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CERTIFIED MAIL – RETURN RECEIPT REQUESTED

October 16, 2015

Doug Hintze, Manager
U.S. Department of Energy
EM-Los Alamos Field Office, DOE
3747 West Jemez Rd, MS A316
Los Alamos, NM 87544

Michael Brandt, Associate Director
Environment, Safety, Health
Los Alamos National Laboratory
P.O. Box 1663, MS K491
Los Alamos, NM 87545

U1600124

RE: ESTABLISHMENT OF GROUNDWATER BACKGROUND FOR THE REGIONAL AQUIFER, LOS ALAMOS NATIONAL LABORATORY
EPA ID#NM0890010515
HWB-LANL-GW-MISC

Dear Messrs. Hintze and Mr. Brandt:

The March 1, 2005, Compliance Order on Consent (the Order), Section IV.A.3.d (most recent revision on October 29, 2012) set forth a requirement by the United States Department of Energy (DOE) and Los Alamos National Laboratory (LANL or the Laboratory) to conduct and prepare a groundwater investigation report for naturally occurring metals and general chemistry (e.g., nitrate). In February 2007, DOE and the Los Alamos National Security, L.L.C's (collectively, the Permittees) submitted a report to the New Mexico Environment Department (NMED) entitled *Groundwater Background Investigation Report, Revision 2*. On March 23, 2007, NMED approved the report with direction. In response to NMED's approval with direction, the Permittees submitted a third revision in May 2007. On February 5, 2010, NMED directed the Permittees to update the groundwater background for the facility. In response to NMED's direction to update the groundwater background, the Permittees submitted "*Groundwater Background Investigation Report, Revision 4"*, dated August 2010. On July 25, 2011, NMED approved, with modifications, the Permittee's Revision 4 report. In November 2011, the Permittees submitted a final revision entitled *Groundwater Background Investigation Report, Update to Revision 4* (EP2011-0354, LA-UR-11-6228). The

groundwater background data set incorporated into Revision 4 (Report) included results from background springs and wells sampled between January 2000 and March 2010. Since 2010, additional monitoring wells have been installed in the regional aquifer that produce representative samples and water-quality data that are considered to be of background quality, with "background" being defined as groundwater not impacted by modern-day pollutants from industrial or municipal waste-water discharges. Such groundwater, as represented by the regional drinking-water aquifer beneath the Pajarito Plateau, would not contain a modern-age (e.g., post-1943) component of recharge and would exhibit residence time in excess of 1000 years.

The background data set presented in the Report, and all prior revisions, was acquired by using methodologies designed for groundwater monitoring purposes, in accordance with the Order, and not for determining accurate and precise background concentrations. As a result, a significant amount of non-detect data were incorporated in the Report. For example, the 23 Target Analyte List (TAL) total-dissolved metals published in the Report comprised 4307 observations with 44% of the observations having a detectable result and 56% being non-detectable by analytical methods used during laboratory analyses of groundwater samples. This high percentage of non-detectable data within a background data set for the regional aquifer is undesirable, especially when evaluating whether or not anthropogenic impacts to groundwater have occurred or for early-warning monitoring at and near (i.e., sentinel wells) municipal water-supply wells. For proper contaminant-detection monitoring, it is critical to have detection and reporting limits that yield as high as possible percentage of detectable results.

It should be understood that the contract laboratory method-detection limits and quantitation limits reported by the Permittees in the Report were not intended for background determination or low-level contaminant-detection monitoring, including important analytes such as chromium. Furthermore, the background sampling stations selected by the Permittees were not optimal because they included water-supply (production wells) that are completed at much greater depths and with longer screened intervals than most regional aquifer monitoring wells. Of the 29 regional aquifer background sampling stations selected by the Permittees and presented in the Report, eight were water-supply wells. A reliable and technically defensible groundwater background data set must incorporate high quality analytical methods with low detection limits and sampling stations that best represent the protected aquifer. In addition, since non-contaminated monitoring wells are susceptible to future contamination from migrating contaminant plumes, it is essential to perform low-level detection monitoring at monitoring and supply wells located near both vapor-and aqueous-phase plumes.

In 2011, NMED initiated a project to determine low-level background concentrations for the 23 TAL metals (excluding mercury) and 19 other trace metals such as molybdenum, strontium, and uranium to improve the background data set for metals (total dissolved) in the regional aquifer. The overall intent of the project is to increase the protection of groundwater resources beneath and downgradient of the Permittee's facility. High resolution-inductively coupled plasma mass spectrometry (HR-ICPMS or HRMS) was

the method used to quantify concentrations of these metals at low levels of detection and quantitation. Analytical services for the HRMS analyses were provided by ALS Environmental – Vancouver, Canada (ALS). During 2011 and 2012, NMED collected 102 samples for low-level HRMS analyses at 34 well screens located on the Pajarito Plateau and eight springs discharging in White Rock Canyon. Of these 42 sampling stations, six springs and 11 wells or well screens were identical to several of the locations sampled as part of the Permittee's Report. The selected background stations vary spatially from the western portion of the Laboratory near the recharge zones in the Sierra de Los Valles to the discharge zones located near the eastern edge of the Pajarito Plateau (e.g., R-16r) and regional aquifer springs located on or near the western bank of the Rio Grande in White Rock Canyon. Stations were selected based on having average chloride concentrations less than 3 mg/L and no measurable tritium activities (<2 pCi/L). The sampling stations represent each of the five major Pliocene and Miocene age regional-aquifer lithologies, including the Puye Formation, Tschicoma Formation, Totavi Lentil, basaltic rocks of the Cerros del Rio volcanic field, and Chamita Formation.

Along with the HRMS filtered-metals data set, NMED compiled filtered/dissolved anions, total dissolved solids, and hardness data, and field-parameter measurements collected by LANL at the stations selected for background determination. Analytical results specific to this background data set were collected by the Permittees as part of the Interim Facility Groundwater Monitoring Program (e.g., IFGMP, 2012, LA-UR-12-21331/EP2012-0092), and are reported in the Intellus database (http://www.intellusnmdata.com/). This background data set spans the monitoring period 2008 through 2012.

Table 1 lists sampling stations selected for regional aquifer groundwater background determination. The table also includes the sampling dates and the hydrostratigraphic or lithologic unit(s) for each well-screen interval and spring discharge point. Figure 1 shows the locations of all groundwater background sampling stations.

All groundwater samples were collected at wellheads and spring discharge points or as close to the spring discharge points as possible. All groundwater samples were field filtered using either a 0.45 micrometer Geotech "dispos-a-filter"™ from Geotech Environmental Equipment, Inc. or a 0.45 micrometer syringe-top disk filter provided by ALS. Prior to sample collection, four liters of groundwater were passed through each Geotech filter to purge any leachable, low-level metals. Approximately 100 milliliters of groundwater were purged through the disk filters prior to sample collection to remove any leachable constituents. ALS provided all blank water used and analyzed as part of this investigation.

ALS is certified through the Canadian Association for Laboratory Accreditation for providing accurate and technically defensible inorganic and organic analyses for air, soil, oil, waste solid, tissue, and water samples. This accreditation is valid to May 3, 2015. Various quality assurance/control water samples were collected as part of this investigation, including:

1. Eight blind duplicate samples;

2. Four blind equipment-blank samples using 0.45-micrometer disk filters with one-time use disposable syringes;

3. Four blind equipment blanks using 0.45-micrometer Geotech filters and disposable one-time use silicone tubing, and

4. Three blind blanks.

Results of blind duplicates of groundwater samples collected as part of this project are or will be available in the LANL-NMED Intellus database. Additional duplicate results for samples collected at other wells and springs that were not part of this project can also be found in Intellus.

Trace metals with typical dissolved concentrations of less than 10 µg/L in groundwater samples were analyzed by HR-ICPMS, modified from United States Environmental Protection Agency's (US EPA) method 200.8 (Revision 5.5). Inorganic solutes analyzed by the EPA 200.8M method include silver, aluminum, arsenic, boron, barium, beryllium, bismuth, cadmium, cobalt, chromium, cesium, copper, gallium, lithium, manganese, molybdenum, nickel, lead, rubidium, rhenium, antimony, selenium, tin, strontium, tellurium, thorium, titanium, thallium, uranium, vanadium, tungsten, yttrium, zinc, and zirconium. All groundwater samples were filtered through a 0.45 micrometer filter and acidified in the field with ultrapure nitric acid to a pH of 2 or less. Instrument detection and reporting limits for the HR-ICPMS results for various dissolved trace metals (or elements) are below 1 µg/L in the non-digested aqueous samples with turbidity values less than 1 NTU, and are available in Intellus. As an example, detection limits for total-dissolved chromium, lead, selenium, and zinc are 0.05 µg/L, 0.005 µg/L, 0.04 µg/L, and 0.1 µg/L, respectively.

Trace metals with typical dissolved concentrations greater than 10 µg/L in groundwater samples were analyzed by inductively coupled plasma optical emission spectroscopy (ICPOES), based on US EPA Method 6010B. Inorganic solutes analyzed by the EPA 6010B method include calcium, iron, magnesium, sodium, phosphorus, potassium, and silicon. Groundwater samples analyzed by the 6010B method were passed through a 0.45-micrometer filter (Geotech or disk) and acidified with ultrapure nitric acid to a pH of 2 or less. Instrument detection limits for the various dissolved trace elements analyzed by ICPOES are greater than 10 µg/L in the non-digested aqueous samples with turbidity values less than 1 NTU.

Compilation and statistical analyses for the low-level metals, major anions, total dissolved solids, hardness, and field parameters are similar to that prescribed in the Permittee's Report. For the low-level metals, outliers were not identified; therefore, all metal results derived using the low-level methods (HR-ICPMS and ICPOES) were incorporated in the statistical analyses as discussed below. For major anions, total dissolved solids, and hardness data, only analytical results provided by General Engineering Laboratory (see IFGMP, 2012) were used in the

statistical analyses. Duplicate results and results with qualifiers such as hold-time exceedances were removed from the data set. Table 2 highlights all outliers specific to major anions, total dissolved solids, and hardness, which were not incorporated into the statistical analyses due to concerns regarding sample representativeness or data quality. For the field parameters, dissolved oxygen, pH, specific conductance, and temperature, outliers listed in Table 2 were identified using the United States Environmental Protection Agency's (US EPA) statistical-analysis software package ProUCL, Version 4.1 (Pro UCL). At a 5% significance level, up to 10 outliers were selected for each analyzed field parameter. Outlier analysis was not performed on oxidation-reduction potential (ORP) data. The ORP measurements are reported in millivolts (mV) and have not been converted to Eh values, which are dependent on ORP electrode filling solution and water temperature.

The ProUCL software package and the ProUCL 2009 technical guidance document were used to determine the upper tolerance limits (UTL) as well as other statistical parameters (e.g., mean and median) for each constituent. A total of 51 chemical constituents and seven field parameters (e.g., pH) shown in Table 3 were included in the rigorous statistical analyses. Results of the statistical analyses include: 1) percentiles 25, 50, 75, and 90 and means for constituents with 100% detections, 2) Kaplan-Meier means for constituents with both detected and non-detected data, and 3) calculated UTLs for each constituent with at least 25% detections. The detection limit, or average of detection limits, if applicable, was substituted for the UTL for constituents with less than 25% detections (see Table 3). The UTL for each constituent was based on a 95% confidence level with 95% coverage.

The methodology and order for selecting the appropriate UTL includes:

a. If data have a normal distribution and the constituent was detected at 100% for each sample collected, then the normal UTL based on a 95% confidence level with 95% coverage was selected;

b. If data have a normal distribution and the constituent was not detected at 100%, then the maximum likelihood estimate of the UTL based on a 95% confidence level with 95% coverage was selected;

c. If the data are gamma distributed and the constituent was detected at 100%, then the Wilson-Hilferty Approximate Gamma UTL was selected;

d. If the data are gamma distributed, but the constituent was not detected at 100%, then the Wilson-Hilferty Approximate Gamma UTL based on extrapolated data using the gamma regression-on-order statistics (ROS) substitution method was selected;

e. If data have a lognormal distribution and the constituent was detected at 100%, then the lognormal UTL based on a 95% confidence level with 95% coverage was selected;

f. If the data have a lognormal distribution but the constituent was not detected at 100%, then the lognormal ROS substitution UTL based on a 95% confidence level with 95% coverage was selected;

g. If the data have no discernible distribution and the constituent was detected at 100%, then the nonparametric UTL based on a 95% confidence level with 95% coverage was selected; and

h. If the data have no discernible distribution and the constituent was not detected at 100%, then the nonparametric UTL Kaplan-Meier (95% confidence level with 95% coverage) was selected.

In comparison to the Permittee's most current Revision 4 background data set for these particular constituents, many of the updated UTLs presented in Table 3 are lower than the Revision 4 UTLs. For example, the updated UTLs for dissolved chromium, barium, chloride, and manganese are approximately one-half the concentration values in the Permittee's Revision 4 Report. In some cases, the UTLs calculated by NMED and LANL are very similar (boron, calcium, fluoride, magnesium, dissolved silicon dioxide, sodium, sulfate, uranium, and vanadium). On the other hand, the updated UTLs for dissolved antimony, nitrate-nitrite as nitrogen and phosphate as phosphorus, and field turbidity were slightly higher than the Revision 4 UTLs. Differences in UTL values calculated by NMED and LANL are most likely related to the lower detection limits and associated higher percentage of detectable results for many of the trace metals reported by the NMED, as well as the quality and number of new or more recent background sampling locations for the regional aquifer. Solute concentrations that are above method detection limits and below reporting limits (J values) were considered by NMED in calculating UTL values for different metals. Statistical data for silicon dioxide (SiO_2) as noted in Table 3 were calculated from elemental silicon (Si) concentration results provided by ALS. The conversion from Si to SiO_2:

SiO_2 (conc) = 2.14 x Si (conc), where

2.14 = $_{mw}SiO_2$ / Si_{aw} (or 60/28), and
$_{mw}$ = molecular weight and $_{aw}$ = atomic weight

Attachment A provides output files for the ProUCL statistical analyses for each background constituent.

Radionuclides, total (non-filtered) metals and anions, and total organic carbon were not evaluated as part of this updated data set of UTLs. For these constituents, the Permittees must continue to apply the current UTLs as published in "*Groundwater Background Investigation Report, Update to Revision 4*", dated November 2011.

It is acknowledged that US EPA Region 6 participated in the funding associated with HR-ICPMS and ICPOES analyses of groundwater samples collected as part of this investigation.

The UTLs presented in Table 3 for regional aquifer solutes and field parameters must be applied by the Permittees as screening values for all future groundwater sampling (detection monitoring) of the regional aquifer, as required in the March 1, 2005, Compliance Order on Consent, with revisions on June 18, 2008 and October 29, 2012. These regional aquifer background screening values or UTLs must be used to determine the presence or absence of anthropogenic contamination, the distribution, nature and extent of contamination, the reliability and representativeness of groundwater samples collected at monitoring wells and springs, and to assess natural attenuation and progress of active remediation.

Should you have any questions, please contact Michael Dale of my staff at (505) 476-3078.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
N. Dhawan, NMED HWB
B. Wear, NMED HWB
M. Dale, NMED HWB
M. Hunter, NMED GWQB
S. Yanicak, NMED DOE OB, MS M894
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File: Reading and LANL 2015, Groundwater Background

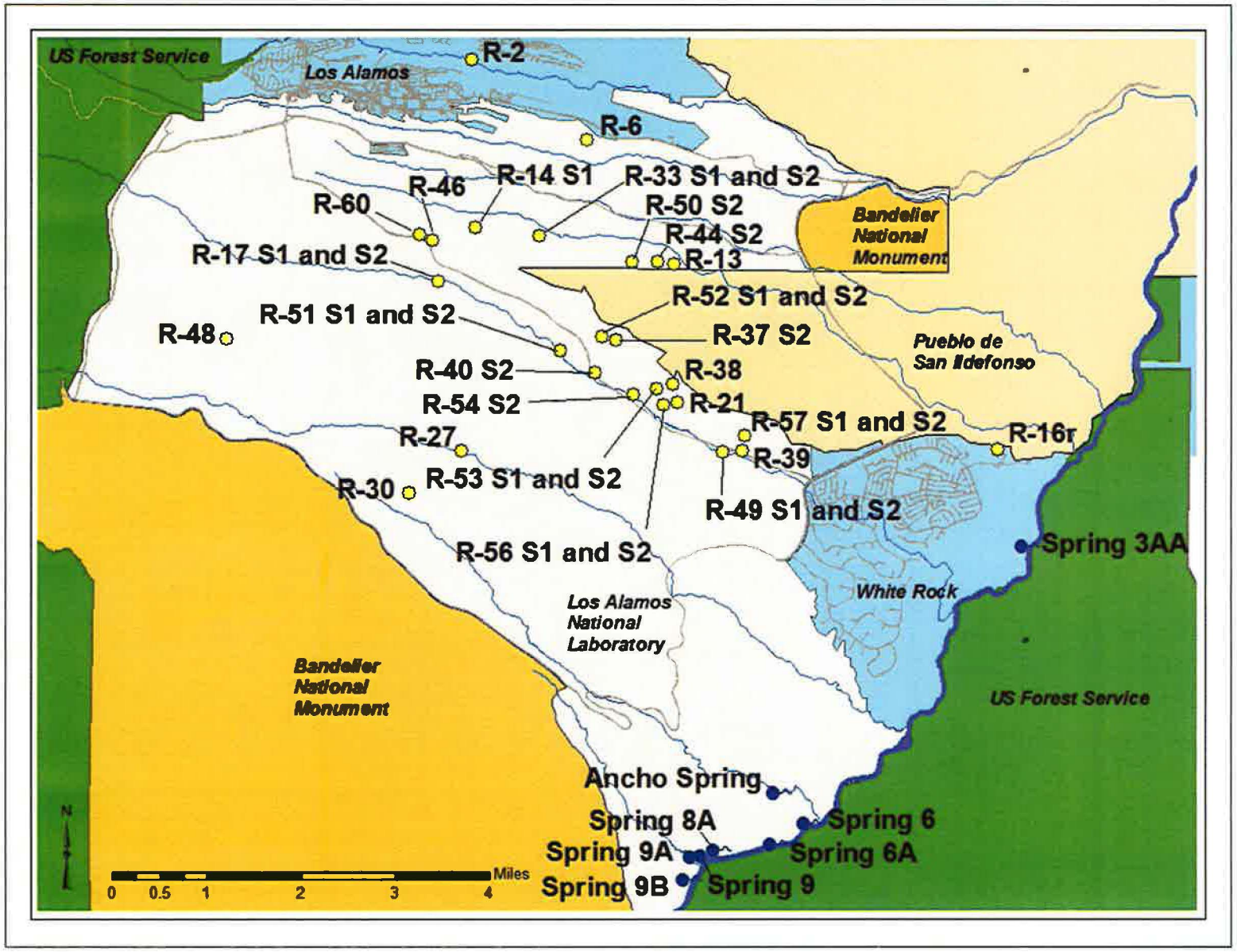

Figure 1. Map Showing Sampling Locations for the Regional Aquifer Groundwater Background Data Set, Los Alamos, New Mexico.

Table 1. Groundwater Background Sampling Locations, Lithology, and Collection Dates.

Location	Lithologic Unit(s)	Collection Dates
R-2	Chamita Formation (Miocene Jemez fanglomerate) - Tcar	LANL Data: 1/11/08 to 4/17/12 NMED Data: 4/17/12
R-6	Chamita Formation (Miocene Jemez fanglomerate) - Tcar	LANL Data: 8/27/08 to 8/27/12 NMED Data: 8/27/12
R-13	Puye Formation and Miocene pumiceous deposits - Tpf and Tjfp	LANL Data: 2/14/08 to 10/31/12 NMED Data: 6/5/12 & 10/31/12
R-14 S1	Puye Formation and Miocene pumiceous deposits - Tpf and Tjfp	LANL Data: 8/20/08 to 11/5/12 NMED Data: 11/8/11 to 11/5/12
R-16r	Totavi Lentil - Tpt	LANL Data: 2/6/08 to 8/9/12 NMED Data: 8/9/12
R-17 S1	Puye Formation - Tpf	LANL Data: 3/13/08 to 5/2/12 NMED Data: 5/2/12
R-17 S2	Puye Formation - Tpf	LANL Data: 3/13/08 to 5/02/12 NMED Data: 5/2/12
R-21	Puye Formation and Cerros de Rio volcanic field - Tpf and Tb4	LANL Data: 2/11/08 to 10/15/12 NMED Data: 11/3/11 to 10/15/12
R-27	Puye Formation - Tpf	LANL Data: 10/10/08 to 2/3/12 NMED Data: 2/3/12
R-30	Puye Formation - Tpf	LANL Data: 5/19/10 to 2/1/12 NMED Data: 2/1/12
R-33 S1	Miocene pumiceous deposits - Tjfp	LANL Data: 8/14/08 to 8/21/12 NMED Data: 8/21/12
R-33 S2	Miocene pumiceous deposits - Tjfp	LANL Data: 8/14/08 to 8/21/12 NMED Data: 8/21/12
R-37 S2	Puye Formation - Tpf	LANL Data: 6/22/09 to 10/22/12 NMED Data: 10/31/11 to 10/22/12
R-38	Puye Formation composed of Tb4 sediments - Tpf w/ Tb4 sediments	LANL Data: 2/6/09 to 10/9/12 NMED Data: 10/25/11 to 10/9/12
R-39 S1	Dacitic lavas and dacite-rich sediments - Tb4	LANL Data: 2/19/09 to 10/11/12 NMED Data: 10/27/11 to 10/11/12
R-40 S2	Puye Formation - Tpf	LANL Data: 1/15/09 to 10/12/12 NMED Data: 10/20/11 to 10/12/12
R-44 S2	Puye Formation - Tpf	LANL Data: 2/22/09 to 11/12/12 NMED Data: 11/17/11 to 11/12/12
R-46	Puye Formation - Tpf	LANL Data: 3/11/09 to 11/16/12 NMED Data: 11/8/11 to 11/16/12
R-48	Tschicoma Formation - Tt	LANL Data: 11/23/09 to 1/18/12 NMED Data: 1/18/12
R-49 S1	Dacitic lavas - Tb4	LANL Data: 6/23/09 to 10/15/12 NMED Data: 10/26/11 to 10/15/12
R-49 S2	Totavi Lentil - Tpt	LANL Data: 6/18/09 to 10/25/12 NMED Data: 10/27/11 to 10/25/12
R-50 S2	Miocene pumiceous deposits - Tjfp	LANL Data: 3/11/10 to 11/9/12 NMED Data: 11/28/11 to 11/9/12
R-51 S1	Puye Formation - Tpf	LANL Data: 3/8/10 to 10/10/12 NMED Data: 10/21/11 to 10/10/12
R-51 S2	Puye Formation - Tpf	LANL Data: 6/18/10 to 10/10/12 NMED Data: 10/21/11 to 10/10/12
R-52 S1	Puye Formation - Tpf	LANL Data: 5/2/10 to 10/16/12 NMED Data: 11/1/11 to 10/16/12
R-52 S2	Puye Formation - Tpf	LANL Data: 4/23/10 to 10/16/12 NMED Data: 11/1/11 to 10/16/12
R-53 S1	Puye Formation - Tpf	LANL Data: 4/19/10 to 10/11/12 NMED Data: 4/24/12 to 10/11/12
R-53 S2	Puye Formation - Tpf	LANL Data: 4/14/10 to 10/11/12 NMED Data: 10/25/11 to 10/11/12

Table 1. (Continued)

Location	Lithologic Unit(s)	Collection Dates
R-54 S2	Puye Formation - Tpf	LANL Data: 2/21/10 to 10/24/12 NMED Data: 10/31/11 to 10/24/12
R-56 S1	Puye Formation - Tpf	LANL Data: 8/19/10 to 10/18/12 NMED Data: 11/2/11 to 10/18/12
R-56 S2	Puye Formation - Tpf	LANL Data: 8/13/10 to 10/18/12 NMED Data: 11/2/11 to 10/18/12
R-57 S1	Dacitic lavas - Tb4	LANL Data: 7/1/10 to 10/10/12 NMED Data: 10/21/11 to 10/10/12
R-57 S2	Totavi Lentil - Tpt	LANL Data: 6/25/10 to 10/10/12 NMED Data: 10/21/11 to 10/10/12
R-60	Puye Formation - Tpf	LANL Data: 12/16/10 to 11/1/12 NMED Data: 11/22/11 to 11/1/12
Ancho Spring	Totavi Lentil - Tpt	LANL Data: 4/28/08 NMED Data: 1/10/12 to 12/13/12
Spring 3AA	Chamita Formation (Miocene Jemez fanglomerate) covered by landslide - Tcar	LANL Data: 9/29/08 to 9/24/12 NMED Data: 10/3/11 to 9/24/12
Spring 6	Cerros del Rio volcanics - Tb4	LANL Data: 9/30/08 to 9/25/12 NMED Data: 10/6/11 to 9/25/12
Spring 6A	Cerros del Rio volcanics covered by landslide - Tb4	LANL Data: 9/30/08 to 9/25/12 NMED Data: 10/13/11 to 1/10/12
Spring 8A	Cerros del Rio volcanics covered by landslide - Tb4	LANL Data: 9/30/08 to 9/25/12 NMED Data: 10/13/11
Spring 9	Cerros del Rio volcanics covered by landslide - Tb4	LANL Data: 9/30/08 to 9/25/12 NMED Data: 10/6/11 to 9/25/12
Spring 9A	Cerros del Rio volcanics covered by landslide - Tb4	LANL Data: 10/1/08 to 9/26/12 NMED Data: 10/13/11 to 9/26/12
Spring 9B	Cerros del Rio volcanics - Tb4	LANL Data: 4/23/08 to 9/29/12 NMED Data: 10/6/11 to 1/10/12

Table 2. Groundwater Background Outliers for Anions, Hardness, Total Dissolved Solids, and Field Parameters.

Location	Collection Date	Outlier(s)	Comment
R-2	1/14/2009	Specific Conductance	Anomalously low value of 23.2 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-13	5/14/2008	Specific Conductance	Anomalously high value of 356 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-14 S1	2/27/2008	Entire Data Set	Data suspect due to sample collection as part of well reconfiguration.
R-14 S1	7/30/2008	Entire Data Set	Data suspect due to sample collection too soon after well reconfiguration. Intellus showing "*10 day tot*" statement in the Field Sample Comment column.
R-16r	5/19/2008	Total Phosphate as Phosphorus	Data suspect due to anomalously high value of 15.1 mg/L.
R-16r	8/9/2012	Total Dissolved Solids	Analytical Hold Time exceeded.
R-21	2/11/2008	Specific Conductance	Anomalously low value of 20.5 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-21	12/4/2009	Br, Cl, F, and SO_4	Analytical Hold Time exceeded.
R-27	4/11/2008	Entire Data Set	Data suspect due to Intellus showing "*Has a sulfuric odor*" statement in the Field Sample Comment column.
R-33 S1	8/14/2008	Specific Conductance	Anomalously low value of 17.2 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-33 S2	8/14/2008	Specific Conductance	Anomalously low value of 16.43 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-37 S2	6/22/2009	Dissolved Oxygen	Anomalously low value of 1.01 mg/L. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-37 S2	11/18/2009	Entire Data Set	Data suspect due to Intellus showing "*1st full suite (characterization) sample after installation of new Baski sampling system. 6 CV purge. Clone of CAMO-10-5484*" statement in the Field Sample Comment column.
R-37 S2	12/18/2009	Specific Conductance	Anomalously high value of 215 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.

Table 2. (Continued)

Location	Collection Date	Outlier(s)	Comment
R-38	12/4/2008	Entire Data Set	Data suspect due to anomalously high concentrations.
R-38	1/23/2009	Entire Data Set	Data suspect due to anomalously high concentrations and Intellus showing "10 day tot" statement in the Field Sample Comment column..
R-38	8/21/2009	Specific Conductance	Anomalously high value of 244 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-38	7/26/2011	Hardness	Data suspect due to Intellus showing two values for the same sample with one result anomalously high and the other low.
R-39	12/9/2009	Br, Cl, F, and SO_4	Analytical Hold Time exceeded.
R-40 S2	2/23/2010	Temperature	Anomalously low value of 15.48°C. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-41 S2	9/1/2009	Specific Conductance	Anomalously high value of 344 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-46	2/10/2009	Entire Data Set	Data suspect due to anomalously high concentrations and Intellus showing "*R-46 Decon water filtered*" statement in the Field Sample Comment column..
R-46	2/25/2009	Entire Data Set	Data suspect due to anomalously high concentrations and Intellus showing "Drill pit fluids R-46 10 day tot" statement in the Field Sample Comment column..
R-46	3/17/2009	Dissolved Oxygen	Anomalously high value of 13.45 mg/L. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-46	3/17/2009	Temperature	Anomalously low value of 7.6°C. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-46	5/13/2009	Entire Data Set	Data appear to be duplicated data for original sample but not noted as duplicate in Intellus.
R-46	8/3/2011	Alkalinity-CO3+HCO3	Data suspect due to an anomalously high value of 530 mg/L.
R-46	11/16/2012	Dissolved Oxygen	Anomalously low value of 0.5 mg/L. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.

Table 2. (Continued)

Location	Collection Date	Outlier(s)	Comment
R-49 S1	6/23/2009	Dissolved Oxygen	Anomalously low value of 0.52 mg/L. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-49 S1	12/7/2009	Br, Cl, F, and SO_4	Analytical Hold Time exceeded.
R-49 S2	12/9/2009	Br, Cl, F, and SO_4	Analytical Hold Time exceeded.
R-49 S2	10/7/2010	Hardness	Data suspect due to anomalously low value of 1.24 mg/L.
R-50 S2	3/11/2010	Temperature	Anomalously low value of 13.78°C. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-50 S2	8/16/2012	Nitrate-Nitrite as Nitrogen	Analytical Hold Time exceeded.
R-51 S1	6/18/2010	Dissolved Oxygen	Anomalously high value of 11.19 mg/L. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
R-51 S2	2/22/2010	Entire Data Set	Data suspect due to Intellus showing "*Samples filtered @ TA-59 stormwater lab*" statement in the Field Sample Comment column.
R-51 S2	10/19/2010	Entire Data Set	Data suspect due to an anomalously high value of 120 mg/L.
R-52 S1	5/2/2010	Total Dissolved Solids	Analytical Hold Time exceeded.
Ancho Spring	9/30/2008	Entire Data Set	Sample collected down stream of spring source and mixing with an iron-rich microbial mat. Very high Fe and Mn concentrations compared to concentrations from samples collected at the spring source.
Ancho Spring	9/29/2009	Entire Data Set	Sample collected down stream of spring source and mixing with an iron-rich microbial mat. Very high Fe and Mn concentrations compared to concentrations from samples collected at the spring source.
Ancho Spring	9/28/2010	Entire Data Set	Sample collected down stream of spring source and mixing with an iron-rich microbial mat. Very high Fe and Mn concentrations compared to concentrations from samples collected at the spring source.
Ancho Spring	10/7/2011	Entire Data Set	Sample collected down stream of spring source and mixing with an iron-rich microbial mat. Very high Fe and Mn concentrations compared to concentrations from samples collected at the spring source.
Ancho Spring	9/25/2012	Entire Data Set	Sample collected down stream of spring source and mixing with an iron-rich microbial mat. Very high Fe and Mn concentrations compared to concentrations from samples collected at the spring source.

Table 2. (Continued)

Location	Collection Date	Outlier(s)	Comment
Spring 6A	9/29/2009	Specific Conductance	Anomalously high value of 360 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
Spring 9	9/30/2008	pH	Anomalously low value of 6.04 S.U. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
Spring 9	9/29/2009	Specific Conductance	Anomalously high value of 301 µS/cm. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.
Spring 9	9/9/2010	pH	Anomalously low value of 6 S.U. Rosner's outlier test using ProUCL identified the value as an outlier at a 5% significance level.

Table 3. Results of Statistical Analyses for Groundwater Background

Analyte	Unit	Filtration	Total Number of Observations/ Number of Valid Data	Number of Detected Data	Minimum/ Minimum Detected	Maximum/ Maximum Detected	Number of Non-Detected Data	Minimum Non-Detect	Maximum Non-Detect	First Quartile/25th Percentile	Median /50th Percentile	Third Quartile/75th Percentile	95th Percentile	Mean /Average	KM Mean	NMED UTL 2013	LANL UTL-Nov. 2011
Alkalinity-CO3+HCO3	mg/L	F	409	409	49.6	86.9	0			57	60.1	63.8	76.6	61.4		78.40	106
Aluminum	µg/L	F	102	101	0.5	25.1	1	1	1						3.4	11.94	47.19
Ammonia as Nitrogen	mg/L	F	411	160	0.02	0.45	251	0.02	0.05						0.04	0.09	0.031
Antimony	µg/L	F	102	102	0.035	4.47	0			0.056	0.067	0.10	0.51	0.2		2.72	0.61
Arsenic	µg/L	F	102	102	0.53	2.34	0			0.68	0.80	0.99	1.34	0.89		2.31	3.9
Barium	µg/L	F	102	102	4.11	62.3	0			17.45	23.35	27.9	31.99	22.41		38.31	73.23
Beryllium	µg/L	F	102	19	0.002	0.004	83	0.002	0.002						0.002	0.002	not reported
Bismuth	µg/L	F	102	2	0.001	0.002	100	0.001	0.001						0.001	0.001	not determined
Boron	µg/L	F	102	102	9.8	28	0			12.2	13.45	14.95	22.5	14.19		26.80	38.33
Bromide	mg/L	F	407	23	0.067	0.104	384	0.067	0.2						0.072	0.188	0.0749
Cadmium	µg/L	F	102	2	0.006	0.013	100	0.005	0.005						0.006	0.005	not reported
Calcium	mg/L	F	102	102	8.66	20.4	0			10.93	11.8	12.6	14.68	12.09		18.2	21.1
Cesium	µg/L	F	102	91	0.005	0.312	11	0.005	0.005						0.050	0.22	not determined
Chloride	mg/L	F	407	407	1.42	4.73	0			1.83	2.09	2.31	2.75	2.11		2.98	7.27
Chromium	µg/L	F	102	102	1.24	5.52	0			2.33	2.87	3.72	5.23	3.12		5.53	10.44
Cobalt	µg/L	F	102	93	0.006	0.671	9	0.005	0.005						0.049	0.217	2.318
Copper	µg/L	F	102	60	0.05	6.03	42	0.05	0.05						0.24	1.47	4.688
DO-field	mg/L	NF	399	399	1.70	9.54	0			5.18	6.0	6.7	7.98	5.93		8.10	7.516
Fluoride	mg/L	F	407	407	0.12	0.69	0			0.22	0.27	0.34	0.47	0.29		0.48	0.497
Gallium	µg/L	F	102	0			102	0.05	0.05							0.05	not determined
Hardness	mg/L	F	396	396	19.9	70.1	0			39.5	43.2	47.1	52.3	43.5		53.3	71.6
Iron	µg/L	F	102	19	10	55	83	10	10						11.3	10.0	63.03
Lead	µg/L	F	102	61	0.005	0.125	41	0.005	0.005						0.014	0.06	0.306
Lithium	µg/L	F	102	102	18.9	30.1	0			22.83	24.2	25.85	27.89	24.23		28.59	not reported
Magnesium	mg/L	F	102	102	0.28	4.19	0			2.95	3.22	3.53	4.05	3.20		4.10	4.48
Manganese	µg/L	F	102	101	0.0104	42.2	1	0.005	0.005						1.821	11.77	21.21
Molybdenum	µg/L	F	102	102	0.74	2.27	0			1.03	1.16	1.46	1.87	1.26		2.02	3.394
Nickel	µg/L	F	102	89	0.05	2.68	13	0.05	0.05						0.51	2.28	2.5
Nitrate-Nitrite as Nitrogen	mg/L	F	412	411	0.025	0.98	1	0.25	0.25						0.44	0.78	0.589
ORP-field	mV	NF	367	367	-69.3	504	0			78.15	132	205	391	152		404	366.1
Perchlorate	µg/L	F	389	389	0.12	0.47	0			0.28	0.32	0.36	0.41	0.32		0.43	0.51
pH-field	SU	NF	403	406	6.57	8.97	0			7.66	7.89	8.07	8.29	7.84		8.35	8.45
Phosphorus	µg/L	F	102	1	2	24.1	101	50	50							50	not determined
Potassium	mg/L	F	102	102	1.11	2.95	0			1.47	1.64	1.79	2.40	1.69		2.84	3.23
Rhenium	µg/L	F	102	0			102	0.005	0.005							0.005	not determined
Rubidium	µg/L	F	102	102	1.47	6.44	0			2.34	2.62	3.1	5.03	2.88		5.69	not determined
Selenium	µg/L	F	102	102	0.113	0.783	0			0.303	0.369	0.448	0.607	0.391		0.659	1.842
Silicon Dioxide*	mg/L	F	102	102	42.6	86	0			68.9	72.9	75.8	79.8	71.2		85.0	86.3
Silver	µg/L	F	102	2	0.005	0.011	100	0.005	0.005						0.005	0.005	not reported
Sodium	mg/L	F	102	102	9.55	16.9	0			10.43	10.9	11.5	14.1	11.22		16.8	18.2
Specific Conductance-field	µS/cm	NF	395	395	98	200	0			124	132	144	174	136		178	211
Strontium	µg/L	F	102	102	37.6	165	0			44.28	47.5	51.7	59.69	51.85		139	190

Table 3. (Continued)

Analyte	Unit	Filtration	Total Number of Observations/ Number of Valid Data	Number of Detected Data	Minimum/ Minimum Detected	Maximum/ Maximum Detected	Number of Non-Detected Data	Minimum Non-Detect	Maximum Non-Detect	First Quartile/25th Percentile	Median /50th Percentile	Third Quartile/75th Percentile	95th Percentile	Mean /Average	KM Mean	NMED UTL 2013	LANL UTL-Nov. 2011
Sulfate	mg/L	F	407	407	1.37	7.89	0			2.05	2.69	3.4	5.07	2.95		5.84	7.89
Tellurium	µg/L	F	102	0			102	0.01	0.01							0.01	not determined
Temperature-field	degrees C	NF	400	400	15.9	24.78	0			20.34	21.35	22.07	23.4	21.17		23.69	28.8
Thallium	µg/L	F	102	72	0.001	0.015	30	0.001	0.001						0.004	0.017	0.768
Thorium	µg/L	F	102	7	0.005	0.018	95	0.005	0.005						0.006	0.011	not determined
Tin	µg/L	F	102	7	0.01	0.032	95	0.01	0.01						0.01	0.01	8.224
Titanium	µg/L	F	102	35	0.05	0.38	67	0.05	0.05						0.08	0.20	not reported
TDS	mg/L	F	409	409	81.4	268	0			127	135	143	157	135.6		159	186
Total Phosphate as Phosphorus	mg/L	F	410	366	0.01	0.37	44	0.02	0.05						0.06	0.14	0.0999
Tungsten	µg/L	F	102	102	0.29	22.4	0			0.40	0.50	0.82	1.56	1.08		6.98	not determined
Turbidity-field	NTU	NF	403	403	0	262	0			0.46	0.86	1.92	7.49	2.74		9.54	8.9
Uranium	µg/L	F	102	102	0.12	1.37	0			0.30	0.36	0.50	0.77	0.43		1.27	1.544
Vanadium	µg/L	F	102	102	3.97	14.8	0			4.99	5.86	7.56	11.72	6.55		14.30	15.31
Yttrium	µg/L	F	102	71	0.005	0.035	31	0.005	0.005						0.013	0.059	not determined
Zinc	µg/L	F	102	89	0.11	14	13	0.1	0.4						2.44	11.14	19.5
Zirconium	µg/L	F	102	25	0.01	0.04	77	0.01	0.01						0.01	0.01	not determined

* Silicon Dioxide data were calculated using ALS's silicon results. The formula used to convert Si to SiO_2 is SiO_2 = Si(conc.) x 2.14

NF - Non-filtered, applied to all field parameters.

Attachment A

ProUCL Version 4.1 Output Results

Alkalinity-CO3+HCO3

General Statistics

Total Number of Observations	409
Number of Distinct Observations	177
Tolerance Factor	1.775

Raw Statistics		Log-Transformed Statistics	
Minimum	49.6	Minimum	3.904
Maximum	86.9	Maximum	4.465
Second Largest	85.8	Second Largest	4.452
First Quartile	57	First Quartile	4.043
Median	60.1	Median	4.096
Third Quartile	63.8	Third Quartile	4.156
Mean	61.36	Mean	4.112
Geometric Mean	61.04	SD	0.0997
SD	6.44		
Coefficient of Variation	0.105		
Skewness	1.302		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	**0.11**	Lilliefors Test Statistic	0.0883
Lilliefors Critical Value	0.0438	Lilliefors Critical Value	0.0438
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with	95% Coverage 72.79	95% UTL with	95% Coverage 72.86
95% UPL (t)	71.98	95% UPL (t)	71.96
90% Percentile (z)	69.61	90% Percentile (z)	69.36
95% Percentile (z)	71.95	95% Percentile (z)	71.92
99% Percentile (z)	76.34	99% Percentile (z)	76.98

Gamma Distribution Test		Data Distribution Test
k star	97.08	**Data do not follow a Discernable Distribution (0.05)**
Theta Star	0.632	
MLE of Mean	61.36	
MLE of Standard Deviation	6.227	
nu star	79415	
A-D Test Statistic	7.679	**Nonparametric Statistics**
5% A-D Critical Value	0.751	90% Percentile 69.32
K-S Test Statistic	0.0958	95% Percentile 76.64
5% K-S Critical Value	0.0446	99% Percentile 81.29
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution			
90% Percentile	69.46	95% UTL with	95% Coverage 78.4
95% Percentile	71.94	95% Percentile Bootstrap UTL with	95% Coverage 78.32
99% Percentile	76.76	95% BCA Bootstrap UTL with	95% Coverage 78.4
		95% UPL	77
95% WH Approx. Gamma UPL	71.95	95% Chebyshev UPL	89.46
95% HW Approx. Gamma UPL	71.95	Upper Threshold Limit Based upon IQR	74
95% WH Approx. Gamma UTL with	95% Coverage 72.82		
95% HW Approx. Gamma UTL with	95% Coverage 72.83		

U1600124

Aluminum

General Statistics

Number of Valid Data	102
Number of Distinct Detected Data	89
Tolerance Factor	1.92
Number of Detected Data	101
Number of Non-Detect Data	1
Percent Non-Detects	0.98%

Raw Statistics

Minimum Detected	0.5
Maximum Detected	25.1
Mean of Detected	3.457
SD of Detected	4.466
Minimum Non-Detect	1
Maximum Non-Detect	1

Log-transformed Statistics

Minimum Detected	-0.693
Maximum Detected	3.223
Mean of Detected	0.814
SD of Detected	0.826
Minimum Non-Detect	0
Maximum Non-Detect	0

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.28
5% Lilliefors Critical Value	0.0882

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.122
5% Lilliefors Critical Value	0.0882

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	3.428
SD	4.454
95% UTL 95% Coverage	11.98
95% UPL (t)	10.86
90% Percentile (z)	9.136
95% Percentile (z)	10.75
99% Percentile (z)	13.79

Maximum Likelihood Estimate(MLE) Method

Mean	2.976
SD	4.921
95% UTL with 95% Coverage	12.43
95% UPL (t)	11.19
90% Percentile (z)	9.285
95% Percentile (z)	11.07
99% Percentile (z)	14.43

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	0.799
SD (Log Scale)	0.835
95% UTL 95% Coverage	11.05
95% UPL (t)	8.953
90% Percentile (z)	6.483
95% Percentile (z)	8.78
99% Percentile (z)	15.51

Log ROS Method

Mean in Original Scale	3.429
SD in Original Scale	4.453
95% UTL with 95% Coverage	10.98
95% BCA UTL with 95% Coverage	20.98
95% Bootstrap (%) UTL with 95% Coverage	21.03
95% UPL (t)	8.909
90% Percentile (z)	6.463
95% Percentile (z)	8.738
99% Percentile (z)	15.38

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.282
Theta Star	2.696
nu star	259
A-D Test Statistic	5.666
5% A-D Critical Value	0.775
K-S Test Statistic	0.193
5% K-S Critical Value	0.0912

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	3.423
Median	1.915
SD	4.457
k star	1.004
Theta star	3.409
Nu star	204.8
95% Percentile of Chisquare (2k)	6.007
90% Percentile	7.874
95% Percentile	10.24
99% Percentile	15.73

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	3.431
SD	4.43
SE of Mean	0.441
95% KM UTL with 95% Coverage	11.94
95% KM Chebyshev UPL	22.84
95% KM UPL (t)	10.82
90% Percentile (z)	9.108
95% Percentile (z)	10.72
99% Percentile (z)	13.74

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.376
95% Hawkins Wixley (HW) Approx. Gamma UPL	9.597
95% WH Approx. Gamma UTL with 95% Coverage	10.98
95% HW Approx. Gamma UTL with 95% Coverage	11.42

Note: DL/2 is not a recommended method.

Ammonia as Nitrogen

General Statistics

Number of Valid Data	411
Number of Detected Data	160
Number of Distinct Detected Data	109
Number of Non-Detect Data	251
Tolerance Factor	1.775
Percent Non-Detects	61.07%

Raw Statistics

Minimum Detected	0.016
Maximum Detected	0.45
Mean of Detected	0.0531
SD of Detected	0.0581
Minimum Non-Detect	0.017
Maximum Non-Detect	0.05

Log-transformed Statistics

Minimum Detected	-4.135
Maximum Detected	-0.799
Mean of Detected	-3.194
SD of Detected	0.635
Minimum Non-Detect	-4.075
Maximum Non-Detect	-2.996

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	358
Number treated as Detected with Single DL	53
Single DL Non-Detect Percentage	87.10%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.261
5% Lilliefors Critical Value	0.07

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.07
5% Lilliefors Critical Value	0.07

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.0353
SD	0.039
95% UTL 95% Coverage	0.105
95% UPL (t)	0.0997
90% Percentile (z)	0.0853
95% Percentile (z)	0.0995
99% Percentile (z)	0.126

Maximum Likelihood Estimate(MLE) Method

Mean	-0.1
SD	0.129
95% UTL with 95% Coverage	0.128
95% UPL (t)	0.112
90% Percentile (z)	0.0646
95% Percentile (z)	0.111
99% Percentile (z)	0.199

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	-3.538
SD (Log Scale)	0.524
95% UTL 95% Coverage	0.0737
95% UPL (t)	0.069
90% Percentile (z)	0.0569
95% Percentile (z)	0.0688
99% Percentile (z)	0.0983

Log ROS Method

Mean in Original Scale	0.0376
SD in Original Scale	0.0396
95% UTL with 95% Coverage	0.0907
95% BCA UTL with 95% Coverage	0.0889
95% Bootstrap (%) UTL with 95% Coverage	0.0889
95% UPL (t)	0.0839
90% Percentile (z)	0.0666
95% Percentile (z)	0.0836
99% Percentile (z)	0.128

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.045
Theta Star	0.026
nu star	654.4
A-D Test Statistic	5.743
5% A-D Critical Value	0.765
K-S Test Statistic	0.126
5% K-S Critical Value	0.0749

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0405
Median	0.0358
SD	0.0429
k star	0.392
Theta star	0.103
Nu star	322.3
95% Percentile of Chisquare (2k)	3.281
90% Percentile	0.115
95% Percentile	0.17
99% Percentile	0.307

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0376
SD	0.039
SE of Mean	0.00203
95% KM UTL with 95% Coverage	0.107
95% KM Chebyshev UPL	0.208
95% KM UPL (t)	0.102
90% Percentile (z)	0.0876
95% Percentile (z)	0.102
99% Percentile (z)	0.128

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.146
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.187
95% WH Approx. Gamma UTL with 95% Coverage	0.161
95% HW Approx. Gamma UTL with 95% Coverage	0.212

Note: DL/2 is not a recommended method.

U1600124

Antimony

General Statistics

Total Number of Observations 102
Number of Distinct Observations 101
Tolerance Factor 1.92

Raw Statistics

Minimum 0.0348
Maximum 4.47
Second Largest 2.89
First Quartile 0.0557
Median 0.0674
Third Quartile 0.105
Mean 0.203
Geometric Mean 0.0911
SD 0.58
Coefficient of Variation 2.857
Skewness 5.863

Log-Transformed Statistics

Minimum -3.358
Maximum 1.497
Second Largest 1.061
First Quartile -2.889
Median -2.698
Third Quartile -2.254
Mean -2.395
SD 0.885

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.386
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.211
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 1.316
95% UPL (t) 1.17
90% Percentile (z) 0.946
95% Percentile (z) 1.156
99% Percentile (z) 1.551

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.499
95% UPL (t) 0.399
90% Percentile (z) 0.283
95% Percentile (z) 0.391
99% Percentile (z) 0.715

Gamma Distribution Test

k star 0.733
Theta Star 0.277
MLE of Mean 0.203
MLE of Standard Deviation 0.237
nu star 149.5

A-D Test Statistic 16.64
5% A-D Critical Value 0.795
K-S Test Statistic 0.309
5% K-S Critical Value 0.0924
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 0.281
95% Percentile 0.506
99% Percentile 2.888

Assuming Gamma Distribution

90% Percentile 0.504
95% Percentile 0.679
99% Percentile 1.097

95% WH Approx. Gamma UPL 0.561
95% HW Approx. Gamma UPL 0.51
95% WH Approx. Gamma UTL with 95% Coverage 0.676
95% HW Approx. Gamma UTL with 95% Coverage 0.62

95% UTL with 95% Coverage 2.72
95% Percentile Bootstrap UTL with 95% Coverage 2.618
95% BCA Bootstrap UTL with 95% Coverage 2.614
95% UPL 0.593
95% Chebyshev UPL 2.742
Upper Threshold Limit Based upon IQR 0.179

Arsenic

General Statistics

Total Number of Observations 102
Number of Distinct Observations 91
Tolerance Factor 1.92

Raw Statistics

Minimum 0.532
Maximum 2.34
Second Largest 2.34
First Quartile 0.679
Median 0.796
Third Quartile 0.99
Mean 0.888
Geometric Mean 0.84
SD 0.353
Coefficient of Variation 0.397
Skewness 2.58

Log-Transformed Statistics

Minimum -0.631
Maximum 0.85
Second Largest 0.85
First Quartile -0.387
Median -0.229
Third Quartile -0.0106
Mean -0.174
SD 0.312

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.168
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 1.665
95% UPL (t) 1.476
90% Percentile (z) 1.34
95% Percentile (z) 1.468
99% Percentile (z) 1.709

Lognormal Distribution Test

Lilliefors Test Statistic 0.102
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% UTL with 95% Coverage 1.526
95% UPL (t) 1.413
90% Percentile (z) 1.252
95% Percentile (z) 1.403
99% Percentile (z) 1.735

Gamma Distribution Test

k star 8.923
Theta Star 0.0995
MLE of Mean 0.888
MLE of Standard Deviation 0.297
nu star 1820

A-D Test Statistic 3.354
5% A-D Critical Value 0.753
K-S Test Statistic 0.121
5% K-S Critical Value 0.0869
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile 1.284
95% Percentile 1.426
99% Percentile 1.721

95% WH Approx. Gamma UPL 1.426
95% HW Approx. Gamma UPL 1.422
95% WH Approx. Gamma UTL with 95% Coverage 1.53
95% HW Approx. Gamma UTL with 95% Coverage 1.529

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 1.225
95% Percentile 1.339
99% Percentile 2.34

95% UTL with 95% Coverage 2.31
95% Percentile Bootstrap UTL with 95% Coverage 2.301
95% BCA Bootstrap UTL with 95% Coverage 2.301
95% UPL 1.646
95% Chebyshev UPL 2.433
Upper Threshold Limit Based upon IQR 1.455

U1600124

Barium

General Statistics

Total Number of Observations 102
Number of Distinct Observations 88
Tolerance Factor 1.92

Raw Statistics

Minimum 4.11
Maximum 82.3
Second Largest 37.3
First Quartile 17.45
Median 23.35
Third Quartile 27.9
Mean 22.41
Geometric Mean 20.68
SD 8.261
Coefficient of Variation 0.37
Skewness 0.752

Log-Transformed Statistics

Minimum 1.413
Maximum 4.132
Second Largest 3.619
First Quartile 2.859
Median 3.151
Third Quartile 3.329
Mean 3.029
SD 0.435

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0844
Lilliefors Critical Value 0.0877
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.165
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 38.31
95% UPL (t) 36.22
90% Percentile (z) 33.02
95% Percentile (z) 36.03
99% Percentile (z) 41.67

Assuming Lognormal Distribution

95% UTL with 95% Coverage 47.71
95% UPL (t) 42.75
90% Percentile (z) 36.13
95% Percentile (z) 42.32
99% Percentile (z) 56.93

Gamma Distribution Test

k star 6.227
Theta Star 3.598
MLE of Mean 22.41
MLE of Standard Deviation 8.979
nu star 1270

A-D Test Statistic 2.162
5% A-D Critical Value 0.754
K-S Test Statistic 0.14
5% K-S Critical Value 0.089
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 30.64
95% Percentile 31.99
99% Percentile 37.3

Assuming Gamma Distribution

90% Percentile 34.41
95% Percentile 38.92
99% Percentile 48.37

95% WH Approx. Gamma UPL 39.03
95% HW Approx. Gamma UPL 39.73
95% WH Approx. Gamma UTL with 95% Coverage 42.35
95% HW Approx. Gamma UTL with 95% Coverage 43.35

95% UTL with 95% Coverage 37.2
95% Percentile Bootstrap UTL with 95% Coverage 37.01
95% BCA Bootstrap UTL with 95% Coverage 37.01
95% UPL 32.51
95% Chebyshev UPL 58.68
Upper Threshold Limit Based upon IQR 43.58

U1600124

Beryllium

General Statistics

Number of Valid Data	102	Number of Detected Data	19
Number of Distinct Detected Data	13	Number of Non-Detect Data	83
Tolerance Factor	1.92	Percent Non-Detects	81.37%

Raw Statistics

Minimum Detected	0.0021
Maximum Detected	0.0042
Mean of Detected	0.00311
SD of Detected	0.00062581
Minimum Non-Detect	0.002
Maximum Non-Detect	0.002

Log-transformed Statistics

Minimum Detected	-6.166
Maximum Detected	-5.473
Mean of Detected	-5.794
SD of Detected	0.206
Minimum Non-Detect	-6.215
Maximum Non-Detect	-6.215

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.967
5% Shapiro Wilk Critical Value	0.901

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.962
5% Shapiro Wilk Critical Value	0.901

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00139
SD		0.00086502
95% UTL	95% Coverage	0.00305
95% UPL (t)		0.00284
90% Percentile (z)		0.0025
95% Percentile (z)		0.00281
99% Percentile (z)		0.0034

Maximum Likelihood Estimate(MLE) Method

Mean		0.00040287
SD		0.00183
95% UTL with	95% Coverage	0.00392
95% UPL (t)		0.00346
90% Percentile (z)		0.00275
95% Percentile (z)		0.00342
99% Percentile (z)		0.00467

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-6.7
SD (Log Scale)		0.444
95% UTL	95% Coverage	0.00289
95% UPL (t)		0.00258
90% Percentile (z)		0.00217
95% Percentile (z)		0.00255
99% Percentile (z)		0.00346

Log ROS Method

Mean in Original Scale		0.00172
SD in Original Scale		0.00083161
95% UTL with	95% Coverage	0.0038
95% BCA UTL with	95% Coverage	0.00389
95% Bootstrap (%) UTL with	95% Coverage	0.00389
95% UPL (t)		0.00338
90% Percentile (z)		0.00281
95% Percentile (z)		0.00334
99% Percentile (z)		0.0046

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	21.43
Theta Star	0.00014492
nu star	814.3
A-D Test Statistic	0.225
5% A-D Critical Value	0.74
K-S Test Statistic	0.123
5% K-S Critical Value	0.198

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		0.00229
SD		0.00047147
SE of Mean		4.7962E-05
95% KM UTL with	95% Coverage	0.00319
95% KM Chebyshev UPL		0.00435
95% KM UPL (t)		0.00307
90% Percentile (z)		0.00289
95% Percentile (z)		0.00306
99% Percentile (z)		0.00338

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00071463
Median	0.000001
SD	0.00124
k star	0.181
Theta star	0.00395
Nu star	36.9
95% Percentile of Chisquare (2k)	1.912
90% Percentile	0.00216
95% Percentile	0.00378
99% Percentile	0.00831

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.00278
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.00287
95% WH Approx. Gamma UTL with 95% Coverage	0.0037
95% HW Approx. Gamma UTL with 95% Coverage	0.0041

Note: DL/2 is not a recommended method.

Bismuth

General Statistics

Number of Valid Data	102	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	100

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 1.92 Percent Non-Detects 98.04%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0012	Minimum Detected	-6.725
Maximum Detected	0.0021	Maximum Detected	-6.166
Mean of Detected	0.00165	Mean of Detected	-6.446
SD of Detected	0.0006364	SD of Detected	0.396
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.001	Maximum Non-Detect	-6.908

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

DL/2 Substitution Method

Mean		0.00052255
SD		0.00017229
95% UTL	95% Coverage	0.00085342
95% UPL (t)		0.00080997
90% Percentile (z)		0.00074335
95% Percentile (z)		0.00080594
99% Percentile (z)		0.00092336

Maximum Likelihood Estimate(MLE) Method N/A

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 (Log Scale)		-7.578
SD (Log Scale)		0.166
95% UTL	95% Coverage	0.0007031
95% UPL (t)		0.00067432
90% Percentile (z)		0.00063247
95% Percentile (z)		0.00067172
99% Percentile (z)		0.00075202

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		0.00121
SD		8.8675E-05
SE of Mean		1.2417E-05
95% KM UTL with	95% Coverage	0.00138
95% KM Chebyshev UPL		0.0016
95% KM UPL (t)		0.00136
90% Percentile (z)		0.00132
95% Percentile (z)		0.00135
99% Percentile (z)		0.00142

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.

U1600124

Boron

General Statistics

Total Number of Observations 102
Number of Distinct Observations 55
Tolerance Factor 1.92

Raw Statistics

Minimum 9.8
Maximum 28
Second Largest 27.2
First Quartile 12.2
Median 13.45
Third Quartile 14.95
Mean 14.19
Geometric Mean 13.9
SD 3.288
Coefficient of Variation 0.232
Skewness 2.479

Log-Transformed Statistics

Minimum 2.282
Maximum 3.332
Second Largest 3.303
First Quartile 2.501
Median 2.599
Third Quartile 2.705
Mean 2.632
SD 0.193

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.195
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.152
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 20.51
95% UPL (t) 19.68
90% Percentile (z) 18.41
95% Percentile (z) 19.6
99% Percentile (z) 21.84

Assuming Lognormal Distribution

95% UTL with 95% Coverage 20.15
95% UPL (t) 19.19
90% Percentile (z) 17.81
95% Percentile (z) 19.11
99% Percentile (z) 21.8

Gamma Distribution Test

k star 23.59
Theta Star 0.602
MLE of Mean 14.19
MLE of Standard Deviation 2.922
nu star 4812

A-D Test Statistic 5.071
5% A-D Critical Value 0.75
K-S Test Statistic 0.168
5% K-S Critical Value 0.0887
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 16.96
95% Percentile 22.5
99% Percentile 27.2

Assuming Gamma Distribution

90% Percentile 18.04
95% Percentile 19.31
99% Percentile 21.86

95% WH Approx. Gamma UPL 19.33
95% HW Approx. Gamma UPL 19.29
95% WH Approx. Gamma UTL with 95% Coverage 20.24
95% HW Approx. Gamma UTL with 95% Coverage 20.21

95% UTL with 95% Coverage 26.8
95% Percentile Bootstrap UTL with 95% Coverage 26.65
95% BCA Bootstrap UTL with 95% Coverage 26.65
95% UPL 22.87
95% Chebyshev UPL 28.59
Upper Threshold Limit Based upon IQR 19.08

U1600124

Bromide

General Statistics

Number of Valid Data 407	Number of Detected Data 23
Number of Distinct Detected Data 23	Number of Non-Detect Data 384
Tolerance Factor 1.776	Percent Non-Detects 94.35%

Raw Statistics

Minimum Detected 0.0668	
Maximum Detected 0.104	
Mean of Detected 0.0791	
SD of Detected 0.0121	
Minimum Non-Detect 0.067	
Maximum Non-Detect 0.2	

Log-transformed Statistics

Minimum Detected -2.706	
Maximum Detected -2.263	
Mean of Detected -2.548	
SD of Detected 0.146	
Minimum Non-Detect -2.703	
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 407	
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 0.865	
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 0.881	
5% Shapiro Wilk Critcal Value 0.914	
Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method	
Mean 0.0931	
SD 0.0191	
95% UTL 95% Coverage 0.127	
95% UPL (t) 0.125	
90% Percentile (z) 0.118	
95% Percentile (z) 0.125	
99% Percentile (z) 0.138	
Maximum Likelihood Estimate(MLE) Method N/A	

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale) -2.411	
SD (Log Scale) 0.31	
95% UTL 95% Coverage 0.156	
95% UPL (t) 0.15	
90% Percentile (z) 0.134	
95% Percentile (z) 0.149	
99% Percentile (z) 0.185	
Log ROS Method	
Mean in Original Scale 0.0646	
SD in Original Scale 0.0154	
Mean in Log Scale -2.767	
SD in Log Scale 0.235	
95% UTL 95% Coverage 0.0955	
95% UPL (t) 0.0927	
90% Percentile (z) 0.085	
95% Percentile (z) 0.0926	
99% Percentile (z) 0.109	

Gamma Distribution Test with Detected Values Only

k star (bias corrected) 41.41	
Theta Star 0.00191	
nu star 1905	
A-D Test Statistic 1.031	
5% A-D Critical Value 0.741	
K-S Test Statistic 0.178	
5% K-S Critical Value 0.181	
Data follow Appx. Gamma Distribution at 5% Significance Level	

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean 0.0563	
Median 0.0633	
SD 0.0262	
k star 0.781	
Theta star 0.0721	
Nu star 635.6	
95% Percentile of Chisquare (2k) 5.11	
90% Percentile 0.138	
95% Percentile 0.184	
99% Percentile 0.294	

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean 0.0717	
SD 0.00956	
SE of Mean 0.00128	
95% KM UTL with 95% Coverage 0.0886	
95% KM Chebyshev UPL 0.113	
95% KM UPL (t) 0.0874	
90% Percentile (z) 0.0839	
95% Percentile (z) 0.0874	
99% Percentile (z) 0.0939	

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL 0.158	
95% Hawkins Wixley (HW) Approx. Gamma UPL 0.196	
95% WH Approx. Gamma UTL with 95% Coverage 0.17	
95% HW Approx. Gamma UTL with 95% Coverage 0.216	

Note: DL/2 is not a recommended method.

Cadmium

General Statistics

Number of Valid Data 102	Number of Detected Data 2
Number of Distinct Detected Data 2	Number of Non-Detect Data 100

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 1.92 | Percent Non-Detects 98.04%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0058	Minimum Detected	-5.15
Maximum Detected	0.0126	Maximum Detected	-4.374
Mean of Detected	0.0092	Mean of Detected	-4.762
SD of Detected	0.00481	SD of Detected	0.549
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

0 0

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

DL/2 Substitution Method

Mean		0.00263
SD		0.00105
95% UTL	95% Coverage	0.00465
95% UPL (t)		0.00438
90% Percentile (z)		0.00398
95% Percentile (z)		0.00436
99% Percentile (z)		0.00507

Maximum Likelihood Estimate(MLE) Method N/A

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 (Log Scale)		-5.967
SD (Log Scale)		0.18
95% UTL	95% Coverage	0.00362
95% UPL (t)		0.00346
90% Percentile (z)		0.00322
95% Percentile (z)		0.00344
99% Percentile (z)		0.00389

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		0.00587
SD		0.00066999
SE of Mean		9.3818E-05
95% KM UTL with	95% Coverage	0.00715
95% KM Chebyshev UPL		0.0088
95% KM UPL (t)		0.00698
90% Percentile (z)		0.00673
95% Percentile (z)		0.00697
99% Percentile (z)		0.00743

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.

U1600124

Calcium (mg/L)

General Statistics

Total Number of Observations 102
Number of Distinct Observations 46
Tolerance Factor 1.92

Raw Statistics

Minimum 8.66
Maximum 20.4
Second Largest 18.7
First Quartile 10.93
Median 11.8
Third Quartile 12.6
Mean 12.09
Geometric Mean 11.96
SD 1.875
Coefficient of Variation 0.155
Skewness 1.997

Log-Transformed Statistics

Minimum 2.159
Maximum 3.016
Second Largest 2.929
First Quartile 2.391
Median 2.468
Third Quartile 2.534
Mean 2.482
SD 0.14

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.147
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.111
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 15.69
95% UPL (t) 15.22
90% Percentile (z) 14.49
95% Percentile (z) 15.17
99% Percentile (z) 16.45

Assuming Lognormal Distribution

95% UTL with 95% Coverage 15.66
95% UPL (t) 15.12
90% Percentile (z) 14.32
95% Percentile (z) 15.07
99% Percentile (z) 16.58

Gamma Distribution Test

k star 47.02
Theta Star 0.257
MLE of Mean 12.09
MLE of Standard Deviation 1.763
nu star 9592

A-D Test Statistic 2.597
5% A-D Critical Value 0.75
K-S Test Statistic 0.122
5% K-S Critical Value 0.0887
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 13.59
95% Percentile 14.68
99% Percentile 18.7

Assuming Gamma Distribution

90% Percentile 14.4
95% Percentile 15.13
99% Percentile 16.56

95% WH Approx. Gamma UPL 15.14
95% HW Approx. Gamma UPL 15.13
95% WH Approx. Gamma UTL with 95% Coverage 15.66
95% HW Approx. Gamma UTL with 95% Coverage 15.66

95% UTL with 95% Coverage 18.2
95% Percentile Bootstrap UTL with 95% Coverage 18.18
95% BCA Bootstrap UTL with 95% Coverage 18.01
95% UPL 17
95% Chebyshev UPL 20.3
Upper Threshold Limit Based upon IQR 15.11

U1600124

Cesium

General Statistics

Number of Valid Data	102	Number of Detected Data	91
Number of Distinct Detected Data	73	Number of Non-Detect Data	11
Tolerance Factor	1.92	Percent Non-Detects	10.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.005	Minimum Detected	-5.298
Maximum Detected	0.312	Maximum Detected	-1.165
Mean of Detected	0.0555	Mean of Detected	-3.923
SD of Detected	0.093	SD of Detected	1.294
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.389	Lilliefors Test Statistic	0.217
5% Lilliefors Critical Value	0.0929	5% Lilliefors Critical Value	0.0929
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0498	Mean (Log Scale)	-4.146
SD	0.0893	SD (Log Scale)	1.381
95% UTL 95% Coverage	0.221	95% UTL 95% Coverage	0.225
95% UPL (t)	0.199	95% UPL (t)	0.158
90% Percentile (z)	0.164	90% Percentile (z)	0.0929
95% Percentile (z)	0.197	95% Percentile (z)	0.153
99% Percentile (z)	0.258	99% Percentile (z)	0.393
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0432	Mean in Original Scale	0.0497
SD	0.0958	SD in Original Scale	0.0894
95% UTL with 95% Coverage	0.227	95% UTL with 95% Coverage	0.266
		95% BCA UTL with 95% Coverage	0.282
		95% Bootstrap (%) UTL with 95% Coverage	0.288
95% UPL (t)	0.203	95% UPL (t)	0.182
90% Percentile (z)	0.166	90% Percentile (z)	0.101
95% Percentile (z)	0.201	95% Percentile (z)	0.175
99% Percentile (z)	0.266	99% Percentile (z)	0.491

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.587	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.0946	
nu star	106.8	
A-D Test Statistic	11.11	Nonparametric Statistics
5% A-D Critical Value	0.809	Kaplan-Meier (KM) Method
K-S Test Statistic	0.315	Mean 0.0501
5% K-S Critical Value	0.0984	SD 0.0887
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.00884
		95% KM UTL with 95% Coverage 0.22
Assuming Gamma Distribution		95% KM Chebyshev UPL 0.439
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t) 0.198
Mean	0.0495	90% Percentile (z) 0.164
Median	0.0105	95% Percentile (z) 0.196
SD	0.0895	99% Percentile (z) 0.257
k star	0.337	
Theta star	0.147	Gamma ROS Limits with Extrapolated Data
Nu star	68.73	95% Wilson Hilferty (WH) Approx. Gamma UPL 0.177
95% Percentile of Chisquare (2k)	2.968	95% Hawkins Wixley (HW) Approx. Gamma UPL 0.193
		95% WH Approx. Gamma UTL with 95% Coverage 0.223
90% Percentile	0.144	95% HW Approx. Gamma UTL with 95% Coverage 0.252
95% Percentile	0.218	
99% Percentile	0.409	

Note: DL/2 is not a recommended method.

Chloride

General Statistics

Total Number of Observations 407
Number of Distinct Observations 129
Tolerance Factor 1.776

Raw Statistics

Minimum 1.42
Maximum 4.73
Second Largest 3.84
First Quartile 1.835
Median 2.09
Third Quartile 2.315
Mean 2.111
Geometric Mean 2.079
SD 0.39
Coefficient of Variation 0.185
Skewness 1.61

Log-Transformed Statistics

Minimum 0.351
Maximum 1.554
Second Largest 1.345
First Quartile 0.607
Median 0.737
Third Quartile 0.839
Mean 0.732
SD 0.171

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0766
Lilliefors Critical Value 0.0439
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0599
Lilliefors Critical Value 0.0439
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 2.803
95% UPL (t) 2.755
90% Percentile (z) 2.611
95% Percentile (z) 2.752
99% Percentile (z) 3.016

Assuming Lognormal Distribution

95% UTL with 95% Coverage 2.819
95% UPL (t) 2.76
90% Percentile (z) 2.59
95% Percentile (z) 2.757
99% Percentile (z) 3.099

Gamma Distribution Test

k star 32.69
Theta Star 0.0646
MLE of Mean 2.111
MLE of Standard Deviation 0.369
nu star 26611

A-D Test Statistic 2.458
5% A-D Critical Value 0.752
K-S Test Statistic 0.0645
5% K-S Critical Value 0.0447
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 2.514
95% Percentile 2.75
99% Percentile 3.273

Assuming Gamma Distribution

90% Percentile 2.596
95% Percentile 2.753
99% Percentile 3.064

95% WH Approx. Gamma UPL 2.753
95% HW Approx. Gamma UPL 2.754
95% WH Approx. Gamma UTL with 95% Coverage 2.809
95% HW Approx. Gamma UTL with 95% Coverage 2.811

95% UTL with 95% Coverage 2.98
95% Percentile Bootstrap UTL with 95% Coverage 2.956
95% BCA Bootstrap UTL with 95% Coverage 2.89
95% UPL 2.758
95% Chebyshev UPL 3.812
Upper Threshold Limit Based upon IQR 3.035

U1600124

Chromium

General Statistics

Total Number of Observations 102
Number of Distinct Observations 89
Tolerance Factor 1.92

Raw Statistics

Minimum 1.24
Maximum 5.52
Second Largest 5.5
First Quartile 2.333
Median 2.865
Third Quartile 3.718
Mean 3.116
Geometric Mean 2.957
SD 1.025
Coefficient of Variation 0.329
Skewness 0.669

Log-Transformed Statistics

Minimum 0.215
Maximum 1.708
Second Largest 1.705
First Quartile 0.847
Median 1.053
Third Quartile 1.313
Mean 1.084
SD 0.326

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.121
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0719
Lilliefors Critical Value 0.0877
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 5.084
95% UPL (t) 4.825
90% Percentile (z) 4.429
95% Percentile (z) 4.802
99% Percentile (z) 5.5

Assuming Lognormal Distribution

95% UTL with 95% Coverage 5.526
95% UPL (t) 5.091
90% Percentile (z) 4.488
95% Percentile (z) 5.052
99% Percentile (z) 6.307

Gamma Distribution Test

k star 9.442
Theta Star 0.33
MLE of Mean 3.116
MLE of Standard Deviation 1.014
nu star 1926

A-D Test Statistic 0.774
5% A-D Critical Value 0.752
K-S Test Statistic 0.0908
5% K-S Critical Value 0.0889
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

90% Percentile 4.726
95% Percentile 5.229
99% Percentile 5.499

Assuming Gamma Distribution

90% Percentile 4.466
95% Percentile 4.95
99% Percentile 5.945

95% WH Approx. Gamma UPL 4.962
95% HW Approx. Gamma UPL 4.989
95% WH Approx. Gamma UTL with 95% Coverage 5.315
95% HW Approx. Gamma UTL with 95% Coverage 5.36

95% UTL with 95% Coverage 5.37
95% Percentile Bootstrap UTL with 95% Coverage 5.369
95% BCA Bootstrap UTL with 95% Coverage 5.369
95% UPL 5.291
95% Chebyshev UPL 7.605
Upper Threshold Limit Based upon IQR 5.795

U1600124

Cobalt

General Statistics

Number of Valid Data	102
Number of Detected Data	93
Number of Distinct Detected Data	87
Number of Non-Detect Data	9
Tolerance Factor	1.92
Percent Non-Detects	8.82%

Raw Statistics

Minimum Detected	0.006
Maximum Detected	0.671
Mean of Detected	0.0536
SD of Detected	0.0889
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.116
Maximum Detected	-0.399
Mean of Detected	-3.469
SD of Detected	0.954
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.296
5% Lilliefors Critical Value	0.0919

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0686
5% Lilliefors Critical Value	0.0919

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.0491
SD	0.0861
95% UTL 95% Coverage	0.214
95% UPL (t)	0.193
90% Percentile (z)	0.159
95% Percentile (z)	0.191
99% Percentile (z)	0.249

Maximum Likelihood Estimate(MLE) Method

Mean	0.044
SD	0.091
95% UTL with 95% Coverage	0.219
95% UPL (t)	0.196
90% Percentile (z)	0.161
95% Percentile (z)	0.194
99% Percentile (z)	0.256

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	-3.691
SD (Log Scale)	1.16
95% UTL 95% Coverage	0.231
95% UPL (t)	0.173
90% Percentile (z)	0.11
95% Percentile (z)	0.168
99% Percentile (z)	0.37

Log ROS Method

Mean in Original Scale	0.0492
SD in Original Scale	0.0861
95% UTL with 95% Coverage	0.217
95% BCA UTL with 95% Coverage	0.198
95% Bootstrap (%) UTL with 95% Coverage	0.198
95% UPL (t)	0.164
90% Percentile (z)	0.105
95% Percentile (z)	0.159
99% Percentile (z)	0.34

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.029
Theta Star	0.0522
nu star	191.3
A-D Test Statistic	2.893
5% A-D Critical Value	0.782
K-S Test Statistic	0.122
5% K-S Critical Value	0.0954

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0489
Median	0.0251
SD	0.0862
k star	0.463
Theta star	0.106
Nu star	94.42
95% Percentile of Chisquare (2k)	3.655
90% Percentile	0.134
95% Percentile	0.193
99% Percentile	0.339

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0494
SD	0.0855
SE of Mean	0.00851
95% KM UTL with 95% Coverage	0.214
95% KM Chebyshev UPL	0.424
95% KM UPL (t)	0.192
90% Percentile (z)	0.159
95% Percentile (z)	0.19
99% Percentile (z)	0.248

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.164
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.188
95% WH Approx. Gamma UTL with 95% Coverage	0.2
95% HW Approx. Gamma UTL with 95% Coverage	0.238

Note: DL/2 is not a recommended method.

Copper

General Statistics

Number of Valid Data	102	Number of Detected Data	60
Number of Distinct Detected Data	56	Number of Non-Detect Data	42
Tolerance Factor	1.92	Percent Non-Detects	41.18%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.053	Minimum Detected	-2.937
Maximum Detected	6.03	Maximum Detected	1.797
Mean of Detected	0.375	Mean of Detected	-1.688
SD of Detected	0.813	SD of Detected	1.004
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.346
5% Lilliefors Critical Value	0.114

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.146
5% Lilliefors Critical Value	0.114

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.231	
SD	0.645	
95% UTL	95% Coverage	1.469
95% UPL (t)		1.307
90% Percentile (z)		1.057
95% Percentile (z)		1.291
99% Percentile (z)		1.731

Maximum Likelihood Estimate(MLE) Method

Mean	-0.0708	
SD	0.891	
95% UTL with	95% Coverage	1.641
95% UPL (t)		1.416
90% Percentile (z)		1.072
95% Percentile (z)		1.395
99% Percentile (z)		2.003

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-2.512
SD (Log Scale)		1.252
95% UTL	95% Coverage	0.899
95% UPL (t)		0.655
90% Percentile (z)		0.404
95% Percentile (z)		0.636
99% Percentile (z)		1.494

Log ROS Method

Mean in Original Scale		0.228
SD in Original Scale		0.646
95% UTL with	95% Coverage	1.326
95% BCA UTL with	95% Coverage	1.311
95% Bootstrap (%) UTL with	95% Coverage	1.311
95% UPL (t)		0.892
90% Percentile (z)		0.485
95% Percentile (z)		0.86
99% Percentile (z)		2.511

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.805
Theta Star	0.465
nu star	96.66
A-D Test Statistic	4.43
5% A-D Critical Value	0.788
K-S Test Statistic	0.239
5% K-S Critical Value	0.119

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean		0.22
Median		0.0685
SD		0.648
k star		0.151
Theta star		1.459
Nu star		30.81
95% Percentile of Chisquare (2k)		1.66
90% Percentile		0.654
95% Percentile		1.211
99% Percentile		2.825

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.242
SD		0.638
SE of Mean		0.0637
95% KM UTL with	95% Coverage	1.468
95% KM Chebyshev UPL		3.038
95% KM UPL (t)		1.307
90% Percentile (z)		1.06
95% Percentile (z)		1.292
99% Percentile (z)		1.727

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.855
95% Hawkins Wixley (HW) Approx. Gamma UPL		1.014
95% WH Approx. Gamma UTL with	95% Coverage	1.119
95% HW Approx. Gamma UTL with	95% Coverage	1.426

Note: DL/2 is not a recommended method.

U1600124

Dissolved Oxygen

General Statistics

Total Number of Observations 399
Number of Distinct Observations 252
Tolerance Factor 1.777

Raw Statistics

Minimum 1.7
Maximum 9.54
Second Largest 9.37
First Quartile 5.18
Median 6
Third Quartile 6.7
Mean 5.934
Geometric Mean 5.796
SD 1.219
Coefficient of Variation 0.205
Skewness -0.131

Log-Transformed Statistics

Minimum 0.531
Maximum 2.255
Second Largest 2.238
First Quartile 1.645
Median 1.792
Third Quartile 1.902
Mean 1.757
SD 0.225

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0424
Lilliefors Critical Value 0.0444
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0731
Lilliefors Critical Value 0.0444
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 8.1
95% UPL (t) 7.946
90% Percentile (z) 7.496
95% Percentile (z) 7.938
99% Percentile (z) 8.769

Assuming Lognormal Distribution

95% UTL with 95% Coverage 8.645
95% UPL (t) 8.403
90% Percentile (z) 7.733
95% Percentile (z) 8.391
99% Percentile (z) 9.782

Gamma Distribution Test

k star 21.36
Theta Star 0.278
MLE of Mean 5.934
MLE of Standard Deviation 1.284
nu star 17045

Data Distribution Test

Data appear Normal at 5% Significance Level

A-D Test Statistic 3.189
5% A-D Critical Value 0.752
K-S Test Statistic 0.0628
5% K-S Critical Value 0.0451
Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 7.254
95% Percentile 7.982
99% Percentile 9.103

Assuming Gamma Distribution

90% Percentile 7.627
95% Percentile 8.191
99% Percentile 9.321

95% WH Approx. Gamma UPL 8.194
95% HW Approx. Gamma UPL 8.239
95% WH Approx. Gamma UTL with 95% Coverage 8.396
95% HW Approx. Gamma UTL with 95% Coverage 8.45

95% UTL with 95% Coverage 8.07
95% Percentile Bootstrap UTL with 95% Coverage 8.12
95% BCA Bootstrap UTL with 95% Coverage 8.075
95% UPL 8
95% Chebyshev UPL 11.25
Upper Threshold Limit Based upon IQR 8.98

U1600124

Fluoride

General Statistics

Total Number of Observations 407
Number of Distinct Observations 238
Tolerance Factor 1.776

Raw Statistics		Log-Transformed Statistics	
Minimum	0.121	Minimum	-2.112
Maximum	0.688	Maximum	-0.374
Second Largest	0.646	Second Largest	-0.437
First Quartile	0.221	First Quartile	-1.51
Median	0.27	Median	-1.309
Third Quartile	0.336	Third Quartile	-1.092
Mean	0.287	Mean	-1.298
Geometric Mean	0.273	SD	0.315
SD	0.0945		
Coefficient of Variation	0.329		
Skewness	1.033		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.0901	Lilliefors Test Statistic	0.0263
Lilliefors Critical Value	0.0439	Lilliefors Critical Value	0.0439
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	0.455	95% UTL with 95% Coverage	0.478
95% UPL (t)	0.443	95% UPL (t)	0.459
90% Percentile (z)	0.408	90% Percentile (z)	0.409
95% Percentile (z)	0.443	95% Percentile (z)	0.459
99% Percentile (z)	0.507	99% Percentile (z)	0.568

Gamma Distribution Test		Data Distribution Test	
k star	10.04	Data appear Lognormal at 5% Significance Level	
Theta Star	0.0286		
MLE of Mean	0.287		
MLE of Standard Deviation	0.0907		
nu star	8173		
A-D Test Statistic	1.248	Nonparametric Statistics	
5% A-D Critical Value	0.754	90% Percentile	0.414
K-S Test Statistic	0.0476	95% Percentile	0.472
5% K-S Critical Value	0.0449	99% Percentile	0.574
Data not Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	0.408	95% UTL with 95% Coverage	0.497
95% Percentile	0.451	95% Percentile Bootstrap UTL with 95% Coverage	0.497
99% Percentile	0.539	95% BCA Bootstrap UTL with 95% Coverage	0.496
		95% UPL	0.48
95% WH Approx. Gamma UPL	0.451	95% Chebyshev UPL	0.7
95% HW Approx. Gamma UPL	0.453	Upper Threshold Limit Based upon IQR	0.507
95% WH Approx. Gamma UTL with 95% Coverage	0.466		
95% HW Approx. Gamma UTL with 95% Coverage	0.469		

U1600124

Gallium

General Statistics

Number of Valid Data 102	Number of Detected Data 0
Number of Distinct Detected Data 0	Number of Non-Detect Data 102

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 Gallium was not processed!

Hardness

General Statistics

Total Number of Observations 396
Number of Distinct Observations 171
Tolerance Factor 1.778

Raw Statistics

Minimum 19.9
Maximum 70.1
Second Largest 63
First Quartile 39.5
Median 43.2
Third Quartile 47.13
Mean 43.54
Geometric Mean 43.2
SD 5.478
Coefficient of Variation 0.126
Skewness 0.302

Log-Transformed Statistics

Minimum 2.991
Maximum 4.25
Second Largest 4.143
First Quartile 3.676
Median 3.766
Third Quartile 3.853
Mean 3.766
SD 0.128

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0401
Lilliefors Critical Value 0.0445
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.039
Lilliefors Critical Value 0.0445
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 53.28
95% UPL (t) 52.59
90% Percentile (z) 50.56
95% Percentile (z) 52.55
99% Percentile (z) 56.29

Assuming Lognormal Distribution

95% UTL with 95% Coverage 54.19
95% UPL (t) 53.32
90% Percentile (z) 50.86
95% Percentile (z) 53.27
99% Percentile (z) 58.11

Gamma Distribution Test

k star 62.3
Theta Star 0.699
MLE of Mean 43.54
MLE of Standard Deviation 5.516
nu star 49344

A-D Test Statistic 0.571
5% A-D Critical Value 0.752
K-S Test Statistic 0.0329
5% K-S Critical Value 0.0453
Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 50.95
95% Percentile 52.33
99% Percentile 55.61

Assuming Gamma Distribution

90% Percentile 50.74
95% Percentile 53
99% Percentile 57.39

95% WH Approx. Gamma UPL 53
95% HW Approx. Gamma UPL 53.07
95% WH Approx. Gamma UTL with 95% Coverage 53.8
95% HW Approx. Gamma UTL with 95% Coverage 53.89

95% UTL with 95% Coverage 53.1
95% Percentile Bootstrap UTL with 95% Coverage 53.03
95% BCA Bootstrap UTL with 95% Coverage 53.03
95% UPL 52.4
95% Chebyshev UPL 67.45
Upper Threshold Limit Based upon IQR 58.56

U1600124

Iron

General Statistics

Number of Valid Data	102
Number of Distinct Detected Data	11
Tolerance Factor	1.92
Number of Detected Data	19
Number of Non-Detect Data	83
Percent Non-Detects	81.37%

Raw Statistics

Minimum Detected	10
Maximum Detected	55
Mean of Detected	17.14
SD of Detected	10.56
Minimum Non-Detect	10
Maximum Non-Detect	10

Log-transformed Statistics

Minimum Detected	2.303
Maximum Detected	4.007
Mean of Detected	2.734
SD of Detected	0.421
Minimum Non-Detect	2.303
Maximum Non-Detect	2.303

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.604
5% Shapiro Wilk Critical Value	0.901

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.787
5% Shapiro Wilk Critical Value	0.901

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	7.261
SD	6.514
95% UTL 95% Coverage	19.77
95% UPL (t)	18.13
90% Percentile (z)	15.61
95% Percentile (z)	17.98
99% Percentile (z)	22.41

Maximum Likelihood Estimate(MLE) Method

Mean	-5.16
SD	16.27
95% UTL with 95% Coverage	25.09
95% UPL (t)	21.99
90% Percentile (z)	15.7
95% Percentile (z)	21.61
99% Percentile (z)	32.7

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	1.819
SD (Log Scale)	0.475
95% UTL 95% Coverage	15.34
95% UPL (t)	13.61
90% Percentile (z)	11.33
95% Percentile (z)	13.46
99% Percentile (z)	18.6

Log ROS Method

Mean in Original Scale	6.036
SD in Original Scale	7.238
95% UTL with 95% Coverage	24.27
95% BCA UTL with 95% Coverage	18
95% Bootstrap (%) UTL with 95% Coverage	25.6
95% UPL (t)	19.02
90% Percentile (z)	13.1
95% Percentile (z)	18.6
99% Percentile (z)	35.91

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	4.113
Theta Star	4.167
nu star	156.3
A-D Test Statistic	1.985
5% A-D Critical Value	0.743
K-S Test Statistic	0.312
5% K-S Critical Value	0.199

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	3.222
Median	0.000001
SD	8.044
k star	0.0769
Theta star	41.88
Nu star	15.7
95% Percentile of Chisquare (2k)	0.893
90% Percentile	7.448
95% Percentile	18.7
99% Percentile	58.12

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	11.33
SD	5.236
SE of Mean	0.533
95% KM UTL with 95% Coverage	21.38
95% KM Chebyshev UPL	34.26
95% KM UPL (t)	20.06
90% Percentile (z)	18.04
95% Percentile (z)	19.94
99% Percentile (z)	23.51

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	10.07
95% Hawkins Wixley (HW) Approx. Gamma UPL	8.639
95% WH Approx. Gamma UTL with 95% Coverage	14.01
95% HW Approx. Gamma UTL with 95% Coverage	13.32

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data	102
Number of Distinct Detected Data	55
Tolerance Factor	1.92
Number of Detected Data	61
Number of Non-Detect Data	41
Percent Non-Detects	40.20%

Raw Statistics

Minimum Detected	0.0053
Maximum Detected	0.125
Mean of Detected	0.0198
SD of Detected	0.0221
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.24
Maximum Detected	-2.079
Mean of Detected	-4.244
SD of Detected	0.726
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.293
5% Lilliefors Critical Value	0.113

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.113
5% Lilliefors Critical Value	0.113

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0129
SD		0.019
95% UTL	95% Coverage	0.0494
95% UPL (t)		0.0446
90% Percentile (z)		0.0373
95% Percentile (z)		0.0442
99% Percentile (z)		0.0572

Maximum Likelihood Estimate(MLE) Method

Mean		0.00551
SD		0.0263
95% UTL with	95% Coverage	0.056
95% UPL (t)		0.0494
90% Percentile (z)		0.0392
95% Percentile (z)		0.0488
99% Percentile (z)		0.0667

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-4.947
SD (Log Scale)		1.027
95% UTL	95% Coverage	0.051
95% UPL (t)		0.0394
90% Percentile (z)		0.0265
95% Percentile (z)		0.0385
99% Percentile (z)		0.0774

Log ROS Method

Mean in Original Scale		0.0129
SD in Original Scale		0.019
95% UTL with	95% Coverage	0.0598
95% BCA UTL with	95% Coverage	0.076
95% Bootstrap (%) UTL with	95% Coverage	0.0765
95% UPL (t)		0.045
90% Percentile (z)		0.0291
95% Percentile (z)		0.0439
99% Percentile (z)		0.0945

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.618
Theta Star	0.0123
nu star	197.5
A-D Test Statistic	3.063
5% A-D Critical Value	0.767
K-S Test Statistic	0.183
5% K-S Critical Value	0.116

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0119
Median	0.0072
SD	0.0196
k star	0.202
Theta star	0.0588
Nu star	41.14
95% Percentile of Chisquare (2k)	2.074
90% Percentile	0.0359
95% Percentile	0.061
99% Percentile	0.13

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.014
SD		0.0184
SE of Mean		0.00183
95% KM UTL with	95% Coverage	0.0493
95% KM Chebyshev UPL		0.0945
95% KM UPL (t)		0.0446
90% Percentile (z)		0.0375
95% Percentile (z)		0.0442
99% Percentile (z)		0.0567

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.051
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.0634
95% WH Approx. Gamma UTL with	95% Coverage	0.0657
95% HW Approx. Gamma UTL with	95% Coverage	0.0875

Note: DL/2 is not a recommended method.

U1600124

Lithium

General Statistics

Total Number of Observations 102
Number of Distinct Observations 59
Tolerance Factor 1.92

Raw Statistics

Minimum 18.9
Maximum 30.1
Second Largest 29.1
First Quartile 22.83
Median 24.2
Third Quartile 25.85
Mean 24.23
Geometric Mean 24.12
SD 2.27
Coefficient of Variation 0.0937
Skewness 0.0672

Log-Transformed Statistics

Minimum 2.939
Maximum 3.405
Second Largest 3.371
First Quartile 3.128
Median 3.186
Third Quartile 3.252
Mean 3.183
SD 0.0943

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0406
Lilliefors Critical Value 0.0877
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0426
Lilliefors Critical Value 0.0877
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 28.59
95% UPL (t) 28.02
90% Percentile (z) 27.14
95% Percentile (z) 27.96
99% Percentile (z) 29.51

Assuming Lognormal Distribution

95% UTL with 95% Coverage 28.91
95% UPL (t) 28.23
90% Percentile (z) 27.22
95% Percentile (z) 28.17
99% Percentile (z) 30.04

Gamma Distribution Test

k star 111
Theta Star 0.218
MLE of Mean 24.23
MLE of Standard Deviation 2.3
nu star 22642

A-D Test Statistic 0.159
5% A-D Critical Value 0.75
K-S Test Statistic 0.0369
5% K-S Critical Value 0.0887
Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile 27.27
95% Percentile 27.89
99% Percentile 29.09

Assuming Gamma Distribution

90% Percentile 27.22
95% Percentile 28.13
99% Percentile 29.9

95% WH Approx. Gamma UPL 28.15
95% HW Approx. Gamma UPL 28.17
95% WH Approx. Gamma UTL with 95% Coverage 28.79
95% HW Approx. Gamma UTL with 95% Coverage 28.82

95% UTL with 95% Coverage 28.5
95% Percentile Bootstrap UTL with 95% Coverage 28.49
95% BCA Bootstrap UTL with 95% Coverage 28.49
95% UPL 27.9
95% Chebyshev UPL 34.17
Upper Threshold Limit Based upon IQR 30.39

U1600124

Magnesium (mg/L)

General Statistics

Total Number of Observations 102
Number of Distinct Observations 71
Tolerance Factor 1.92

Raw Statistics

Minimum 0.28
Maximum 4.19
Second Largest 4.18
First Quartile 2.955
Median 3.22
Third Quartile 3.528
Mean 3.199
Geometric Mean 3.022
SD 0.691
Coefficient of Variation 0.216
Skewness -2.397

Log-Transformed Statistics

Minimum -1.273
Maximum 1.433
Second Largest 1.43
First Quartile 1.083
Median 1.169
Third Quartile 1.261
Mean 1.106
SD 0.444

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.194
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.354
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 4.525
95% UPL (t) 4.351
90% Percentile (z) 4.084
95% Percentile (z) 4.335
99% Percentile (z) 4.805

Assuming Lognormal Distribution

95% UTL with 95% Coverage 7.088
95% UPL (t) 6.337
90% Percentile (z) 5.338
95% Percentile (z) 6.272
99% Percentile (z) 8.488

Gamma Distribution Test

k star 8.715
Theta Star 0.367
MLE of Mean 3.199
MLE of Standard Deviation 1.084
nu star 1778

A-D Test Statistic 13.29
5% A-D Critical Value 0.753
K-S Test Statistic 0.308
5% K-S Critical Value 0.0889
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 3.978
95% Percentile 4.05
99% Percentile 4.179

Assuming Gamma Distribution

90% Percentile 4.642
95% Percentile 5.164
99% Percentile 6.242

95% WH Approx. Gamma UPL 5.138
95% HW Approx. Gamma UPL 5.343
95% WH Approx. Gamma UTL with 95% Coverage 5.507
95% HW Approx. Gamma UTL with 95% Coverage 5.77

95% UTL with 95% Coverage 4.1
95% Percentile Bootstrap UTL with 95% Coverage 4.1
95% BCA Bootstrap UTL with 95% Coverage 4.09
95% UPL 4.076
95% Chebyshev UPL 6.224
Upper Threshold Limit Based upon IQR 4.386

U1600124

Manganese

General Statistics

Number of Valid Data	102	Number of Detected Data	101
Number of Distinct Detected Data	99	Number of Non-Detect Data	1
Tolerance Factor	1.92	Percent Non-Detects	0.98%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0104	Minimum Detected	-4.566
Maximum Detected	42.2	Maximum Detected	3.742
Mean of Detected	1.839	Mean of Detected	-0.83
SD of Detected	5.227	SD of Detected	1.614
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.363
5% Lilliefors Critical Value	0.0882

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	1.821		
SD	5.204		
95% UTL	95% Coverage	11.82	
95% UPL (t)		10.5	
90% Percentile (z)		8.491	
95% Percentile (z)		10.38	
99% Percentile (z)		13.93	

Maximum Likelihood Estimate(MLE) Method

Mean	1.786		
SD	5.211		
95% UTL with	95% Coverage	11.79	
95% UPL (t)		10.48	
90% Percentile (z)		8.464	
95% Percentile (z)		10.36	
99% Percentile (z)		13.91	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.442
Theta Star	4.161
nu star	89.29
A-D Test Statistic	5.779
5% A-D Critical Value	0.831
K-S Test Statistic	0.2
5% K-S Critical Value	0.095

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	1.821
Median	0.353
SD	5.204
k star	0.414
Theta star	4.403
Nu star	84.37
95% Percentile of Chisquare (2k)	3.397
90% Percentile	5.113
95% Percentile	7.479
99% Percentile	13.41

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0972
5% Lilliefors Critical Value	0.0882

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-0.881	
SD (Log Scale)		1.685	
95% UTL	95% Coverage	10.54	
95% UPL (t)		6.89	
90% Percentile (z)		3.592	
95% Percentile (z)		6.625	
99% Percentile (z)		20.89	

Log ROS Method

Mean in Original Scale		1.821	
SD in Original Scale		5.204	
95% UTL with	95% Coverage	10.2	
95% BCA UTL with	95% Coverage	17.43	
95% Bootstrap (%) UTL with	95% Coverage	17.43	
95% UPL (t)		6.706	
90% Percentile (z)		3.523	
95% Percentile (z)		6.45	
99% Percentile (z)		20.05	

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		1.821	
SD		5.179	
SE of Mean		0.515	
95% KM UTL with	95% Coverage	11.77	
95% KM Chebyshev UPL		24.51	
95% KM UPL (t)		10.46	
90% Percentile (z)		8.458	
95% Percentile (z)		10.34	
99% Percentile (z)		13.87	

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		6.877	
95% Hawkins Wixley (HW) Approx. Gamma UPL		5.741	
95% WH Approx. Gamma UTL with	95% Coverage	7.362	
95% HW Approx. Gamma UTL with	95% Coverage	7.404	

Note: DL/2 is not a recommended method.

U1600124

Molybdenum

General Statistics

Total Number of Observations	102	Number of Distinct Observations	70
Tolerance Factor	1.92		

Raw Statistics		Log-Transformed Statistics	
Minimum	0.743	Minimum	-0.297
Maximum	2.27	Maximum	0.82
Second Largest	2.25	Second Largest	0.811
First Quartile	1.033	First Quartile	0.032
Median	1.165	Median	0.153
Third Quartile	1.46	Third Quartile	0.378
Mean	1.26	Mean	0.203
Geometric Mean	1.225	SD	0.236
SD	0.318		
Coefficient of Variation	0.252		
Skewness	1.076		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.183	Lilliefors Test Statistic	0.142
Lilliefors Critical Value	0.0877	Lilliefors Critical Value	0.0877
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 95% Coverage	1.871	95% UTL with 95% Coverage	1.925
95% UPL (t)	1.791	95% UPL (t)	1.814
90% Percentile (z)	1.668	90% Percentile (z)	1.656
95% Percentile (z)	1.783	95% Percentile (z)	1.804
99% Percentile (z)	2	99% Percentile (z)	2.119

Gamma Distribution Test		Data Distribution Test
k star	17.13	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.0736	
MLE of Mean	1.26	
MLE of Standard Deviation	0.304	
nu star	3494	
A-D Test Statistic	2.262	**Nonparametric Statistics**
5% A-D Critical Value	0.75	90% Percentile 1.726
K-S Test Statistic	0.157	95% Percentile 1.866
5% K-S Critical Value	0.0888	99% Percentile 2.248
Data not Gamma Distributed at 5% Significance Level		
Assuming Gamma Distribution		95% UTL with 95% Coverage 2.02
90% Percentile	1.663	95% Percentile Bootstrap UTL with 95% Coverage 2.018
95% Percentile	1.799	95% BCA Bootstrap UTL with 95% Coverage 2.018
99% Percentile	2.074	95% UPL 1.879
		95% Chebyshev UPL 2.653
95% WH Approx. Gamma UPL	1.802	Upper Threshold Limit Based upon IQR 2.101
95% HW Approx. Gamma UPL	1.805	
95% WH Approx. Gamma UTL with 95% Coverage	1.9	
95% HW Approx. Gamma UTL with 95% Coverage	1.906	

Nickel

General Statistics

Number of Valid Data	102	Number of Detected Data	89
Number of Distinct Detected Data	81	Number of Non-Detect Data	13
Tolerance Factor	1.92	Percent Non-Detects	12.75%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.052	Minimum Detected	-2.957
Maximum Detected	2.68	Maximum Detected	0.986
Mean of Detected	0.577	Mean of Detected	-1.026
SD of Detected	0.595	SD of Detected	1.011
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.189
5% Lilliefors Critical Value	0.0939

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0491
5% Lilliefors Critical Value	0.0939

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.507		
SD	0.586		
95% UTL	95% Coverage	1.631	
95% UPL (t)		1.484	
90% Percentile (z)		1.257	
95% Percentile (z)		1.47	
99% Percentile (z)		1.869	

Maximum Likelihood Estimate(MLE) Method

Mean		0.461	
SD		0.642	
95% UTL with	95% Coverage	1.693	
95% UPL (t)		1.531	
90% Percentile (z)		1.283	
95% Percentile (z)		1.516	
99% Percentile (z)		1.953	

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-1.365	
SD (Log Scale)		1.299	
95% UTL	95% Coverage	3.095	
95% UPL (t)		2.23	
90% Percentile (z)		1.35	
95% Percentile (z)		2.164	
99% Percentile (z)		5.244	

Log ROS Method

Mean in Original Scale		0.509	
SD in Original Scale		0.584	
95% UTL with	95% Coverage	2.84	
95% BCA UTL with	95% Coverage	2.39	
95% Bootstrap (%) UTL with	95% Coverage	2.466	
95% UPL (t)		2.082	
90% Percentile (z)		1.293	
95% Percentile (z)		2.023	
99% Percentile (z)		4.68	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.156
Theta Star	0.499
nu star	205.8
A-D Test Statistic	0.94
5% A-D Critical Value	0.778
K-S Test Statistic	0.0953
5% K-S Critical Value	0.0972

Data follow Appx. Gamma Distribution at 5% Significance Level

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean		0.504	
Median		0.297	
SD		0.588	
k star		0.339	
Theta star		1.486	
Nu star		69.15	
95% Percentile of Chisquare (2k)		2.98	
90% Percentile		1.462	
95% Percentile		2.214	
99% Percentile		4.141	

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.51	
SD		0.58	
SE of Mean		0.0577	
95% KM UTL with	95% Coverage	1.624	
95% KM Chebyshev UPL		3.05	
95% KM UPL (t)		1.478	
90% Percentile (z)		1.254	
95% Percentile (z)		1.464	
99% Percentile (z)		1.859	

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		1.858	
95% Hawkins Wixley (HW) Approx. Gamma UPL		2.309	
95% WH Approx. Gamma UTL with	95% Coverage	2.278	
95% HW Approx. Gamma UTL with	95% Coverage	2.973	

Note: DL/2 is not a recommended method.

Nitrate-Nitrite as Nitrogen

General Statistics

Number of Valid Data	412	Number of Detected Data	411
Number of Distinct Detected Data	259	Number of Non-Detect Data	1
Tolerance Factor	1.775	Percent Non-Detects	0.24%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0254	Minimum Detected	-3.673
Maximum Detected	0.98	Maximum Detected	-0.0202
Mean of Detected	0.439	Mean of Detected	-0.965
SD of Detected	0.194	SD of Detected	0.617
Minimum Non-Detect	0.25	Minimum Non-Detect	-1.386
Maximum Non-Detect	0.25	Maximum Non-Detect	-1.386

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.0786	Lilliefors Test Statistic	0.145
5% Lilliefors Critical Value	0.0437	5% Lilliefors Critical Value	0.0437
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.438	Mean (Log Scale)	-0.967
SD	0.194	SD (Log Scale)	0.618
95% UTL 95% Coverage	0.782	95% UTL 95% Coverage	1.139
95% UPL (t)	0.758	95% UPL (t)	1.055
90% Percentile (z)	0.687	90% Percentile (z)	0.84
95% Percentile (z)	0.757	95% Percentile (z)	1.051
99% Percentile (z)	0.89	99% Percentile (z)	1.602
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.44	Mean in Original Scale	0.438
SD	0.191	SD in Original Scale	0.194
95% UTL with 95% Coverage	0.78	95% UTL with 95% Coverage	1.138
		95% BCA UTL with 95% Coverage	0.786
		95% Bootstrap (%) UTL with 95% Coverage	0.788
95% UPL (t)	0.756	95% UPL (t)	1.054
90% Percentile (z)	0.685	90% Percentile (z)	0.839
95% Percentile (z)	0.755	95% Percentile (z)	1.05
99% Percentile (z)	0.885	99% Percentile (z)	1.6

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	3.692	Data do not follow a Discernable Distribution (0.05)
Theta Star	0.119	
nu star	3035	
A-D Test Statistic	6.592	
5% A-D Critical Value	0.759	
K-S Test Statistic	0.101	
5% K-S Critical Value	0.0449	
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics with Extrapolated Data		Kaplan-Meier (KM) Method	
Mean	0.438	Mean	0.438
Median	0.405	SD	0.194
SD	0.194	SE of Mean	0.00957
k star	3.662	95% KM UTL with 95% Coverage	0.782
Theta star	0.12	95% KM Chebyshev UPL	1.284
Nu star	3018	95% KM UPL (t)	0.758
95% Percentile of Chisquare (2k)	14.54	90% Percentile (z)	0.686
		95% Percentile (z)	0.757
90% Percentile	0.745	99% Percentile (z)	0.889
95% Percentile	0.869		
99% Percentile	1.136	Gamma ROS Limits with Extrapolated Data	
		95% Wilson Hilferty (WH) Approx. Gamma UPL	0.868
		95% Hawkins Wixley (HW) Approx. Gamma UPL	0.899
		95% WH Approx. Gamma UTL with 95% Coverage	0.913
		95% HW Approx. Gamma UTL with 95% Coverage	0.95

Note: DL/2 is not a recommended method.

Oxidation-Reduction Potential

General Statistics

Total Number of Observations 367
Number of Distinct Observations 345
Tolerance Factor 1.783

Raw Statistics

Minimum -69.3
Maximum 503.7
Second Largest 455.8
First Quartile 78.15
Median 131.9
Third Quartile 204.8
Mean 151.6
Geometric Mean N/A
SD 108
Coefficient of Variation 0.712
Skewness 0.876

Log-Transformed Statistics

Log Statistics Not Available
Log Statistics Not Available

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0972
Lilliefors Critical Value 0.0462
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Not Available

Assuming Normal Distribution

95% UTL 95% Coverage 344.1
95% UPL (t) 329.9
90% Percentile (z) 290
95% Percentile (z) 329.2
99% Percentile (z) 402.8

Assuming Lognormal Distribution

Cannot Derive Log-Transformed Statistics

Gamma Distribution Test

Gamma Statistics Not Available

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 300.6
95% Percentile 391.4
99% Percentile 442.2
99% Percentile 442.2
Approximate 95% Confidence with 95% Coverage UTL 403.6
95% Percentile Bootstrap UTL with 95% Coverage 403.2
95% BCA Bootstrap UTL with 95% Coverage 403.6
95% UPL 393.4
95% Chebyshev UPL 622.8
Upper Threshold Limit Based upon IQR 394.7

U1600124

Perchlorate (ug/L)

General Statistics

Total Number of Observations 389
Number of Distinct Observations 179
Tolerance Factor 1.779

Raw Statistics

Minimum 0.123
Maximum 0.468
Second Largest 0.465
First Quartile 0.277
Median 0.32
Third Quartile 0.363
Mean 0.322
Geometric Mean 0.317
SD 0.055
Coefficient of Variation 0.171
Skewness 0.129

Log-Transformed Statistics

Minimum -2.096
Maximum -0.759
Second Largest -0.766
First Quartile -1.284
Median -1.139
Third Quartile -1.013
Mean -1.148
SD 0.175

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0557
Lilliefors Critical Value 0.0449
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0417
Lilliefors Critical Value 0.0449
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.42
95% UPL (t) 0.413
90% Percentile (z) 0.393
95% Percentile (z) 0.413
99% Percentile (z) 0.45

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.434
95% UPL (t) 0.424
90% Percentile (z) 0.397
95% Percentile (z) 0.424
99% Percentile (z) 0.477

Gamma Distribution Test

k star 33.26
Theta Star 0.00969
MLE of Mean 0.322
MLE of Standard Deviation 0.0559
nu star 25877

Data Distribution Test

Data Follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic 0.939

5% A-D Critical Value 0.752
K-S Test Statistic 0.0427
5% K-S Critical Value 0.0458
Data follow Appx. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

90% Percentile 0.4
95% Percentile 0.413
99% Percentile 0.442

Assuming Gamma Distribution

90% Percentile 0.396
95% Percentile 0.419
99% Percentile 0.466

95% WH Approx. Gamma UPL 0.419
95% HW Approx. Gamma UPL 0.42
95% WH Approx. Gamma UTL with 95% Coverage 0.428
95% HW Approx. Gamma UTL with 95% Coverage 0.429

95% UTL with 95% Coverage 0.419
95% Percentile Bootstrap UTL with 95% Coverage 0.419
95% BCA Bootstrap UTL with 95% Coverage 0.419
95% UPL 0.413
95% Chebyshev UPL 0.562
Upper Threshold Limit Based upon IQR 0.492

U1600124

pH

General Statistics

Total Number of Observations 403
Number of Distinct Observations 134
Tolerance Factor 1.777

Raw Statistics

Minimum 6.57
Maximum 8.97
Second Largest 8.86
First Quartile 7.66
Median 7.89
Third Quartile 8.07
Mean 7.837
Geometric Mean 7.829
SD 0.349
Coefficient of Variation 0.0445
Skewness -0.863

Log-Transformed Statistics

Minimum 1.883
Maximum 2.194
Second Largest 2.182
First Quartile 2.036
Median 2.066
Third Quartile 2.088
Mean 2.058
SD 0.0453

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.091
Lilliefors Critical Value 0.0441
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.1
Lilliefors Critical Value 0.0441
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 8.457
95% UPL (t) 8.413
90% Percentile (z) 8.284
95% Percentile (z) 8.411
99% Percentile (z) 8.649

Assuming Lognormal Distribution

95% UTL with 95% Coverage 8.486
95% UPL (t) 8.437
90% Percentile (z) 8.297
95% Percentile (z) 8.435
99% Percentile (z) 8.7

Gamma Distribution Test

k star 490.5
Theta Star 0.016
MLE of Mean 7.837
MLE of Standard Deviation 0.354
nu star 395319

A-D Test Statistic 5.627
5% A-D Critical Value 0.751
K-S Test Statistic 0.0972
5% K-S Critical Value 0.0449
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 8.22
95% Percentile 8.29
99% Percentile 8.45

Assuming Gamma Distribution

90% Percentile 8.294
95% Percentile 8.428
99% Percentile 8.684

95% WH Approx. Gamma UPL 8.429
95% HW Approx. Gamma UPL 8.431
95% WH Approx. Gamma UTL with 95% Coverage 8.475
95% HW Approx. Gamma UTL with 95% Coverage 8.478

95% UTL with 95% Coverage 8.35
95% Percentile Bootstrap UTL with 95% Coverage 8.35
95% BCA Bootstrap UTL with 95% Coverage 8.328
95% UPL 8.298
95% Chebyshev UPL 9.36
Upper Threshold Limit Based upon IQR 8.685

U1600124

Phosphorus

General Statistics

Number of Valid Data 102	Number of Detected Data 1
Number of Distinct Detected Data 1	Number of Non-Detect Data 101

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 Phosphorus was not processed!

Potassium (mg/L)

General Statistics

Total Number of Observations 102
Number of Distinct Observations 63
Tolerance Factor 1.92

Raw Statistics

Minimum 1.11
Maximum 2.95
Second Largest 2.87
First Quartile 1.473
Median 1.645
Third Quartile 1.793
Mean 1.688
Geometric Mean 1.66
SD 0.328
Coefficient of Variation 0.194
Skewness 1.67

Log-Transformed Statistics

Minimum 0.104
Maximum 1.082
Second Largest 1.054
First Quartile 0.387
Median 0.498
Third Quartile 0.584
Mean 0.507
SD 0.177

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.146
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.104
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 2.318
95% UPL (t) 2.235
90% Percentile (z) 2.108
95% Percentile (z) 2.227
99% Percentile (z) 2.451

Assuming Lognormal Distribution

95% UTL with 95% Coverage 2.332
95% UPL (t) 2.23
90% Percentile (z) 2.083
95% Percentile (z) 2.221
99% Percentile (z) 2.505

Gamma Distribution Test

k star 29.82
Theta Star 0.0566
MLE of Mean 1.688
MLE of Standard Deviation 0.309
nu star 6083

A-D Test Statistic 1.856
5% A-D Critical Value 0.75
K-S Test Statistic 0.117
5% K-S Critical Value 0.0887
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 2.026
95% Percentile 2.398
99% Percentile 2.87

Assuming Gamma Distribution

90% Percentile 2.094
95% Percentile 2.226
99% Percentile 2.489

95% WH Approx. Gamma UPL 2.229
95% HW Approx. Gamma UPL 2.229
95% WH Approx. Gamma UTL with 95% Coverage 2.323
95% HW Approx. Gamma UTL with 95% Coverage 2.324

95% UTL with 95% Coverage 2.84
95% Percentile Bootstrap UTL with 95% Coverage 2.82
95% BCA Bootstrap UTL with 95% Coverage 2.82
95% UPL 2.436
95% Chebyshev UPL 3.125
Upper Threshold Limit Based upon IQR 2.273

U1600124

Rhenium

General Statistics

Number of Valid Data 102	Number of Detected Data 0
Number of Distinct Detected Data 0	Number of Non-Detect Data 102

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 Rhenium was not processed!

Rubidium

General Statistics

Total Number of Observations 102
Number of Distinct Observations 80
Tolerance Factor 1.92

Raw Statistics

Minimum 1.47
Maximum 6.44
Second Largest 5.9
First Quartile 2.343
Median 2.62
Third Quartile 3.103
Mean 2.876
Geometric Mean 2.752
SD 0.951
Coefficient of Variation 0.331
Skewness 1.748

Log-Transformed Statistics

Minimum 0.385
Maximum 1.863
Second Largest 1.775
First Quartile 0.851
Median 0.963
Third Quartile 1.132
Mean 1.012
SD 0.286

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.185
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.118
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 4.702
95% UPL (t) 4.462
90% Percentile (z) 4.094
95% Percentile (z) 4.44
99% Percentile (z) 5.088

Assuming Lognormal Distribution

95% UTL with 95% Coverage 4.763
95% UPL (t) 4.432
90% Percentile (z) 3.968
95% Percentile (z) 4.402
99% Percentile (z) 5.349

Gamma Distribution Test

k star 11.19
Theta Star 0.257
MLE of Mean 2.876
MLE of Standard Deviation 0.859
nu star 2284

A-D Test Statistic 3.174
5% A-D Critical Value 0.752
K-S Test Statistic 0.14
5% K-S Critical Value 0.0889
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 4.041
95% Percentile 5.035
99% Percentile 5.898

Assuming Gamma Distribution

90% Percentile 4.017
95% Percentile 4.42
99% Percentile 5.242

95% WH Approx. Gamma UPL 4.425
95% HW Approx. Gamma UPL 4.425
95% WH Approx. Gamma UTL with 95% Coverage 4.717
95% HW Approx. Gamma UTL with 95% Coverage 4.725

95% UTL with 95% Coverage 5.69
95% Percentile Bootstrap UTL with 95% Coverage 5.685
95% BCA Bootstrap UTL with 95% Coverage 5.685
95% UPL 5.049
95% Chebyshev UPL 7.041
Upper Threshold Limit Based upon IQR 4.243

U1600124

Selenium

General Statistics

Total Number of Observations	102
Number of Distinct Observations	91
Tolerance Factor	1.92

Raw Statistics	
Minimum	0.113
Maximum	0.783
Second Largest	0.708
First Quartile	0.303
Median	0.369
Third Quartile	0.448
Mean	0.391
Geometric Mean	0.372
SD	0.125
Coefficient of Variation	0.319
Skewness	0.745

Log-Transformed Statistics	
Minimum	-2.18
Maximum	-0.245
Second Largest	-0.345
First Quartile	-1.196
Median	-0.997
Third Quartile	-0.804
Mean	-0.988
SD	0.319

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic	0.0946
Lilliefors Critical Value	0.0877

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic	0.0512
Lilliefors Critical Value	0.0877

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	0.631
95% UPL (t)	0.599
90% Percentile (z)	0.551
95% Percentile (z)	0.596
99% Percentile (z)	0.681

Assuming Lognormal Distribution

95% UTL with 95% Coverage	0.688
95% UPL (t)	0.634
90% Percentile (z)	0.561
95% Percentile (z)	0.63
99% Percentile (z)	0.783

Gamma Distribution Test

k star	9.959
Theta Star	0.0393
MLE of Mean	0.391
MLE of Standard Deviation	0.124
nu star	2032
A-D Test Statistic	0.672
5% A-D Critical Value	0.752
K-S Test Statistic	0.065
5% K-S Critical Value	0.0889

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile	0.556
95% Percentile	0.615
99% Percentile	0.736
95% WH Approx. Gamma UPL	0.616
95% HW Approx. Gamma UPL	0.62
95% WH Approx. Gamma UTL with 95% Coverage	0.659
95% HW Approx. Gamma UTL with 95% Coverage	0.665

Nonparametric Statistics

90% Percentile	0.578
95% Percentile	0.607
99% Percentile	0.708
95% UTL with 95% Coverage	0.679
95% Percentile Bootstrap UTL with 95% Coverage	0.676
95% BCA Bootstrap UTL with 95% Coverage	0.676
95% UPL	0.622
95% Chebyshev UPL	0.937
Upper Threshold Limit Based upon IQR	0.665

U1600124

Silicon Dioxide (mg/L)

General Statistics

Total Number of Observations 102
Number of Distinct Observations 50
Tolerance Factor 1.92

Raw Statistics

Minimum 42.6
Maximum 86
Second Largest 86
First Quartile 68.9
Median 72.9
Third Quartile 75.8
Mean 71.16
Geometric Mean 70.56
SD 8.399
Coefficient of Variation 0.118
Skewness -2.008

Log-Transformed Statistics

Minimum 3.752
Maximum 4.454
Second Largest 4.454
First Quartile 4.233
Median 4.289
Third Quartile 4.328
Mean 4.256
SD 0.138

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.202
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.245
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 87.29
95% UPL (t) 85.17
90% Percentile (z) 81.92
95% Percentile (z) 84.98
99% Percentile (z) 90.7

Assuming Lognormal Distribution

95% UTL with 95% Coverage 92.05
95% UPL (t) 88.89
90% Percentile (z) 84.26
95% Percentile (z) 88.6
99% Percentile (z) 97.37

Gamma Distribution Test

k star 57.29
Theta Star 1.242
MLE of Mean 71.16
MLE of Standard Deviation 9.402
nu star 11687

A-D Test Statistic 8.603
5% A-D Critical Value 0.75
K-S Test Statistic 0.231
5% K-S Critical Value 0.0887
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 77.9
95% Percentile 79.8
99% Percentile 85.99

Assuming Gamma Distribution

90% Percentile 83.44
95% Percentile 87.3
99% Percentile 94.84

95% WH Approx. Gamma UPL 87.38
95% HW Approx. Gamma UPL 87.73
95% WH Approx. Gamma UTL with 95% Coverage 90.1
95% HW Approx. Gamma UTL with 95% Coverage 90.54

95% UTL with 95% Coverage 85
95% Percentile Bootstrap UTL with 95% Coverage 84.77
95% BCA Bootstrap UTL with 95% Coverage 80.5
95% UPL 80.23
95% Chebyshev UPL 108
Upper Threshold Limit Based upon IQR 86.15

U1600124

Silver

General Statistics

Number of Valid Data	102	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	100

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 1.92 Percent Non-Detects 98.04%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0053	Minimum Detected	-5.24
Maximum Detected	0.0109	Maximum Detected	-4.519
Mean of Detected	0.0081	Mean of Detected	-4.88
SD of Detected	0.00396	SD of Detected	0.51
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	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.
These 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		0.00261
SD		0.00087411
95% UTL	95% Coverage	0.00429
	95% UPL (t)	0.00407
	90% Percentile (z)	0.00373
	95% Percentile (z)	0.00405
	99% Percentile (z)	0.00464

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.97
SD (Log Scale)		0.163
95% UTL	95% Coverage	0.00349
	95% UPL (t)	0.00335
	90% Percentile (z)	0.00315
	95% Percentile (z)	0.00334
	99% Percentile (z)	0.00373

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		0.00535
SD		0.00055176
SE of Mean		7.7262E-05
95% KM UTL with	95% Coverage	0.00641
95% KM Chebyshev UPL		0.00777
95% KM UPL (t)		0.00628
90% Percentile (z)		0.00606
95% Percentile (z)		0.00626
99% Percentile (z)		0.00664

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.

U1600124

Sodium (mg/L)

General Statistics

Total Number of Observations 102
Number of Distinct Observations 37
Tolerance Factor 1.92

Raw Statistics

Minimum 9.55
Maximum 16.9
Second Largest 16.9
First Quartile 10.43
Median 10.9
Third Quartile 11.5
Mean 11.22
Geometric Mean 11.14
SD 1.445
Coefficient of Variation 0.129
Skewness 2.514

Log-Transformed Statistics

Minimum 2.257
Maximum 2.827
Second Largest 2.827
First Quartile 2.344
Median 2.389
Third Quartile 2.442
Mean 2.41
SD 0.114

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.22
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.198
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 13.99
95% UPL (t) 13.63
90% Percentile (z) 13.07
95% Percentile (z) 13.59
99% Percentile (z) 14.58

Assuming Lognormal Distribution

95% UTL with 95% Coverage 13.86
95% UPL (t) 13.47
90% Percentile (z) 12.89
95% Percentile (z) 13.43
99% Percentile (z) 14.52

Gamma Distribution Test

k star 69.92
Theta Star 0.16
MLE of Mean 11.22
MLE of Standard Deviation 1.341
nu star 14264

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 6.885
5% A-D Critical Value 0.75
K-S Test Statistic 0.206
5% K-S Critical Value 0.0887
Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 12.6
95% Percentile 14.1
99% Percentile 16.9

Assuming Gamma Distribution

90% Percentile 12.97
95% Percentile 13.51
99% Percentile 14.57

95% WH Approx. Gamma UPL 13.52
95% HW Approx. Gamma UPL 13.51
95% WH Approx. Gamma UTL with 95% Coverage 13.9
95% HW Approx. Gamma UTL with 95% Coverage 13.89

95% UTL with 95% Coverage 16.8
95% Percentile Bootstrap UTL with 95% Coverage 16.79
95% BCA Bootstrap UTL with 95% Coverage 16.5
95% UPL 14.53
95% Chebyshev UPL 17.55
Upper Threshold Limit Based upon IQR 13.11

U1600124

Specific Conductance

General Statistics

Total Number of Observations 395
Number of Distinct Observations 104
Tolerance Factor 1.778

Raw Statistics

Minimum 98
Maximum 200
Second Largest 199
First Quartile 124
Median 132
Third Quartile 144
Mean 135.8
Geometric Mean 134.7
SD 18
Coefficient of Variation 0.133
Skewness 0.92

Log-Transformed Statistics

Minimum 4.585
Maximum 5.298
Second Largest 5.293
First Quartile 4.82
Median 4.883
Third Quartile 4.97
Mean 4.903
SD 0.128

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0983
Lilliefors Critical Value 0.0446
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0766
Lilliefors Critical Value 0.0446
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 167.8
95% UPL (t) 165.5
90% Percentile (z) 158.9
95% Percentile (z) 165.4
99% Percentile (z) 177.7

Assuming Lognormal Distribution

95% UTL with 95% Coverage 169
95% UPL (t) 166.3
90% Percentile (z) 158.7
95% Percentile (z) 166.2
99% Percentile (z) 181.3

Gamma Distribution Test

k star 59.81
Theta Star 2.271
MLE of Mean 135.8
MLE of Standard Deviation 17.56
nu star 47252

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 4.781
5% A-D Critical Value 0.752
K-S Test Statistic 0.0832
5% K-S Critical Value 0.0454
Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 163.2
95% Percentile 174
99% Percentile 186.2

Assuming Gamma Distribution

90% Percentile 158.7
95% Percentile 165.9
99% Percentile 180

95% UTL with 95% Coverage 178
95% Percentile Bootstrap UTL with 95% Coverage 176.6
95% BCA Bootstrap UTL with 95% Coverage 174.6
95% UPL 174
95% Chebyshev UPL 214.4
Upper Threshold Limit Based upon IQR 174

95% WH Approx. Gamma UPL 166
95% HW Approx. Gamma UPL 166
95% WH Approx. Gamma UTL with 95% Coverage 168.5
95% HW Approx. Gamma UTL with 95% Coverage 168.6

U1600124

Strontium

General Statistics

Total Number of Observations	102
Number of Distinct Observations	81
Tolerance Factor	1.92

Raw Statistics		Log-Transformed Statistics	
Minimum	37.6	Minimum	3.627
Maximum	165	Maximum	5.106
Second Largest	162	Second Largest	5.088
First Quartile	44.28	First Quartile	3.79
Median	47.5	Median	3.861
Third Quartile	51.7	Third Quartile	3.945
Mean	51.85	Mean	3.906
Geometric Mean	49.72	SD	0.25
SD	20.86		
Coefficient of Variation	0.402		
Skewness	4.46		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.331	Lilliefors Test Statistic	0.243
Lilliefors Critical Value	0.0877	Lilliefors Critical Value	0.0877
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with	95% Coverage 91.91	95% UTL with	95% Coverage 80.29
95% UPL (t)	86.65	95% UPL (t)	75.39
90% Percentile (z)	78.58	90% Percentile (z)	68.46
95% Percentile (z)	86.16	95% Percentile (z)	74.95
99% Percentile (z)	100.4	99% Percentile (z)	88.85

Gamma Distribution Test		Data Distribution Test
k star	11.76	Data do not follow a Discernable Distribution (0.05)
Theta Star	4.41	
MLE of Mean	51.85	
MLE of Standard Deviation	15.12	
nu star	2398	
A-D Test Statistic	13.16	Nonparametric Statistics
5% A-D Critical Value	0.752	90% Percentile 56.26
K-S Test Statistic	0.278	95% Percentile 59.69
5% K-S Critical Value	0.0889	99% Percentile 161.8
Data not Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution			
90% Percentile	71.92	95% UTL with	95% Coverage 139
95% Percentile	78.96	95% Percentile Bootstrap UTL with	95% Coverage 138.9
99% Percentile	93.33	95% BCA Bootstrap UTL with	95% Coverage 136
		95% UPL	62.42
95% WH Approx. Gamma UPL	78.68	95% Chebyshev UPL	143.2
95% HW Approx. Gamma UPL	77.81	Upper Threshold Limit Based upon IQR	62.84
95% WH Approx. Gamma UTL with	95% Coverage 83.74		
95% HW Approx. Gamma UTL with	95% Coverage 82.83		

U1600124

Sulfate

General Statistics

Total Number of Observations 407
Number of Distinct Observations 226
Tolerance Factor 1.776

Raw Statistics

Minimum 1.37
Maximum 7.89
Second Largest 7.86
First Quartile 2.05
Median 2.69
Third Quartile 3.405
Mean 2.946
Geometric Mean 2.76
SD 1.173
Coefficient of Variation 0.398
Skewness 1.642

Log-Transformed Statistics

Minimum 0.315
Maximum 2.066
Second Largest 2.062
First Quartile 0.718
Median 0.99
Third Quartile 1.225
Mean 1.015
SD 0.349

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.133
Lilliefors Critical Value 0.0439
Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 5.03
95% UPL (t) 4.883
90% Percentile (z) 4.45
95% Percentile (z) 4.876
99% Percentile (z) 5.675

Lognormal Distribution Test

Lilliefors Test Statistic 0.0732
Lilliefors Critical Value 0.0439
Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% UTL with 95% Coverage 5.129
95% UPL (t) 4.909
90% Percentile (z) 4.316
95% Percentile (z) 4.9
99% Percentile (z) 6.214

Gamma Distribution Test

k star 7.771
Theta Star 0.379
MLE of Mean 2.946
MLE of Standard Deviation 1.057
nu star 6326

A-D Test Statistic 6.782
5% A-D Critical Value 0.755
K-S Test Statistic 0.0808
5% K-S Critical Value 0.0449
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile 4.356
95% Percentile 4.872
99% Percentile 5.943

95% WH Approx. Gamma UPL 4.867
95% HW Approx. Gamma UPL 4.873
95% WH Approx. Gamma UTL with 95% Coverage 5.053
95% HW Approx. Gamma UTL with 95% Coverage 5.067

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 4.488
95% Percentile 5.072
99% Percentile 7.169

95% UTL with 95% Coverage 5.84
95% Percentile Bootstrap UTL with 95% Coverage 5.807
95% BCA Bootstrap UTL with 95% Coverage 5.842
95% UPL 5.09
95% Chebyshev UPL 8.066
Upper Threshold Limit Based upon IQR 5.436

U1600124

Tellurium

General Statistics

Number of Valid Data 102	Number of Detected Data 0
Number of Distinct Detected Data 0	Number of Non-Detect Data 102

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 Tellurium was not processed!

Temperature

General Statistics

Total Number of Observations 400
Number of Distinct Observations 260
Tolerance Factor 1.777

Raw Statistics

Minimum 15.9
Maximum 24.78
Second Largest 24.64
First Quartile 20.34
Median 21.35
Third Quartile 22.07
Mean 21.17
Geometric Mean 21.12
SD 1.464
Coefficient of Variation 0.0692
Skewness -0.483

Log-Transformed Statistics

Minimum 2.766
Maximum 3.21
Second Largest 3.204
First Quartile 3.013
Median 3.061
Third Quartile 3.094
Mean 3.05
SD 0.0708

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0652
Lilliefors Critical Value 0.0443
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0795
Lilliefors Critical Value 0.0443
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 23.77
95% UPL (t) 23.59
90% Percentile (z) 23.05
95% Percentile (z) 23.58
99% Percentile (z) 24.58

Assuming Lognormal Distribution

95% UTL with 95% Coverage 23.95
95% UPL (t) 23.74
90% Percentile (z) 23.13
95% Percentile (z) 23.73
99% Percentile (z) 24.9

Gamma Distribution Test

k star 201.9
Theta Star 0.105
MLE of Mean 21.17
MLE of Standard Deviation 1.49
nu star 161519

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 3.152
5% A-D Critical Value 0.751
K-S Test Statistic 0.0748
5% K-S Critical Value 0.0451
Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 22.91
95% Percentile 23.4
99% Percentile 24.3

Assuming Gamma Distribution

90% Percentile 23.1
95% Percentile 23.68
99% Percentile 24.79

95% WH Approx. Gamma UPL 23.69
95% HW Approx. Gamma UPL 23.7
95% WH Approx. Gamma UTL with 95% Coverage 23.89
95% HW Approx. Gamma UTL with 95% Coverage 23.9

95% UTL with 95% Coverage 23.69
95% Percentile Bootstrap UTL with 95% Coverage 23.69
95% BCA Bootstrap UTL with 95% Coverage 23.69
95% UPL 23.41
95% Chebyshev UPL 27.56
Upper Threshold Limit Based upon IQR 24.67

U1600124

Thallium

General Statistics

Number of Valid Data	102	Number of Detected Data	72
Number of Distinct Detected Data	46	Number of Non-Detect Data	30
Tolerance Factor	1.92	Percent Non-Detects	29.41%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.001	Minimum Detected	-6.908
Maximum Detected	0.0155	Maximum Detected	-4.167
Mean of Detected	0.00456	Mean of Detected	-5.634
SD of Detected	0.00339	SD of Detected	0.703
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.001	Maximum Non-Detect	-6.908

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.147
5% Lilliefors Critical Value	0.104

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00336
SD		0.00339
95% UTL	95% Coverage	0.00988
95% UPL (t)		0.00902
90% Percentile (z)		0.00771
95% Percentile (z)		0.00894
99% Percentile (z)		0.0113

Maximum Likelihood Estimate(MLE) Method

Mean		0.00267
SD		0.00424
95% UTL with	95% Coverage	0.0108
95% UPL (t)		0.00975
90% Percentile (z)		0.00811
95% Percentile (z)		0.00965
99% Percentile (z)		0.0125

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.134
Theta Star	0.00213
nu star	307.3
A-D Test Statistic	0.781
5% A-D Critical Value	0.762
K-S Test Statistic	0.0869
5% K-S Critical Value	0.106

Data follow Appx. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00322
Median	0.00215
SD	0.00352
k star	0.298
Theta star	0.0108
Nu star	60.69
95% Percentile of Chisquare (2k)	2.729
90% Percentile	0.00949
95% Percentile	0.0148
99% Percentile	0.0284

Note: DL/2 is not a recommended method.

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0747
5% Lilliefors Critical Value	0.104

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-6.212
SD (Log Scale)		1.076
95% UTL	95% Coverage	0.0158
95% UPL (t)		0.0121
90% Percentile (z)		0.00797
95% Percentile (z)		0.0118
99% Percentile (z)		0.0245

Log ROS Method

Mean in Original Scale		0.00344
SD in Original Scale		0.00333
95% UTL with	95% Coverage	0.0148
95% BCA UTL with	95% Coverage	0.0137
95% Bootstrap (%) UTL with	95% Coverage	0.0137
95% UPL (t)		0.0115
90% Percentile (z)		0.00785
95% Percentile (z)		0.0113
99% Percentile (z)		0.0222

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.00351
SD		0.00326
SE of Mean		0.00032467
95% KM UTL with	95% Coverage	0.00976
95% KM Chebyshev UPL		0.0178
95% KM UPL (t)		0.00894
90% Percentile (z)		0.00768
95% Percentile (z)		0.00887
99% Percentile (z)		0.0111

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.0134
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.017
95% WH Approx. Gamma UTL with	95% Coverage	0.0169
95% HW Approx. Gamma UTL with	95% Coverage	0.0226

Thorium

General Statistics

Number of Valid Data	102	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	95
Tolerance Factor	1.92	Percent Non-Detects	93.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0055	Minimum Detected	-5.203
Maximum Detected	0.0182	Maximum Detected	-4.006
Mean of Detected	0.0108	Mean of Detected	-4.608
SD of Detected	0.00471	SD of Detected	0.441
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	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	0.933
5% Shapiro Wilk Critical Value	0.803

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00307
SD		0.00241
95% UTL	95% Coverage	0.0077
95% UPL (t)		0.00709
90% Percentile (z)		0.00616
95% Percentile (z)		0.00703
99% Percentile (z)		0.00867

Maximum Likelihood Estimate(MLE) Method

Mean		-0.014
SD		0.0128
95% UTL with	95% Coverage	0.0106
95% UPL (t)		0.00738
90% Percentile (z)		0.00243
95% Percentile (z)		0.00708
99% Percentile (z)		0.0158

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.955
5% Shapiro Wilk Critical Value	0.803

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.897
SD (Log Scale)		0.368
95% UTL	95% Coverage	0.00557
95% UPL (t)		0.00508
90% Percentile (z)		0.0044
95% Percentile (z)		0.00503
99% Percentile (z)		0.00646

Log ROS Method

Mean in Original Scale		0.00167
SD in Original Scale		0.00295
95% UTL with	95% Coverage	0.00982
95% BCA UTL with	95% Coverage	0.0119
95% Bootstrap (%) UTL with	95% Coverage	0.0119
95% UPL (t)		0.00685
90% Percentile (z)		0.00395
95% Percentile (z)		0.00663
99% Percentile (z)		0.0175

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.651
Theta Star	0.00297
nu star	51.12
A-D Test Statistic	0.253
5% A-D Critical Value	0.71
K-S Test Statistic	0.212
5% K-S Critical Value	0.313

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean		0.00074407
Median		0.000001
SD		0.00298
k star		0.134
Theta star		0.00557
Nu star		27.28
95% Percentile of Chisquare (2k)		1.502
90% Percentile		0.00216
95% Percentile		0.00418
99% Percentile		0.0102

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.00587
SD		0.00177
SE of Mean		0.000188896
95% KM UTL with	95% Coverage	0.00926
95% KM Chebyshev UPL		0.0136
95% KM UPL (t)		0.00881
90% Percentile (z)		0.00813
95% Percentile (z)		0.00877
99% Percentile (z)		0.00998

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.00144
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.00090236
95% WH Approx. Gamma UTL with	95% Coverage	0.00202
95% HW Approx. Gamma UTL with	95% Coverage	0.00135

Note: DL/2 is not a recommended method.

U1600124

Tin

General Statistics

Number of Valid Data	102	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	95
Tolerance Factor	1.92	Percent Non-Detects	93.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.014	Minimum Detected	-4.269
Maximum Detected	0.032	Maximum Detected	-3.442
Mean of Detected	0.0241	Mean of Detected	-3.756
SD of Detected	0.00626	SD of Detected	0.285
Minimum Non-Detect	0.01	Minimum Non-Detect	-4.605
Maximum Non-Detect	0.01	Maximum Non-Detect	-4.605

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		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.973	Shapiro Wilk Test Statistic	0.936
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution	
DL/2 Substitution Method			DL/2 Substitution Method	
Mean	0.00631		Mean (Log Scale)	-5.192
SD	0.0051		SD (Log Scale)	0.398
95% UTL 95% Coverage	0.0161		95% UTL 95% Coverage	0.0119
95% UPL (t)	0.0148		95% UPL (t)	0.0108
90% Percentile (z)	0.0128		90% Percentile (z)	0.00926
95% Percentile (z)	0.0147		95% Percentile (z)	0.0107
99% Percentile (z)	0.0182		99% Percentile (z)	0.014
Maximum Likelihood Estimate(MLE) Method			Log ROS Method	
Mean	-0.0327		Mean in Original Scale	0.00646
SD	0.0289		SD in Original Scale	0.00611
95% UTL with 95% Coverage	0.0229		95% UTL with 95% Coverage	0.0232
			95% BCA UTL with 95% Coverage	0.0268
			95% Bootstrap (%) UTL with 95% Coverage	0.0269
95% UPL (t)	0.0156		95% UPL (t)	0.0187
90% Percentile (z)	0.00442		90% Percentile (z)	0.0135
95% Percentile (z)	0.0149		95% Percentile (z)	0.0183
99% Percentile (z)	0.0346		99% Percentile (z)	0.0327

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	8.957	Data appear Normal at 5% Significance Level	
Theta Star	0.0027		
nu star	125.4		
A-D Test Statistic	0.235	Nonparametric Statistics	
5% A-D Critical Value	0.707	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.173	Mean	0.0147
5% K-S Critical Value	0.312	SD	0.00298
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00031867
		95% KM UTL with 95% Coverage	0.0204
Assuming Gamma Distribution		95% KM Chebyshev UPL	0.0277
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	0.0197
Mean	0.00183	90% Percentile (z)	0.0185
Median	0.000001	95% Percentile (z)	0.0196
SD	0.00637	99% Percentile (z)	0.0216
k star	0.124		
Theta star	0.0148	Gamma ROS Limits with Extrapolated Data	
Nu star	25.21	95% Wilson Hilferty (WH) Approx. Gamma UPL	0.00402
95% Percentile of Chisquare (2k)	1.405	95% Hawkins Wixley (HW) Approx. Gamma UPL	0.00271
		95% WH Approx. Gamma UTL with 95% Coverage	0.00563
90% Percentile	0.00523	95% HW Approx. Gamma UTL with 95% Coverage	0.0041
95% Percentile	0.0104		
99% Percentile	0.0261		

Note: DL/2 is not a recommended method.

U1600124

Titanium

General Statistics

Number of Valid Data	102	Number of Detected Data	35
Number of Distinct Detected Data	30	Number of Non-Detect Data	67
Tolerance Factor	1.92	Percent Non-Detects	65.69%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.053	Minimum Detected	-2.937
Maximum Detected	0.385	Maximum Detected	-0.955
Mean of Detected	0.131	Mean of Detected	-2.235
SD of Detected	0.0925	SD of Detected	0.62
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.796
5% Shapiro Wilk Critical Value	0.934

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0613
SD		0.0737
95% UTL	95% Coverage	0.203
95% UPL (t)		0.184
90% Percentile (z)		0.156
95% Percentile (z)		0.183
99% Percentile (z)		0.233

Maximum Likelihood Estimate(MLE) Method

Mean		-0.0139
SD		0.141
95% UTL with	95% Coverage	0.258
95% UPL (t)		0.222
90% Percentile (z)		0.167
95% Percentile (z)		0.219
99% Percentile (z)		0.315

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.428
Theta Star	0.0539
nu star	170
A-D Test Statistic	1.411
5% A-D Critical Value	0.756
K-S Test Statistic	0.159
5% K-S Critical Value	0.15

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean		0.0449
Median		0.000001
SD		0.0823
k star		0.121
Theta star		0.371
Nu star		24.69
95% Percentile of Chisquare (2k)		1.38
90% Percentile		0.127
95% Percentile		0.256
99% Percentile		0.647

Note: DL/2 is not a recommended method.

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.934

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-3.19
SD (Log Scale)		0.781
95% UTL	95% Coverage	0.185
95% UPL (t)		0.152
90% Percentile (z)		0.112
95% Percentile (z)		0.149
99% Percentile (z)		0.253

Log ROS Method

Mean in Original Scale		0.0573
SD in Original Scale		0.0764
95% UTL with	95% Coverage	0.295
95% BCA UTL with	95% Coverage	0.336
95% Bootstrap (%) UTL with	95% Coverage	0.336
95% UPL (t)		0.217
90% Percentile (z)		0.136
95% Percentile (z)		0.211
99% Percentile (z)		0.482

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.0797
SD		0.065
SE of Mean		0.00653
95% KM UTL with	95% Coverage	0.204
95% KM Chebyshev UPL		0.364
95% KM UPL (t)		0.188
90% Percentile (z)		0.163
95% Percentile (z)		0.187
99% Percentile (z)		0.231

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.18
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.195
95% WH Approx. Gamma UTL with	95% Coverage	0.243
95% HW Approx. Gamma UTL with	95% Coverage	0.286

U1600124

Total Dissolved Solids

General Statistics

Total Number of Observations 409
Number of Distinct Observations 67
Tolerance Factor 1.775

Raw Statistics

Minimum 81.4
Maximum 268
Second Largest 222
First Quartile 127
Median 135
Third Quartile 143
Mean 135.6
Geometric Mean 134.8
SD 14.85
Coefficient of Variation 0.11
Skewness 1.982

Log-Transformed Statistics

Minimum 4.399
Maximum 5.591
Second Largest 5.403
First Quartile 4.844
Median 4.905
Third Quartile 4.963
Mean 4.904
SD 0.105

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.0852
Lilliefors Critical Value 0.0438
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0707
Lilliefors Critical Value 0.0438
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 162
95% UPL (t) 160.1
90% Percentile (z) 154.6
95% Percentile (z) 160
99% Percentile (z) 170.1

Assuming Lognormal Distribution

95% UTL with 95% Coverage 162.5
95% UPL (t) 160.4
90% Percentile (z) 154.3
95% Percentile (z) 160.3
99% Percentile (z) 172.2

Gamma Distribution Test

k star 88.81
Theta Star 1.527
MLE of Mean 135.6
MLE of Standard Deviation 14.39
nu star 72649

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic 3.464
5% A-D Critical Value 0.752
K-S Test Statistic 0.0722
5% K-S Critical Value 0.0446
Data not Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile 151
95% Percentile 157
99% Percentile 166.8

Assuming Gamma Distribution

90% Percentile 154.3
95% Percentile 160.1
99% Percentile 171.3

95% WH Approx. Gamma UPL 160.1
95% HW Approx. Gamma UPL 160.2
95% WH Approx. Gamma UTL with 95% Coverage 162.1
95% HW Approx. Gamma UTL with 95% Coverage 162.2

95% UTL with 95% Coverage 159
95% Percentile Bootstrap UTL with 95% Coverage 159
95% BCA Bootstrap UTL with 95% Coverage 157.6
95% UPL 157.5
95% Chebyshev UPL 200.4
Upper Threshold Limit Based upon IQR 167

U1600124

Total Phosphate as Phosphorus

General Statistics

Number of Valid Data	410	Number of Detected Data	366
Number of Distinct Detected Data	205	Number of Non-Detect Data	44
Tolerance Factor	1.775	Percent Non-Detects	10.73%
Number of Missing Values	1		

Raw Statistics

Minimum Detected	0.015
Maximum Detected	0.37
Mean of Detected	0.0666
SD of Detected	0.0463
Minimum Non-Detect	0.017
Maximum Non-Detect	0.05

Log-transformed Statistics

Minimum Detected	-4.2
Maximum Detected	-0.994
Mean of Detected	-2.869
SD of Detected	0.537
Minimum Non-Detect	-4.075
Maximum Non-Detect	-2.996

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	187
Number treated as Detected with Single DL	223
Single DL Non-Detect Percentage	45.61%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.2
5% Lilliefors Critical Value	0.0463

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0747
5% Lilliefors Critical Value	0.0463

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0618
SD		0.0458
95% UTL	95% Coverage	0.143
95% UPL (t)		0.138
90% Percentile (z)		0.121
95% Percentile (z)		0.137
99% Percentile (z)		0.168

Maximum Likelihood Estimate(MLE) Method

Mean		0.0466
SD		0.0624
95% UTL with	95% Coverage	0.157
95% UPL (t)		0.15
90% Percentile (z)		0.127
95% Percentile (z)		0.149
99% Percentile (z)		0.192

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-2.975
SD (Log Scale)		0.607
95% UTL	95% Coverage	0.15
95% UPL (t)		0.139
90% Percentile (z)		0.111
95% Percentile (z)		0.139
99% Percentile (z)		0.21

Log ROS Method

Mean in Original Scale		0.0627
SD in Original Scale		0.0452
95% UTL with	95% Coverage	0.144
95% BCA UTL with	95% Coverage	0.171
95% Bootstrap (%) UTL with	95% Coverage	0.175
95% UPL (t)		0.134
90% Percentile (z)		0.109
95% Percentile (z)		0.134
99% Percentile (z)		0.197

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.264
Theta Star	0.0204
nu star	2389
A-D Test Statistic	6.215
5% A-D Critical Value	0.76
K-S Test Statistic	0.115
5% K-S Critical Value	0.0478

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0624
Median	0.0543
SD	0.0459
k star	1.216
Theta star	0.0513
Nu star	997.2
95% Percentile of Chisquare (2k)	6.805
90% Percentile	0.137
95% Percentile	0.175
99% Percentile	0.261

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.0628
SD		0.0451
SE of Mean		0.00224
95% KM UTL with	95% Coverage	0.143
95% KM Chebyshev UPL		0.26
95% KM UPL (t)		0.137
90% Percentile (z)		0.121
95% Percentile (z)		0.137
99% Percentile (z)		0.168

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.154
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.174
95% WH Approx. Gamma UTL with	95% Coverage	0.165
95% HW Approx. Gamma UTL with	95% Coverage	0.189

Note: DL/2 is not a recommended method.

U1600124

Tungsten

General Statistics

Total Number of Observations 102
Number of Distinct Observations 98
Tolerance Factor 1.92

Raw Statistics

Minimum 0.291
Maximum 22.4
Second Largest 18.1
First Quartile 0.396
Median 0.504
Third Quartile 0.62
Mean 1.082
Geometric Mean 0.616
SD 2.835
Coefficient of Variation 2.62
Skewness 6.558

Log-Transformed Statistics

Minimum -1.234
Maximum 3.109
Second Largest 2.896
First Quartile -0.928
Median -0.686
Third Quartile -0.199
Mean -0.484
SD 0.726

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.39
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.157
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 6.528
95% UPL (t) 5.813
90% Percentile (z) 4.716
95% Percentile (z) 5.746
99% Percentile (z) 7.679

Assuming Lognormal Distribution

95% UTL with 95% Coverage 2.485
95% UPL (t) 2.069
90% Percentile (z) 1.563
95% Percentile (z) 2.034
99% Percentile (z) 3.337

Gamma Distribution Test

k star 0.999
Theta Star 1.084
MLE of Mean 1.082
MLE of Standard Deviation 1.083
nu star 203.7

A-D Test Statistic 14.45
5% A-D Critical Value 0.782
K-S Test Statistic 0.247
5% K-S Critical Value 0.0916
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 1.177
95% Percentile 1.56
99% Percentile 17.99

Assuming Gamma Distribution

90% Percentile 2.493
95% Percentile 3.244
99% Percentile 4.988

95% WH Approx. Gamma UPL 2.794
95% HW Approx. Gamma UPL 2.561
95% WH Approx. Gamma UTL with 95% Coverage 3.294
95% HW Approx. Gamma UTL with 95% Coverage 3.033

95% UTL with 95% Coverage 6.98
95% Percentile Bootstrap UTL with 95% Coverage 6.742
95% BCA Bootstrap UTL with 95% Coverage 2.23
95% UPL 1.909
95% Chebyshev UPL 13.5
Upper Threshold Limit Based upon IQR 1.456

U1600124

Turbidity

General Statistics

Total Number of Observations 403
Number of Distinct Observations 215
Tolerance Factor 1.777

Raw Statistics

Minimum 0
Maximum 262
Second Largest 42.2
First Quartile 0.46
Median 0.86
Third Quartile 1.92
Mean 2.738
Geometric Mean 0
SD 13.61
Coefficient of Variation 4.973
Skewness 17.42

Log-Transformed Statistics

Log Statistics Not Available

Log Statistics Not Available

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.42
Lilliefors Critical Value 0.0441
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Not Available

Assuming Normal Distribution

95% UTL 95% Coverage 26.92
95% UPL (t) 25.21
90% Percentile (z) 20.18
95% Percentile (z) 25.13
99% Percentile (z) 34.41

Assuming Lognormal Distribution

Cannot Derive Log-Transformed Statistics

Gamma Distribution Test

Gamma Statistics Not Available

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 4.51
95% Percentile 7.487
99% Percentile 27.62
99% Percentile 27.62
Approximate 95% Confidence with 95% Coverage UTL 9.54
95% Percentile Bootstrap UTL with 95% Coverage 9.482
95% BCA Bootstrap UTL with 95% Coverage 9.54
95% UPL 7.5
95% Chebyshev UPL 62.15
Upper Threshold Limit Based upon IQR 4.11

U1600124

Uranium

General Statistics

Total Number of Observations 102
Number of Distinct Observations 94
Tolerance Factor 1.92

Raw Statistics

Minimum 0.121
Maximum 1.37
Second Largest 1.28
First Quartile 0.305
Median 0.357
Third Quartile 0.496
Mean 0.435
Geometric Mean 0.391
SD 0.23
Coefficient of Variation 0.529
Skewness 2.078

Log-Transformed Statistics

Minimum -2.112
Maximum 0.315
Second Largest 0.247
First Quartile -1.187
Median -1.031
Third Quartile -0.701
Mean -0.938
SD 0.445

Background Statistics

Normal Distribution Test

Lilliefors Test Statistic 0.181
Lilliefors Critical Value 0.0877
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Lilliefors Test Statistic 0.0889
Lilliefors Critical Value 0.0877
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage 0.877
95% UPL (t) 0.819
90% Percentile (z) 0.73
95% Percentile (z) 0.814
99% Percentile (z) 0.97

Assuming Lognormal Distribution

95% UTL with 95% Coverage 0.919
95% UPL (t) 0.821
90% Percentile (z) 0.692
95% Percentile (z) 0.813
99% Percentile (z) 1.1

Gamma Distribution Test

k star 4.737
Theta Star 0.0918
MLE of Mean 0.435
MLE of Standard Deviation 0.2
nu star 966.3

A-D Test Statistic 2.124
5% A-D Critical Value 0.755
K-S Test Statistic 0.117
5% K-S Critical Value 0.0891
Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile 0.687
95% Percentile 0.767
99% Percentile 1.28

Assuming Gamma Distribution

90% Percentile 0.703
95% Percentile 0.807
99% Percentile 1.029

95% WH Approx. Gamma UPL 0.807
95% HW Approx. Gamma UPL 0.809
95% WH Approx. Gamma UTL with 95% Coverage 0.885
95% HW Approx. Gamma UTL with 95% Coverage 0.89

95% UTL with 95% Coverage 1.27
95% Percentile Bootstrap UTL with 95% Coverage 1.265
95% BCA Bootstrap UTL with 95% Coverage 1.252
95% UPL 0.894
95% Chebyshev UPL 1.443
Upper Threshold Limit Based upon IQR 0.783

U1600124

Vanadium

General Statistics

Total Number of Observations	102	Number of Distinct Observations	93
Tolerance Factor	1.92		

Raw Statistics		Log-Transformed Statistics	
Minimum	3.97	Minimum	1.379
Maximum	14.8	Maximum	2.695
Second Largest	14.4	Second Largest	2.667
First Quartile	4.993	First Quartile	1.608
Median	5.865	Median	1.769
Third Quartile	7.56	Third Quartile	2.023
Mean	6.554	Mean	1.832
Geometric Mean	6.249	SD	0.297
SD	2.266		
Coefficient of Variation	0.346		
Skewness	1.795		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.139	Lilliefors Test Statistic	0.115
Lilliefors Critical Value	0.0877	Lilliefors Critical Value	0.0877
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	10.9	95% UTL with 95% Coverage	11.05
95% UPL (t)	10.33	95% UPL (t)	10.25
90% Percentile (z)	9.457	90% Percentile (z)	9.142
95% Percentile (z)	10.28	95% Percentile (z)	10.18
99% Percentile (z)	11.82	99% Percentile (z)	12.47

Gamma Distribution Test		Data Distribution Test	
k star	10.34	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.634		
MLE of Mean	6.554		
MLE of Standard Deviation	2.039		
nu star	2109		
A-D Test Statistic	2.647	Nonparametric Statistics	
5% A-D Critical Value	0.752	90% Percentile	8.902
K-S Test Statistic	0.123	95% Percentile	11.72
5% K-S Critical Value	0.0889	99% Percentile	14.4
Data not Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	9.264	95% UTL with 95% Coverage	14.3
95% Percentile	10.23	95% Percentile Bootstrap UTL with 95% Coverage	14.26
99% Percentile	12.2	95% BCA Bootstrap UTL with 95% Coverage	14.26
		95% UPL	11.8
95% WH Approx. Gamma UPL	10.24	95% Chebyshev UPL	16.48
95% HW Approx. Gamma UPL	10.24	Upper Threshold Limit Based upon IQR	11.41
95% WH Approx. Gamma UTL with 95% Coverage	10.94		
95% HW Approx. Gamma UTL with 95% Coverage	10.96		

U1600124

Yttrium

General Statistics

Number of Valid Data	102	Number of Detected Data	71
Number of Distinct Detected Data	62	Number of Non-Detect Data	31
Tolerance Factor	1.92	Percent Non-Detects	30.39%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0054	Minimum Detected	-5.221
Maximum Detected	0.0353	Maximum Detected	-3.344
Mean of Detected	0.0157	Mean of Detected	-4.271
SD of Detected	0.00753	SD of Detected	0.493
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.12	Lilliefors Test Statistic	0.096
5% Lilliefors Critical Value	0.105	5% Lilliefors Critical Value	0.105
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	0.0117		Mean (Log Scale)	-4.794	
SD	0.00875		SD (Log Scale)	0.895	
95% UTL	95% Coverage	0.0285	95% UTL	95% Coverage	0.0462
95% UPL (t)		0.0263	95% UPL (t)		0.0369
90% Percentile (z)		0.0229	90% Percentile (z)		0.0261
95% Percentile (z)		0.0261	95% Percentile (z)		0.0361
99% Percentile (z)		0.032	99% Percentile (z)		0.0664
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		0.0104	Mean in Original Scale		0.0123
SD		0.0106	SD in Original Scale		0.00813
95% UTL with	95% Coverage	0.0308	95% UTL with	95% Coverage	0.0376
			95% BCA UTL with	95% Coverage	0.0334
			95% Bootstrap (%) UTL with	95% Coverage	0.0334
95% UPL (t)		0.0281	95% UPL (t)		0.0315
90% Percentile (z)		0.024	90% Percentile (z)		0.024
95% Percentile (z)		0.0278	95% Percentile (z)		0.031
99% Percentile (z)		0.0351	99% Percentile (z)		0.0498

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	4.276	Data follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	0.00367		
nu star	607.3		
A-D Test Statistic	0.859	Nonparametric Statistics	
5% A-D Critical Value	0.755	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.0944	Mean	0.0126
5% K-S Critical Value	0.106	SD	0.00783
Data follow Appx. Gamma Distribution at 5% Significance Level		SE of Mean	0.00078114
		95% KM UTL with 95% Coverage	0.0276
Assuming Gamma Distribution		95% KM Chebyshev UPL	0.0469
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	0.0256
Mean	0.0109	90% Percentile (z)	0.0226
Median	0.0096	95% Percentile (z)	0.0254
SD	0.00958	99% Percentile (z)	0.0308
k star	0.274		
Theta star	0.04	Gamma ROS Limits with Extrapolated Data	
Nu star	55.8	95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0469
95% Percentile of Chisquare (2k)	2.577	95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0619
		95% WH Approx. Gamma UTL with 95% Coverage	0.0587
90% Percentile	0.0326	95% HW Approx. Gamma UTL with 95% Coverage	0.0825
95% Percentile	0.0515		
99% Percentile	0.101		

Note: DL/2 is not a recommended method.

U1600124

Zinc

General Statistics

Number of Valid Data	102	Number of Detected Data	89
Number of Distinct Detected Data	80	Number of Non-Detect Data	13
Tolerance Factor	1.92	Percent Non-Detects	12.75%

Raw Statistics

Minimum Detected	0.11
Maximum Detected	14
Mean of Detected	2.779
SD of Detected	2.708
Minimum Non-Detect	0.1
Maximum Non-Detect	0.4

Log-transformed Statistics

Minimum Detected	-2.207
Maximum Detected	2.639
Mean of Detected	0.52
SD of Detected	1.113
Minimum Non-Detect	-2.303
Maximum Non-Detect	-0.916

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	80
Single DL Non-Detect Percentage	21.57%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.204
5% Lilliefors Critical Value	0.0939

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.0858
5% Lilliefors Critical Value	0.0939

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	2.435		
SD	2.685		
95% UTL	95% Coverage	7.591	
95% UPL (t)		6.914	
90% Percentile (z)		5.876	
95% Percentile (z)		6.851	
99% Percentile (z)		8.681	

Maximum Likelihood Estimate(MLE) Method

Mean	2.063		
SD	3.15		
95% UTL with	95% Coverage	8.111	
95% UPL (t)		7.317	
90% Percentile (z)		6.099	
95% Percentile (z)		7.244	
99% Percentile (z)		9.39	

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	0.107		
SD (Log Scale)	1.514		
95% UTL	95% Coverage	20.39	
95% UPL (t)		13.92	
90% Percentile (z)		7.75	
95% Percentile (z)		13.43	
99% Percentile (z)		37.7	

Log ROS Method

Mean in Original Scale	2.446		
SD in Original Scale	2.676		
95% UTL with	95% Coverage	15.8	
95% BCA UTL with	95% Coverage	9.02	
95% Bootstrap (%) UTL with	95% Coverage	9.761	
95% UPL (t)		11.31	
90% Percentile (z)		6.77	
95% Percentile (z)		10.96	
99% Percentile (z)		27.06	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.103
Theta Star	2.519
nu star	196.4
A-D Test Statistic	0.291
5% A-D Critical Value	0.78
K-S Test Statistic	0.0843
5% K-S Critical Value	0.0973

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	2.425
Median	1.695
SD	2.694
k star	0.31
Theta star	7.828
Nu star	63.19
95% Percentile of Chisquare (2k)	2.805
90% Percentile	7.123
95% Percentile	10.98
99% Percentile	20.96

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		2.44
SD		2.668
SE of Mean		0.266
95% KM UTL with	95% Coverage	7.562
95% KM Chebyshev UPL		14.12
95% KM UPL (t)		6.89
90% Percentile (z)		5.858
95% Percentile (z)		6.827
99% Percentile (z)		8.645

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		9.071
95% Hawkins Wixley (HW) Approx. Gamma UPL		11.42
95% WH Approx. Gamma UTL with	95% Coverage	11.14
95% HW Approx. Gamma UTL with	95% Coverage	14.76

Note: DL/2 is not a recommended method.

Zirconium

General Statistics

Number of Valid Data	102	Number of Detected Data	25
Number of Distinct Detected Data	14	Number of Non-Detect Data	77
Tolerance Factor	1.92	Percent Non-Detects	75.49%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	0.042	Maximum Detected	-3.17
Mean of Detected	0.0177	Mean of Detected	-4.118
SD of Detected	0.00826	SD of Detected	0.491
Minimum Non-Detect	0.01	Minimum Non-Detect	-4.605
Maximum Non-Detect	0.014	Maximum Non-Detect	-4.269

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	86
Number treated as Detected with Single DL	16
Single DL Non-Detect Percentage	84.31%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.818
5% Shapiro Wilk Critical Value	0.918

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.92
5% Shapiro Wilk Critical Value	0.918

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.00814		
SD	0.00681		
95% UTL	95% Coverage	0.0212	
95% UPL (t)		0.0195	
90% Percentile (z)		0.0169	
95% Percentile (z)		0.0193	
99% Percentile (z)		0.024	

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	-5.006		
SD (Log Scale)	0.546		
95% UTL	95% Coverage	0.0191	
95% UPL (t)		0.0167	
90% Percentile (z)		0.0135	
95% Percentile (z)		0.0164	
99% Percentile (z)		0.0239	

Maximum Likelihood Estimate(MLE) Method

Mean	-0.00164		
SD	0.0153		
95% UTL with	95% Coverage	0.0278	
95% UPL (t)		0.0239	
90% Percentile (z)		0.018	
95% Percentile (z)		0.0235	
99% Percentile (z)		0.034	

Log ROS Method

Mean in Original Scale	0.00762		
SD in Original Scale	0.00733		
95% UTL with	95% Coverage	0.0279	
95% BCA UTL with	95% Coverage	0.026	
95% Bootstrap (%) UTL with	95% Coverage	0.027	
95% UPL (t)		0.0224	
90% Percentile (z)		0.016	
95% Percentile (z)		0.022	
99% Percentile (z)		0.0397	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	5.377
Theta Star	0.0033
nu star	268.9
A-D Test Statistic	0.857
5% A-D Critical Value	0.747
K-S Test Statistic	0.203
5% K-S Critical Value	0.175

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.0119
SD		0.00521
SE of Mean		0.00052605
95% KM UTL with	95% Coverage	0.0219
95% KM Chebyshev UPL		0.0347
95% KM UPL (t)		0.0206
90% Percentile (z)		0.0186
95% Percentile (z)		0.0205
99% Percentile (z)		0.024

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00443		
Median	0.000001		
SD	0.00863		
k star	0.139		
Theta star	0.0319		
Nu star	28.27		
95% Percentile of Chisquare (2k)	1.548		
90% Percentile		0.013	
95% Percentile		0.0247	
99% Percentile		0.0594	

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.0164
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.0163
95% WH Approx. Gamma UTL with	95% Coverage	0.0222
95% HW Approx. Gamma UTL with	95% Coverage	0.0239

Note: DL/2 is not a recommended method.