - OWMRP
 Phone: 517-241-2108
 Fax: 517-373-4797

From: Tomka, Mike [<mailto:mtomka@croworld.com>]
Sent: Wednesday, November 21, 2012 3:30 PM
To: Conforti, Rich (DEQ); Rogers, Joseph (DEQ); McCabe, John (DEQ); Schinderle, Jack (DEQ); Yocum,

12/18/2012

William (DEQ)

Cc: Grant Trigger; Dave Favero; Anthony Finch; John O'Neill; Dyck, Wesley; Araujo, Daniela; Chatfield, Richard; Project Email Hold

Subject: Calculated Site-Specific Background Values for Inorganics in Groundwater, RACER Trust, Coldwater Road Sites~COR-012636~

Please find attached a memorandum on the calculation of Site-Specific Background Values for inorganics in Groundwater for the RACER Trust Coldwater Road Industrial Lands, for your review and comment.

Please let me know if you need a hard copy.

Please call or email with any questions or comments.

Thanks Mike

Michael Tomka, P. Eng., P.E.
Conestoga-Rovers & Associates (CRA)

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Think before you print 

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ATTACHMENT B

ATTACHMENT B.1

PROUCL OUTPUT

TOTAL METALS IN SHALLOW WATER BEARING UNIT

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Total Metals - Shallow.wst
Full Precision OFF
Confidence Coefficient 95%
Coverage 95%
Different or Future K Values 1
Number of Bootstrap Operations 10000

Aluminum

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected 0.26
Maximum Detected 9.2
Mean of Detected 3.543
SD of Detected 4.124
Minimum Non-Detect 0.05
Maximum Non-Detect 0.2

Log-transformed Statistics

Minimum Detected -1.347
Maximum Detected 2.219
Mean of Detected 0.479
SD of Detected 1.619
Minimum Non-Detect -2.996
Maximum Non-Detect -1.609

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL 5
Number treated as Detected with Single DL 4
Single DL Non-Detect Percentage 55.56%

Warning: There are only 4 Distinct Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.879
5% Shapiro Wilk Critical Value 0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.956
5% Shapiro Wilk Critical Value 0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
Mean 1.597
SD 3.128
95% UTL 95% Coverage 11.08
95% UPL (t) 7.728
90% Percentile (z) 5.605
95% Percentile (z) 6.742

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean (Log Scale) -1.682
SD (Log Scale) 2.319
95% UTL 95% Coverage 210.1
95% UPL (t) 17.53
90% Percentile (z) 3.633
95% Percentile (z) 8.436

99% Percentile (z) 8.874

99% Percentile (z) 40.98

Maximum Likelihood Estimate(MLE) Method

Mean -0.868

SD 5.244

95% UTL with 95% Coverage 15.03

95% UPL (t) 9.41

90% Percentile (z) 5.852

95% Percentile (z) 7.757

99% Percentile (z) 11.33

Log ROS Method

Mean in Original Scale 1.582

SD in Original Scale 3.136

95% UTL with 95% Coverage 1351

95% BCA UTL with 95% Coverage 9.2

95% Bootstrap (%) UTL with 95% Coverage 9.2

95% UPL (t) 43.09

90% Percentile (z) 4.855

95% Percentile (z) 15.63

99% Percentile (z) 140

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.357

Theta Star 9.93

nu star 2.854

A-D Test Statistic 0.272

5% A-D Critical Value 0.67

K-S Test Statistic 0.257

5% K-S Critical Value 0.405

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 1.719

SD 2.886

SE of Mean 1.111

95% KM UTL with 95% Coverage 10.47

95% KM Chebyshev UPL 14.98

95% KM UPL (t) 7.376

90% Percentile (z) 5.417

95% Percentile (z) 6.466

99% Percentile (z) 8.433

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 1.574

Median 0.000001

SD 3.14

k star 0.142

Theta star 11.07

Nu star 2.561

95% Percentile of Chisquare (2k) 1.582

90% Percentile 4.631

95% Percentile 8.752

99% Percentile 20.84

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 9.801

95% Hawkins Wixley (HW) Approx. Gamma UPL 12.43

95% WH Approx. Gamma UTL with 95% Coverage 26.72

95% HW Approx. Gamma UTL with 95% Coverage 45.92

Note: DL/2 is not a recommended method.

Antimony

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected	0.0035
Maximum Detected	0.0086
Mean of Detected	0.00563
SD of Detected	0.00243
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.655
Maximum Detected	-4.756
Mean of Detected	-5.251
SD of Detected	0.434
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00389
SD	0.00222
95% UTL	95% Coverage 0.0106
	95% UPL (t) 0.00824
	90% Percentile (z) 0.00673
	95% Percentile (z) 0.00754
	99% Percentile (z) 0.00905

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.662
SD (Log Scale)	0.472
95% UTL	95% Coverage 0.0145
	95% UPL (t) 0.00876
	90% Percentile (z) 0.00636
	95% Percentile (z) 0.00755
	99% Percentile (z) 0.0104

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method
Mean in Original Scale 0.0046
SD in Original Scale 0.0019
Mean in Log Scale -5.448
SD in Log Scale 0.374
95% UTL 95% Coverage 0.0134
95% UPL (t) 0.00896
90% Percentile (z) 0.00695
95% Percentile (z) 0.00796
99% Percentile (z) 0.0103

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 1.979
Theta Star 0.00284
nu star 15.83

A-D Test Statistic 0.385
5% A-D Critical Value 0.658
K-S Test Statistic 0.306
5% K-S Critical Value 0.395

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00461
Median 0.00394
SD 0.00216
k star 3.189
Theta star 0.00144
Nu star 57.4
95% Percentile of Chisquare (2k) 13.15

90% Percentile 0.00806
95% Percentile 0.0095
99% Percentile 0.0126

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00453
SD 0.00171
SE of Mean 0.0006645
95% KM UTL with 95% Coverage 0.00972
95% KM Chebyshev UPL 0.0124
95% KM UPL (t) 0.00789
90% Percentile (z) 0.00672
95% Percentile (z) 0.00735
99% Percentile (z) 0.00851

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.01
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0103
95% WH Approx. Gamma UTL with 95% Coverage 0.0147
95% HW Approx. Gamma UTL with 95% Coverage 0.0156

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations 9
Tolerance Factor 3.031

Number of Distinct Observations 8

Raw Statistics

Minimum 0.033
Maximum 0.13
Second Largest 0.072
First Quartile 0.054
Median 0.0671
Third Quartile 0.072
Mean 0.0652
Geometric Mean 0.0603
SD 0.0285
Coefficient of Variation 0.437
Skewness 1.439

Log-Transformed Statistics

Minimum -3.411
Maximum -2.04
Second Largest -2.631
First Quartile -2.919
Median -2.702
Third Quartile -2.631
Mean -2.808
SD 0.416

Warning: There are only 9 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.842
Shapiro Wilk Critical Value 0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.912
Shapiro Wilk Critical Value 0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.152
95% UPL (t) 0.121
90% Percentile (z) 0.102
95% Percentile (z) 0.112
99% Percentile (z) 0.132

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.213
95% UPL (t) 0.136
90% Percentile (z) 0.103
95% Percentile (z) 0.12
99% Percentile (z) 0.159

Gamma Distribution Test

k star 4.468
Theta Star 0.0146
MLE of Mean 0.0652
MLE of Standard Deviation 0.0308
nu star 80.42

A-D Test Statistic 0.472
5% A-D Critical Value 0.722
K-S Test Statistic 0.237
5% K-S Critical Value 0.28

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 0.0836
95% Percentile 0.107
99% Percentile 0.125

Assuming Gamma Distribution		95% UTL with 95% Coverage	0.13
90% Percentile	0.106	95% Percentile Bootstrap UTL with 95% Coverage	0.13
95% Percentile	0.123	95% BCA Bootstrap UTL with 95% Coverage	0.13
99% Percentile	0.157		95% UPL 0.13
		95% Chebyshev UPL	0.196
95% WH Approx. Gamma UPL	0.128	Upper Threshold Limit Based upon IQR	0.099
95% HW Approx. Gamma UPL	0.13		
95% WH Approx. Gamma UTL with 95% Coverage	0.179		
95% HW Approx. Gamma UTL with 95% Coverage	0.185		

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	9	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	6

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 66.67%

Raw Statistics

Minimum Detected	0.0078
Maximum Detected	0.03
Mean of Detected	0.0153
SD of Detected	0.0128
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-4.854
Maximum Detected	-3.507
Mean of Detected	-4.396
SD of Detected	0.771
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.757
5% Shapiro Wilk Critical Value	0.767

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.764
5% Shapiro Wilk Critical Value	0.767

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00676
SD	0.00902
95% UTL	95% Coverage 0.0341
95% UPL (t)	0.0244
90% Percentile (z)	0.0183
95% Percentile (z)	0.0216
99% Percentile (z)	0.0278

Maximum Likelihood Estimate(MLE) Method

Mean	-0.00293
SD	0.0172
95% UTL with	95% Coverage 0.0492

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.46
SD (Log Scale)	0.886
95% UTL	95% Coverage 0.0624
95% UPL (t)	0.0242
90% Percentile (z)	0.0132
95% Percentile (z)	0.0183
99% Percentile (z)	0.0334

Log ROS Method

Mean in Original Scale	0.00572
SD in Original Scale	0.00961
95% UTL with	95% Coverage 0.352
95% BCA UTL with	95% Coverage 0.03
95% Bootstrap (%) UTL with	95% Coverage 0.03

95% UPL (t) 0.0308
90% Percentile (z) 0.0191
95% Percentile (z) 0.0253
99% Percentile (z) 0.0371

95% UPL (t) 0.0535
90% Percentile (z) 0.0162
95% Percentile (z) 0.0307
99% Percentile (z) 0.102

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A
Theta Star N/A
nu star N/A

A-D Test Statistic N/A
5% A-D Critical Value N/A
K-S Test Statistic N/A
5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A
Median N/A
SD N/A
k star N/A
Theta star N/A
Nu star N/A
95% Percentile of Chisquare (2k) N/A

90% Percentile N/A
95% Percentile N/A
99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0103

SD 0.00697

SE of Mean 0.00285

95% KM UTL with 95% Coverage 0.0314

95% KM Chebyshev UPL 0.0423

95% KM UPL (t) 0.0239

90% Percentile (z) 0.0192

95% Percentile (z) 0.0218

99% Percentile (z) 0.0265

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

General Statistics

Number of Valid Data 9	Number of Detected Data 3
Number of Distinct Detected Data 3	Number of Non-Detect Data 6

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 66.67%

Raw Statistics

Minimum Detected 0.0027
Maximum Detected 0.0056
Mean of Detected 0.0039
SD of Detected 0.00151
Minimum Non-Detect 0.007
Maximum Non-Detect 0.007

Log-transformed Statistics

Minimum Detected -5.915
Maximum Detected -5.185
Mean of Detected -5.594
SD of Detected 0.373
Minimum Non-Detect -4.962
Maximum Non-Detect -4.962

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics**Normal Distribution Test with Detected Values Only**

Shapiro Wilk Test Statistic 0.918
5% Shapiro Wilk Critical Value 0.767

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.957
5% Shapiro Wilk Critical Value 0.767

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
Mean 0.00363
SD 0.0007826
95% UTL 95% Coverage 0.00601
95% UPL (t) 0.00517
90% Percentile (z) 0.00464
95% Percentile (z) 0.00492
99% Percentile (z) 0.00545

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean (Log Scale) -5.635
SD (Log Scale) 0.189
95% UTL 95% Coverage 0.00633
95% UPL (t) 0.00517
90% Percentile (z) 0.00455
95% Percentile (z) 0.00487
99% Percentile (z) 0.00554

Log ROS Method

Mean in Original Scale 0.00396
SD in Original Scale 0.00151
Mean in Log Scale -5.594
SD in Log Scale 0.379
95% UTL 95% Coverage 0.0117

95% UPL (t) 0.00782
90% Percentile (z) 0.00605
95% Percentile (z) 0.00694
99% Percentile (z) 0.00899

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A
Theta Star N/A
nu star N/A

A-D Test Statistic N/A
5% A-D Critical Value N/A
K-S Test Statistic N/A
5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A
Median N/A
SD N/A
k star N/A
Theta star N/A
Nu star N/A
95% Percentile of Chisquare (2k) N/A

90% Percentile N/A
95% Percentile N/A
99% Percentile N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0039

SD 0.00124

SE of Mean 0.0008737

95% KM UTL with 95% Coverage 0.00765

95% KM Chebyshev UPL 0.00958

95% KM UPL (t) 0.00632

90% Percentile (z) 0.00548

95% Percentile (z) 0.00593

99% Percentile (z) 0.00677

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Copper

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 77.78%

Raw Statistics

Minimum Detected	0.0039
Maximum Detected	0.0096
Mean of Detected	0.00675
SD of Detected	0.00403
Minimum Non-Detect	0.002
Maximum Non-Detect	0.0045

Log-transformed Statistics

Minimum Detected	-5.547
Maximum Detected	-4.646
Mean of Detected	-5.096
SD of Detected	0.637
Minimum Non-Detect	-6.215
Maximum Non-Detect	-5.404

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL 8

Number treated as Detected with Single DL 1

Single DL Non-Detect Percentage 88.89%

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00244
SD	0.00286
95% UTL	95% Coverage 0.0111
95% UPL (t)	0.00804
90% Percentile (z)	0.0061

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-6.39
SD (Log Scale)	0.811
95% UTL	95% Coverage 0.0196
95% UPL (t)	0.00823
90% Percentile (z)	0.00475

95% Percentile (z) 0.00714
99% Percentile (z) 0.00909

95% Percentile (z) 0.00637
99% Percentile (z) 0.0111

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method
Mean in Original Scale N/A
SD in Original Scale N/A
Mean in Log Scale N/A
SD in Log Scale N/A
95% UTL 95% Coverage N/A
95% UPL (t) N/A
90% Percentile (z) N/A
95% Percentile (z) N/A
99% Percentile (z) N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A
Theta Star N/A
nu star N/A

A-D Test Statistic N/A
5% A-D Critical Value N/A
K-S Test Statistic N/A
5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A
Median N/A
SD N/A
k star N/A
Theta star N/A
Nu star N/A
95% Percentile of Chisquare (2k) N/A

90% Percentile N/A
95% Percentile N/A
99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method
Mean 0.00453
SD 0.00179
SE of Mean 0.0008444
95% KM UTL with 95% Coverage 0.00996
95% KM Chebyshev UPL 0.0128
95% KM UPL (t) 0.00804
90% Percentile (z) 0.00683
95% Percentile (z) 0.00748
99% Percentile (z) 0.0087

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL N/A
95% WH Approx. Gamma UTL with 95% Coverage N/A
95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	9	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	3.031	Percent Non-Detects	33.33%

Raw Statistics

Minimum Detected	0.0927
Maximum Detected	12
Mean of Detected	3.164
SD of Detected	4.715
Minimum Non-Detect	0.1
Maximum Non-Detect	0.1

Log-transformed Statistics

Minimum Detected	-2.378
Maximum Detected	2.485
Mean of Detected	-0.0122
SD of Detected	1.797
Minimum Non-Detect	-2.303
Maximum Non-Detect	-2.303

Warning: There are only 6 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.732
5% Shapiro Wilk Critical Value	0.788

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.964
5% Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	2.126
SD	4.04
95% UTL	95% Coverage 14.37
	95% UPL (t) 10.04
	90% Percentile (z) 7.303
	95% Percentile (z) 8.771
	99% Percentile (z) 11.52

Maximum Likelihood Estimate(MLE) Method

Mean	0.0874
SD	5.792
95% UTL with	95% Coverage 17.64
	95% UPL (t) 11.44
	90% Percentile (z) 7.51
	95% Percentile (z) 9.614
	99% Percentile (z) 13.56

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-1.007
SD (Log Scale)	2.06
95% UTL	95% Coverage 188.2
	95% UPL (t) 20.73
	90% Percentile (z) 5.121
	95% Percentile (z) 10.83
	99% Percentile (z) 44.07

Log ROS Method

Mean in Original Scale	2.132
SD in Original Scale	4.036
95% UTL with 95% Coverage	213.8
95% BCA UTL with 95% Coverage	12
95% Bootstrap (%) UTL with 95% Coverage	12
95% UPL (t)	22.65
90% Percentile (z)	5.459
95% Percentile (z)	11.69
99% Percentile (z)	48.8

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.381
Theta Star 8.308
nu star 4.57

A-D Test Statistic 0.374
5% A-D Critical Value 0.734
K-S Test Statistic 0.291
5% K-S Critical Value 0.348

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 2.109
Median 0.3
SD 4.05
k star 0.17
Theta star 12.39
Nu star 3.064
95% Percentile of Chisquare (2k) 1.824

90% Percentile 6.339
95% Percentile 11.3
99% Percentile 25.36

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 2.14
SD 3.801
SE of Mean 1.388
95% KM UTL with 95% Coverage 13.66
95% KM Chebyshev UPL 19.61
95% KM UPL (t) 9.591
90% Percentile (z) 7.012
95% Percentile (z) 8.393
99% Percentile (z) 10.98

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 12.8
95% Hawkins Wixley (HW) Approx. Gamma UPL 16.7
95% WH Approx. Gamma UTL with 95% Coverage 32.58
95% HW Approx. Gamma UTL with 95% Coverage 55.13

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 77.78%

Raw Statistics

Minimum Detected	0.0023
Maximum Detected	0.0029
Mean of Detected	0.0026
SD of Detected	0.0004243
Minimum Non-Detect	0.003
Maximum Non-Detect	0.003

Log-transformed Statistics

Minimum Detected	-6.075
Maximum Detected	-5.843
Mean of Detected	-5.959
SD of Detected	0.164
Minimum Non-Detect	-5.809
Maximum Non-Detect	-5.809

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00174
SD	0.0005077
95% UTL	95% Coverage 0.00328
	95% UPL (t) 0.00274
	90% Percentile (z) 0.0024
	95% Percentile (z) 0.00258
	99% Percentile (z) 0.00293

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-6.382
SD (Log Scale)	0.247
95% UTL	95% Coverage 0.00357
	95% UPL (t) 0.00274
	90% Percentile (z) 0.00232
	95% Percentile (z) 0.00254
	99% Percentile (z) 0.003

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

Mean in Original Scale N/A

SD in Original Scale N/A

Mean in Log Scale N/A

SD in Log Scale N/A

95% UTL 95% Coverage N/A

95% UPL (t) N/A

90% Percentile (z) N/A

95% Percentile (z) N/A

99% Percentile (z) N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A

Theta Star N/A

nu star N/A

A-D Test Statistic N/A

5% A-D Critical Value N/A

K-S Test Statistic N/A

5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A

Median N/A

SD N/A

k star N/A

Theta star N/A

Nu star N/A

95% Percentile of Chisquare (2k) N/A

90% Percentile N/A

95% Percentile N/A

99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0026

SD 0.0003

SE of Mean 0.0003

95% KM UTL with 95% Coverage 0.00351

95% KM Chebyshev UPL 0.00398

95% KM UPL (t) 0.00319

90% Percentile (z) 0.00298

95% Percentile (z) 0.00309

99% Percentile (z) 0.0033

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Manganese

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	1
Tolerance Factor	3.031	Percent Non-Detects	11.11%

Raw Statistics

Minimum Detected	0.00445
Maximum Detected	0.26
Mean of Detected	0.089
SD of Detected	0.112
Minimum Non-Detect	0.015
Maximum Non-Detect	0.015

Log-transformed Statistics

Minimum Detected	-5.415
Maximum Detected	-1.347
Mean of Detected	-3.388
SD of Detected	1.603
Minimum Non-Detect	-4.2
Maximum Non-Detect	-4.2

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.736
5% Shapiro Wilk Critical Value	0.818

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.818

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0799
SD	0.108
95% UTL	95% Coverage 0.408
	95% UPL (t) 0.292
	90% Percentile (z) 0.219
	95% Percentile (z) 0.258
	99% Percentile (z) 0.332

Maximum Likelihood Estimate(MLE) Method

Mean	0.051
SD	0.135
95% UTL with	95% Coverage 0.46
	95% UPL (t) 0.316
	90% Percentile (z) 0.224
	95% Percentile (z) 0.273
	99% Percentile (z) 0.365

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-3.555
SD (Log Scale)	1.581
95% UTL	95% Coverage 3.447
	95% UPL (t) 0.634
	90% Percentile (z) 0.217
	95% Percentile (z) 0.385
	99% Percentile (z) 1.131

Log ROS Method

Mean in Original Scale	0.0796
SD in Original Scale	0.108
95% UTL with	95% Coverage 3.903
95% BCA UTL with	95% Coverage 0.26
95% Bootstrap (%) UTL with	95% Coverage 0.26
	95% UPL (t) 0.674
	90% Percentile (z) 0.221
	95% Percentile (z) 0.402
	99% Percentile (z) 1.229

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.479
 Theta Star 0.186
 nu star 7.66

A-D Test Statistic 0.556
 5% A-D Critical Value 0.753
 K-S Test Statistic 0.238
 5% K-S Critical Value 0.306

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0791
 Median 0.016
 SD 0.109
 k star 0.299
 Theta star 0.265
 Nu star 5.373
 95% Percentile of Chisquare (2k) 2.736
 90% Percentile 0.233
 95% Percentile 0.362
 99% Percentile 0.698

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0797
 SD 0.102
 SE of Mean 0.0364
 95% KM UTL with 95% Coverage 0.389
 95% KM Chebyshev UPL 0.549
 95% KM UPL (t) 0.28
 90% Percentile (z) 0.211
 95% Percentile (z) 0.248
 99% Percentile (z) 0.317

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.429
 95% Hawkins Wixley (HW) Approx. Gamma UPL 0.531
 95% WH Approx. Gamma UTL with 95% Coverage 0.963
 95% HW Approx. Gamma UTL with 95% Coverage 1.437

Note: DL/2 is not a recommended method.

Mercury**General Statistics**

Number of Valid Data 9
 Number of Distinct Detected Data 0

Number of Detected Data 0
 Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
 Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
 The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected	0.0043
Maximum Detected	0.023
Mean of Detected	0.0104
SD of Detected	0.0088
Minimum Non-Detect	0.02
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-5.449
Maximum Detected	-3.772
Mean of Detected	-4.813
SD of Detected	0.797
Minimum Non-Detect	-3.912
Maximum Non-Detect	-3.912

Warning: There are only 4 Distinct Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.819
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.873
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0102
SD	0.00539
95% UTL	95% Coverage 0.0265
	95% UPL (t) 0.0208
	90% Percentile (z) 0.0171
	95% Percentile (z) 0.0191
	99% Percentile (z) 0.0227

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-4.698
SD (Log Scale)	0.5
95% UTL	95% Coverage 0.0415
	95% UPL (t) 0.0243
	90% Percentile (z) 0.0173
	95% Percentile (z) 0.0208
	99% Percentile (z) 0.0292

Log ROS Method

Mean in Original Scale	0.00816
SD in Original Scale	0.00619
Mean in Log Scale	-5.005
SD in Log Scale	0.632
95% UTL	95% Coverage 0.0455
	95% UPL (t) 0.0231
	90% Percentile (z) 0.0151
	95% Percentile (z) 0.019
	99% Percentile (z) 0.0292

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.705
 Theta Star 0.0148
 nu star 5.643

A-D Test Statistic 0.429
 5% A-D Critical Value 0.66
 K-S Test Statistic 0.307
 5% K-S Critical Value 0.398

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00851
 Median 0.00643
 SD 0.00694
 k star 0.985
 Theta star 0.00864
 Nu star 17.73
 95% Percentile of Chisquare (2k) 5.933
 90% Percentile 0.0197
 95% Percentile 0.0256
 99% Percentile 0.0395

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0081

SD 0.00584

SE of Mean 0.00257

95% KM UTL with 95% Coverage 0.0258

95% KM Chebyshev UPL 0.0349

95% KM UPL (t) 0.0195

90% Percentile (z) 0.0156

95% Percentile (z) 0.0177

99% Percentile (z) 0.0217

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0291

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0318

95% WH Approx. Gamma UTL with 95% Coverage 0.0517

95% HW Approx. Gamma UTL with 95% Coverage 0.0617

Note: DL/2 is not a recommended method.

Selenium**General Statistics**

Number of Valid Data 9
 Number of Distinct Detected Data 0

Number of Detected Data 0
 Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
 Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
 The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver**General Statistics**

Number of Valid Data 9
 Number of Distinct Detected Data 1

Number of Detected Data 1
 Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
 It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Vanadium

General Statistics

Number of Valid Data	9	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	6

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful and reliable test statistics and estimates.
No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	66.67%
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Raw Statistics

Minimum Detected	0.0014
Maximum Detected	0.023
Mean of Detected	0.0113
SD of Detected	0.0109
Minimum Non-Detect	0.004
Maximum Non-Detect	0.004

Log-transformed Statistics

Minimum Detected	-6.571
Maximum Detected	-3.772
Mean of Detected	-4.997
SD of Detected	1.432
Minimum Non-Detect	-5.521
Maximum Non-Detect	-5.521

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.981
5% Shapiro Wilk Critical Value	0.767

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.955
5% Shapiro Wilk Critical Value	0.767

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean 0.00511

SD 0.00718

95% UTL 95% Coverage 0.0269

95% UPL (t) 0.0192

90% Percentile (z) 0.0143

95% Percentile (z) 0.0169

99% Percentile (z) 0.0218

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale) -5.809

SD (Log Scale) 0.94

95% UTL 95% Coverage 0.0519

95% UPL (t) 0.0189

90% Percentile (z) 0.01

95% Percentile (z) 0.0141

99% Percentile (z) 0.0267

Log ROS Method

Mean in Original Scale 0.00495

SD in Original Scale 0.00735

Mean in Log Scale -6.119

SD in Log Scale 1.338

95% UTL 95% Coverage 0.127

95% UPL (t) 0.0303

90% Percentile (z) 0.0122

95% Percentile (z) 0.0199

99% Percentile (z) 0.0495

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A

Theta Star N/A

nu star N/A

A-D Test Statistic N/A

5% A-D Critical Value N/A

K-S Test Statistic N/A

5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A

Median N/A

SD N/A

k star N/A

Theta star N/A

Nu star N/A

95% Percentile of Chisquare (2k) N/A

90% Percentile N/A

95% Percentile N/A

99% Percentile N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00471

SD 0.00695

SE of Mean 0.00284

95% KM UTL with 95% Coverage 0.0258

95% KM Chebyshev UPL 0.0367

95% KM UPL (t) 0.0183

90% Percentile (z) 0.0136

95% Percentile (z) 0.0161

99% Percentile (z) 0.0209

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Zinc

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc was not processed!

ATTACHMENT B.2

PROUCL OUTPUT
TOTAL METALS IN DEEP AQUIFER

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Total Metals - Deep.wst
Full Precision OFF
Confidence Coefficient 95%
Coverage 95%
Different or Future K Values 1
Number of Bootstrap Operations 10000

Aluminum

General Statistics

Total Number of Observations 10
Tolerance Factor 2.911
Number of Distinct Observations 10

Raw Statistics

Minimum 0.17
Maximum 3.7
Second Largest 1.65
First Quartile 0.504
Median 0.6
Third Quartile 1.033
Mean 0.993
Geometric Mean 0.685
SD 1.043
Coefficient of Variation 1.051
Skewness 2.3

Log-Transformed Statistics

Minimum -1.772
Maximum 1.308
Second Largest 0.501
First Quartile -0.686
Median -0.518
Third Quartile 0.0249
Mean -0.379
SD 0.882

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.72
Shapiro Wilk Critical Value 0.842

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.974
Shapiro Wilk Critical Value 0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 4.03
95% UPL (t) 2.999
90% Percentile (z) 2.33
95% Percentile (z) 2.709
99% Percentile (z) 3.42

Assuming Lognormal Distribution

95% UTL with 95% Coverage 8.928
95% UPL (t) 3.733
90% Percentile (z) 2.121
95% Percentile (z) 2.922
99% Percentile (z) 5.33

Gamma Distribution Test

k star 1.11
Theta Star 0.894
MLE of Mean 0.993
MLE of Standard Deviation 0.942
nu star 22.2

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic 0.406

5% A-D Critical Value 0.739

Nonparametric Statistics

90% Percentile 1.855

K-S Test Statistic 0.173

95% Percentile 2.778

5% K-S Critical Value 0.271

99% Percentile 3.516

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile 2.228

95% Percentile 2.867

99% Percentile 4.34

95% WH Approx. Gamma UPL 3.147

95% HW Approx. Gamma UPL 3.231

95% WH Approx. Gamma UTL with 95% Coverage 5.334

95% HW Approx. Gamma UTL with 95% Coverage 5.798

95% UTL with 95% Coverage 3.7

95% Percentile Bootstrap UTL with 95% Coverage 3.7

95% BCA Bootstrap UTL with 95% Coverage 3.7

95% UPL 3.7

95% Chebyshev UPL 5.763

Upper Threshold Limit Based upon IQR 1.826

Antimony

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 2.911

Percent Non-Detects 80.00%

Raw Statistics

Minimum Detected	0.000135
Maximum Detected	0.00025
Mean of Detected	0.0001925
SD of Detected	8.132E-05
Minimum Non-Detect	0.002
Maximum Non-Detect	0.002

Log-transformed Statistics

Minimum Detected	-8.91
Maximum Detected	-8.294
Mean of Detected	-8.602
SD of Detected	0.436
Minimum Non-Detect	-6.215
Maximum Non-Detect	-6.215

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0008385
SD	0.0003416
95% UTL	95% Coverage 0.00183
	95% UPL (t) 0.0015
	90% Percentile (z) 0.00128
	95% Percentile (z) 0.0014
	99% Percentile (z) 0.00163

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-7.247
SD (Log Scale)	0.729
95% UTL	95% Coverage 0.00595
	95% UPL (t) 0.00289
	90% Percentile (z) 0.00181
	95% Percentile (z) 0.00236
	99% Percentile (z) 0.00388

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL 95% Coverage	N/A
95% UPL (t)	N/A
90% Percentile (z)	N/A
95% Percentile (z)	N/A
99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A

A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0001925
SD	0.0000575
SE of Mean	0.0000575
95% KM UTL with 95% Coverage	0.0003599
95% KM Chebyshev UPL	0.0004554
95% KM UPL (t)	0.0003031
90% Percentile (z)	0.0002662
95% Percentile (z)	0.0002871
99% Percentile (z)	0.0003263

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Note: DL/2 is not a recommended method.

Arsenic

General Statistics

Number of Valid Data	10	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	2
Tolerance Factor	2.911	Percent Non-Detects	20.00%

Raw Statistics

Minimum Detected	0.004
Maximum Detected	0.054
Mean of Detected	0.0358
SD of Detected	0.018
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.521
Maximum Detected	-2.919
Mean of Detected	-3.569
SD of Detected	0.908
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.858
5% Shapiro Wilk Critical Value	0.818

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.729
5% Shapiro Wilk Critical Value	0.818

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0291
SD	0.0212
95% UTL	95% Coverage 0.0908
	95% UPL (t) 0.0699
	90% Percentile (z) 0.0563
	95% Percentile (z) 0.064
	99% Percentile (z) 0.0784

Maximum Likelihood Estimate(MLE) Method

Mean	0.0252
SD	0.0264
95% UTL with 95% Coverage	0.102
	95% UPL (t) 0.0758
	90% Percentile (z) 0.0589
	95% Percentile (z) 0.0685
	99% Percentile (z) 0.0865

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-4.054
SD (Log Scale)	1.298
95% UTL	95% Coverage 0.759
	95% UPL (t) 0.21
	90% Percentile (z) 0.0916
	95% Percentile (z) 0.147
	99% Percentile (z) 0.355

Log ROS Method

Mean in Original Scale	0.03
SD in Original Scale	0.02
95% UTL with 95% Coverage	0.395
95% BCA UTL with 95% Coverage	0.054
95% Bootstrap (%) UTL with 95% Coverage	0.054
	95% UPL (t) 0.146
	90% Percentile (z) 0.0769
	95% Percentile (z) 0.111
	99% Percentile (z) 0.22

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 1.491
Theta Star 0.024
nu star 23.85

A-D Test Statistic 0.931
5% A-D Critical Value 0.723
K-S Test Statistic 0.374
5% K-S Critical Value 0.297

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0294
Median 0.0385
SD 0.0208
k star 0.437
Theta star 0.0674
Nu star 8.736
95% Percentile of Chisquare (2k) 3.52

90% Percentile 0.0818
95% Percentile 0.119
99% Percentile 0.21

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0294
SD 0.0197
SE of Mean 0.00667
95% KM UTL with 95% Coverage 0.0868
95% KM Chebyshev UPL 0.12
95% KM UPL (t) 0.0673
90% Percentile (z) 0.0547
95% Percentile (z) 0.0618
99% Percentile (z) 0.0753

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.128
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.17
95% WH Approx. Gamma UTL with 95% Coverage 0.242
95% HW Approx. Gamma UTL with 95% Coverage 0.377

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations 10
Tolerance Factor 2.911

Number of Distinct Observations 9

Raw Statistics

Minimum 0.05
Maximum 0.31
Second Largest 0.18
First Quartile 0.0603
Median 0.0859
Third Quartile 0.168
Mean 0.123
Geometric Mean 0.102
SD 0.0829
Coefficient of Variation 0.675
Skewness 1.378

Log-Transformed Statistics

Minimum -2.996
Maximum -1.171
Second Largest -1.715
First Quartile -2.828
Median -2.455
Third Quartile -1.787
Mean -2.283
SD 0.63

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.832
Shapiro Wilk Critical Value 0.842

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.909
Shapiro Wilk Critical Value 0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.364
95% UPL (t) 0.282
90% Percentile (z) 0.229
95% Percentile (z) 0.259
99% Percentile (z) 0.315

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.639
95% UPL (t) 0.343
90% Percentile (z) 0.229
95% Percentile (z) 0.288
99% Percentile (z) 0.442

Gamma Distribution Test

k star 2.069
Theta Star 0.0593
MLE of Mean 0.123
MLE of Standard Deviation 0.0853
nu star 41.38

A-D Test Statistic 0.493
5% A-D Critical Value 0.733
K-S Test Statistic 0.226
5% K-S Critical Value 0.269

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 0.193
95% Percentile 0.252
99% Percentile 0.298

Assuming Gamma Distribution

90% Percentile 0.237
95% Percentile 0.288
99% Percentile 0.401

95% UTL with 95% Coverage 0.31
95% Percentile Bootstrap UTL with 95% Coverage 0.31
95% BCA Bootstrap UTL with 95% Coverage 0.31
95% UPL 0.31
95% Chebyshev UPL 0.502

95% WH Approx. Gamma UPL 0.308

Upper Threshold Limit Based upon IQR 0.328

95% HW Approx. Gamma UPL 0.315

95% WH Approx. Gamma UTL with 95% Coverage 0.47

95% HW Approx. Gamma UTL with 95% Coverage 0.498

Beryllium

General Statistics

Number of Valid Data 10

Number of Detected Data 0

Number of Distinct Detected Data 0

Number of Non-Detect Data 10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data 10

Number of Detected Data 0

Number of Distinct Detected Data 0

Number of Non-Detect Data 10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	10	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	7

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 2.911

Percent Non-Detects 70.00%

Raw Statistics

Minimum Detected	0.0025
Maximum Detected	0.0067
Mean of Detected	0.00408
SD of Detected	0.00228
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.991
Maximum Detected	-5.006
Mean of Detected	-5.597
SD of Detected	0.521
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.846
5% Shapiro Wilk Critical Value	0.767

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.894
5% Shapiro Wilk Critical Value	0.767

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00298
SD	0.00132
95% UTL	95% Coverage 0.00682
95% UPL (t)	0.00551
90% Percentile (z)	0.00467
95% Percentile (z)	0.00515
99% Percentile (z)	0.00605

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.873
SD (Log Scale)	0.311
95% UTL	95% Coverage 0.00696
95% UPL (t)	0.00512
90% Percentile (z)	0.00419
95% Percentile (z)	0.00469
99% Percentile (z)	0.0058

Log ROS Method

Mean in Original Scale	0.00326
SD in Original Scale	0.00143
Mean in Log Scale	-5.798
SD in Log Scale	0.388
95% UTL	95% Coverage 0.0094

95% UPL (t) 0.0064
90% Percentile (z) 0.00499
95% Percentile (z) 0.00575
99% Percentile (z) 0.00749

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A
Theta Star N/A
nu star N/A

A-D Test Statistic N/A
5% A-D Critical Value N/A
K-S Test Statistic N/A
5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A
Median N/A
SD N/A
k star N/A
Theta star N/A
Nu star N/A
95% Percentile of Chisquare (2k) N/A

90% Percentile N/A
95% Percentile N/A
99% Percentile N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00317

SD 0.00121

SE of Mean 0.0005039

95% KM UTL with 95% Coverage 0.00668

95% KM Chebyshev UPL 0.00868

95% KM UPL (t) 0.00549

90% Percentile (z) 0.00471

95% Percentile (z) 0.00515

99% Percentile (z) 0.00597

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 2.911

Percent Non-Detects 80.00%

Raw Statistics

Minimum Detected	0.0018
Maximum Detected	0.003
Mean of Detected	0.0024
SD of Detected	0.0008485
Minimum Non-Detect	0.007
Maximum Non-Detect	0.007

Log-transformed Statistics

Minimum Detected	-6.32
Maximum Detected	-5.809
Mean of Detected	-6.065
SD of Detected	0.361
Minimum Non-Detect	-4.962
Maximum Non-Detect	-4.962

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics**Normal Distribution Test with Detected Values Only**

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00328
SD	0.0005432
95% UTL	95% Coverage 0.00486
95% UPL (t)	0.00432
90% Percentile (z)	0.00398
95% Percentile (z)	0.00417
99% Percentile (z)	0.00454

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.737
SD (Log Scale)	0.211
95% UTL	95% Coverage 0.00595
95% UPL (t)	0.00483
90% Percentile (z)	0.00422
95% Percentile (z)	0.00456
99% Percentile (z)	0.00526

Log ROS Method

Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL 95% Coverage	N/A
95% UPL (t)	N/A
90% Percentile (z)	N/A
95% Percentile (z)	N/A
99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A

A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0024
SD	0.0006
SE of Mean	0.0006
95% KM UTL with 95% Coverage	0.00415
95% KM Chebyshev UPL	0.00514
95% KM UPL (t)	0.00355
90% Percentile (z)	0.00317
95% Percentile (z)	0.00339
99% Percentile (z)	0.0038

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Note: DL/2 is not a recommended method.

Copper

General Statistics

Number of Valid Data	10	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	4
Tolerance Factor	2.911	Percent Non-Detects	40.00%

Raw Statistics

Minimum Detected	0.0025
Maximum Detected	0.0091
Mean of Detected	0.00482
SD of Detected	0.00274
Minimum Non-Detect	0.002
Maximum Non-Detect	0.0037

Log-transformed Statistics

Minimum Detected	-5.991
Maximum Detected	-4.699
Mean of Detected	-5.462
SD of Detected	0.54
Minimum Non-Detect	-6.215
Maximum Non-Detect	-5.599

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	7
Number treated as Detected with Single DL	3
Single DL Non-Detect Percentage	70.00%

Warning: There are only 6 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.843
5% Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.888
5% Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00341
SD	0.00274
95% UTL	95% Coverage 0.0114
95% UPL (t)	0.00869
90% Percentile (z)	0.00693
95% Percentile (z)	0.00792
99% Percentile (z)	0.00979

Maximum Likelihood Estimate(MLE) Method

Mean	0.00137
SD	0.00463
95% UTL with 95% Coverage	0.0149
95% UPL (t)	0.0103
90% Percentile (z)	0.0073

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.948
SD (Log Scale)	0.762
95% UTL	95% Coverage 0.024
95% UPL (t)	0.0113
90% Percentile (z)	0.00694
95% Percentile (z)	0.00915
99% Percentile (z)	0.0154

Log ROS Method

Mean in Original Scale	0.00346
SD in Original Scale	0.0027
95% UTL with 95% Coverage	0.0217
95% BCA UTL with 95% Coverage	0.0091
95% Bootstrap (%) UTL with 95% Coverage	0.0091
95% UPL (t)	0.0107
90% Percentile (z)	0.0068

95% Percentile (z) 0.00899
99% Percentile (z) 0.0121

95% Percentile (z) 0.00881
99% Percentile (z) 0.0143

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 2.166
Theta Star 0.00222
nu star 26

A-D Test Statistic 0.451
5% A-D Critical Value 0.7
K-S Test Statistic 0.228
5% K-S Critical Value 0.333

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00295
Median 0.00258
SD 0.00316
k star 0.274
Theta star 0.0108
Nu star 5.474
95% Percentile of Chisquare (2k) 2.578

90% Percentile 0.00879
95% Percentile 0.0139
99% Percentile 0.0273

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0039

SD 0.00224

SE of Mean 0.0007768

95% KM UTL with 95% Coverage 0.0104

95% KM Chebyshev UPL 0.0141

95% KM UPL (t) 0.00821

90% Percentile (z) 0.00678

95% Percentile (z) 0.00759

99% Percentile (z) 0.00912

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.017

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0233

95% WH Approx. Gamma UTL with 95% Coverage 0.037

95% HW Approx. Gamma UTL with 95% Coverage 0.0622

Note: DL/2 is not a recommended method.

Iron

General Statistics

Total Number of Observations 10
Tolerance Factor 2.911

Number of Distinct Observations 10

Raw Statistics

Minimum 0.99
Maximum 7
Second Largest 4.4
First Quartile 2.125
Median 2.6
Third Quartile 3.358
Mean 3.057
Geometric Mean 2.711
SD 1.662
Coefficient of Variation 0.544
Skewness 1.578

Log-Transformed Statistics

Minimum -0.0101
Maximum 1.946
Second Largest 1.482
First Quartile 0.754
Median 0.955
Third Quartile 1.211
Mean 0.997
SD 0.519

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.864
Shapiro Wilk Critical Value 0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.962
Shapiro Wilk Critical Value 0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 7.896
95% UPL (t) 6.253
90% Percentile (z) 5.187
95% Percentile (z) 5.791
99% Percentile (z) 6.924

Assuming Lognormal Distribution

95% UTL with 95% Coverage 12.28
95% UPL (t) 7.353
90% Percentile (z) 5.272
95% Percentile (z) 6.366
99% Percentile (z) 9.067

Gamma Distribution Test

k star 3.088
Theta Star 0.99
MLE of Mean 3.057
MLE of Standard Deviation 1.74
nu star 61.76

A-D Test Statistic 0.317
5% A-D Critical Value 0.729
K-S Test Statistic 0.17
5% K-S Critical Value 0.268

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 4.66
95% Percentile 5.83
99% Percentile 6.766

Assuming Gamma Distribution

90% Percentile 5.39
95% Percentile 6.362
99% Percentile 8.468
95% WH Approx. Gamma UPL 6.691

95% UTL with 95% Coverage 7
95% Percentile Bootstrap UTL with 95% Coverage 7
95% BCA Bootstrap UTL with 95% Coverage 7
95% UPL 7
95% Chebyshev UPL 10.66
Upper Threshold Limit Based upon IQR 5.206

95% HW Approx. Gamma UPL 6.811
95% WH Approx. Gamma UTL with 95% Coverage 9.618
95% HW Approx. Gamma UTL with 95% Coverage 10.07

Lead

General Statistics

Number of Valid Data 10
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 9

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Total Number of Observations 10
Tolerance Factor 2.911

Number of Distinct Observations 9

Raw Statistics

Minimum 0.039
Maximum 0.18
Second Largest 0.167
First Quartile 0.0569
Median 0.072
Third Quartile 0.145
Mean 0.0981
Geometric Mean 0.0857
SD 0.053
Coefficient of Variation 0.54
Skewness 0.54

Log-Transformed Statistics

Minimum -3.244
Maximum -1.715
Second Largest -1.79
First Quartile -2.869
Median -2.637
Third Quartile -1.933
Mean -2.457
SD 0.55

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.863
Shapiro Wilk Critical Value 0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.906
Shapiro Wilk Critical Value 0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.252
95% UPL (t) 0.2
90% Percentile (z) 0.166
95% Percentile (z) 0.185
99% Percentile (z) 0.221

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.425
95% UPL (t) 0.247
90% Percentile (z) 0.173
95% Percentile (z) 0.212
99% Percentile (z) 0.308

Gamma Distribution Test

k star 2.774
Theta Star 0.0354
MLE of Mean 0.0981
MLE of Standard Deviation 0.0589
nu star 55.47

A-D Test Statistic 0.558
5% A-D Critical Value 0.73
K-S Test Statistic 0.229
5% K-S Critical Value 0.268

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 0.168
95% Percentile 0.174
99% Percentile 0.179

Assuming Gamma Distribution

90% Percentile 0.177
95% Percentile 0.211
99% Percentile 0.284

95% UTL with 95% Coverage 0.18
95% Percentile Bootstrap UTL with 95% Coverage 0.18
95% BCA Bootstrap UTL with 95% Coverage 0.18
95% UPL 0.18
95% Chebyshev UPL 0.34

95% WH Approx. Gamma UPL	0.223	Upper Threshold Limit Based upon IQR	0.277
95% HW Approx. Gamma UPL	0.228		
95% WH Approx. Gamma UTL with 95% Coverage	0.326		
95% HW Approx. Gamma UTL with 95% Coverage	0.343		

Mercury

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 2.911

Percent Non-Detects 80.00%

Raw Statistics

Minimum Detected 0.0055
Maximum Detected 0.0065
Mean of Detected 0.006
SD of Detected 0.0007071
Minimum Non-Detect 0.02
Maximum Non-Detect 0.02

Log-transformed Statistics

Minimum Detected -5.203
Maximum Detected -5.036
Mean of Detected -5.119
SD of Detected 0.118
Minimum Non-Detect -3.912
Maximum Non-Detect -3.912

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics**Normal Distribution Test with Detected Values Only**

Shapiro Wilk Test Statistic N/A
5% Shapiro Wilk Critical Value N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic N/A
5% Shapiro Wilk Critical Value N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
Mean 0.0092
SD 0.0017
95% UTL 95% Coverage 0.0142
95% UPL (t) 0.0125
90% Percentile (z) 0.0114
95% Percentile (z) 0.012
99% Percentile (z) 0.0132

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean (Log Scale) -4.708
SD (Log Scale) 0.22
95% UTL 95% Coverage 0.0171
95% UPL (t) 0.0138
90% Percentile (z) 0.012
95% Percentile (z) 0.013
99% Percentile (z) 0.0151

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

Mean in Original Scale N/A

SD in Original Scale N/A

Mean in Log Scale N/A

SD in Log Scale N/A

95% UTL 95% Coverage N/A

95% UPL (t) N/A

90% Percentile (z) N/A

95% Percentile (z) N/A

99% Percentile (z) N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A

Theta Star N/A

nu star N/A

A-D Test Statistic N/A

5% A-D Critical Value N/A

K-S Test Statistic N/A

5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A

Median N/A

SD N/A

k star N/A

Theta star N/A

Nu star N/A

95% Percentile of Chisquare (2k) N/A

90% Percentile N/A

95% Percentile N/A

99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.006

SD 0.0005

SE of Mean 0.0005

95% KM UTL with 95% Coverage 0.00746

95% KM Chebyshev UPL 0.00829

95% KM UPL (t) 0.00696

90% Percentile (z) 0.00664

95% Percentile (z) 0.00682

99% Percentile (z) 0.00716

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data 10

Number of Distinct Detected Data 0

Number of Detected Data 0

Number of Non-Detect Data 10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful and reliable test statistics and estimates.
No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	80.00%
------------------	-------	---------------------	--------

Raw Statistics

Minimum Detected	0.00019
Maximum Detected	0.00028
Mean of Detected	0.000235
SD of Detected	6.364E-05
Minimum Non-Detect	0.001
Maximum Non-Detect	0.0021

Log-transformed Statistics

Minimum Detected	-8.568
Maximum Detected	-8.181
Mean of Detected	-8.375
SD of Detected	0.274
Minimum Non-Detect	-6.908
Maximum Non-Detect	-6.166

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	10
Number treated as Detected with Single DL	0
Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only	Lognormal Distribution Test with Detected Values Only
--	---

Shapiro Wilk Test Statistic N/A
 5% Shapiro Wilk Critical Value N/A
Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
 Mean 0.000502
 SD 0.0002229
 95% UTL 95% Coverage 0.00115
 95% UPL (t) 0.0009305
 90% Percentile (z) 0.0007876
 95% Percentile (z) 0.0008686
 99% Percentile (z) 0.00102

Maximum Likelihood Estimate(MLE) Method N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A
 Theta Star N/A
 nu star N/A

A-D Test Statistic N/A
 5% A-D Critical Value N/A
 K-S Test Statistic N/A
 5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data
 Mean N/A
 Median N/A
 SD N/A
 k star N/A
 Theta star N/A
 Nu star N/A
 95% Percentile of Chisquare (2k) N/A
 90% Percentile N/A
 95% Percentile N/A
 99% Percentile N/A

Shapiro Wilk Test Statistic N/A
 5% Shapiro Wilk Critical Value N/A
Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method
 Mean (Log Scale) -7.681
 SD (Log Scale) 0.442
 95% UTL 95% Coverage 0.00167
 95% UPL (t) 0.00108
 90% Percentile (z) 0.0008128
 95% Percentile (z) 0.0009544
 99% Percentile (z) 0.00129

Log ROS Method
 Mean in Original Scale N/A
 SD in Original Scale N/A
 Mean in Log Scale N/A
 SD in Log Scale N/A
 95% UTL 95% Coverage N/A
 95% UPL (t) N/A
 90% Percentile (z) N/A
 95% Percentile (z) N/A
 99% Percentile (z) N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method
 Mean 0.000235
 SD 0.000045
 SE of Mean 0.000045
 95% KM UTL with 95% Coverage 0.000366
 95% KM Chebyshev UPL 0.0004407
 95% KM UPL (t) 0.0003215
 90% Percentile (z) 0.0002927
 95% Percentile (z) 0.000309
 99% Percentile (z) 0.0003397

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A
 95% Hawkins Wixley (HW) Approx. Gamma UPL N/A
 95% WH Approx. Gamma UTL with 95% Coverage N/A
 95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Vanadium

General Statistics

Number of Valid Data	10	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	2.911	Percent Non-Detects	30.00%

Raw Statistics

Minimum Detected	0.0013
Maximum Detected	0.01
Mean of Detected	0.00366
SD of Detected	0.00306
Minimum Non-Detect	0.004
Maximum Non-Detect	0.004

Log-transformed Statistics

Minimum Detected	-6.645
Maximum Detected	-4.605
Mean of Detected	-5.858
SD of Detected	0.732
Minimum Non-Detect	-5.521
Maximum Non-Detect	-5.521

Warning: There are only 7 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.792
5% Shapiro Wilk Critical Value	0.803

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.936
5% Shapiro Wilk Critical Value	0.803

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00316
SD	0.00262
95% UTL	95% Coverage 0.0108
95% UPL (t)	0.0082
90% Percentile (z)	0.00652
95% Percentile (z)	0.00747
99% Percentile (z)	0.00926

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.965
SD (Log Scale)	0.622
95% UTL	95% Coverage 0.0157
95% UPL (t)	0.00849
90% Percentile (z)	0.0057
95% Percentile (z)	0.00715
99% Percentile (z)	0.0109

Log ROS Method	
Mean in Original Scale	0.00321
SD in Original Scale	0.00263
Mean in Log Scale	-5.959
SD in Log Scale	0.651
95% UTL	95% Coverage 0.0172
95% UPL (t)	0.00902
90% Percentile (z)	0.00594
95% Percentile (z)	0.00753
99% Percentile (z)	0.0117

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 1.341
Theta Star 0.00273
nu star 18.78

A-D Test Statistic 0.346
5% A-D Critical Value 0.714
K-S Test Statistic 0.187
5% K-S Critical Value 0.315

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00331
Median 0.00253
SD 0.00269
k star 1.519
Theta star 0.00218
Nu star 30.37
95% Percentile of Chisquare (2k) 7.879

90% Percentile 0.00687
95% Percentile 0.00858
99% Percentile 0.0124

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00321

SD 0.00251

SE of Mean 0.0008813

95% KM UTL with 95% Coverage 0.0105

95% KM Chebyshev UPL 0.0147

95% KM UPL (t) 0.00804

90% Percentile (z) 0.00643

95% Percentile (z) 0.00734

99% Percentile (z) 0.00905

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.00931

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0096

95% WH Approx. Gamma UTL with 95% Coverage 0.0149

95% HW Approx. Gamma UTL with 95% Coverage 0.0162

Note: DL/2 is not a recommended method.

Zinc

General Statistics

Number of Valid Data 10
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 9

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc was not processed!

ATTACHMENT B.3

PROUCL OUTPUT

DISSOLVED METALS IN SHALLOW WATER BEARING UNIT

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Dissolved Metals - Shallow.wst
Full Precision OFF
Confidence Coefficient 95%
Coverage 95%
Different or Future K Values 1
Number of Bootstrap Operations 10000

Aluminum

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 2
Number of Detected Data 2
Number of Non-Detect Data 7

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful and reliable test statistics and estimates.
No statistics will be produced!

Tolerance Factor 3.031
Percent Non-Detects 77.78%

Raw Statistics

Minimum Detected 1.6
Maximum Detected 3.4
Mean of Detected 2.5
SD of Detected 1.273
Minimum Non-Detect 0.05
Maximum Non-Detect 0.05

Log-transformed Statistics

Minimum Detected 0.47
Maximum Detected 1.224
Mean of Detected 0.847
SD of Detected 0.533
Minimum Non-Detect -2.996
Maximum Non-Detect -2.996

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic N/A
5% Shapiro Wilk Critical Value N/A

Data not Normal at 5% Significance Level

Assuming Normal Distribution

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic N/A
5% Shapiro Wilk Critical Value N/A

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean	0.575
SD	1.181
95% UTL	95% Coverage 4.153
	95% UPL (t) 2.889
	90% Percentile (z) 2.088
	95% Percentile (z) 2.517
	99% Percentile (z) 3.321

Maximum Likelihood Estimate(MLE) Method N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A

A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

DL/2 Substitution Method

Mean (Log Scale)	-2.681
SD (Log Scale)	2.009
95% UTL	95% Coverage 30.21
	95% UPL (t) 3.514
	90% Percentile (z) 0.899
	95% Percentile (z) 1.865
	99% Percentile (z) 7.334

Log ROS Method

Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL	95% Coverage N/A
	95% UPL (t) N/A
	90% Percentile (z) N/A
	95% Percentile (z) N/A
	99% Percentile (z) N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	1.8
SD	0.566
SE of Mean	0.267
95% KM UTL with	95% Coverage 3.515
95% KM Chebyshev UPL	4.399
95% KM UPL (t)	2.909
90% Percentile (z)	2.525
95% Percentile (z)	2.73
99% Percentile (z)	3.116

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with	95% Coverage N/A
95% HW Approx. Gamma UTL with	95% Coverage N/A

Note: DL/2 is not a recommended method.

Antimony

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 77.78%

Raw Statistics

Minimum Detected	0.00014
Maximum Detected	0.0004
Mean of Detected	0.00027
SD of Detected	0.0001839
Minimum Non-Detect	0.002
Maximum Non-Detect	0.002

Log-transformed Statistics

Minimum Detected	-8.874
Maximum Detected	-7.824
Mean of Detected	-8.349
SD of Detected	0.742
Minimum Non-Detect	-6.215
Maximum Non-Detect	-6.215

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0008378
SD	0.0003284
95% UTL	95% Coverage 0.00183
	95% UPL (t) 0.00148
	90% Percentile (z) 0.00126
	95% Percentile (z) 0.00138
	99% Percentile (z) 0.0016

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-7.228
SD (Log Scale)	0.688
95% UTL	95% Coverage 0.00583
	95% UPL (t) 0.00279
	90% Percentile (z) 0.00175
	95% Percentile (z) 0.00225
	99% Percentile (z) 0.00359

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

Mean in Original Scale N/A

SD in Original Scale N/A

Mean in Log Scale N/A

SD in Log Scale N/A

95% UTL 95% Coverage N/A

95% UPL (t) N/A

90% Percentile (z) N/A

95% Percentile (z) N/A

99% Percentile (z) N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A

Theta Star N/A

nu star N/A

A-D Test Statistic N/A

5% A-D Critical Value N/A

K-S Test Statistic N/A

5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A

Median N/A

SD N/A

k star N/A

Theta star N/A

Nu star N/A

95% Percentile of Chisquare (2k) N/A

90% Percentile N/A

95% Percentile N/A

99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00027

SD 0.00013

SE of Mean 0.00013

95% KM UTL with 95% Coverage **0.000664**

95% KM Chebyshev UPL 0.0008673

95% KM UPL (t) 0.0005248

90% Percentile (z) 0.0004366

95% Percentile (z) 0.0004838

99% Percentile (z) 0.0005724

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor 3.031

Percent Non-Detects 77.78%

Raw Statistics

Minimum Detected	0.0066
Maximum Detected	0.0072
Mean of Detected	0.0069
SD of Detected	0.0004243
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.021
Maximum Detected	-4.934
Mean of Detected	-4.977
SD of Detected	0.0615
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00348
SD	0.00195
95% UTL	95% Coverage 0.00938
95% UPL (t)	0.00729
90% Percentile (z)	0.00597
95% Percentile (z)	0.00668
99% Percentile (z)	0.008

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.766
SD (Log Scale)	0.448
95% UTL	95% Coverage 0.0122
95% UPL (t)	0.00753
90% Percentile (z)	0.00556
95% Percentile (z)	0.00654
99% Percentile (z)	0.00888

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

Mean in Original Scale N/A

SD in Original Scale N/A

Mean in Log Scale N/A

SD in Log Scale N/A

95% UTL 95% Coverage N/A

95% UPL (t) N/A

90% Percentile (z) N/A

95% Percentile (z) N/A

99% Percentile (z) N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected) N/A

Theta Star N/A

nu star N/A

A-D Test Statistic N/A

5% A-D Critical Value N/A

K-S Test Statistic N/A

5% K-S Critical Value N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean N/A

Median N/A

SD N/A

k star N/A

Theta star N/A

Nu star N/A

95% Percentile of Chisquare (2k) N/A

90% Percentile N/A

95% Percentile N/A

99% Percentile N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00667

SD 0.0001886

SE of Mean 8.889E-05

95% KM UTL with 95% Coverage **0.00724**

95% KM Chebyshev UPL 0.00753

95% KM UPL (t) 0.00704

90% Percentile (z) 0.00691

95% Percentile (z) 0.00698

99% Percentile (z) 0.00711

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL N/A

95% Hawkins Wixley (HW) Approx. Gamma UPL N/A

95% WH Approx. Gamma UTL with 95% Coverage N/A

95% HW Approx. Gamma UTL with 95% Coverage N/A

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations 9
Tolerance Factor 3.031

Number of Distinct Observations 8

Raw Statistics

Minimum 0.027
Maximum 0.077
Second Largest 0.071
First Quartile 0.035
Median 0.045
Third Quartile 0.053
Mean 0.0474
Geometric Mean 0.0448
SD 0.0174
Coefficient of Variation 0.366
Skewness 0.726

Log-Transformed Statistics

Minimum -3.612
Maximum -2.564
Second Largest -2.645
First Quartile -3.352
Median -3.101
Third Quartile -2.937
Mean -3.106
SD 0.357

Warning: There are only 9 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.909
Shapiro Wilk Critical Value 0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.946
Shapiro Wilk Critical Value 0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage
95% UPL (t) 0.0815
90% Percentile (z) 0.0697
95% Percentile (z) 0.076
99% Percentile (z) 0.0879

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.132
95% UPL (t) 0.0903
90% Percentile (z) 0.0708
95% Percentile (z) 0.0806
99% Percentile (z) 0.103

Gamma Distribution Test

k star 5.978
Theta Star 0.00794
MLE of Mean 0.0474
MLE of Standard Deviation 0.0194
nu star 107.6

A-D Test Statistic 0.329
5% A-D Critical Value 0.722
K-S Test Statistic 0.217
5% K-S Critical Value 0.279

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 0.0722
95% Percentile 0.0746
99% Percentile 0.0765

Assuming Gamma Distribution		95% UTL with	95% Coverage	0.077
90% Percentile	0.0734	95% Percentile Bootstrap UTL with	95% Coverage	0.077
95% Percentile	0.0832	95% BCA Bootstrap UTL with	95% Coverage	0.077
99% Percentile	0.104		95% UPL	0.077
			95% Chebyshev UPL	0.127
95% WH Approx. Gamma UPL	0.0862	Upper Threshold Limit Based upon IQR 0.08		
95% HW Approx. Gamma UPL	0.0871			
95% WH Approx. Gamma UTL with	95% Coverage	0.116		
95% HW Approx. Gamma UTL with	95% Coverage	0.119		

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	124	Number of Detected Data	30
Number of Distinct Detected Data	12	Number of Non-Detect Data	94
Tolerance Factor	1.892	Percent Non-Detects	75.81%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.017
Mean of Detected	0.00812
SD of Detected	0.0037
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-4.075
Mean of Detected	-4.948
SD of Detected	0.588
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	124
Number treated as Detected with Single DL	0
Single DL Non-Detect Percentage	100.00%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.927

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.884
5% Shapiro Wilk Critical Value	0.927

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00525
SD	0.00333
95% UTL	95% Coverage 0.0115
95% UPL (t)	0.0108
90% Percentile (z)	0.00952
95% Percentile (z)	0.0107
99% Percentile (z)	0.013

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.432
SD (Log Scale)	0.596
95% UTL	95% Coverage 0.0135
95% UPL (t)	0.0118
90% Percentile (z)	0.00939
95% Percentile (z)	0.0117
99% Percentile (z)	0.0175

Log ROS Method

Mean in Original Scale	0.00422
SD in Original Scale	0.0032
Mean in Log Scale	-5.722
SD in Log Scale	0.719
95% UTL	95% Coverage 0.0128
95% UPL (t)	0.0108
90% Percentile (z)	0.00823
95% Percentile (z)	0.0107
99% Percentile (z)	0.0174

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.521
Theta Star	0.00231
nu star	211.3

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic 0.838
5% A-D Critical Value 0.75
K-S Test Statistic 0.18
5% K-S Critical Value 0.161

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00449
Median 0.00449
SD 0.00377
k star 0.36
Theta star 0.0125
Nu star 89.3
95% Percentile of Chisquare (2k) 3.102

90% Percentile 0.0129
95% Percentile 0.0193
99% Percentile 0.0357

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00429
SD 0.00323
SE of Mean 0.0004727
95% KM UTL with 95% Coverage 0.0104
95% KM Chebyshev UPL 0.0184
95% KM UPL (t) 0.00967
90% Percentile (z) 0.00844
95% Percentile (z) 0.00961
99% Percentile (z) 0.0118

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0178
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0228
95% WH Approx. Gamma UTL with 95% Coverage 0.0216
95% HW Approx. Gamma UTL with 95% Coverage 0.029

Note: DL/2 is not a recommended method.

Cobalt

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt was not processed!

Copper

General Statistics

Number of Valid Data	124	Number of Detected Data	23
Number of Distinct Detected Data	11	Number of Non-Detect Data	101
Tolerance Factor	1.892	Percent Non-Detects	81.45%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.027
Mean of Detected	0.00451
SD of Detected	0.00537
Minimum Non-Detect	0.001
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-3.612
Mean of Detected	-5.758
SD of Detected	0.798
Minimum Non-Detect	-6.908
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	123
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.19%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.567
5% Shapiro Wilk Critical Value	0.914

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.914

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00399
SD	0.00342
95% UTL	95% Coverage 0.0105
95% UPL (t)	0.00968
90% Percentile (z)	0.00837
95% Percentile (z)	0.00961
99% Percentile (z)	0.0119

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.788
SD (Log Scale)	0.719
95% UTL	95% Coverage 0.0119
95% UPL (t)	0.0101
90% Percentile (z)	0.0077
95% Percentile (z)	0.01
99% Percentile (z)	0.0163

Log ROS Method	
Mean in Original Scale	0.00217
SD in Original Scale	0.00275
Mean in Log Scale	-6.489
SD in Log Scale	0.805
95% UTL	95% Coverage 0.00697
95% UPL (t)	0.0058
90% Percentile (z)	0.00426
95% Percentile (z)	0.00571
99% Percentile (z)	0.00989

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.374
Theta Star	0.00329
nu star	63.18

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic 0.916
5% A-D Critical Value 0.76
K-S Test Statistic 0.173
5% K-S Critical Value 0.185

Data follow Appx. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution
Gamma ROS Statistics with Extrapolated Data
Mean 0.00241
Median 0.00164
SD 0.00324
k star 0.257
Theta star 0.00939
Nu star 63.72
95% Percentile of Chisquare (2k) 2.467
90% Percentile 0.00723
95% Percentile 0.0116
99% Percentile 0.0231

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00231

SD 0.0027

SE of Mean 0.0002981

95% KM UTL with 95% Coverage 0.00742

95% KM Chebyshev UPL 0.0141

95% KM UPL (t) 0.0068

90% Percentile (z) 0.00577

95% Percentile (z) 0.00675

99% Percentile (z) 0.00859

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0103

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0127

95% WH Approx. Gamma UTL with 95% Coverage 0.0128

95% HW Approx. Gamma UTL with 95% Coverage 0.0168

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	63	Number of Detected Data	52
Number of Distinct Detected Data	42	Number of Non-Detect Data	11
Tolerance Factor	2.007	Percent Non-Detects	17.46%

Raw Statistics

Minimum Detected	0.01
Maximum Detected	10.6
Mean of Detected	0.892
SD of Detected	1.769
Minimum Non-Detect	0.02
Maximum Non-Detect	0.1

Log-transformed Statistics

Minimum Detected	-4.605
Maximum Detected	2.361
Mean of Detected	-1.24
SD of Detected	1.473
Minimum Non-Detect	-3.912
Maximum Non-Detect	-2.303

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	20
Number treated as Detected with Single DL	43
Single DL Non-Detect Percentage	31.75%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.359
5% Lilliefors Critical Value	0.123

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.163
5% Lilliefors Critical Value	0.123

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.741
SD	1.638
95% UTL	95% Coverage 4.028
95% UPL (t)	3.498
90% Percentile (z)	2.84
95% Percentile (z)	3.435
99% Percentile (z)	4.552

Maximum Likelihood Estimate(MLE) Method

Mean	0.253
SD	2.079
95% UTL with	95% Coverage 4.423
95% UPL (t)	3.751
90% Percentile (z)	2.917
95% Percentile (z)	3.672
99% Percentile (z)	5.088

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.536
Theta Star	1.663
nu star	55.75

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-1.7
SD (Log Scale)	1.707
95% UTL	95% Coverage 5.615
95% UPL (t)	3.232
90% Percentile (z)	1.629
95% Percentile (z)	3.028
99% Percentile (z)	9.694

Log ROS Method

Mean in Original Scale	0.74
SD in Original Scale	1.639
95% UTL with	95% Coverage 6
95% BCA UTL with	95% Coverage 4.36
95% Bootstrap (%) UTL with	95% Coverage 4.4
95% UPL (t)	3.391
90% Percentile (z)	1.671
95% Percentile (z)	3.171
99% Percentile (z)	10.55

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 3.349
5% A-D Critical Value 0.81
K-S Test Statistic 0.273
5% K-S Critical Value 0.13

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.736
Median 0.19
SD 1.64
k star 0.23
Theta star 3.205
Nu star 28.94
95% Percentile of Chisquare (2k) 2.279

90% Percentile 2.22
95% Percentile 3.652
99% Percentile 7.511

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.739
SD 1.626
SE of Mean 0.207
95% KM UTL with 95% Coverage 4.002
95% KM Chebyshev UPL 7.882
95% KM UPL (t) 3.476
90% Percentile (z) 2.823
95% Percentile (z) 3.414
99% Percentile (z) 4.522

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 2.779
95% Hawkins Wixley (HW) Approx. Gamma UPL 3.177
95% WH Approx. Gamma UTL with 95% Coverage 3.775
95% HW Approx. Gamma UTL with 95% Coverage 4.619

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 0

Number of Detected Data 0
Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Number of Valid Data	59	Number of Detected Data	45
Number of Distinct Detected Data	41	Number of Non-Detect Data	14
Tolerance Factor	2.02	Percent Non-Detects	23.73%

Raw Statistics

Minimum Detected	0.0016
Maximum Detected	0.448
Mean of Detected	0.123
SD of Detected	0.117
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.438
Maximum Detected	-0.803
Mean of Detected	-2.776
SD of Detected	1.411
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	22
Number treated as Detected with Single DL	37
Single DL Non-Detect Percentage	37.29%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.867
5% Shapiro Wilk Critical Value	0.945

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.928
5% Shapiro Wilk Critical Value	0.945

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0945
SD	0.114
95% UTL	95% Coverage 0.326
95% UPL (t)	0.287
90% Percentile (z)	0.241
95% Percentile (z)	0.283
99% Percentile (z)	0.361

Maximum Likelihood Estimate(MLE) Method

Mean	0.0588
SD	0.156
95% UTL with	95% Coverage 0.373
95% UPL (t)	0.321
90% Percentile (z)	0.258
95% Percentile (z)	0.315
99% Percentile (z)	0.421

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.823
Theta Star	0.149
nu star	74.03

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-3.497
SD (Log Scale)	1.804
95% UTL	95% Coverage 1.16
95% UPL (t)	0.634
90% Percentile (z)	0.306
95% Percentile (z)	0.589
99% Percentile (z)	2.015

Log ROS Method

Mean in Original Scale	0.0948
SD in Original Scale	0.114
95% UTL with	95% Coverage 1.082
95% BCA UTL with	95% Coverage 0.426
95% Bootstrap (%) UTL with	95% Coverage 0.426
95% UPL (t)	0.605
90% Percentile (z)	0.3
95% Percentile (z)	0.564
99% Percentile (z)	1.84

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic 0.475
5% A-D Critical Value 0.784
K-S Test Statistic 0.109
5% K-S Critical Value 0.136

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0937
Median 0.042
SD 0.115
k star 0.236
Theta star 0.397
Nu star 27.84
95% Percentile of Chisquare (2k) 2.323

90% Percentile 0.282
95% Percentile 0.461
99% Percentile 0.942

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0943
SD 0.114
SE of Mean 0.0149
95% KM UTL with 95% Coverage 0.324
95% KM Chebyshev UPL 0.593
95% KM UPL (t) 0.286
90% Percentile (z) 0.24
95% Percentile (z) 0.281
99% Percentile (z) 0.358

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.402
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.508
95% WH Approx. Gamma UTL with 95% Coverage 0.547
95% HW Approx. Gamma UTL with 95% Coverage 0.75

Note: DL/2 is not a recommended method.

Mercury

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	124	Number of Detected Data	42
Number of Distinct Detected Data	19	Number of Non-Detect Data	82
Tolerance Factor	1.892	Percent Non-Detects	66.13%

Raw Statistics

Minimum Detected	0.002
Maximum Detected	0.062
Mean of Detected	0.0101
SD of Detected	0.01
Minimum Non-Detect	0.005
Maximum Non-Detect	0.04

Log-transformed Statistics

Minimum Detected	-6.215
Maximum Detected	-2.781
Mean of Detected	-4.836
SD of Detected	0.623
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.219

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	123
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.19%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.567
5% Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9
5% Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00674
SD	0.00736
95% UTL	95% Coverage 0.0207
95% UPL (t)	0.019
90% Percentile (z)	0.0162
95% Percentile (z)	0.0189
99% Percentile (z)	0.0239

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.336
SD (Log Scale)	0.762
95% UTL	95% Coverage 0.0203
95% UPL (t)	0.0171
90% Percentile (z)	0.0128
95% Percentile (z)	0.0168
99% Percentile (z)	0.0283

Log ROS Method

Mean in Original Scale	0.00542
SD in Original Scale	0.00684
Mean in Log Scale	-5.584
SD in Log Scale	0.808
95% UTL	95% Coverage 0.0173
95% UPL (t)	0.0144
90% Percentile (z)	0.0106
95% Percentile (z)	0.0142
99% Percentile (z)	0.0246

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.107
Theta Star	0.00478
nu star	177

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 2.244
5% A-D Critical Value 0.758
K-S Test Statistic 0.238
5% K-S Critical Value 0.138

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00499
Median 0.00401
SD 0.00736
k star 0.249
Theta star 0.02
Nu star 61.73
95% Percentile of Chisquare (2k) 2.413

90% Percentile 0.015
95% Percentile 0.0242
99% Percentile 0.0487

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00589
SD 0.00669
SE of Mean 0.0006795
95% KM UTL with 95% Coverage 0.0185

95% KM Chebyshev UPL 0.0351

95% KM UPL (t) 0.017

90% Percentile (z) 0.0145

95% Percentile (z) 0.0169

99% Percentile (z) 0.0214

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0211

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0264

95% WH Approx. Gamma UTL with 95% Coverage 0.0263

95% HW Approx. Gamma UTL with 95% Coverage 0.0348

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 0

Number of Detected Data 0
Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 0

Number of Detected Data 0
Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected	0.00021
Maximum Detected	0.00084
Mean of Detected	0.0003925
SD of Detected	0.0002994
Minimum Non-Detect	0.001
Maximum Non-Detect	0.001

Log-transformed Statistics

Minimum Detected	-8.468
Maximum Detected	-7.082
Mean of Detected	-8.015
SD of Detected	0.631
Minimum Non-Detect	-6.908
Maximum Non-Detect	-6.908

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.708
5% Shapiro Wilk Critical Value	0.748

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.78
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0004522
SD	0.0001919
95% UTL 95% Coverage	0.00103
95% UPL (t)	0.0008283
90% Percentile (z)	0.0006981
95% Percentile (z)	0.0007678
99% Percentile (z)	0.0008986

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-7.785
SD (Log Scale)	0.444
95% UTL 95% Coverage	0.0016
95% UPL (t)	0.0009928
90% Percentile (z)	0.0007346
95% Percentile (z)	0.0008631
99% Percentile (z)	0.00117

Log ROS Method	
Mean in Original Scale	0.0003832
SD in Original Scale	0.0002364
Mean in Log Scale	-8.015
SD in Log Scale	0.561
95% UTL 95% Coverage	0.00181
95% UPL (t)	0.0009918
90% Percentile (z)	0.0006778
95% Percentile (z)	0.000831
99% Percentile (z)	0.00122

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.931
Theta Star 0.0004217
nu star 7.446

A-D Test Statistic 0.683
5% A-D Critical Value 0.659
K-S Test Statistic 0.412
5% K-S Critical Value 0.397

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0003929
Median 0.00027
SD 0.0002572
k star 1.737
Theta star 0.0002262
Nu star 31.26
95% Percentile of Chisquare (2k) 8.621

90% Percentile 0.0007902
95% Percentile 0.0009752
99% Percentile 0.00139

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0003925
SD 0.0002593
SE of Mean 0.0001497
95% KM UTL with 95% Coverage 0.00118
95% KM Chebyshev UPL 0.00158
95% KM UPL (t) 0.0009007
90% Percentile (z) 0.0007248
95% Percentile (z) 0.000819
99% Percentile (z) 0.0009956

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.00106
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.00111
95% WH Approx. Gamma UTL with 95% Coverage 0.00171
95% HW Approx. Gamma UTL with 95% Coverage 0.00188

Note: DL/2 is not a recommended method.

Vanadium**General Statistics**

Number of Valid Data 9
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium was not processed!

Zinc

General Statistics

Number of Valid Data	124	Number of Detected Data	71
Number of Distinct Detected Data	27	Number of Non-Detect Data	53
Tolerance Factor	1.892	Percent Non-Detects	42.74%

Raw Statistics

Minimum Detected	0.005
Maximum Detected	0.15
Mean of Detected	0.0212
SD of Detected	0.023
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-5.298
Maximum Detected	-1.897
Mean of Detected	-4.174
SD of Detected	0.729
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	100
Number treated as Detected with Single DL	24
Single DL Non-Detect Percentage	80.65%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.296
5% Lilliefors Critical Value	0.105

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.134
5% Lilliefors Critical Value	0.105

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0142
SD	0.0193
95% UTL	95% Coverage 0.0507
95% UPL (t)	0.0463
90% Percentile (z)	0.0389
95% Percentile (z)	0.046
99% Percentile (z)	0.0591

Maximum Likelihood Estimate(MLE) Method

Mean	-0.0233
SD	0.048
95% UTL with	95% Coverage 0.0675
95% UPL (t)	0.0566
90% Percentile (z)	0.0382
95% Percentile (z)	0.0557
99% Percentile (z)	0.0884

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.641
Theta Star	0.0129
nu star	233.1

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-4.755
SD (Log Scale)	0.956
95% UTL	95% Coverage 0.0526
95% UPL (t)	0.0423
90% Percentile (z)	0.0293
95% Percentile (z)	0.0415
99% Percentile (z)	0.0796

Log ROS Method

Mean in Original Scale	0.0139
SD in Original Scale	0.0194
95% UTL with	95% Coverage 0.0567
95% BCA UTL with	95% Coverage 0.06
95% Bootstrap (%) UTL with	95% Coverage 0.06
95% UPL (t)	0.0447
90% Percentile (z)	0.0301
95% Percentile (z)	0.0439
99% Percentile (z)	0.0888

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 3.807
5% A-D Critical Value 0.767
K-S Test Statistic 0.202
5% K-S Critical Value 0.107

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0129
Median 0.00907
SD 0.0202
k star 0.21
Theta star 0.0615
Nu star 52.05
95% Percentile of Chisquare (2k) 2.136

90% Percentile 0.0391
95% Percentile 0.0657
99% Percentile 0.138

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0147
SD 0.0189
SE of Mean 0.00172
95% KM UTL with 95% Coverage 0.0505
95% KM Chebyshev UPL 0.0976
95% KM UPL (t) 0.0462
90% Percentile (z) 0.039
95% Percentile (z) 0.0458
99% Percentile (z) 0.0588

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0553
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0694
95% WH Approx. Gamma UTL with 95% Coverage 0.0694
95% HW Approx. Gamma UTL with 95% Coverage 0.0926

Note: DL/2 is not a recommended method.

ATTACHMENT B.4

PROUCL OUTPUT
DISSOLVED METALS IN DEEP AQUIFER

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Dissolved Metals - Deep.wst
Full Precision OFF
Confidence Coefficient 95%
Coverage 95%
Different or Future K Values 1
Number of Bootstrap Operations 10000

Aluminum

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
Tolerance Factor	3.031	Percent Non-Detects	44.44%

Raw Statistics

Minimum Detected 0.019
Maximum Detected 0.1
Mean of Detected 0.0575
SD of Detected 0.0341
Minimum Non-Detect 0.05
Maximum Non-Detect 0.05

Log-transformed Statistics

Minimum Detected -3.963
Maximum Detected -2.303
Mean of Detected -3.024
SD of Detected 0.679
Minimum Non-Detect -2.996
Maximum Non-Detect -2.996

Warning: There are only 5 Detected Values in this data

**Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions**

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.939
5% Shapiro Wilk Critical Value 0.762

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.952
5% Shapiro Wilk Critical Value 0.762

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
Mean 0.0431
SD 0.0296
95% UTL 95% Coverage 0.133
95% UPL (t) 0.101
90% Percentile (z) 0.081
95% Percentile (z) 0.0917
99% Percentile (z) 0.112

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean (Log Scale) -3.319
SD (Log Scale) 0.594
95% UTL 95% Coverage 0.219
95% UPL (t) 0.116
90% Percentile (z) 0.0775
95% Percentile (z) 0.0962
99% Percentile (z) 0.144

Log ROS Method
Mean in Original Scale 0.0466

SD in Original Scale 0.0285

Mean in Log Scale -3.224

SD in Log Scale 0.59

95% UTL 95% Coverage 0.238

95% UPL (t) 0.127

90% Percentile (z) 0.0848

95% Percentile (z) 0.105

99% Percentile (z) 0.157

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 1.389

Theta Star 0.0414

nu star 13.89

A-D Test Statistic 0.242

5% A-D Critical Value 0.682

K-S Test Statistic 0.222

5% K-S Critical Value 0.359

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0479

Median 0.0456

SD 0.0303

k star 1.623

Theta star 0.0295

Nu star 29.21

95% Percentile of Chisquare (2k) 8.236

90% Percentile 0.0979

95% Percentile 0.122

99% Percentile 0.175

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0471

SD 0.0269

SE of Mean 0.0111

95% KM UTL with 95% Coverage 0.129

95% KM Chebyshev UPL 0.171

95% KM UPL (t) 0.0998

90% Percentile (z) 0.0815

95% Percentile (z) 0.0913

99% Percentile (z) 0.11

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.133

95% Hawkins Wixley (HW) Approx. Gamma UPL 0.141

95% WH Approx. Gamma UTL with 95% Coverage 0.217

95% HW Approx. Gamma UTL with 95% Coverage 0.243

Note: DL/2 is not a recommended method.

Antimony

General Statistics

Number of Valid Data 9

Number of Distinct Detected Data 1

Number of Detected Data 1

Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	2
Tolerance Factor	3.031	Percent Non-Detects	22.22%

Raw Statistics

Minimum Detected	0.014
Maximum Detected	0.048
Mean of Detected	0.0368
SD of Detected	0.0113
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-4.269
Maximum Detected	-3.037
Mean of Detected	-3.364
SD of Detected	0.419
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.845
5% Shapiro Wilk Critical Value	0.803

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.728
5% Shapiro Wilk Critical Value	0.803

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0292
SD	0.018
95% UTL	95% Coverage 0.0838
	95% UPL (t) 0.0645
	90% Percentile (z) 0.0523
	95% Percentile (z) 0.0588
	99% Percentile (z) 0.0711

Maximum Likelihood Estimate(MLE) Method

Mean	0.0275
SD	0.0202
95% UTL with	95% Coverage 0.0886
	95% UPL (t) 0.067
	90% Percentile (z) 0.0533
	95% Percentile (z) 0.0606
	99% Percentile (z) 0.0744

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-3.947
SD (Log Scale)	1.214
95% UTL	95% Coverage 0.766
	95% UPL (t) 0.209
	90% Percentile (z) 0.0915
	95% Percentile (z) 0.142
	99% Percentile (z) 0.325

Log ROS Method

Mean in Original Scale	0.0319
SD in Original Scale	0.0138
95% UTL with	95% Coverage 0.14
	95% BCA UTL with
	95% Coverage 0.048
95% Bootstrap (%) UTL with	95% Coverage 0.048
	95% UPL (t) 0.0799
	90% Percentile (z) 0.0561
	95% Percentile (z) 0.0678
	99% Percentile (z) 0.0967

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 4.883
Theta Star 0.00753
nu star 68.37

A-D Test Statistic 0.794
5% A-D Critical Value 0.709
K-S Test Statistic 0.346
5% K-S Critical Value 0.312

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0293
Median 0.036
SD 0.0179
k star 0.428
Theta star 0.0684
Nu star 7.708
95% Percentile of Chisquare (2k) 3.475

90% Percentile 0.0818
95% Percentile 0.119
99% Percentile 0.212

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0317
SD 0.0132
SE of Mean 0.00477
95% KM UTL with 95% Coverage 0.0719
95% KM Chebyshev UPL 0.0926
95% KM UPL (t) 0.0577
90% Percentile (z) 0.0487
95% Percentile (z) 0.0535
99% Percentile (z) 0.0625

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.129
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.178
95% WH Approx. Gamma UTL with 95% Coverage 0.25
95% HW Approx. Gamma UTL with 95% Coverage 0.413

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations 9
Tolerance Factor 3.031

Number of Distinct Observations 9

Raw Statistics

Minimum 0.042
Maximum 0.33
Second Largest 0.17
First Quartile 0.049
Median 0.08
Third Quartile 0.16
Mean 0.123
Geometric Mean 0.0978
SD 0.0927
Coefficient of Variation 0.755
Skewness 1.518

Log-Transformed Statistics

Minimum -3.17
Maximum -1.109
Second Largest -1.772
First Quartile -3.016
Median -2.526
Third Quartile -1.833
Mean -2.325
SD 0.708

Warning: There are only 9 Values in this data

**Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions**

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.824
Shapiro Wilk Critical Value 0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.921
Shapiro Wilk Critical Value 0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.404
95% UPL (t) 0.305
90% Percentile (z) 0.242
95% Percentile (z) 0.275
99% Percentile (z) 0.339

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.835
95% UPL (t) 0.392
90% Percentile (z) 0.242
95% Percentile (z) 0.313
99% Percentile (z) 0.507

Gamma Distribution Test

k star 1.637
Theta Star 0.0751
MLE of Mean 0.123
MLE of Standard Deviation 0.0961
nu star 29.46

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

A-D Test Statistic 0.431
5% A-D Critical Value 0.729
K-S Test Statistic 0.206
5% K-S Critical Value 0.282

90% Percentile 0.202
95% Percentile 0.266
99% Percentile 0.317

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution		95% UTL with 95% Coverage	0.33
90% Percentile	0.251	95% Percentile Bootstrap UTL with 95% Coverage	0.33
95% Percentile	0.311	95% BCA Bootstrap UTL with 95% Coverage	0.33
99% Percentile	0.446	95% UPL	0.33
		95% Chebyshev UPL	0.549
95% WH Approx. Gamma UPL	0.34	Upper Threshold Limit Based upon IQR	0.327
95% HW Approx. Gamma UPL	0.349		
95% WH Approx. Gamma UTL with 95% Coverage	0.553		
95% HW Approx. Gamma UTL with 95% Coverage	0.596		

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	117	Number of Detected Data	20
Number of Distinct Detected Data	10	Number of Non-Detect Data	97
Tolerance Factor	1.9	Percent Non-Detects	82.91%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.032
Mean of Detected	0.00925
SD of Detected	0.00614
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-3.442
Mean of Detected	-4.883
SD of Detected	0.719
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	116
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.15%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.684
5% Shapiro Wilk Critical Value	0.905

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.805
5% Shapiro Wilk Critical Value	0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00534
SD	0.00391
95% UTL	95% Coverage 0.0128
95% UPL (t)	0.0119
90% Percentile (z)	0.0104
95% Percentile (z)	0.0118
99% Percentile (z)	0.0144

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.429
SD (Log Scale)	0.609
95% UTL	95% Coverage 0.014
95% UPL (t)	0.0121
90% Percentile (z)	0.00958
95% Percentile (z)	0.0119
99% Percentile (z)	0.0181

Log ROS Method

Mean in Original Scale	0.00381
SD in Original Scale	0.00386
Mean in Log Scale	-5.916
SD in Log Scale	0.829
95% UTL	95% Coverage 0.013
95% UPL (t)	0.0107
90% Percentile (z)	0.0078
95% Percentile (z)	0.0105
99% Percentile (z)	0.0185

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.291
Theta Star	0.00404
nu star	91.62

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 1.522
5% A-D Critical Value 0.749
K-S Test Statistic 0.261
5% K-S Critical Value 0.195

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.00449
Median 0.00391
SD 0.00456
k star 0.289
Theta star 0.0155
Nu star 67.74
95% Percentile of Chisquare (2k) 2.679

90% Percentile 0.0133
95% Percentile 0.0208
99% Percentile 0.0403

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.00363
SD 0.00395
SE of Mean 0.00056
95% KM UTL with 95% Coverage 0.0111
95% KM Chebyshev UPL 0.0209
95% KM UPL (t) 0.0102
90% Percentile (z) 0.00869
95% Percentile (z) 0.0101
99% Percentile (z) 0.0128

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0189
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0242
95% WH Approx. Gamma UTL with 95% Coverage 0.0234
95% HW Approx. Gamma UTL with 95% Coverage 0.0317

Note: DL/2 is not a recommended method.

Cobalt

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 0

Number of Detected Data 0
Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt was not processed!

Copper

General Statistics

Number of Valid Data 117
Number of Distinct Detected Data 9
Tolerance Factor 1.9

Number of Detected Data 17
Number of Non-Detect Data 100
Percent Non-Detects 85.47%

Raw Statistics

Minimum Detected 0.001
Maximum Detected 0.203
Mean of Detected 0.0198
SD of Detected 0.0482
Minimum Non-Detect 0.001
Maximum Non-Detect 0.02

Log-transformed Statistics

Minimum Detected -6.908
Maximum Detected -1.595
Mean of Detected -5.377
SD of Detected 1.636
Minimum Non-Detect -6.908
Maximum Non-Detect -3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL 111
Number treated as Detected with Single DL 6
Single DL Non-Detect Percentage 94.87%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.413
5% Shapiro Wilk Critical Value 0.892

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic 0.845
5% Shapiro Wilk Critical Value 0.892

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method
Mean 0.00629
SD 0.0189
95% UTL 95% Coverage 0.0423
95% UPL (t) 0.0378
90% Percentile (z) 0.0305
95% Percentile (z) 0.0374
99% Percentile (z) 0.0503

Maximum Likelihood Estimate(MLE) Method

Mean -0.156
SD 0.106
95% UTL with 95% Coverage 0.0457

95% UPL (t) 0.0208
90% Percentile (z) -0.02
95% Percentile (z) 0.0186
99% Percentile (z) 0.091

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 0.406
Theta Star 0.0487
nu star 13.8

Assuming Lognormal Distribution

DL/2 Substitution Method
Mean (Log Scale) -5.72
SD (Log Scale) 0.932
95% UTL 95% Coverage 0.0193
95% UPL (t) 0.0155
90% Percentile (z) 0.0108
95% Percentile (z) 0.0152
99% Percentile (z) 0.0287

Log ROS Method

Mean in Original Scale 0.00383
SD in Original Scale 0.0191
95% UTL with 95% Coverage 0.0149
95% BCA UTL with 95% Coverage 0.0212
95% Bootstrap (%) UTL with 95% Coverage 0.0212
95% UPL (t) 0.0102
90% Percentile (z) 0.00546
95% Percentile (z) 0.00985
99% Percentile (z) 0.0298

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 1.585
5% A-D Critical Value 0.81
K-S Test Statistic 0.249
5% K-S Critical Value 0.223

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution
Gamma ROS Statistics with Extrapolated Data
Mean 0.00624
Median 0.000001
SD 0.0201
k star 0.149
Theta star 0.0419
Nu star 34.85
95% Percentile of Chisquare (2k) 1.642

90% Percentile 0.0185
95% Percentile 0.0344
99% Percentile 0.0806

Nonparametric Statistics

Kaplan-Meier (KM) Method
Mean 0.00389
SD 0.019
SE of Mean 0.00181

95% KM UTL with 95% Coverage 0.04
95% KM Chebyshev UPL 0.087
95% KM UPL (t) 0.0355
90% Percentile (z) 0.0282
95% Percentile (z) 0.0351
99% Percentile (z) 0.0481

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0221
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0228
95% WH Approx. Gamma UTL with 95% Coverage 0.0292
95% HW Approx. Gamma UTL with 95% Coverage 0.0322

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	58	Number of Detected Data	53
Number of Distinct Detected Data	46	Number of Non-Detect Data	5
Tolerance Factor	2.024	Percent Non-Detects	8.62%

Raw Statistics

Minimum Detected	0.02
Maximum Detected	2.55
Mean of Detected	0.815
SD of Detected	0.746
Minimum Non-Detect	0.01
Maximum Non-Detect	0.1

Log-transformed Statistics

Minimum Detected	-3.912
Maximum Detected	0.936
Mean of Detected	-0.84
SD of Detected	1.322
Minimum Non-Detect	-4.605
Maximum Non-Detect	-2.303

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	11
Number treated as Detected with Single DL	47
Single DL Non-Detect Percentage	18.97%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.208
5% Lilliefors Critical Value	0.122

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.148
5% Lilliefors Critical Value	0.122

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.747
SD	0.747
95% UTL	95% Coverage 2.26
95% UPL (t)	2.007
90% Percentile (z)	1.705
95% Percentile (z)	1.976
99% Percentile (z)	2.486

Maximum Likelihood Estimate(MLE) Method

Mean	0.661
SD	0.858
95% UTL with	95% Coverage 2.398
95% UPL (t)	2.108
90% Percentile (z)	1.761
95% Percentile (z)	2.073
99% Percentile (z)	2.657

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.877
Theta Star	0.93
nu star	92.99

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-1.133
SD (Log Scale)	1.617
95% UTL	95% Coverage 8.5
95% UPL (t)	4.922
90% Percentile (z)	2.558
95% Percentile (z)	4.603
99% Percentile (z)	13.86

Log ROS Method

Mean in Original Scale	0.748
SD in Original Scale	0.747
95% UTL with	95% Coverage 6.918
95% BCA UTL with	95% Coverage 2.4
95% Bootstrap (%) UTL with	95% Coverage 2.423
95% UPL (t)	4.186
90% Percentile (z)	2.293
95% Percentile (z)	3.935
99% Percentile (z)	10.84

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 1.181
5% A-D Critical Value 0.784
K-S Test Statistic 0.128
5% K-S Critical Value 0.126

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution
Gamma ROS Statistics with Extrapolated Data
Mean 0.745
Median 0.325
SD 0.749
k star 0.387
Theta star 1.926
Nu star 44.89
95% Percentile of Chisquare (2k) 3.252

90% Percentile 2.117
95% Percentile 3.132
99% Percentile 5.692

Nonparametric Statistics

Kaplan-Meier (KM) Method
Mean 0.747
SD 0.74
SE of Mean 0.0982
95% KM UTL with 95% Coverage 2.246
95% KM Chebyshev UPL 4.003
95% KM UPL (t) 1.996
90% Percentile (z) 1.696
95% Percentile (z) 1.965
99% Percentile (z) 2.47

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 2.772
95% Hawkins Wixley (HW) Approx. Gamma UPL 3.355
95% WH Approx. Gamma UTL with 95% Coverage 3.617
95% HW Approx. Gamma UTL with 95% Coverage 4.643

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data 9
Number of Distinct Detected Data 0

Number of Detected Data 0
Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Number of Valid Data	52	Number of Detected Data	51
Number of Distinct Detected Data	41	Number of Non-Detect Data	1
Tolerance Factor	2.049	Percent Non-Detects	1.92%

Raw Statistics

Minimum Detected	0.0036
Maximum Detected	0.577
Mean of Detected	0.0665
SD of Detected	0.0827
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.627
Maximum Detected	-0.55
Mean of Detected	-3.094
SD of Detected	0.895
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.264
5% Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.152
5% Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0653
SD	0.0824
95% UTL	95% Coverage 0.234
95% UPL (t)	0.205
90% Percentile (z)	0.171
95% Percentile (z)	0.201
99% Percentile (z)	0.257

Maximum Likelihood Estimate(MLE) Method

Mean	0.0634
SD	0.0839
95% UTL with	95% Coverage 0.235
95% UPL (t)	0.205
90% Percentile (z)	0.171
95% Percentile (z)	0.201
99% Percentile (z)	0.259

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.378
Theta Star	0.0483
nu star	140.6

A-D Test Statistic	1.305
5% A-D Critical Value	0.769
K-S Test Statistic	0.142

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-3.149
SD (Log Scale)	0.973
95% UTL	95% Coverage 0.315
95% UPL (t)	0.222
90% Percentile (z)	0.149
95% Percentile (z)	0.213
99% Percentile (z)	0.413

Log ROS Method

Mean in Original Scale	0.0653
SD in Original Scale	0.0823
95% UTL with	95% Coverage 0.292
95% BCA UTL with	95% Coverage 0.348
95% Bootstrap (%) UTL with	95% Coverage 0.369
95% UPL (t)	0.21
90% Percentile (z)	0.143
95% Percentile (z)	0.201
99% Percentile (z)	0.378

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	Mean 0.0653
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5% K-S Critical Value	0.127	SD	0.0816
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0114
Assuming Gamma Distribution		95% KM UTL with 95% Coverage	0.232
Gamma ROS Statistics with Extrapolated Data		95% KM Chebyshev UPL	0.424
Mean		95% KM UPL (t)	0.203
Median		90% Percentile (z)	0.17
SD		95% Percentile (z)	0.199
k star		99% Percentile (z)	0.255
Theta star		Gamma ROS Limits with Extrapolated Data	
Nu star		95% Wilson Hilferty (WH) Approx. Gamma UPL	0.184
95% Percentile of Chisquare (2k)		95% Hawkins Wixley (HW) Approx. Gamma UPL	0.198
90% Percentile		95% WH Approx. Gamma UTL with 95% Coverage	0.229
95% Percentile		95% HW Approx. Gamma UTL with 95% Coverage	0.254
99% Percentile			

Note: DL/2 is not a recommended method.

Mercury

General Statistics	
Number of Valid Data	9
Number of Distinct Detected Data	0
Number of Detected Data	0
Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	117	Number of Detected Data	28
Number of Distinct Detected Data	17	Number of Non-Detect Data	89
Tolerance Factor	1.9	Percent Non-Detects	76.07%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.054
Mean of Detected	0.0144
SD of Detected	0.0131
Minimum Non-Detect	0.005
Maximum Non-Detect	0.04

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-2.919
Mean of Detected	-4.602
SD of Detected	0.879
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.219

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	115
Number treated as Detected with Single DL	2
Single DL Non-Detect Percentage	98.29%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.79
5% Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.948
5% Shapiro Wilk Critical Value	0.924

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.00741
SD	0.00855
95% UTL	95% Coverage 0.0237
	95% UPL (t) 0.0217
	90% Percentile (z) 0.0184
	95% Percentile (z) 0.0215
	99% Percentile (z) 0.0273

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-5.329
SD (Log Scale)	0.856
95% UTL	95% Coverage 0.0247
	95% UPL (t) 0.0202
	90% Percentile (z) 0.0145
	95% Percentile (z) 0.0198
	99% Percentile (z) 0.0355

Log ROS Method	
Mean in Original Scale	0.00507
SD in Original Scale	0.0084
Mean in Log Scale	-6.068
SD in Log Scale	1.239
95% UTL	95% Coverage 0.0244
	95% UPL (t) 0.0182
	90% Percentile (z) 0.0113
	95% Percentile (z) 0.0178
	99% Percentile (z) 0.0414

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.398
Theta Star	0.0103
nu star	78.29

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic 0.891
5% A-D Critical Value 0.762
K-S Test Statistic 0.138
5% K-S Critical Value 0.168

Data follow Appx. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution
Gamma ROS Statistics with Extrapolated Data
Mean 0.00497
Median 0.000001
SD 0.00892
k star 0.176
Theta star 0.0282
Nu star 41.24
95% Percentile of Chisquare (2k) 1.874

90% Percentile 0.015
95% Percentile 0.0264
99% Percentile 0.0586

Nonparametric Statistics
Kaplan-Meier (KM) Method
Mean 0.0057
SD 0.00831
SE of Mean 0.00112
95% KM UTL with 95% Coverage 0.0215
95% KM Chebyshev UPL 0.0421
95% KM UPL (t) 0.0195
90% Percentile (z) 0.0164
95% Percentile (z) 0.0194
99% Percentile (z) 0.025

Gamma ROS Limits with Extrapolated Data
95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0207
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0238
95% WH Approx. Gamma UTL with 95% Coverage 0.0267
95% HW Approx. Gamma UTL with 95% Coverage 0.0329

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data 9	Number of Detected Data 0
Number of Distinct Detected Data 0	Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data 9	Number of Detected Data 0
Number of Distinct Detected Data 0	Number of Non-Detect Data 9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected	0.00015
Maximum Detected	0.00027
Mean of Detected	0.0002025
SD of Detected	5.377E-05
Minimum Non-Detect	0.001
Maximum Non-Detect	0.001

Log-transformed Statistics

Minimum Detected	-8.805
Maximum Detected	-8.217
Mean of Detected	-8.531
SD of Detected	0.263
Minimum Non-Detect	-6.908
Maximum Non-Detect	-6.908

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.951
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0003678
SD	0.0001602
95% UTL 95% Coverage	0.0008534
95% UPL (t)	0.0006818
90% Percentile (z)	0.0005731
95% Percentile (z)	0.0006313
99% Percentile (z)	0.0007405

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-8.014
SD (Log Scale)	0.516
95% UTL 95% Coverage	0.00158
95% UPL (t)	0.0009092
90% Percentile (z)	0.0006407
95% Percentile (z)	0.0007727
99% Percentile (z)	0.0011

Log ROS Method	
Mean in Original Scale	0.0002029
SD in Original Scale	5.087E-05
Mean in Log Scale	-8.531
SD in Log Scale	0.251
95% UTL 95% Coverage	0.0004216
95% UPL (t)	0.0003224
90% Percentile (z)	0.000272
95% Percentile (z)	0.0002979
99% Percentile (z)	0.0003534

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 4.994
Theta Star 4.055E-05
nu star 39.95

A-D Test Statistic 0.261
5% A-D Critical Value 0.657
K-S Test Statistic 0.249
5% K-S Critical Value 0.394

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.000202
Median 0.0002088
SD 5.011E-05
k star 11.65
Theta star 1.733E-05
Nu star 209.8
95% Percentile of Chisquare (2k) 35.56

90% Percentile 0.0002806
95% Percentile 0.0003081
99% Percentile 0.0003644

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.0002025
SD 4.657E-05
SE of Mean 2.689E-05
95% KM UTL with 95% Coverage 0.0003437
95% KM Chebyshev UPL 0.0004165
95% KM UPL (t) 0.0002938
90% Percentile (z) 0.0002622
95% Percentile (z) 0.0002791
99% Percentile (z) 0.0003108

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0003153
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0003178
95% WH Approx. Gamma UTL with 95% Coverage 0.0003954
95% HW Approx. Gamma UTL with 95% Coverage 0.000403

Note: DL/2 is not a recommended method.

Vanadium**General Statistics**

Number of Valid Data 9
Number of Distinct Detected Data 1

Number of Detected Data 1
Number of Non-Detect Data 8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium was not processed!

Zinc

General Statistics

Number of Valid Data	117	Number of Detected Data	48
Number of Distinct Detected Data	19	Number of Non-Detect Data	69
Tolerance Factor	1.9	Percent Non-Detects	58.97%

Raw Statistics

Minimum Detected	0.005
Maximum Detected	0.124
Mean of Detected	0.0236
SD of Detected	0.0292
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-5.298
Maximum Detected	-2.087
Mean of Detected	-4.234
SD of Detected	0.912
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	101
Number treated as Detected with Single DL	16
Single DL Non-Detect Percentage	86.32%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.638
5% Shapiro Wilk Critical Value	0.947

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.857
5% Shapiro Wilk Critical Value	0.947

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	0.0128
SD	0.0208
95% UTL	95% Coverage 0.0523
95% UPL (t)	0.0475
90% Percentile (z)	0.0395
95% Percentile (z)	0.047
99% Percentile (z)	0.0612

Maximum Likelihood Estimate(MLE) Method

Mean	-0.0569
SD	0.0698
95% UTL with	95% Coverage 0.0757
95% UPL (t)	0.0593
90% Percentile (z)	0.0325
95% Percentile (z)	0.0579
99% Percentile (z)	0.105

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.103
Theta Star	0.0214
nu star	105.9

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	-4.933
SD (Log Scale)	0.928
95% UTL	95% Coverage 0.0421
95% UPL (t)	0.0338
90% Percentile (z)	0.0237
95% Percentile (z)	0.0332
99% Percentile (z)	0.0625

Log ROS Method

Mean in Original Scale	0.0115
SD in Original Scale	0.0213
95% UTL with	95% Coverage 0.0582
95% BCA UTL with	95% Coverage 0.061
95% Bootstrap (%) UTL with	95% Coverage 0.0714
95% UPL (t)	0.0425
90% Percentile (z)	0.0254
95% Percentile (z)	0.0413
99% Percentile (z)	0.103

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 3.637
5% A-D Critical Value 0.775
K-S Test Statistic 0.289
5% K-S Critical Value 0.131

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean 0.0109
Median 0.00108
SD 0.0219
k star 0.169
Theta star 0.0645
Nu star 39.53
95% Percentile of Chisquare (2k) 1.814

90% Percentile 0.0327
95% Percentile 0.0585
99% Percentile 0.132

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean 0.013
SD 0.0206
SE of Mean 0.00192
95% KM UTL with 95% Coverage 0.0521
95% KM Chebyshev UPL 0.103
95% KM UPL (t) 0.0473
90% Percentile (z) 0.0394
95% Percentile (z) 0.0468
99% Percentile (z) 0.0608

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.0445
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.0515
95% WH Approx. Gamma UTL with 95% Coverage 0.0575
95% HW Approx. Gamma UTL with 95% Coverage 0.0713

Note: DL/2 is not a recommended method.