Nursery Products
Planting a Better Tomorrow

VIA HAND DELIVERY

July 18, 2012

Michael R. Plaziak, P.G.
Supervising Engineering Geologist
Division Manager
Lahontan RWQCB
14440 Civic Drive, Suite 200
Victorville, CA 92392

RE: REVISED MONITORING AND REPORTING PLAN & SAMPLING AND ANALYSIS PLAN, NURSERY PRODUCTS HAWES COMPOSTING FACILITY

Dear Mr. Plaziak;

Enclosed please find the Monitoring and Reporting Plan and Sampling and Analysis Plan (MRP&SAP) for the Nursery Products Hawes Composting Facility revised in response to the July 13, 2012, letter from the California Regional Water Quality Control Board, Lahontan Region (Water Board) regarding the MRP&SAP. The Water Board letter requested that Nursery Products determine now its choice of statistical data analysis methods for the groundwater monitoring and the surface impoundment vadose zone monitoring. The MRP&SAP is enclosed and has been revised with the requested information on page 14 and 15.

If you have any questions, please call Chris Seney at 760-272-1224.

Sincerely,

Chris Seney, P.E.

Enclosures

cc Lynda Brothers

Geosyntec consultants

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17 July 2012

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Mr. Chris Seney
Nursery Products, LLC
12277 Apple Valley Road, Suite 131
Apple Valley, California 92308

Subject: Monitoring and Reporting Plan & Sampling and Analysis Plan
Nursery Products Hawes Composting Facility
San Bernardino County, California

Dear Mr. Seney:

Geosyntec Consultants Inc., (Geosyntec) has reviewed and revised the attached Monitoring and Reporting Plan & Sampling and Analysis Plan (MRPSAP), Sections 4.1 and 4.2. This document was revised in response to comments made by the Lahontan Regional Water Quality Control.

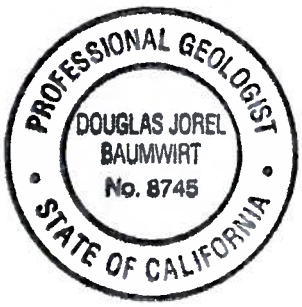
I certify under penalty of perjury that I have personally examined and am familiar with the information submitted in this MRPSAP for the Nursery Products Hawes Composting Facility and all attachments and, based on my inquiry of those individuals immediately responsible for obtaining the information; I believe the information is true, accurate, and complete. Our seals as a registered professional engineer/geologist licensed in the State of California is affixed below.

Please contact me at (858) 705-5273 if you have any questions.

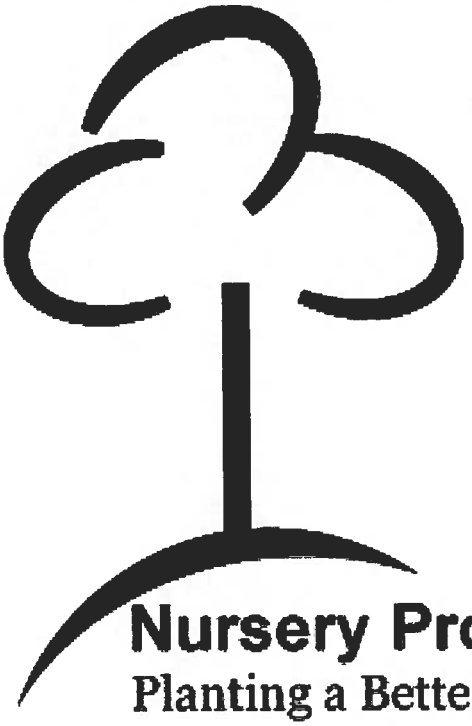
Sincerely,

Jennifer L. Nevius, R.C.E. 64932
Project Engineer

Douglas J. Baumwirt, P.G. 8745
Project Geologist



NURSERY PRODUCTS
HAWES COMPOST FACILITY
WDID No. 6B3609903006



Monitoring and Reporting Plan & Sampling and Analysis Plan

Prepared by:
Nursery Products
Suite 131
12277 Apple Valley Road
Apple Valley, CA 92308

17 July 2012

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1. INTRODUCTION

1.1 Terms of Reference

Nursery Products has prepared this Monitoring and Reporting Plan & Sampling and Analysis Plan (MRPSAP) for the Nursery Products Hawes Composting Facility (Facility) (WDID No. 6B3609903006).

1.2 Overview and Purpose

This document was updated in support of the Report of Waste Discharge (ROWD) for the Facility. This MRPSAP has been prepared in accordance with California Code of Regulations (CCR) Title 27 and Board Order No. R6V-2010-0010.

2. FACILITY OVERVIEW

The Facility is a biosolids and green material composting facility located on approximately 80 acres of a 160-acre parcel located within an unincorporated area of San Bernardino County. The Facility will compost biosolids and green material to produce agricultural grade compost in compliance with U.S. Environmental Protection Agency (EPA) Code of Federal Regulations (CFR) Title 40, Chapter 1, Part 503 and the CCR Title 14.

There are two surface impoundments located on the northern end of the Facility that will collect storm water. The surface impoundments are designed to collect all storm water from the 100-year, 24-hour storm event over the entire Facility and the 1,000-year, 24-hour storm event that falls directly on the surface impoundments.

The waste pile (engineered pad for composting operations) consists of prepared subgrade of no less than 12 inches of engineered fill derived from native material. The engineered pad is sloped to prevent ponding such that all storm water will flow toward the surface impoundments. The exterior berm of the Facility is designed so that the Facility will contain all storm water from the 1,000-year, 24-hour storm event that falls on the site.

3. ENVIRONMENTAL CONTROL AND MONITORING SYSTEMS

This section describes the environmental control and monitoring systems at the Facility in accordance with CCR Title 27. Monitoring frequency of each system will be performed in accordance with the Lahontan Regional Water Quality Control Board (RWQCB) Monitoring and Reporting Program No. R6V-2010-0010 (MRP) for the Facility. Quarterly monitoring events will occur during the first week of the second month of the quarter, and annual monitoring events will occur concurrently with the second quarter sampling event each year.

Nursery Products employees responsible for monitoring will be properly trained to use monitoring equipment, and will be familiar with the monitoring system, appropriate corrective action and reporting procedures.

3.1 Groundwater Monitoring

Monitoring well locations were identified so that groundwater data can be collected upgradient (MW-1) and downgradient (MW-2 and MW-3) of the two surface impoundments and waste pile. The proposed monitoring well locations are shown on the figures provided in the Facility Design Plan [Geosyntec, 2011]. The specific locations of the wells were selected because groundwater is expected to flow northward (see ROWD). Additional groundwater wells may be necessary if the three well locations are insufficient to characterize the groundwater beneath the Facility. Following installation of the monitoring wells, site-specific groundwater flow direction will be assessed using groundwater elevation data from the on-site wells. The list of groundwater monitoring parameters can be found in Board Order No. R6V-2010-0010. The samples, with the exception of field parameters, will be analyzed by a California state-certified laboratory. Initially, these wells will be sampled quarterly for at least eight quarters to characterize background water quality, flow conditions, and seasonal variation.

3.1.1 Monitoring Well Installation

Prior to drilling, Underground Service Alert (USA) will be contacted at least 48 hours in advance of drilling to notify operators of subsurface utilities of our intention to drill as required by law. The utility companies will conduct a mark-out of their utilities that are in the vicinity of the proposed drilling. In addition, well permits will be obtained from the San Bernardino County Department of Environmental Health.

The monitoring wells will be installed by a state-licensed drilling contractor. Installation methods and materials will comply with the California State Department of Water Resources (DWR) Well Standards for monitoring wells (DWR Bulletin Nos. 74-81 and 74-90) that are described in the sections below. The proposed groundwater monitoring well design was provided in the Facility Design Plan [Geosyntec, 2011].

The field engineer/geologist will inventory the well construction materials prior to the start of well construction. Drill cuttings will be stockpiled on plastic sheeting and development water will be containerized onsite pending laboratory analysis to determine the proper disposal method. Samples of investigative-derived wastes will be collected in pre-cleaned, properly preserved, laboratory-provided containers and analyzed. For soil disposal characterization purposes, a minimum of one composite soil sample comprised of approximately equal portions of material from each stockpile will be collected and analyzed for Title 22 metals, Total Petroleum Hydrocarbons (TPH), and Volatile Organic Compounds (VOCs) by EPA Methods 6010, 8015, and 8260, respectively. The results of analytical testing from the first sampling event will be used for liquid disposal characterization purposes. Soil, fluids, and water determined to be impacted will be disposed of at an appropriate landfill or water treatment facility. Wastes determined not to be impacted will be discharged to the ground surface near each well without impact to site design.

Monitoring wells will be constructed from new and clean materials. The well casing will consist of threaded, Schedule 80 polyvinyl chloride (PVC), four-inch-diameter pipe. The well screen will consist of threaded, machine-slotted Schedule 80 PVC pipe (0.020–inch slots) with a threaded PVC end-cap. Stainless steel centralizers will be used at 30-foot intervals. The screened interval is proposed to be the bottom 25 feet of each well. The annular space will be backfilled with a Monterey #3 sand (or equivalent) filter pack to a minimum of 2 feet above the top of the well screen using a tremie pipe. The level of the sand will be periodically sounded to identify its depth and the water in the well will be surged during placement to settle the filter pack.

A minimum 5-foot transition seal will be tremied into place through the conductor casing and will consist of bentonite chips or pellets, placed in 6-inch lifts followed by hydration using approximately 1 gallon of potable water. The completed bentonite transition seal will be allowed to hydrate for at least 30 minutes prior to placing the grout. The depth to the top of the transition seal will be verified by measuring using a weighted tape.

The annular seal above the transition seal will consist of a high-solids bentonite grout (or bentonite chips placed and hydrated in accordance with the above procedure) which

will be pumped and placed using a tremie pipe or equivalent to fill the annular space to approximately 5 feet below ground surface. Concrete will be tremied to complete the backfilling of the annular space and be continuous with the minimum 3-foot-diameter surface completion.

Upon completion of the well, the riser pipe will be cut cleanly so that the top of the well is level, and a mark or notch made on the top of the riser pipe identifying a measuring point for water level measurements. A locking cap will be placed at the top of the casing to secure the well from unauthorized entry. A steel monument-style well enclosure with a locking cap will be installed as part of the concrete surface completion, and will extend above grade.

After completion of well installation, the drilling contractor will perform well development by airlifting/swabbing, and pumping or other methods to remove residual drilling solids. Water will be pumped from the well until the discharge is relatively free of fine-grained sediment prior to collecting groundwater field parameters including temperature, pH, and conductivity. To facilitate groundwater parameter data collection, a groundwater quality meter (such as YSI 556 or equivalent) and flow-through cell will be fitted to a valve on the effluent of the pump so as to allow non-turbulent flow through the cell. Groundwater quality meters will be calibrated prior to use.

To ensure representative data is collected, the volume and rate of flow through the cell will be determined to confirm the minimum frequency of data collection. For example, if the flow-through cell holds 500 milliliters (mL), and flow through the cell (not from the pump) is 100 mL per minute, groundwater data collection can be performed a minimum of once every 5 minutes. Monitoring wells will be considered developed when temperature stabilizes to within ±1 degree Celsius, when pH stabilizes to within ±0.1 pH unit, and when conductivity stabilizes to within ±3 percent for three consecutive readings. Additionally, depth to water data will be collected using an electronic water-level indicator.

A boring log showing the well construction/completion for each well will be completed in the field by the field geologist/engineer under the supervision of a California-certified Professional Geologist or Engineer, and submitted in the monitoring systems installation report.

Following the completion of well installation, wells will be surveyed by a professional land surveyor licensed in the state of California, and in accordance with the California State Plane coordinate system and appropriate vertical datum. Groundwater levels will be measured post-installation to evaluate the groundwater flow direction.

3.1.2 Groundwater Monitoring and Sampling

Groundwater monitoring, sampling, and analysis will be conducted on a quarterly basis for the first two years of operation. Thereafter, and assuming constant and consistent results, Nursery Products will submit a request for less frequent monitoring for the duration of operation. Prior to purging, the water level in each well will be measured using an electronic water-level indicator to the nearest 0.01 foot. Each well will be purged and sampled using the "purge to stabilization" groundwater sampling technique in general accordance with the Guidance Manual for Groundwater Investigations prepared by the California EPA (CalEPA), Department of Toxic Substances Control (DTSC), dated July 1995 (revised February 2008). Groundwater purging will be performed using either a dedicated or non-dedicated variable-speed pump set within the screened interval with a pump rate set such that drawdown is minimized. During purging, water level measurements will be taken regularly at 3-minute intervals to document the amount of drawdown during purging. After a minimum of one tubing volume (including pump and flow-through-cell volume) has been purged from the well, field parameters (including temperature, pH, and conductivity) will be monitored at a minimum frequency of every 3 minutes during purging to document the stability of these parameters before sampling. Well water will be considered stabilized when temperature stabilizes to within ±1 degree Celsius, when pH stabilizes to within ±0.1 pH unit, and when conductivity stabilizes to within ±3 percent for three consecutive readings. To facilitate groundwater field parameter data collection, a groundwater quality meter (such as YSI 556 or equivalent) and flow-through cell will be fitted to a valve on the effluent of the pump so as to allow non-turbulent flow through the cell. Groundwater quality meters will be calibrated prior to use. Subsequent to documentation of stabilization of field parameters, groundwater shall be sampled directly from the discharge by slowing the pumping rate to a thin, slowly flowing stream and filling the appropriate sample containers. The sample containers will be pre-cleaned, pre-labeled, properly preserved laboratory-supplied containers appropriate for each analyte.

Purge water will be containerized onsite pending laboratory analysis of groundwater samples. One purge water sample will be analyzed for VOCs by EPA Method 8260 and Title 22 Metals by EPA Method 6010 for disposal characterization purposes. Soil, fluids, and water determined to be impacted will be disposed of at an appropriate landfill or water treatment facility. Wastes determined not to be impacted will be discharged to the ground surface near each well upon written receipt of approval from the RWQCB.

Water samples will be collected using disposable or dedicated tubing. Therefore, no equipment rinsate blank will be collected for analysis when sampling the wells. However, when samples are collected for analysis of VOCs, a quality control trip blank (QCTB) provided by the laboratory will be used to evaluate if VOC contamination occurred during sample transport or storage. A trip blank consists of a deionized water sample transported to the field by sampling personnel, shipped along with the groundwater samples to the laboratory, and analyzed for the same VOCs as the groundwater samples. One QCTB will be analyzed with each sample shipment to the laboratory. The laboratory will be notified that samples are going to be collected, and the laboratory will pick up the samples and transport them to the laboratory for analysis using proper sample preservation, containers, handling and storage per standard chain-of-custody protocols. Analyses listed in Board Order No. R6V-2010-0010 will be performed in accordance with recommended holding times, containers, and preservatives by a state-certified laboratory.

3.2 Vadose (Unsaturated) Zone Monitoring – Surface Impoundments

The vadose zone monitoring system beneath each surface impoundment will consist of a permanent lysimeter (See Design Plan). The lysimeter liner will consist of 60-mil high-density polyethylene (HDPE). The dimensions of each lysimeter sump will be 25 feet square, 2 feet deep and be filled with crushed rock. Each lysimeter sump will be located with the top being 5 feet below the bottom of the surface impoundment. Access to the lysimeter is through a 6-inch riser pipe that will have a locking cover. The particular locations of the monitoring points were selected below the lowest point of each surface impoundment.

Each lysimeter will be inspected weekly for the presence of liquids using an electronic moisture detector. If liquid is detected in a previously dry lysimeter, the RWQCB will be notified, and the liquid analyzed for the parameters in Attachment B of Board Order No. R6V-2010-0010 provided the amount of liquid is sufficient for testing. If a smaller quantity of liquid is present a proposed priority for testing will be submitted to the RWQCB.

In such an event, the following procedures will be implemented. The laboratory will be notified that samples are planned for collection, and the laboratory courier will pick up the samples and transport them to the laboratory for analysis using standard c ain-of-custody protocols. The samples will be collected using pre-cleaned portable pumping equipment. Re-usable sampling equipment will be decontaminated using an Alconox wash followed by a potable water rinse, followed by a distilled water final rinse (the 3-bucket wash method). The samples will be collected in pre-cleaned, pre-labeled,

properly preserved, laboratory-supplied containers appropriate for each analyte. In addition to the surface impoundment vadose zone samples, a quality control equipment blank (QCEB) will be prepared and collected by the sampling personnel to be used to evaluate whether contamination was introduced as a result of improper decontamination of reusable sampling equipment. A QCEB consists of deionized water either poured over or through reusable sampling equipment after decontamination procedures. The QCEB will be collected in appropriately preserved and labeled containers and will be shipped along with the groundwater samples to the laboratory, and analyzed for the same constituents as the leachate samples. One QCEB will be analyzed for each day that reusable groundwater sampling equipment is utilized at the site to facilitate sample collection.

Where samples are collected for analysis of VOCs, a QCTB provided by the laboratory will be used to evaluate whether VOC contamination occurred during sample transport or storage. A trip blank consists of a deionized water sample transported to the field by sampling personnel, shipped along with the groundwater samples to the laboratory, and analyzed for the same VOCs as the groundwater samples. One QCTB will be analyzed with each sample shipment to the laboratory.

3.3 Vadose (Unsaturated) Zone Monitoring – Waste Pile (Compost Pad)

3.3.1 Annual Soil Monitoring

The proposed vadose zone monitoring for the waste pile consists of annual soil sampling and comparison of results to background threshold values (BTVs) established prior to Facility construction as described in Appendix A. The purpose for this sampling protocol is to assess the effectiveness of the composting pad engineered fill liner and provide cumulative assessment of the condition thereof. Monitoring Parameters are tested annually, and Constituents of Concern are tested on a five-year cycle as presented in Table 3 in Board Order No. R6V-2010-0010. Ten soil samples will be collected from random locations at six-inch intervals to a depth of 1.5 feet within the waste pile area. A probability-based "simple random sampling" plan will be implemented based on the December 2002 EPA Guidance on Choosing a Sampling Design for Environmental Data Collection [EPA, 2002]. Soil samples, with the exception of field parameters, will be analyzed by a California-certified laboratory.

3.3.2 Soil Sampling Procedures

To determine random sampling locations, the footprint of the compost pad will be divided into a 100-unit by 100-unit grid over the entire waste pile area. Using a random number generator, "x" and "y" sample location coordinates will be determined for each

of the 10 random soil boring locations. Each of the soil borings will be advanced to a depth of 18 inches, with samples retained from 6 to 12-inch and 12 to 18-inch intervals. A clean hand-auger or sample tube will be used to retrieve the representative samples. The hand-augered samples will be placed into pre-cleaned, pre-labeled, properly preserved laboratory-supplied containers. Soil samples retrieved with sampling tubes will be sealed and will not be transferred into other containers. Following sample collection, the borings will be backfilled with bentonite and hydrated.

The laboratory will be notified that samples are planned for collection, and the laboratory will pick up the samples and transport them to the laboratory for analysis using standard chain-of-custody protocols.

Initially, the 10 samples collected from the 6 to 12-inch interval will be analyzed by the laboratory, and the 10 samples collected from the 12 to 18-inch interval will be archived by the laboratory pending results of the shallow samples. Laboratory analysis will include those constituents listed in Table 3 (Unsaturated Zone – Waste Pile, Monitoring Parameters and Constituents of Concern) of Attachment C in Board Order No. R6V-2010-0010. Annual monitoring events will include analysis of the listed Monitoring Parameters, and each fifth annual monitoring event will included analysis of the listed Monitoring Parameters and Constituents of Concern. During each sampling event the sampler will visually evaluate soil conditions for physical evidence of a significant release as specified in Section III.C of Board Order No. R6V-2010-0010, including unexplained volumetric changes, unexplained stress in biological communities, unexplained changes in soil characteristics or moisture content, visible signs of leachate migration, and/or any other change in the environment that could reasonably be expected to be the result of a measurably significant release from the Facility.

3.3.3 Determination of a Measurably Significant Release

Within 45 days of sampling, determination of whether a measurably significant release has occurred from the Facility will be performed. To reduce the false-positive rate and to address outliers, naturally-occurring constituents that were not detected, general uncertainty associated with unbiased statistical methodology, and considering a depth to groundwater approximately 360 feet below ground surface, determination of a potential significant release from the Facility will initially be defined as the reported detection of five or more constituents at concentrations exceeding respective BTVs (Appendix A) in a given sample, and/or physical evidence of a significant release observed during sampling. If five or more constituents in a single sample collected from the 6 to 12-inch interval exceed respective BTVs, then the archived sample collected from the

underlying 12 to 18-inch interval will be analyzed for only those constituents that exceeded the BTVs in the sample collected from the 6 to 12-inch interval.

If five or more constituents exceed respective BTVs in a single sample collected from the 12 to 18-inch interval, then the RWQCB will be immediately notified by electronic mail and the verification process will be initiated as outlined in Section III.D of Board Order No. R6V-2010-0010. The verification procedure will include a discrete retest within three feet of the location(s) which yielded the elevated results for five or more constituents. Retesting will include collection and analysis of samples collected from the 6 to 12-inch and 12 to 18-inch intervals for those constituents that exceed respective BTVs. Sample collection procedures will be performed in accordance with Section 3.3.2 of this MRPSAP. Results of verification testing will be reported by electronic mail to the RWQCB within 7 days of the last laboratory analysis. Reporting a measurably significant release from the compost pad at the Facility will be reported in accordance with Section IV.G (Unscheduled Reports to be Filed with the Water Board) of Board Order No. R6V-2010-0010. If retesting confirms evidence of a measurably significant release from the Facility, then a workplan will be developed which proposes either mitigation of the release or further investigation and submitted to the RWQCB.

3.4 Impoundment Monitoring – Solid

Annually, in the last quarter of each year, individual grab samples of the bottom sludge from each surface impoundment, if present, will be collected, and each sample will be analyzed for the constituents listed in Board Order No. R6V-2010-0010 MRP.II.A.4. A pre-cleaned shovel, trowel, or scoop will be used to collect a representative sample of the sludge in the bottom of each surface impoundment. Re-usable sampling equipment will be decontaminated using an Alconox wash followed by a potable water rinse, followed by a distilled water final rinse (the 3-bucket wash method). The representative samples will be placed into the pre-labeled container provided by the laboratory and transported to the laboratory for analysis using standard chain-of-custody protocols.

3.5 Impoundment Monitoring – Liquid

Quarterly, a minimum of three grab samples of liquid, if present, from each of the surface impoundments will be collected from a depth of approximately one foot, opposite the inlet, in a quiescent surface area. The grab samples from each surface impoundment will be composited in the field into two samples, one for each surface impoundment. The samples will be analyzed for the constituents presented in Table 1 of Attachment A of Board Order No. R6V-2010-0010. If the surface impoundment is dry at the time of monitoring, this condition will be noted in the monitoring report.

The laboratory will be notified that samples are going to be collected, and the laboratory will pick up the samples and transport them to the laboratory for analysis using standard chain-of-custody protocols. A pre-cleaned pond sampler that consists of an arm or handle with a clamp to attach a sampling container will be used to collect the representative samples of wastewater. Re-usable sampling equipment will be decontaminated using an Alconox wash followed by a potable water rinse, followed by a distilled water final rinse (the 3-bucket wash method). The pond sampler will be slowly submerged and retrieve the samples with minimal surface disturbance. The samples will be collected in pre-cleaned, pre-labeled, properly preserved laboratory-supplied containers provided by the laboratory. The laboratory will composite the three discrete samples for each surface impoundment.

Where samples are collected for analysis of VOCs, a QCTB will be provided by the laboratory to evaluate whether VOC contamination occurred during sample transport or storage. A trip blank consists of a deionized water sample transported to the field by sampling personnel, shipped along with the groundwater samples to the laboratory, and analyzed for the same VOCs as the groundwater samples. One QCTB will be analyzed with each sample shipment to the laboratory.

3.6 Leak Detection Monitoring Sump

Weekly inspection for liquid in each of the two LDMSs will be conducted using a moisture detector. Access to the LDMS is through a 6-inch riser pipe that will have a locking cover. The result of these inspections will be recorded in a permanent logbook kept onsite. If liquid is detected in a LDMS, the RWQCB will be notified immediately. Any volume of liquid pumped out of the LDMS will be recorded along with date, time, and discharge location, in a permanent logbook kept onsite.

Upon detection of liquid in a previously dry LDMS, a grab sample will be collected and tested for the parameters listed in Table 2 in Attachment B of Board Order No. R6V-2010-0010 provided the required amount of liquid is present for testing. If a smaller quantity of liquid is present a proposed priority for testing will be submitted to the RWQCB.

The laboratory will be notified that samples are going to be collected, and the laboratory will pick up the samples and transport them to the laboratory for analysis using standard chain-of-custody protocols. The samples will be collected using pre-cleaned onsite portable pumping equipment. The samples will be collected in pre-cleaned, pre-labeled, properly preserved laboratory-supplied containers appropriate for each analyte.

Re-usable sampling equipment will be decontaminated using an Alconox wash followed by a potable water rinse, followed by a distilled water final rinse (the 3-bucket wash method). In addition to the surface impoundment vadose zone samples, a QCEB will be prepared and collected by the sampling personnel to be used to evaluate whether contamination was introduced as a result of improper decontamination of reusable groundwater sampling equipment. A QCEB consists of deionized water either poured over or through reusable sampling equipment after decontamination procedures or collected in appropriately preserved and labeled containers. The QCEB is shipped along with the groundwater samples to the laboratory, and analyzed for the same constituents as the leachate samples. One QCEB will be analyzed for each day that reusable groundwater sampling equipment is utilized at the site to facilitate sample collection.

Where samples are collected for analysis of VOCs, a QCTB provided by the laboratory will be used to evaluate whether VOC contamination occurred during sample transport or storage. A trip blank consists of a deionized water sample transported to the field by sampling personnel, shipped along with the groundwater samples to the laboratory, and analyzed for the same VOCs as the groundwater samples. One QCTB will be analyzed with each sample shipment to the laboratory.

3.7 Impoundment Inspections – Dikes and Liners

Monthly, each of the surface impoundment dikes and liners will be visually inspected to determine if there are any indications of loss of integrity. Should the inspection indicate that any unauthorized discharge has occurred, or may occur, the RWQCB will be notified within 48 hours, followed by confirmation in writing within 7 days.

Daily, measure and record the freeboard, as measured from the top of the lowest part of the dike to the wastewater surface in each surface impoundment. Observations and measurements will be recorded in a permanent log book kept onsite. If the surface impoundment is dry, it will be indicated as such in the log book and monitoring report.

The weather forecasts will be monitored daily and whenever rain is forecast. Each surface impoundment will be inspected and documented prior to each predicted event.

3.8 Facility Berm Inspections

Monthly, and before, during, and after any storm event that produces precipitation at the Facility, the berm around the Facility must be visually inspected to determine if there are any indications of loss of integrity. Inspections, inspection results, and activities performed to correct deficiencies must be documented. Should the inspection indicate

that any unauthorized discharge of stormwater has occurred, or may occur; the RWQCB must be notified by electronic mail within 48 hours, followed by confirmation in writing within 7 days.

3.9 Facility Odor Monitoring

An Odor Impact Minimization Plan will be developed. Daily, the discharger will assess the site conditions and evaluate potential sources of objectionable odors and document these inspections. Documentation will include a description of any odors detected. Wind speed and direction will be checked and logged daily and just prior to any activities at the Facility that may produce nuisance dust. Odor control measures include odor screening and load checking procedures, feedstock storage and processing measures, windrow management measures, good housekeeping procedures, and an odor complaint response system. Odor control activities at the Facility must be documented daily in a permanent log book kept onsite.

3.10 Operation and Maintenance

A brief summary of any operational problems and maintenance activities must be submitted to the RWQCB with each monitoring report.

3.11 Dust Control

The following mitigation measures must be implemented and monitored to ensure dust is controlled:

- Unpaved roads will be watered, as necessary, to minimize visible dust. Alternatively, roads may be paved;
- During episodes of high winds (>30 miles per hour), activities that may create nuisance dust may not be performed;
- Daily, monitor moisture content of windrows using a standard field test for moisture. Moisture will be determined by taking a representative sample of the windrow materials and forming the material into a ball by hand; the materials should hold together without crumbling. If material crumbles, water will be added. Moisture monitoring activities must be documented daily in a permanent log book onsite.

4. DATA ANALYSIS

4.1 Groundwater Quality Monitoring

The objective of groundwater quality monitoring is to determine whether a monitoring parameter (MPar) has exhibited a new measurably significant increase in monitor wells. The purpose of the selected statistical analysis is to detect the potential arrival of a MPar in a well at a concentration high enough to be considered a measurably significant indication using an appropriate statistical or non-statistical data analysis method.

In accordance with the EPA's Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, dated March 2009 (Unified Guidance), the statistical groundwater detection monitoring program should be designed to suit site-specific conditions, including hydrogeologic heterogeneity and the nature of naturally-occurring constituents. Based on observed site conditions and experience with similar sites in California, it is assumed that inter-well non-parametric Tolerance Intervals utilizing the Sanitas™ statistical software will be an appropriate statistical method for data obtained from monitoring wells at the site to determine if an MPar has exhibited a measurably significant increase. The Tolerance Interval statistical method is listed as an allowable data analysis method in CCR Title 27 Section 20415(2)(8) as required by the MRP. However, the Unified Guidance recommends a comprehensive detection monitoring program design based on two key performance characteristics: adequate statistical power and a low predetermined site-wide false positive rate.

The initial background data set for each MPar for each monitoring well (well/MPar pair), shall include all validated data obtained from the eight quarterly background sample events described in Section 3.1. The background study shall select the constituents deemed appropriate for detection monitoring, identify distributional characteristics, and evaluate the constituent data for trends, stationarity, and mean spatial variability among wells. A combination of background statistical tests including T-tests, analysis of variance (ANOVA), and trend tests will be performed in accordance with the Unified Guidance to confirm appropriate compliance evaluation statistical methods.

Following development of the minimum 8-point background data set ($n \geq 8$) and statistical evaluation, if a statistical method other than the intra-well non-parametric Tolerance Interval method is determined to be more appropriate, then the proposed Detection Monitoring Program (DMP) will be submitted to the RWQCB in accordance with CCR Title-27 Section 20415 for review and approval prior to implementation. During the interim period prior to collection of 8 background data points, background

groundwater will be compared to conservative primary and secondary Maximum Contaminant Levels for drinking water (MCLs), and Basin Plan objectives for other inorganic parameters such as TDS, chloride, and sulfate.

4.2 Surface Impoundment Vadose Zone Monitoring

Vadose zone surface impoundment liquid sample analytical results will be compared to concentration limits for site groundwater wells to determine the significance of the observed concentrations of constituents of concern reported for the collected samples. Samples collected from the vadose zone monitoring system will be considered downgradient monitoring points, and will be compared to background groundwater monitoring data using the inter-well non-parametric Tolerance Interval method, similar to the groundwater quality statistical evaluation described in Section 4.1.

4.3 Compost Pad Monitoring

Compost pad monitoring will be performed to obtain random sampling analytical results of Monitoring Parameters (annually) and Constituents of Concern (five-yearly) for soil samples collected from the compost pad. Background soil sampling was performed to develop BTVs for the compost pad for use in comparison to annual compost pad sampling results. The EPA ProUCL 4.0 software was used to perform the statistical analysis of the background data [EPA, 2007]. For constituents with at least two detected results, BTVs were calculated using the 95 percent Chebyshev upper prediction limit (UPL). This method was selected because it is a non-parametric method and can be used on data sets regardless of their distribution. If the data contain non-detect measurements, the Kaplan-Meier method will be used to estimate the mean and standard deviation. The equation for calculating the Chebyshev UPL is given below:

$$UPL = \bar{x} + \left[\sqrt{\left((1/\alpha) - 1\right) * (1 + 1/n)}\right] S_x$$

Where $\bar{x}$ is the mean and S_x is the standard deviation.

Compost Pad sampling procedures are described in Section 3.3 of this MRPSAP. Results of background soil sampling and presentation of site-specific BTVs are presented in Appendix A.

5. REPORTING

5.1 Monitoring Reports

Monitoring reports will be submitted quarterly on the 30th day of the month following each quarter. Annual monitoring reports will be submitted no later than April 30 of each year. Every five years, sampling for non-monitoring parameter Constituents of Concern (COCs) will be performed with successive alternating direct monitoring efforts being carried out during January 1 through June 30 of one five-year sampling event and July 1 through December 31 of the next five-year sampling event, and every fifth year thereafter. In accordance with Board Order No. R6V-2010-0010, the first five-year non-monitoring parameter COC sampling event must take place during January 1 through June 30 of the second year of operation, and reported no later than 45 days following the monitoring period.

The quarterly monitoring reports, at a minimum, will contain the following components:

- Results of sampling and laboratory analyses for each groundwater monitoring point, including statistical limits for each monitoring parameter and an identification of each sample that exceeds its respective statistical limit at any given monitoring point in accordance with Section III "Data Analyses" of the MRP;

- A description and graphical representation of the velocity and direction of groundwater flow under/around the Facility, based on water-level elevations taken during the collection of the water quality data submitted in the report;

- A map and/or aerial photograph showing the locations of the observation stations, monitoring points, background monitoring points, and the Points of Compliance (POCs) along the downgradient boundary of the Facility;

- Surface impoundments monitoring results, including an evaluation of the effectiveness of the leachate monitoring and control facilities. Monitoring will include a summary of surface impoundment pumping activities for dust control mitigation measures;

- If the Storm Contingency Plan is implemented during a quarter, the volume of liquid removed and the location the liquid was taken to for disposal will be provided, and documentation will include the beginning and ending freeboard levels;

- Monitoring of the Facility berms including an evaluation of the effectiveness of the run on/runoff control facilities;

- Data collected in accordance with this MRPSAP, and the MRP for the surface impoundments' unsaturated zone monitoring system and groundwater monitoring wells;

- An assessment of odor impacts in accordance with the approved Odor Impact Minimization Plan, and mitigation measures implemented for nuisance odor control;

- A summary of all daily wind monitoring data in tabular form, with wind speeds in excess of 30 miles per hour highlighted in the table;

- A summary of moisture monitoring measures for windrows, including any instances where water had to be added to the windrow;

- A letter transmitting the essential points of each report, including a discussion of any violations found since the last such monitoring report was submitted, and describing actions taken or planned for correcting these violations; and

- A reference to any previously submitted time schedule for correcting identified violations. If no violations occurred since the last report submittal, this will also be stated in the transmittal letter.

Annual Monitoring Reports will include, at a minimum, the following components:

- A list of all monitoring point/monitoring parameter (MPt/MPar) pairs, by medium, that have exhibited a verified measurably significant increase, together with the respective date (for each) when that increase occurred. Any MPt/MPar pairs that have shown an increase within that (prior) year will be bolded and underlined. In addition, by medium, list any non-monitoring parameter COCs that, during the testing year (tested every 5 years), have exceeded their respective statistical limit and, as a result, have become monitoring parameters, together with the date when the transition occurred;

- Time-series data plots of groundwater and soil moisture analysis. Time series plots will include appropriate MCL or concentration thresholds established for each respective constituent that has shown a verified increase. For a pair that has a verified measurably significant release indication, these plots must also include the cleanup goal;

- Four maps, one for each quarter of the last reporting year, showing the groundwater elevation iso-contours determined for that quarter, and showing the waste pile and surface impoundments perimeters and the groundwater monitoring point and background monitoring point locations for each waste management unit, and including the surface trace of the Facility's point of compliance;

- Graphical and tabular data for the monitoring data obtained for the previous calendar year (January through December). Each table will summarize the historical and most recently detected constituents concentrations for all locations sampled, and compare these data to both the given monitoring point/COC pair's respective statistical limit and (if applicable) MCL, and be labeled appropriately. Each such graph will be plotted using raw data, and at a scale appropriate to show trends or variations in water quality. For graphs showing trends of similar constituents (e.g., VOCs), the scale must be the same;

- Calibration methods and any discrepancies of any meters used for field parameter evaluations after calibration is performed;

- The compliance record and the corrective actions taken or planned which may be needed to bring the discharge into full compliance with the discharge requirements;

- Evidence that adequate financial assurance for closure and corrective actions for all known or reasonably foreseeable releases is still in effect. Evidence may include a copy of the renewed financial instrument or a copy of the receipt for payment of the financial instrument. Evidence of adequate financial assurance must be signed by the Corporate Officer;

- Evidence that the financial assurance amount is adequate, or increase the amount of financial assurance by an appropriate amount if necessary, due to inflation, a change in the approved closure plan, or other unforeseen events; and

- Any known or reasonably foreseeable releases causing significant changes in the operation of the Facility will prompt the review of the preliminary closure plan and corrective action plan to evaluate whether updates to the plans are warranted. Any changes to these plans will be submitted to the RWQCB in the annual report.

5.2 Technical Reports

5.2.1 Final Construction Quality Assurance Report

Following the completing of construction of the Facility, and at least 60 days prior to discharge the final construction quality assurance (CQA) report must be submitted to the RWQCB for review and acceptance. This report must be submitted to the RWQCB no later than 180 days after completion of construction.

5.2.2 Monitoring Systems Installation Report

No later than 180 days following completion of construction and at least 60 days prior to discharge, a technical report must be submitted summarizing the installation of the monitoring systems. The report shall summarize all work activities associated with the installation of the monitoring systems.

5.2.3 Completion of Construction Report

No later than 90 days following completion of construction, a technical report will be submitted discussing the installation of the monitoring system.

5.2.4 Water Quality Protection Standard Report

No later than 760 days following the beginning of operations, a proposed data analysis method and a proposed concentration limit (background data set) consisting of eight data points from an appropriate groundwater background data source for each COC at each monitoring point will be submitted.

5.2.5 Five-Year Non-Monitoring Parameter Constituent of Concern Monitoring Report

Sample for non-monitoring parameter COCs every five years with successive direct monitoring efforts being carried out alternatively during January 1 through June 30 of one five-year sampling event and July 1 through December 31 of the next five-year sampling event, and every fifth year, thereafter. The first five-year non-monitoring sampling event must take place during January 1 through June 30 of the second year of operation of the Facility, and reported no later than 45 days following the monitoring period.

6. REFERENCES

DWR, 1981. Bulletin 74-81, California Well Standards. Department of Water Resources, 1981.

DWR, 1990. Bulletin 74-81, Water Well Standards. Department of Water Resources, 1990.

EPA, 2002. Guidance on Choosing a Sampling Design for Environmental Data Collection, EPA QA/G-5S. United States Environmental Protection Agency, December 2002.

EPA, 2007. ProUCL Version 4.0 Technical Guide, EPA/600/R-07/041. United States Environmental Protection Agency, April 2007.

EPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, EPA 530/R-09-007. United States Environmental Protection Agency, Office of Resource Conservation and Recovery. March 2009.

Geosyntec, 2011. Final Design Plan, Construction Quality Assurance Plan & Technical Specifications, Hawes Composting Facility. May 2011.

RWQCB, 2010. Board Order No. R6V-2010-0010, WDID No. 6B360903006, Waste Discharge Requirements and Monitoring and Reporting Program for Hawes Composting Facility. Adopted March 2010.

RWQCB, 2011a. Revised Monitoring and Reporting Plan and Sampling and Analysis Plan, Nursery Products Hawes Composting Facility, San Bernardino County. RWQCB letter dated 28 January.

RWQCB, 2011b. Background Native Soils Report, Nursery Products Hawes Composting Facility, San Bernardino County. RWQCB letter dated 4 February.

URS, 2009. Report of Waste Discharge, Nursery Products Hawes Composting Facility, San Bernardino County, California. April, Revised July 2009.

APPENDIX A - Background Native Soils Evaluation

A.1 Background Native Soils Sampling

Prior to construction of the Facility, background data (including Monitoring Parameters and Constituents of Concern) were obtained for the native engineered fill material of the waste pile. Ten representative locations were sampled from the native materials in the planned waste pile area. A probability-based "simple random sampling" plan was implemented as outlined in the December 2002 Environmental Protection Agency (EPA) Guidance on Choosing a Sampling Design for Environmental Data Collection [EPA, 2002] The footprint of the proposed waste pile composting pad was divided into a 100-unit by 100-unit grid (Figure A-1). Using a random number generator, "x" and "y" sample location coordinates were determined for each of the background soil boring locations (Attachment A-1).

Background native soil sampling was performed on 9 February 2012 by a California-licensed Professional Geologist in accordance with Section A.1 described above. Ten (10) soil borings were hand-augered to depths of 1.5 feet (ft) below grade (bg) to facilitate collection of two soil samples per boring (one from 0.5 to 1 ft bg and another from 1 to 1.5 ft bg). Field notes are included in Attachment A-1. A clean hand-auger was used to retrieve each of the samples. The samples were placed in pre-cleaned, pre-labeled, properly preserved laboratory-supplied containers. Following sample collection, the boring was backfilled with the native material soil cuttings and compacted.

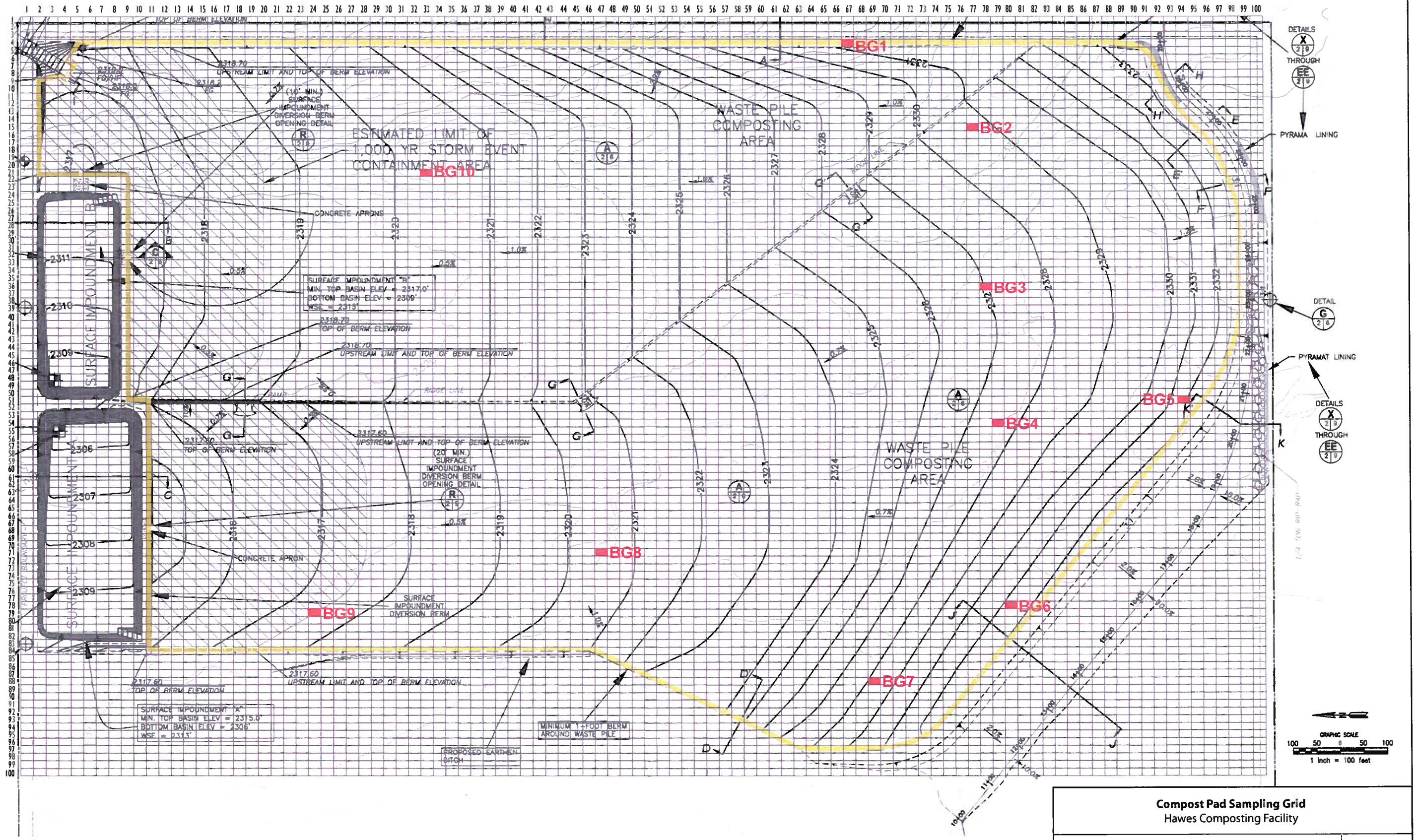
Soil samples were transported under chain-of-custody to Calscience Environmental Laboratory in Garden Grove, California, a California-certified laboratory. The laboratory was notified that samples were being collected, and the laboratory picked up the samples and transported them to the laboratory for analysis using standard chain-of-custody protocols. Initially, 10 samples (5 from the upper interval and 5 from the deeper interval) were analyzed for the naturally-occurring constituents specified in Board Order No. R6V-2010-0010, Attachment C Table 3 (Unsaturated Zone – Waste Pile). For those constituents that are not typically naturally-occurring (e.g., organochlorine pesticides, organophosphorous pesticides, chlorinated herbicides, volatile organic compounds, semi-volatile organic compounds, and methylene blue active substances), two random samples were analyzed. If the results of the initial 10 samples indicated that the background data set was statistically valid, no additional analysis would have been performed. The determination of a statistically-valid background data set was performed in accordance with the EPA ProUCL Technical Guide [EPA, 2007]. Additional analysis was required for some metals analytes to develop a statistically-valid background data set. Background Threshold Values

(BTVs) for the native-derived engineered fill materials were developed in accordance with Section 4.3 of the Monitoring and Reporting Plan & Sampling and Analysis Plan (MRPSAP).

A.2 Background Native Soils Evaluation Results

A summary of analytical results for background native soil sampling is provided as Table A-1 and the laboratory analytical report is included as Attachment A-2. Results of statistical analysis for analytical results are summarized in Table A-2, including the number of outliers and non-detectable results, minimum and maximum values, and ProUCL-calculated BTVs for each constituent specified in Board Order No. R6V-2010-0010. Detailed statistical analysis output sheets are included in Attachment A-3.

Preliminary results were screened for outliers and distribution using the EPA's ProUCL 4.0 software package. In general, results indicated a statistically-valid data set with the exception of several metals with one to two outliers in the 10-sample dataset ($n<10$). Additionally, results indicated four parameters (antimony, selenium, thallium, and silver) that were not detected in the initial 10 samples at reportable concentrations. To address outliers and non-detectable results, the 10 archived samples not previously tested were analyzed for metals by the laboratory.



Reference: Geosyntec (2011) Appendix A, Design Drawings

Compost Pad Sampling Grid
Hawes Composting Facility

Geosyntec consultants

San Diego | February 2012

Figure 1

Table A-1
Summary of Analytical Results
Baseline Compost Pad Soil Sampling
Hawes Composting Facility, Hinkley, CA

Geosyntec consultants

Constituent	Units	Sample IDs																		
		BG1-0.5	BG1-1.0	BG2-0.5	BG2-1.0	BG3-0.5	BG3-1.0	BG4-0.5	BG4-1.0	BG5-0.5	BG5-1.0	BG6-0.5	BG6-1.0	BG7-0.5	BG7-1.0	BG8-0.5	BG8-1.0	BG9-0.5	BG9-1.0	BG10-0.5	BG10-1.0
Monitoring Parameters – Annual Monitoring Frequency																					
Aluminum	mg/kg	4050	14400	20300	9260	3870	4450	16500	15800	4560	14000	7100	9810	4570	13000	4670	10800	8090	4730	9310	7920
Antimony	mg/kg	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750
Arsenic	mg/kg	1.58	9.58	7.84	4.24	1.94	1.76	4.85	8.88	1.73	4.03	2.17	3.72	1.75	9.96	1.83	6.52	6.11	3.67	4.04	3.88
Copper	mg/kg	4.47	15.2	22.8	8.41	4.61	5.24	19.6	16.9	5.84	15.4	8.31	10.9	5.17	12.8	5.87	12.4	8.9	4.5	10.7	9.13
Iron	mg/kg	6070	14700	20300	12000	5680	6280	17900	17300	6840	14200	8950	11500	6740	15200	6990	12600	9870	7230	10200	9650
Manganese	mg/kg	133	229	359	186	122	113	405	258	155	379	179	176	145	230	155	241	175	97.2	163	176
MBAS	mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/kg	4.22	11.6	18.6	7.35	4.12	4.37	17.1	15.2	5.47	22.5	7.16	9.15	5.07	10.6	5.10	10.5	7.47	4.02	8.04	7.70
Nitrate (as N)	mg/kg	2.7	-	-	25	-	1.7	21	-	-	8.3	6.0	-	-	2.4	13	-	-	ND<1.0	1.6	-
Sulfate	mg/kg	10	-	-	310	-	14	86	-	-	240	10	-	-	750	37	-	-	6700	10	-
TDS	mg/kg	576	-	-	2350	-	164	817	-	-	4730	1230	-	-	3290	784	-	-	4900	559	-
Constituents of Concern – Five-Yearly Monitoring Frequency																					
Barium	mg/kg	36.0	104	130	74.5	39.7	43.4	104	123	37.5	333	51.4	66.2	42.1	177	43.2	47.8	72.3	45.3	73.3	-
Beryllium	mg/kg	ND<0.250	1.21	1.26	1.09	0.270	0.369	1.05	1.42	0.255	1.39	0.442	0.622	0.291	1.26	0.300	0.821	0.583	0.525	0.776	0.572
Bicarbonate	mg/kg	45	-	-	120	-	190	510	-	-	380	180	-	-	13000	360	-	-	160	370	-
Boron	mg/kg	1.84	18.7	16.1	16.7	4.78	2.96	6.84	38.8	5.51	38.1	4.42	8.84	4.42	20.3	3.5	12.5	7.72	7.39	4.14	8.24
Bromide	mg/kg	ND<1.0	-	-	ND<1.0	-	ND<1.0	ND<1.0	-	-	ND<1.0	ND<1.0	-	-	ND<1.0	ND<1.0	-	-	ND<1.0	ND<1.0	-
Cadmium	mg/kg	ND<0.500	0.509	0.619	ND<0.500	ND<0.500	ND<0.500	0.633	0.569	ND<0.500	ND<0.500	ND<0.500	ND<0.500	ND<0.500	0.559	ND<0.500	ND<0.500	ND<0.500	ND<0.500	ND<0.500	ND<0.500
Calcium	mg/kg	1760	34800	6940	42500	2960	7620	12700	39800	1740	6150	3100	3170	1870	43300	2740	15000	9130	18700	17800	7680
Carbonate	mg/kg	ND<5.0	-	-	70	-	24	350	-	-	430	ND<5.0	-	-	1100	ND<5.0	-	-	ND<5.0	120	-
Chloride	mg/kg	ND<10	-	-	1100	-	ND<10	ND<10	-	-	580	ND<10	-	-	960	350	-	-	730	ND<10	-
Chromium, Hexavalent	mg/kg	ND<0.80	-	-	ND<0.80	-	ND<0.80	ND<0.80	-	-	ND<0.80	ND<0.80	-	-	ND<0.80	ND<0.80	-	-	ND<0.80	ND<0.80	-
Chromium, Total	mg/kg	4.97	15	22	10.1	4.75	5.17	17.3	20.3	5.85	15.6	7.91	11.2	5.48	14.3	5.97	13.2	9.53	6.19	9.81	9.17
Cobalt	mg/kg	2.73	6.66	9.36	5.61	2.49	2.80	9.19	8.72	3.30	17.6	4.36	5.18	3.16	7.38	2.99	6.63	4.88	3.14	4.43	4.60
Fluoride	mg/kg	ND<1.0	-	-	4.0	-	ND<1.0	1.4	-	-	13	ND<1.0	-	-	14	ND<1.0	-	-	ND<1.0	2.7	-
Total Kjeldahl Nitrogen (TKN)	mg/kg	180	-	-	70	-	180	200	-	-	130	320	-	-	150	600	-	-	84	130	-
Lead	mg/kg	3.07	4.82	9.16	2.83	4.71	2.75	9.52	5.68	3.03	7.30	4.88	4.80	3.23	4.39	7.08	5.18	3.72	2.00	76.8	13.4
Magnesium	mg/kg	1950	7370	9910	6160	2050	2330	8700	8310	2510	6690	3570	4710	2350	7040	2670	5170	3920	2710	4220	3660
Mercury	mg/kg	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835
Molybdenum	mg/kg	0.25	2.19	0.639	2.76	0.323	0.594	1.00	3.37	0.25	1.47	0.394	0.374	0.25	3.06	0.415	0.988	0.678	1.27	1.17	0.619
Nitrite (as N)	mg/kg	1.6	-	-	ND<1.0	-	1.5	ND<1.0	-	-	1.4	1.1	-	-	ND<1.0	ND<1.0	-	-	ND<1.0	1.2	-
o-Phosphate (as P)	mg/kg	1.7	-	-	ND<1.0	-	1.1	2.5	-	-	1.3	1.9	-	-	ND<1.0	8.0	-	-	ND<1.0	1.2	-
Phosphorus, Total	mg/kg	340	-	-	ND<0.5	-	280	ND<1.0	-	-	280	2.0	-	-	360	380	-	-	0.84	2	-
Potassium	mg/kg	1290	2540	6320	2040	1350	1250	5100	3080	1610	2890	2380	2460	1400	2370	1740	2770	1920	1160	2150	1990
Selenium	mg/kg	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750
Silver	mg/kg	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250	ND<0.250
Sodium	mg/kg	65.3	1960	1290	1580	67.2	93.4	1540	4190	155	29	187	578	185	3690	499	1560	877	1590	401	539
Thallium	mg/kg	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750	ND<0.750
Alkalinity	mg/kg	45	-	-	200	-	210	860	-	-	800	180	-	-	15000	360	-	-	160	480	-
Anions	mg/kg	6.0	-	-	1439	-	28	111	-	-	844	9.0	-	-	1727	408	-	-	7431	6.7	-
Cations	mg/kg	11135	-	-	64280	-	17573	45940	-	-	32850	18187	-	-	71600	14639	-	-	31390	34771	-
Total Phosphate	mg/kg	1000	-	-	ND<1.5	-	870	3.0	-	-	840	6.2	-	-	1100	1200	-	-	0.84	6.0	-
Vanadium	mg/kg	10.1	31.5	28.0	29.1	9.82	11.7	27.5	38.5	10.8	23.9	13.8	18.3	10.7	45.5	11.9	27.1	19.8	18.0	18.5	16.4
Zinc	mg/kg	16.4	32.8	55.8	24.5	14.6	13.5	54.9	39.0	19.4	33.9	25.6	29.3	16.8	32.8	22.6	31.6	23.2	14.7	23.9	23.7
VOCs	µg/kg	ND	-	-	ND	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-
SVOCs	mg/kg	ND	-	-	ND	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-
OCPs	µg/kg	ND	-	-	ND	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-
OPPs	mg/kg	ND	-	-	ND	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-
Chlorinated Herbicides	µg/kg	ND	-	-	ND	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-	-	ND	ND	-

Notes
"-" - Not analyzed
ND < - Non detect below incicated reporting limit
Total anions were calculated using the sum of fluoride, chloride, nitrite (as N), bromide, nitrate (as N), o-phosphate (as P), and sulfate.
Total cations were calculated using calcium, iron, magnesium, potassium, and sodium.

APPENDIX A TABLES

Table A-2
Summary of Statistical Analysis
Baseline Compost Pad Sampling
Hawes Composting Facility
Hinkley, CA

Geosyntec consultants

Constituent	Number of Outliers	Number of Detects	Number of Non-Detects	Minimum	Maximum	Maximum with Outliers	BTV
Monitoring Parameters – Annual Monitoring Frequency							
Aluminum	0	20	0	3,870	20,300	20,300	18,787
Antimony	0	0	20	ND<0.75	ND<0.75	ND<0.75	ND<0.75
Arsenic	0	20	0	1.58	9.96	9.96	12.59
Copper	0	20	0	4.47	22.8	22.8	20.72
Iron	0	20	0	5,680	20,300	20,300	19,483
Manganese	0	20	0	97.2	405	405	401.6
MBAS[1]	-	1	1	ND<1.0	1	1	1
Nickel	0	20	0	4.02	22.5	22.5	22.4
Nitrate (as N)	0	9	1	1.6	25	25	28.71
Sulfate	1	6	3	14	750	6,700	857.3
TDS	0	10	0	164	4,900	4,900	6,135
Constituents of Concern – Five-Yearly Monitoring Frequency							
Barium	1	19	0	36	177	333	162.3
Beryllium	0	19	1	0.255	1.42	1.42	1.543
Bicarbonate	1	9	0	45	510	13,000	631.5
Boron	0	20	0	1.84	38.8	38.8	40.98
Bromide	0	1	9	ND<1.0	1	1	ND<1.0
Cadmium	0	5	15	0.509	0.633	0.633	0.616
Calcium	0	20	0	1,740	43,300	43,300	68,089
Carbonate	1	5	4	24	430	1,100	624.3
Chloride	0	6	4	10	1,100	1,100	1,674
Chromium, Hexavalent	0	0	10	ND<0.8	ND<0.8	ND<0.8	ND<0.8
Chromium, Total	0	20	0	4.75	22	22	20.87
Cobalt	1	19	0	2.49	9.36	17.6	10.97
Fluoride	0	5	5	1.4	14	14	19.95
TKN	0	10	0	70	600	600	727.1
Lead	1	9	0	2	9.52	76.8	11.17
Magnesium	0	20	0	1,950	9,910	9,910	9,573
Mercury	0	10	0	ND<0.0835	ND<0.0835	ND<0.0835	ND<0.0835
Molybdenum	0	17	3	0.323	3.37	3.37	5.007
Nitrite (as N)	0	6	4	1	1.6	1.6	1.87
o-Phosphate (as P)	1	6	3	1.1	2.5	8	2.915
Phosphorus, Total	0	9	1	0.84	380	380	555.4
Potassium	2	18	0	1,160	3,080	6,320	3,207
Selenium	0	0	20	ND<0.75	ND<0.75	ND<0.75	ND<0.75
Silver	0	0	20	ND<0.25	ND<0.25	ND<0.25	ND<0.25
Sodium	0	20	0	65.3	4,190	4,190	8,010
Thallium	0	0	20	ND<0.75	ND<0.75	ND<0.75	ND<0.75
Alkalinity	1	9	0	45	860	15,000	1,080
Total Anions[2]	1	9	0	6	1,727	7,431	2,159
Total Cations[3]	0	10	0	11,135	71,600	71,600	83,253
Total Phosphate	0	9	1	2.6	1,200	1,200	1,771
Vanadium	0	20	0	9.82	45.5	45.5	40.5
Zinc	0	19	1	13.5	55.8	55.8	55.45
VOCs[1]	-	0	2	ND<5.0	ND<120	ND<120	PQL
SVOCs[1]	-	0	2	ND<0.50	ND<10	ND<10	PQL
OCPs[1]	-	0	2	ND<5.0	ND<100	ND<100	PQL
OPPs[1]	-	0	2	ND<0.50	ND<4.0	ND<4.0	PQL
Chlorinated Herbicides[1]	-	0	2	ND<10	ND<10,000	ND<10,000	PQL

Notes:

1 – Constituent is not naturally-occurring and was analyzed in two samples; statistical analysis not performed.

2 – Total anions were calculated using the sum of fluoride, chloride, nitrite (as N), bromide, nitrate (as N), o-phosphate (as P), and sulfate.

3 – Total cations were calculated using calcium, iron, magnesium, potassium, and sodium.

BTV – Background Threshold Value

PQL – Laboratory Practical Quantification Limit

Analytical units reported in milligrams per kilogram, except VOCs, OCPs, and chlorinated herbicides reported in micrograms per kilogram

APPENDIX A FIGURE

ATTACHMENT A-1
FIELD NOTES

Geosyntec consultants

Name: BAUMWIRT
Date: 2/9/2012 Page 1 of 1

DAILY FIELD REPORT

Project No.: SC0554 Task No.: 07A-01
Site Name: HALEN COMPOSTING Weather: CLEAR - COOL

05:15 → DEPART SAN DIEGO
07:30 → HOME DEPOT FOR SUPPLIES & FUEL
08:30 → ARRIVE ONSITE, MEET W/ CHRIS SAVOY; TORTOISE TRAINING
08:50 → SURVEY SITE AND CONDUCT HEALTH & SAFETY TAILGATE
09:15 → BEGIN SAMPLING

PG1: 0.5 @ 9:00 1.0 @ 9:05 → 1 JAR EACH (16 oz)
LOOSE, MOIST, 10YR 4/4 DK YELLOWISH, SILTY SAND w/ GRAVEL

PG2: 0.5 @ 9:30 1.0 @ 9:35 → 1 JAR EACH (16 oz)
LOOSE MOIST 10YR 4/4, SILTY SAND w/ GRAVEL

PG3: 0.5 @ 9:40 1.0 @ 9:45 → 1 JAR EACH (16 oz)
LOOSE, MOIST, 10YR 4/4, PG MED SAND TO 6"; THEN SILTY SAND

PG4: 0.5 @ 9:50 1.0 @ 9:55 → 1 JAR EACH
LOOSE, MOIST 10YR 5/3 BRN, PG SILTY SAND w/ GRAVEL

PG5: 0.5 @ 10:00 1.0 @ 10:05 → 1 JAR EACH (16 oz)
LOOSE MOIST, 10YR 4/4, PG SILTY SAND w/ GRAVEL TO 1' THEN SCOPES REFUSAL

PG6: 0.5 @ 10:15 1.0 @ 10:20 → 1 JAR EACH (16 oz)
LOOSE, MOIST, 10YR 4/4, PG SILTY SAND w/ TRACE GRAVEL

PG12: 0.5 @ 10:25 1.0 @ 10:30 → 1 JAR EACH (16 oz)
LOOSE, MOIST, 10YR 4/4, PG SILTY SAND @ 1' w/ GYPSUM

PG8: 0.5 @ 10:35 1.0 @ 10:40 → 1 JAR EACH (16 oz)
LOOSE, MOIST, 10YR 4/4 PG SILTY SAND w/ GRAVEL

PG9: 0.5 @ 10:45 1.0 @ 10:50 → 2 JARS FROM 1.0
LOOSE, MOIST, PG COARSE SAND TO 0.5' THEN SILTY MED SAND 10YR 4/4

PG10: 0.5 @ 11:00 1.0 @ 11:05 → 2 JARS FROM 0.5
LOOSE, MOIST, 10YR 4/4, PG SAND w/ SILT & TRACE GLASS FRAGMENTS

11:15 → SAMPLING COMPLETE; WAITING FOR CHRIS TO FINISH UP ONSITE
12:00 → OFFSITE
3:20 → RETURN HOME

Signature: [signature] Date: 2/9/2012

Hours: 3.5 on-site 6.75 travel 10.25 total

Random Number Generator Results
Compost Pad Sampling
Hawes Composting Facility

Geosyntec consultants

Point Number	X-Axis Random Numbers	Y-Axis Random Numbers	
1	33	21	✓ 34.912922° -117.349320
~~2~~	~~19~~	~~2~~	O.B.
3	69	88	✓ 34.910352° -117.352879
4	47	71	✓ 34.911913° -117.351974
5	80	78	✓ 34.909577 -117.352344
~~6~~	~~7~~	~~62~~	O.B.
7	94	51	✓ 34.908565 -117.350901
~~8~~	~~48~~	~~2~~	O.B.
9	67	4	✓ 34.910487 -117.348415
10	77	15	✓ 34.909767 -117.348995
11	79	54	✓ 34.909632 -117.351070
12	78	36	✓ 34.909695 -117.350115
13	24	79	✓ 34.913562 -117.352401
14	9	100	
15	26	42	
16	12	69	
17	24	99	
18	88	56	
19	87	65	
20	2	54	
21	23	65	
22	24	55	
23	26	36	
24	25	59	
25	98	15	
26	59	78	
27	92	16	
28	85	68	
29	5	69	
30	68	2	

Note:
Random numbers are automatically regenerated each time the worksheet is "calculated."

ATTACHMENT A-3
STATISTICAL ANALYSIS OUTPUT SHEETS

General Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	Data.no outliers.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Alkalinity

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Tolerance Factor	2.454	Number of Missing Values	1

Raw Statistics		Log-Transformed Statistics	
Minimum	45	Minimum	3.807
Maximum	860	Maximum	6.757
Second Largest	800	Second Largest	6.685
First Quartile	180	First Quartile	5.193
Median	210	Median	5.347
Third Quartile	480	Third Quartile	6.174
Mean	366.1	Mean	5.58
Geometric Mean	265.1	SD	0.918
SD	291		
Coefficient of Variation	0.795		
Skewness	0.958		

Warning: There are only 9 Values in this data

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

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

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.857	Shapiro Wilk Test Statistic	0.935
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	1080	95% UTL with 90% Coverage	2519
95% UPL (t)	936.5	95% UPL (t)	1601
90% Percentile (z)	739	90% Percentile (z)	859.2
95% Percentile (z)	844.7	95% Percentile (z)	1199
99% Percentile (z)	1043	99% Percentile (z)	2241

Gamma Distribution Test		Data Distribution Test
k star	1.205	Data appear Normal at 5% Significance Level
Theta Star	303.8	

MLE of Mean	366.1
MLE of Standard Deviation	333.5
nu star	21.69
A-D Test Statistic	0.329
5% A-D Critical Value	0.733
K-S Test Statistic	0.209
5% K-S Critical Value	0.283

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile	805
95% Percentile	1027
99% Percentile	1537
95% WH Approx. Gamma UPL	1149
95% HW Approx. Gamma UPL	1216
95% WH Approx. Gamma UTL with 90% Coverage	1493
95% HW Approx. Gamma UTL with 90% Coverage	1629

Nonparametric Statistics

90% Percentile	812
95% Percentile	836
99% Percentile	855.2
95% UTL with 90% Coverage	860
95% Percentile Bootstrap UTL with 90% Coverage	860
95% BCA Bootstrap UTL with 90% Coverage	860
95% UPL	860
95% Chebyshev UPL	1703
Upper Threshold Limit Based upon IQR	930

Aluminum

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics

Minimum	3870
Maximum	20300
Second Largest	16500
First Quartile	4645
Median	8675
Third Quartile	13250
Mean	9360
Geometric Mean	8191
SD	4895
Coefficient of Variation	0.523
Skewness	0.672

Log-Transformed Statistics

Minimum	8.261
Maximum	9.918
Second Largest	9.711
First Quartile	8.444
Median	9.066
Third Quartile	9.491
Mean	9.011
SD	0.536

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.905

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 90% Coverage	18787
95% UPL (t)	18033
90% Percentile (z)	15633
95% Percentile (z)	17411

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical Value	0.905

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

95% UTL with 90% Coverage	22998
95% UPL (t)	21174
90% Percentile (z)	16281
95% Percentile (z)	19781

99% Percentile (z)	20747	99% Percentile (z)	28502

Gamma Distribution Test		Data Distribution Test	
k star	3.357	Data appear Normal at 5% Significance Level	
Theta Star	2788		
MLE of Mean	9360		
MLE of Standard Deviation	5109		
nu star	134.3		
A-D Test Statistic	0.587	Nonparametric Statistics	
5% A-D Critical Value	0.746	90% Percentile	15870
K-S Test Statistic	0.2	95% Percentile	16690
5% K-S Critical Value	0.195	99% Percentile	19578
Data follow Appx. Gamma Distribution at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	20300
90% Percentile	16210	95% Percentile Bootstrap UTL with 90% Coverage	20300
95% Percentile	19028	95% BCA Bootstrap UTL with 90% Coverage	20300
99% Percentile	25100	95% UPL	20110
		95% Chebyshev UPL	31223
95% WH Approx. Gamma UPL	19543	Upper Threshold Limit Based upon IQR	26158
95% HW Approx. Gamma UPL	19868		
95% WH Approx. Gamma UTL with 90% Coverage	20795		
95% HW Approx. Gamma UTL with 90% Coverage	21228		

Antimony

General Statistics

Number of Valid Data	20	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	20

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

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

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

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	1.58	Minimum	0.457
Maximum	9.96	Maximum	2.299
Second Largest	9.58	Second Largest	2.26
First Quartile	1.913	First Quartile	0.648

Median	3.955	Median	1.375
Third Quartile	6.213	Third Quartile	1.826
Mean	4.504	Mean	1.322
Geometric Mean	3.751	SD	0.629
SD	2.766		
Coefficient of Variation	0.614		
Skewness	0.797		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.872	Shapiro Wilk Test Statistic	0.909
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	9.83	95% UTL with 90% Coverage	12.59
95% UPL (t)	9.404	95% UPL (t)	11.42
90% Percentile (z)	8.048	90% Percentile (z)	8.394
95% Percentile (z)	9.053	95% Percentile (z)	10.55
99% Percentile (z)	10.94	99% Percentile (z)	16.19

Gamma Distribution Test		Data Distribution Test	
k star	2.49	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1.809		
MLE of Mean	4.504		
MLE of Standard Deviation	2.854		
nu star	99.59		
A-D Test Statistic	0.655	**Nonparametric Statistics**	
5% A-D Critical Value	0.748	90% Percentile	8.95
K-S Test Statistic	0.166	95% Percentile	9.599
5% K-S Critical Value	0.195	99% Percentile	9.888
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	9.96
90% Percentile	8.328	95% Percentile Bootstrap UTL with 90% Coverage	9.96
95% Percentile	9.985	95% BCA Bootstrap UTL with 90% Coverage	9.96
99% Percentile	13.61	95% UPL	9.941
		95% Chebyshev UPL	16.86
95% WH Approx. Gamma UPL	10.31	Upper Threshold Limit Based upon IQR	12.66
95% HW Approx. Gamma UPL	10.52		
95% WH Approx. Gamma UTL with 90% Coverage	11.05		
95% HW Approx. Gamma UTL with 90% Coverage	11.34		

Barium

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
Tolerance Factor	1.949	Number of Missing Values	1

Raw Statistics	
Minimum	36
Maximum	177
Second Largest	130
First Quartile	43.3
Median	57.4
Third Quartile	89.25
Mean	72.01
Geometric Mean	64.14
SD	38.79
Coefficient of Variation	0.539
Skewness	1.393

Log-Transformed Statistics	
Minimum	3.584
Maximum	5.176
Second Largest	4.868
First Quartile	3.768
Median	4.05
Third Quartile	4.478
Mean	4.161
SD	0.476

Background Statistics

Normal Distribution Test	
Shapiro Wilk Test Statistic	0.833
Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level	

Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical Value	0.901
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
95% UTL with 90% Coverage	147.6
95% UPL (t)	141
90% Percentile (z)	121.7
95% Percentile (z)	135.8
99% Percentile (z)	162.2

Assuming Lognormal Distribution	
95% UTL with 90% Coverage	162.3
95% UPL (t)	149.7
90% Percentile (z)	118.1
95% Percentile (z)	140.4
99% Percentile (z)	194.2

Gamma Distribution Test	
k star	3.808
Theta Star	18.91
MLE of Mean	72.01
MLE of Standard Deviation	36.9
nu star	144.7
A-D Test Statistic	0.773
5% A-D Critical Value	0.744
K-S Test Statistic	0.17
5% K-S Critical Value	0.199
Data follow Appx. Gamma Distribution at 5% Significance Level	

Data Distribution Test
Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics	
90% Percentile	124.4
95% Percentile	134.7
99% Percentile	168.5

Assuming Gamma Distribution	
90% Percentile	121.5
95% Percentile	141.4
99% Percentile	184.1
95% WH Approx. Gamma UPL	144.8
95% HW Approx. Gamma UPL	145.7
95% WH Approx. Gamma UTL with 90% Coverage	154.4
95% HW Approx. Gamma UTL with 90% Coverage	156

95% UTL with 90% Coverage	177
95% Percentile Bootstrap UTL with 90% Coverage	177
95% BCA Bootstrap UTL with 90% Coverage	177
95% UPL	177
95% Chebyshev UPL	245.5
Upper Threshold Limit Based upon IQR	158.2

Beryllium

General Statistics

Number of Valid Data	20	Number of Detected Data	19
Number of Distinct Detected Data	18	Number of Non-Detect Data	1
Tolerance Factor	1.926	Percent Non-Detects	5.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.255	Minimum Detected	-1.366
Maximum Detected	1.42	Maximum Detected	0.351
Mean of Detected	0.763	Mean of Detected	-0.428
SD of Detected	0.412	SD of Detected	0.6
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	
Shapiro Wilk Test Statistic	0.901	Shapiro Wilk Test Statistic	0.913
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
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	0.732	Mean (Log Scale)	-0.51
SD	0.426	SD (Log Scale)	0.691
95% UTL 90% Coverage	1.551	95% UTL 90% Coverage	2.27
95% UPL (t)	1.486	95% UPL (t)	2.041
90% Percentile (z)	1.277	90% Percentile (z)	1.454
95% Percentile (z)	1.432	95% Percentile (z)	1.869
99% Percentile (z)	1.722	99% Percentile (z)	2.993
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.727	Mean in Original Scale	0.733
SD	0.423	SD in Original Scale	0.424
95% UTL with 90% Coverage	1.543	95% UTL with 90% Coverage	2.197
		95% BCA UTL with 90% Coverage	1.393
		95% Bootstrap (%) UTL with 90% Coverage	1.42
95% UPL (t)	1.478	95% UPL (t)	1.981
90% Percentile (z)	1.27	90% Percentile (z)	1.428
95% Percentile (z)	1.424	95% Percentile (z)	1.82
99% Percentile (z)	1.712	99% Percentile (z)	2.871

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.834	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.269		
nu star	107.7		
A-D Test Statistic	0.546	Nonparametric Statistics	
5% A-D Critical Value	0.747	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.154	Mean	0.738
5% K-S Critical Value	0.2	SD	0.406
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0933

		95% KM UTL with 90% Coverage	1.52
Assuming Gamma Distribution		95% KM Chebyshev UPL	2.552
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	1.458
Mean	0.725	90% Percentile (z)	1.259
Median	0.603	95% Percentile (z)	1.406
SD	0.436	99% Percentile (z)	1.683
k star	0.687		
Theta star	1.056	Gamma ROS Limits with Extrapolated Data	
Nu star	27.47	95% Wilson Hilferty (WH) Approx. Gamma UPL	2.174
95% Percentile of Chisquare (2k)	4.708	95% Hawkins Wixley (HW) Approx. Gamma UPL	2.693
		95% WH Approx. Gamma UTL with 90% Coverage	2.38
90% Percentile	1.829	95% HW Approx. Gamma UTL with 90% Coverage	3.011
95% Percentile	2.486		
99% Percentile	4.056		

Note. DL/2 is not a recommended method

Bicarbonate

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Tolerance Factor	2.454	Number of Missing Values	1

Raw Statistics		Log-Transformed Statistics	
Minimum	45	Minimum	3.807
Maximum	510	Maximum	6.234
Second Largest	380	Second Largest	5.94
First Quartile	160	First Quartile	5.075
Median	190	Median	5.247
Third Quartile	370	Third Quartile	5.914
Mean	257.2	Mean	5.343
Geometric Mean	209.1	SD	0.754
SD	152.5		
Coefficient of Variation	0.593		
Skewness	0.303		

Warning: There are only 9 Values in this data

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

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

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.933	Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	631.5	95% UTL with 90% Coverage	1329

95% UPL (t)	556.1	95% UPL (t)	915.9
90% Percentile (z)	452.7	90% Percentile (z)	549.2
95% Percentile (z)	508.1	95% Percentile (z)	722.2
99% Percentile (z)	612	99% Percentile (z)	1207

Gamma Distribution Test		Data Distribution Test	
k star	1.785	Data appear Normal at 5% Significance Level	
Theta Star	144.1		
MLE of Mean	257.2		
MLE of Standard Deviation	192.5		
nu star	32.13		
A-D Test Statistic	0.347	Nonparametric Statistics	
5% A-D Critical Value	0.728	90% Percentile	406
K-S Test Statistic	0.225	95% Percentile	458
5% K-S Critical Value	0.282	99% Percentile	499.6
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	510
90% Percentile	514	95% Percentile Bootstrap UTL with 90% Coverage	510
95% Percentile	632.8	95% BCA Bootstrap UTL with 90% Coverage	510
99% Percentile	898.1	95% UPL	510
		95% Chebyshev UPL	957.9
95% WH Approx. Gamma UPL	690.2	Upper Threshold Limit Based upon IQR	685
95% HW Approx. Gamma UPL	726.8		
95% WH Approx. Gamma UTL with 90% Coverage	865.2		
95% HW Approx. Gamma UTL with 90% Coverage	933.7		

Boron

General Statistics

Total Number of Observations	20	Number of Distinct Observations	19
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	1.84	Minimum	0.61
Maximum	38.8	Maximum	3.658
Second Largest	38.1	Second Largest	3.64
First Quartile	4.42	First Quartile	1.486
Median	7.555	Median	2.022
Third Quartile	16.25	Third Quartile	2.788
Mean	11.59	Mean	2.111
Geometric Mean	8.258	SD	0.832
SD	10.68		
Coefficient of Variation	0.922		
Skewness	1.725		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.769	Shapiro Wilk Test Statistic	0.967

Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	32.16	95% UTL with 90% Coverage	40.98
95% UPL (t)	30.51	95% UPL (t)	36.05
90% Percentile (z)	25.28	90% Percentile (z)	23.98
95% Percentile (z)	29.16	95% Percentile (z)	32.44
99% Percentile (z)	36.44	99% Percentile (z)	57.18
Gamma Distribution Test		**Data Distribution Test**	
k star	1.412	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	8.209		
MLE of Mean	11.59		
MLE of Standard Deviation	9.754		
nu star	56.48		
A-D Test Statistic	0.592	**Nonparametric Statistics**	
5% A-D Critical Value	0.756	90% Percentile	22.08
K-S Test Statistic	0.174	95% Percentile	38.14
5% K-S Critical Value	0.197	99% Percentile	38.67
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	38.8
90% Percentile	24.51	95% Percentile Bootstrap UTL with 90% Coverage	38.8
95% Percentile	30.81	95% BCA Bootstrap UTL with 90% Coverage	38.8
99% Percentile	45.09	95% UPL	38.77
		95% Chebyshev UPL	59.3
95% WH Approx. Gamma UPL	31.9	Upper Threshold Limit Based upon IQR	34
95% HW Approx. Gamma UPL	32.54		
95% WH Approx. Gamma UTL with 90% Coverage	34.8		
95% HW Approx. Gamma UTL with 90% Coverage	35.77		

Bromide

General Statistics

Number of Valid Data	10	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	9

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

The data set fo variable Bromide was not processed!

Cadmium

General Statistics

Number of Valid Data	20	Number of Detected Data	5

Number of Distinct Detected Data	5	Number of Non-Detect Data	15
Tolerance Factor	1.926	Percent Non-Detects	75.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.509	Minimum Detected	-0.675
Maximum Detected	0.633	Maximum Detected	-0.457
Mean of Detected	0.578	Mean of Detected	-0.552
SD of Detected	0.0498	SD of Detected	0.0872
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: There are only 5 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.947	Shapiro Wilk Test Statistic	0.944
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
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	0.332	Mean (Log Scale)	-1.178
SD	0.147	SD (Log Scale)	0.373
95% UTL 90% Coverage	0.616	95% UTL 90% Coverage	0.632
95% UPL (t)	0.593	95% UPL (t)	0.596
90% Percentile (z)	0.521	90% Percentile (z)	0.497
95% Percentile (z)	0.574	95% Percentile (z)	0.569
99% Percentile (z)	0.675	99% Percentile (z)	0.734
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.423	Mean in Original Scale	0.448
SD	0.118	SD in Original Scale	0.0946
95% UTL with 90% Coverage	0.651	95% UTL with 90% Coverage	0.656
		95% BCA UTL with 90% Coverage	0.633
		95% Bootstrap (%) UTL with 90% Coverage	0.633
95% UPL (t)	0.633	95% UPL (t)	0.636
90% Percentile (z)	0.575	90% Percentile (z)	0.573
95% Percentile (z)	0.618	95% Percentile (z)	0.619
99% Percentile (z)	0.699	99% Percentile (z)	0.714
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	66.49	Data appear Normal at 5% Significance Level	
Theta Star	0.00869		
nu star	664.9		
A-D Test Statistic	0.275	Nonparametric Statistics	

5% A-D Critical Value	0.678	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.222	Mean	0.526
5% K-S Critical Value	0.357	SD	0.0372
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0093
		95% KM UTL with 90% Coverage	0.598
Assuming Gamma Distribution		95% KM Chebyshev UPL	0.692
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	0.592
Mean	0.254	90% Percentile (z)	0.574
Median	0.229	95% Percentile (z)	0.587
SD	0.24	99% Percentile (z)	0.613
k star	0.201		
Theta star	1.261	Gamma ROS Limits with Extrapolated Data	
Nu star	8.055	95% Wilson Hilferty (WH) Approx. Gamma UPL	1.297
95% Percentile of Chisquare (2k)	2.072	95% Hawkins Wixley (HW) Approx. Gamma UPL	1.812
		95% WH Approx. Gamma UTL with 90% Coverage	1.498
90% Percentile	0.768	95% HW Approx. Gamma UTL with 90% Coverage	2.183
95% Percentile	1.306		
99% Percentile	2.785		

ote: DL/2 is not a recommended method

alcium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	1740	Minimum	7.462
Maximum	43300	Maximum	10.68
Second Largest	42500	Second Largest	10.66
First Quartile	3065	First Quartile	8.028
Median	7650	Median	8.942
Third Quartile	18025	Third Quartile	9.799
Mean	13973	Mean	9.006
Geometric Mean	8153	SD	1.102
SD	14430		
Coefficient of Variation	1.033		
Skewness	1.22		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.78	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	41765	95% UTL with 90% Coverage	68089
95% UPL (t)	39540	95% UPL (t)	57450
90% Percentile (z)	32465	90% Percentile (z)	33469
95% Percentile (z)	37708	95% Percentile (z)	49948

99% Percentile (z)	47541	99% Percentile (z)	105848

Gamma Distribution Test		Data Distribution Test	
k star	0.937	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	14905		
MLE of Mean	13973		
MLE of Standard Deviation	14431		
nu star	37.5		
A-D Test Statistic	0.654	Nonparametric Statistics	
5% A-D Critical Value	0.767	90% Percentile	40070
K-S Test Statistic	0.16	95% Percentile	42540
5% K-S Critical Value	0.199	99% Percentile	43148
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	43300
90% Percentile	32689	95% Percentile Bootstrap UTL with 90% Coverage	43300
95% Percentile	42828	95% BCA Bootstrap UTL with 90% Coverage	43300
99% Percentile	66484	95% UPL	43260
		95% Chebyshev UPL	78424
95% WH Approx. Gamma UPL	44811	Upper Threshold Limit Based upon IQR	40465
95% HW Approx. Gamma UPL	46680		
95% WH Approx. Gamma UTL with 90% Coverage	49602		
95% HW Approx. Gamma UTL with 90% Coverage	52272		

Carbonate

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
Tolerance Factor	2.454	Percent Non-Detects	44.44%
Number of Missing Values	1		

Raw Statistics		Log-transformed Statistics	
Minimum Detected	24	Minimum Detected	3.178
Maximum Detected	430	Maximum Detected	6.064
Mean of Detected	198.8	Mean of Detected	4.827
SD of Detected	180	SD of Detected	1.188
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	5	Maximum Non-Detect	1.609

Warning: There are only 5 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.878
5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level	
Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	111.6
SD	164.1
95% UTL 90% Coverage	514.1
95% UPL (t)	433.1
90% Percentile (z)	321.8
95% Percentile (z)	381.4
99% Percentile (z)	493.2
Maximum Likelihood Estimate(MLE) Method	
Mean	31
SD	241.8
95% UTL with 90% Coverage	624.3
95% UPL (t)	504.9
90% Percentile (z)	340.8
95% Percentile (z)	428.7
99% Percentile (z)	593.4
Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.619
Theta Star	321.1
nu star	6.191
A-D Test Statistic	0.284
5% A-D Critical Value	0.689
K-S Test Statistic	0.236
5% K-S Critical Value	0.363
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
Gamma ROS Statistics with Extrapolated Data	
Mean	110.4
Median	24
SD	164.9
k star	0.14
Theta star	786.4
Nu star	2.528
95% Percentile of Chisquare (2k)	1.565
90% Percentile	324.1
95% Percentile	615.3
99% Percentile	1472

Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.942
5% Shapiro Wilk Critical Value	0.762
Data appear Lognormal at 5% Significance Level	
Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean (Log Scale)	3.089
SD (Log Scale)	2.226
95% UTL 90% Coverage	5173
95% UPL (t)	1723
90% Percentile (z)	380.5
95% Percentile (z)	854.3
99% Percentile (z)	3894
Log ROS Method	
Mean in Original Scale	112.9
SD in Original Scale	163.1
95% UTL with 90% Coverage	4563
95% BCA UTL with 90% Coverage	430
95% Bootstrap (%) UTL with 90% Coverage	430
95% UPL (t)	1625
90% Percentile (z)	393.5
95% Percentile (z)	840.8
99% Percentile (z)	3494
Data Distribution Test with Detected Values Only	
Data appear Normal at 5% Significance Level	
Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	121.1
SD	148.2
SE of Mean	55.22
95% KM UTL with 90% Coverage	484.7
95% KM Chebyshev UPL	801.9
95% KM UPL (t)	411.5
90% Percentile (z)	311
95% Percentile (z)	364.8
99% Percentile (z)	465.8
Gamma ROS Limits with Extrapolated Data	
95% Wilson Hilferty (WH) Approx. Gamma UPL	745.1
95% Hawkins Wixley (HW) Approx. Gamma UPL	1077
95% WH Approx. Gamma UTL with 90% Coverage	1193
95% HW Approx. Gamma UTL with 90% Coverage	1995

Note: DL/2 is not a recommended method

Chloride

General Statistics

Number of Valid Data	10	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	4
Tolerance Factor	2.355	Percent Non-Detects	40.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	10	Minimum Detected	2.303
Maximum Detected	1100	Maximum Detected	7.003
Mean of Detected	621.7	Mean of Detected	5.831
SD of Detected	401.2	SD of Detected	1.775
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 6 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.974	Shapiro Wilk Test Statistic	0.702
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data appear 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	375	Mean (Log Scale)	4.142
SD	436.8	SD (Log Scale)	2.55
95% UTL 90% Coverage	1404	95% UTL 90% Coverage	25548
95% UPL (t)	1215	95% UPL (t)	8481
90% Percentile (z)	934.8	90% Percentile (z)	1654
95% Percentile (z)	1094	95% Percentile (z)	4177
99% Percentile (z)	1391	99% Percentile (z)	23748
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	203.3	Mean in Original Scale	377.3
SD	624.5	SD in Original Scale	434.7
95% UTL with 90% Coverage	1674	95% UTL with 90% Coverage	23570
		95% BCA UTL with 90% Coverage	1100
		95% Bootstrap (%) UTL with 90% Coverage	1100
95% UPL (t)	1404	95% UPL (t)	8184
90% Percentile (z)	1004	90% Percentile (z)	1706
95% Percentile (z)	1231	95% Percentile (z)	4148
99% Percentile (z)	1656	99% Percentile (z)	21975

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.593	Data appear Normal at 5% Significance Level	
Theta Star	1048		
nu star	7.118		
A-D Test Statistic	0.669	Nonparametric Statistics	
5% A-D Critical Value	0.716	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.276	Mean	377
5% K-S Critical Value	0.341	SD	412.6
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	142.9
		95% KM UTL with 90% Coverage	1349
Assuming Gamma Distribution		95% KM Chebyshev UPL	2263
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	1170
Mean	373	90% Percentile (z)	905.8
Median	180	95% Percentile (z)	1056
SD	438.7	99% Percentile (z)	1337
k star	0.138		
Theta star	2703	Gamma ROS Limits with Extrapolated Data	
Nu star	2.76	95% Wilson Hilferty (WH) Approx. Gamma UPL	2467
95% Percentile of Chisquare (2k)	1.543	95% Hawkins Wixley (HW) Approx. Gamma UPL	3618
		95% WH Approx. Gamma UTL with 90% Coverage	3723
90% Percentile	1091	95% HW Approx. Gamma UTL with 90% Coverage	6212
95% Percentile	2084		
99% Percentile	5018		

Note: DL/2 is not a recommended method

Chromium

General Statistics			
Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	4.75	Minimum	1.558
Maximum	22	Maximum	3.091
Second Largest	20.3	Second Largest	3.011
First Quartile	5.94	First Quartile	1.782
Median	9.67	Median	2.269
Third Quartile	14.48	Third Quartile	2.672
Mean	10.69	Mean	2.254
Geometric Mean	9.526	SD	0.494
SD	5.283		
Coefficient of Variation	0.494		
Skewness	0.73		

Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.909	Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	20.87	95% UTL with 90% Coverage	24.69
95% UPL (t)	20.05	95% UPL (t)	22.88
90% Percentile (z)	17.46	90% Percentile (z)	17.95
95% Percentile (z)	19.38	95% Percentile (z)	21.48
99% Percentile (z)	22.98	99% Percentile (z)	30.09

Gamma Distribution Test		Data Distribution Test
k star	3.855	Data appear Normal at 5% Significance Level
Theta Star	2.773	
MLE of Mean	10.69	
MLE of Standard Deviation	5.444	
nu star	154.2	
A-D Test Statistic	0.454	Nonparametric Statistics
5% A-D Critical Value	0.745	90% Percentile 17.6
K-S Test Statistic	0.165	95% Percentile 20.39
5% K-S Critical Value	0.195	99% Percentile 21.68
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution			
90% Percentile	17.99	95% UTL with 90% Coverage	22
95% Percentile	20.93	95% Percentile Bootstrap UTL with 90% Coverage	22
99% Percentile	27.21	95% BCA Bootstrap UTL with 90% Coverage	22
		95% UPL	21.92
		95% Chebyshev UPL	34.29
95% WH Approx. Gamma UPL	21.44	Upper Threshold Limit Based upon IQR	27.28
95% HW Approx. Gamma UPL	21.73		
95% WH Approx. Gamma UTL with 90% Coverage	22.73		
95% HW Approx. Gamma UTL with 90% Coverage	23.13		

HexChrom

General Statistics

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

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

The data set for variable HexChrom was not processed!

Cobalt

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
Tolerance Factor	1.949	Number of Missing Values	1

Raw Statistics	
Minimum	2.49
Maximum	9.36
Second Largest	9.19
First Quartile	3.15
Median	4.6
Third Quartile	6.645
Mean	5.137
Geometric Mean	4.694
SD	2.267
Coefficient of Variation	0.441
Skewness	0.682

Log-Transformed Statistics	
Minimum	0.912
Maximum	2.236
Second Largest	2.218
First Quartile	1.147
Median	1.526
Third Quartile	1.894
Mean	1.546
SD	0.436

Background Statistics

Normal Distribution Test	
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level	

Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.901
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
95% UTL with 90% Coverage	9.556
95% UPL (t)	9.171
90% Percentile (z)	8.043
95% Percentile (z)	8.866
99% Percentile (z)	10.41

Assuming Lognormal Distribution	
95% UTL with 90% Coverage	10.97
95% UPL (t)	10.19
90% Percentile (z)	8.205
95% Percentile (z)	9.612
99% Percentile (z)	12.94

Gamma Distribution Test	
k star	4.833
Theta Star	1.063
MLE of Mean	5.137
MLE of Standard Deviation	2.337
nu star	183.7
A-D Test Statistic	0.487
5% A-D Critical Value	0.742
K-S Test Statistic	0.168
5% K-S Critical Value	0.199
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test
Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution	
90% Percentile	8.267
95% Percentile	9.485
99% Percentile	12.06
95% WH Approx. Gamma UPL	9.695
95% HW Approx. Gamma UPL	9.799
95% WH Approx. Gamma UTL with 90% Coverage	10.28
95% HW Approx. Gamma UTL with 90% Coverage	10.42

Nonparametric Statistics	
90% Percentile	8.814
95% Percentile	9.207
99% Percentile	9.329
95% UTL with 90% Coverage	9.36
95% Percentile Bootstrap UTL with 90% Coverage	9.36
95% BCA Bootstrap UTL with 90% Coverage	9.36
95% UPL	9.36
95% Chebyshev UPL	15.28
Upper Threshold Limit Based upon IQR	11.89

Copper

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	4.47	Minimum	1.497
Maximum	22.8	Maximum	3.127
Second Largest	19.6	Second Largest	2.976
First Quartile	5.69	First Quartile	1.738
Median	9.015	Median	2.199
Third Quartile	13.4	Third Quartile	2.592
Mean	10.36	Mean	2.211
Geometric Mean	9.125	SD	0.519
SD	5.379		
Coefficient of Variation	0.519		
Skewness	0.822		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	20.72	95% UTL with 90% Coverage	24.79
95% UPL (t)	19.89	95% UPL (t)	22.89
90% Percentile (z)	17.25	90% Percentile (z)	17.75
95% Percentile (z)	19.21	95% Percentile (z)	21.43
99% Percentile (z)	22.87	99% Percentile (z)	30.52

Gamma Distribution Test		Data Distribution Test	
k star	3.522	Data appear Normal at 5% Significance Level	
Theta Star	2.941		
MLE of Mean	10.36		
MLE of Standard Deviation	5.519		
nu star	140.9		
A-D Test Statistic	0.407	Nonparametric Statistics	
5% A-D Critical Value	0.745	90% Percentile	17.17
K-S Test Statistic	0.16	95% Percentile	19.76
5% K-S Critical Value	0.195	99% Percentile	22.19
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	17.76	95% UTL with 90% Coverage	22.8
95% Percentile	20.78	95% Percentile Bootstrap UTL with 90% Coverage	22.8
99% Percentile	27.27	95% BCA Bootstrap UTL with 90% Coverage	22.8
		95% UPL	22.64
		95% Chebyshev UPL	34.38
95% WH Approx. Gamma UPL	21.31	Upper Threshold Limit Based upon IQR	24.97
95% HW Approx. Gamma UPL	21.63		

95% WH Approx. Gamma UTL with 90% Coverage	22.65
95% HW Approx. Gamma UTL with 90% Coverage	23.07

luoride

General Statistics

Number of Valid Data	10	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	5
Tolerance Factor	2.355	Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.4	Minimum Detected	0.336
Maximum Detected	14	Maximum Detected	2.639
Mean of Detected	7.02	Mean of Detected	1.584
SD of Detected	5.997	SD of Detected	1.002
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 5 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.82	Shapiro Wilk Test Statistic	0.907
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
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	3.76	Mean (Log Scale)	0.445
SD	5.272	SD (Log Scale)	1.374
95% UTL 90% Coverage	16.18	95% UTL 90% Coverage	39.67
95% UPL (t)	13.9	95% UPL (t)	21.9
90% Percentile (z)	10.52	90% Percentile (z)	9.078
95% Percentile (z)	12.43	95% Percentile (z)	14.95
99% Percentile (z)	16.02	99% Percentile (z)	38.13
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.691	Mean in Original Scale	3.668
SD	8.177	SD in Original Scale	5.338
95% UTL with 90% Coverage	19.95	95% UTL with 90% Coverage	83.47
		95% BCA UTL with 90% Coverage	14
		95% Bootstrap (%) UTL with 90% Coverage	14
95% UPL (t)	16.41	95% UPL (t)	37.45
90% Percentile (z)	11.17	90% Percentile (z)	11.41

95% Percentile (z)	14.14	95% Percentile (z)	22.38
99% Percentile (z)	19.71	99% Percentile (z)	79.15

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.74	Data appear Normal at 5% Significance Level	
Theta Star	9.49		
nu star	7.397		
A-D Test Statistic	0.416	Nonparametric Statistics	
5% A-D Critical Value	0.686	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.265	Mean	4.21
5% K-S Critical Value	0.362	SD	4.72
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.669
		95% KM UTL with 90% Coverage	15.33
Assuming Gamma Distribution		95% KM Chebyshev UPL	25.79
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	13.29
Mean	3.51	90% Percentile (z)	10.26
Median	0.7	95% Percentile (z)	11.97
SD	5.447	99% Percentile (z)	15.19
k star	0.143		
Theta star	24.56	Gamma ROS Limits with Extrapolated Data	
Nu star	2.859	95% Wilson Hilferty (WH) Approx. Gamma UPL	22.55
95% Percentile of Chisquare (2k)	1.588	95% Hawkins Wixley (HW) Approx. Gamma UPL	31.27
		95% WH Approx. Gamma UTL with 90% Coverage	34.66
90% Percentile	10.33	95% HW Approx. Gamma UTL with 90% Coverage	54.87
95% Percentile	19.49		
99% Percentile	46.35		

Note: DL/2 is not a recommended method.

Iron

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	5680	Minimum	8.645
Maximum	20300	Maximum	9.918
Second Largest	17900	Second Largest	9.793
First Quartile	6953	First Quartile	8.847
Median	10035	Median	9.214
Third Quartile	14325	Third Quartile	9.57
Mean	11010	Mean	9.231
Geometric Mean	10212	SD	0.399
SD	4399		
Coefficient of Variation	0.4		
Skewness	0.603		

Background Statistics

Normal Distribution Test	Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.905
Data appear Normal at 5% Significance Level	

Shapiro Wilk Test Statistic	0.944
Shapiro Wilk Critical Value	0.905
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

95% UTL with 90% Coverage	19483
95% UPL (t)	18805
90% Percentile (z)	16648
95% Percentile (z)	18246
99% Percentile (z)	21245

Assuming Lognormal Distribution

95% UTL with 90% Coverage	22002
95% UPL (t)	20691
90% Percentile (z)	17019
95% Percentile (z)	19670
99% Percentile (z)	25809

Gamma Distribution Test

k star	5.82
Theta Star	1892
MLE of Mean	11010
MLE of Standard Deviation	4564
nu star	232.8
A-D Test Statistic	0.419
5% A-D Critical Value	0.744
K-S Test Statistic	0.164
5% K-S Critical Value	0.194
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	17360
95% Percentile	18020
99% Percentile	19844
95% UTL with 90% Coverage	20300
95% Percentile Bootstrap UTL with 90% Coverage	20300
95% BCA Bootstrap UTL with 90% Coverage	20300
95% UPL	20180
95% Chebyshev UPL	30660
Upper Threshold Limit Based upon IQR	25384

Assuming Gamma Distribution

90% Percentile	17113
95% Percentile	19430
99% Percentile	24293
95% WH Approx. Gamma UPL	19797
95% HW Approx. Gamma UPL	19986
95% WH Approx. Gamma UTL with 90% Coverage	20802
95% HW Approx. Gamma UTL with 90% Coverage	21054

Lead

General Statistics

Total Number of Observations	19
Tolerance Factor	1.949
Number of Distinct Observations	19
Number of Missing Values	1

Raw Statistics

Minimum	2
Maximum	13.4
Second Largest	9.52
First Quartile	3.15
Median	4.8
Third Quartile	6.38
Mean	5.345
Geometric Mean	4.751
SD	2.866

Log-Transformed Statistics

Minimum	0.693
Maximum	2.595
Second Largest	2.253
First Quartile	1.147
Median	1.569
Third Quartile	1.847
Mean	1.558
SD	0.489

Coefficient of Variation	0.536
Skewness	1.46

Background Statistics

Normal Distribution Test	
Shapiro Wilk Test Statistic	0.865
Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level	

Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.973
Shapiro Wilk Critical Value	0.901
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
95% UTL with 90% Coverage	10.93
95% UPL (t)	10.44
90% Percentile (z)	9.018
95% Percentile (z)	10.06
99% Percentile (z)	12.01

Assuming Lognormal Distribution	
95% UTL with 90% Coverage	12.31
95% UPL (t)	11.33
90% Percentile (z)	8.886
95% Percentile (z)	10.61
99% Percentile (z)	14.8

Gamma Distribution Test	
k star	3.743
Theta Star	1.428
MLE of Mean	5.345
MLE of Standard Deviation	2.763
nu star	142.2
A-D Test Statistic	0.409
5% A-D Critical Value	0.744
K-S Test Statistic	0.146
5% K-S Critical Value	0.199
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics	
90% Percentile	9.232
95% Percentile	9.908
99% Percentile	12.7

Assuming Gamma Distribution	
90% Percentile	9.048
95% Percentile	10.55
99% Percentile	13.75
95% WH Approx. Gamma UPL	10.8
95% HW Approx. Gamma UPL	10.9
95% WH Approx. Gamma UTL with 90% Coverage	11.53
95% HW Approx. Gamma UTL with 90% Coverage	11.68

95% UTL with 90% Coverage	13.4
95% Percentile Bootstrap UTL with 90% Coverage	13.4
95% BCA Bootstrap UTL with 90% Coverage	13.4
95% UPL	13.4
95% Chebyshev UPL	18.16
Upper Threshold Limit Based upon IQR	11.23

Magnesium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics	
Minimum	1950
Maximum	9910
Second Largest	8700
First Quartile	2630

Log-Transformed Statistics	
Minimum	7.576
Maximum	9.201
Second Largest	9.071
First Quartile	7.874

Median	4070	Median	8.311
Third Quartile	6778	Third Quartile	8.821
Mean	4800	Mean	8.348
Geometric Mean	4220	SD	0.525
SD	2478		
Coefficient of Variation	0.516		
Skewness	0.633		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.908	Shapiro Wilk Test Statistic	0.938
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	9573	95% UTL with 90% Coverage	11597
95% UPL (t)	9191	95% UPL (t)	10696
90% Percentile (z)	7976	90% Percentile (z)	8269
95% Percentile (z)	8876	95% Percentile (z)	10006
99% Percentile (z)	10565	99% Percentile (z)	14309

Gamma Distribution Test		Data Distribution Test	
k star	3.468	Data appear Normal at 5% Significance Level	
Theta Star	1384		
MLE of Mean	4800		
MLE of Standard Deviation	2578		
nu star	138.7		
A-D Test Statistic	0.483	**Nonparametric Statistics**	
5% A-D Critical Value	0.746	90% Percentile	8349
K-S Test Statistic	0.159	95% Percentile	8761
5% K-S Critical Value	0.195	99% Percentile	9680
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	9910
90% Percentile	8256	95% Percentile Bootstrap UTL with 90% Coverage	9910
95% Percentile	9671	95% BCA Bootstrap UTL with 90% Coverage	9910
99% Percentile	12714	95% UPL	9850
		95% Chebyshev UPL	15869
95% WH Approx. Gamma UPL	9927	Upper Threshold Limit Based upon IQR	12999
95% HW Approx. Gamma UPL	10081		
95% WH Approx. Gamma UTL with 90% Coverage	10554		
95% HW Approx. Gamma UTL with 90% Coverage	10761		

Manganese

General Statistics

Total Number of Observations	20	Number of Distinct Observations	18
Tolerance Factor	1.926		

Raw Statistics	
Minimum	97.2
Maximum	405
Second Largest	379
First Quartile	152.5
Median	176
Third Quartile	232.8
Mean	203.8
Geometric Mean	188.8
SD	87.48
Coefficient of Variation	0.429
Skewness	1.227

Log-Transformed Statistics	
Minimum	4.577
Maximum	6.004
Second Largest	5.938
First Quartile	5.027
Median	5.17
Third Quartile	5.45
Mean	5.24
SD	0.392

Background Statistics

Normal Distribution Test	
Shapiro Wilk Test Statistic	0.859
Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level	

Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.905
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
95% UTL with 90% Coverage	372.3
95% UPL (t)	358.8
90% Percentile (z)	315.9
95% Percentile (z)	347.7
99% Percentile (z)	407.3

Assuming Lognormal Distribution	
95% UTL with 90% Coverage	401.6
95% UPL (t)	378.1
90% Percentile (z)	311.9
95% Percentile (z)	359.7
99% Percentile (z)	469.9

Gamma Distribution Test	
k star	5.71
Theta Star	35.7
MLE of Mean	203.8
MLE of Standard Deviation	85.29
nu star	228.4
A-D Test Statistic	0.605
5% A-D Critical Value	0.744
K-S Test Statistic	0.191
5% K-S Critical Value	0.194
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test
Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution	
90% Percentile	317.9
95% Percentile	361.3
99% Percentile	452.5
95% WH Approx. Gamma UPL	367.7
95% HW Approx. Gamma UPL	369.8
95% WH Approx. Gamma UTL with 90% Coverage	386.5
95% HW Approx. Gamma UTL with 90% Coverage	389.6

Nonparametric Statistics	
90% Percentile	361
95% Percentile	380.3
99% Percentile	400.1
95% UTL with 90% Coverage	405
95% Percentile Bootstrap UTL with 90% Coverage	405
95% BCA Bootstrap UTL with 90% Coverage	405
95% UPL	403.7
95% Chebyshev UPL	594.6
Upper Threshold Limit Based upon IQR	353.1

Mercury

General Statistics

Number of Valid Data	20	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	20

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

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

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

The data set for variable Mercury was not processed!

olybdenum

General Statistics

Number of Valid Data	20	Number of Detected Data	17
Number of Distinct Detected Data	17	Number of Non-Detect Data	3
Tolerance Factor	1.926	Percent Non-Detects	15.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.323	Minimum Detected	-1.13
Maximum Detected	3.37	Maximum Detected	1.215
Mean of Detected	1.254	Mean of Detected	-0.0506
SD of Detected	0.991	SD of Detected	0.762
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	
Shapiro Wilk Test Statistic	0.826	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.892	5% Shapiro Wilk Critical Value	0.892
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	1.084	Mean (Log Scale)	-0.355
SD	0.999	SD (Log Scale)	1.021
95% UTL 90% Coverage	3.008	95% UTL 90% Coverage	5.007
95% UPL (t)	2.854	95% UPL (t)	4.278
90% Percentile (z)	2.364	90% Percentile (z)	2.594
95% Percentile (z)	2.727	95% Percentile (z)	3.758
99% Percentile (z)	3.408	99% Percentile (z)	7.535
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.007	Mean in Original Scale	1.09
SD	1.082	SD in Original Scale	0.993
95% UTL with 90% Coverage	3.092	95% UTL with 90% Coverage	4.665
		95% BCA UTL with 90% Coverage	3.37
		95% Bootstrap (%) UTL with 90% Coverage	3.37
95% UPL (t)	2.925	95% UPL (t)	4.02

90% Percentile (z)	2.394	90% Percentlle (z)	2.503
95% Percentile (z)	2.787	95% Percentile (z)	3.556
99% Percentile (z)	3.525	99% Percentile (z)	6.868

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.651	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.759		
nu star	56.13		
A-D Test Statistic	0.554	Nonparametric Statistics	
5% A-D Critical Value	0.75	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.173	Mean	1.114
5% K-S Critical Value	0.212	SD	0.946
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.218
		95% KM UTL with 90% Coverage	2.937
Assuming Gamma Distribution		95% KM Chebyshev UPL	5.341
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	2.791
Mean	1.066	90% Percentile (z)	2.327
Median	0.659	95% Percentile (z)	2.671
SD	1.019	99% Percentile (z)	3.316
k star	0.3		
Theta star	3.549	Gamma ROS Limits with Extrapolated Data	
Nu star	12.01	95% Wilson Hilferty (WH) Approx. Gamma UPL	4.45
95% Percentile of Chisquare (2k)	2.747	95% Hawkins Wixley (HW) Approx. Gamma UPL	6.015
		95% WH Approx. Gamma UTL with 90% Coverage	5.025
90% Percentile	3.143	95% HW Approx. Gamma UTL with 90% Coverage	7.017
95% Percentile	4.873		
99% Percentile	9.37		

Note: DL/2 is not a recommended method

Nickel

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	4.02	Minimum	1.391
Maximum	22.5	Maximum	3.114
Second Largest	18.6	Second Largest	2.923
First Quartile	5.093	First Quartile	1.628
Median	7.585	Median	2.026
Third Quartile	10.85	Third Quartile	2.383
Mean	9.267	Mean	2.087
Geometric Mean	8.064	SD	0.531
SD	5.31		
Coefficient of Variation	0.573		
Skewness	1.203		

Background Statistics

Normal Distribution Test	
Shapiro Wilk Test Statistic	0.861
Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level	
Assuming Normal Distribution	
95% UTL with 90% Coverage	19.49
95% UPL (t)	18.68
90% Percentile (z)	16.07
95% Percentile (z)	18
99% Percentile (z)	21.62

Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical Value	0.905
Data appear Lognormal at 5% Significance Level	
Assuming Lognormal Distribution	
95% UTL with 90% Coverage	22.4
95% UPL (t)	20.64
90% Percentile (z)	15.92
95% Percentile (z)	19.3
99% Percentile (z)	27.7

Gamma Distribution Test	
k star	3.224
Theta Star	2.875
MLE of Mean	9.267
MLE of Standard Deviation	5.161
nu star	128.9
A-D Test Statistic	0.524
5% A-D Critical Value	0.746
K-S Test Statistic	0.137
5% K-S Critical Value	0.195
Data appear Gamma Distributed at 5% Significance Level	
Assuming Gamma Distribution	
90% Percentile	16.19
95% Percentile	19.05
99% Percentile	25.24
95% WH Approx. Gamma UPL	19.54
95% HW Approx. Gamma UPL	19.75
95% WH Approx Gamma UTL with 90% Coverage	20.81
95% HW Approx. Gamma UTL with 90% Coverage	21.12

Data Distribution Test	
Data appear Gamma Distributed at 5% Significance Level	
Nonparametric Statistics	
90% Percentile	17.25
95% Percentile	18.8
99% Percentile	21.76
95% UTL with 90% Coverage	22.5
95% Percentile Bootstrap UTL with 90% Coverage	22.5
95% BCA Bootstrap UTL with 90% Coverage	22.5
95% UPL	22.31
95% Chebyshev UPL	32.98
Upper Threshold Limit Based upon IQR	19.49

Nitrate (as N)

General Statistics			
Number of Valid Data	10	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	1
Tolerance Factor	2.355	Percent Non-Detects	10.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.6	Minimum Detected	0.47
Maximum Detected	25	Maximum Detected	3.219
Mean of Detected	9.078	Mean of Detected	1.734
SD of Detected	8.78	SD of Detected	1.066
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 9 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	0.833
5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level	

Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.908
5% Shapiro Wilk Critical Value	0.829
Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	8.22
SD	8.711
95% UTL 90% Coverage	28.73
95% UPL (t)	24.97
90% Percentile (z)	19.38
95% Percentile (z)	22.55
99% Percentile (z)	28.49
Maximum Likelihood Estimate(MLE) Method	
Mean	7.757
SD	8.899
95% UTL with 90% Coverage	28.71
95% UPL (t)	24.87
90% Percentile (z)	19.16
95% Percentile (z)	22.39
99% Percentile (z)	28.46

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean (Log Scale)	1.491
SD (Log Scale)	1.265
95% UTL 90% Coverage	87.33
95% UPL (t)	50.54
90% Percentile (z)	22.47
95% Percentile (z)	35.57
99% Percentile (z)	84.22
Log ROS Method	
Mean in Original Scale	8.211
SD in Original Scale	8.72
95% UTL with 90% Coverage	93.64
95% BCA UTL with 90% Coverage	25
95% Bootstrap (%) UTL with 90% Coverage	25
95% UPL (t)	53.32
90% Percentile (z)	23.13
95% Percentile (z)	37.13
99% Percentile (z)	90.21

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.873
Theta Star	10.39
nu star	15.72
A-D Test Statistic	0.418
5% A-D Critical Value	0.74
K-S Test Statistic	0.226
5% K-S Critical Value	0.286
Data appear Gamma Distributed at 5% Significance Level	

Data Distribution Test with Detected Values Only
Data appear Normal at 5% Significance Level

Assuming Gamma Distribution	
Gamma ROS Statistics with Extrapolated Data	
Mean	8.17
Median	4.35
SD	8.762
k star	0.312

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	8.33
SD	8.167
SE of Mean	2.739
95% KM UTL with 90% Coverage	27.56
95% KM Chebyshev UPL	45.67
95% KM UPL (t)	24.03
90% Percentile (z)	18.8
95% Percentile (z)	21.76
99% Percentile (z)	27.33

Theta star	26.22	Gamma ROS Limits with Extrapolated Data	
Nu star	6.233	95% Wilson Hilferty (WH) Approx. Gamma UPL	38.17
95% Percentile of Chisquare (2k)	2.816	95% Hawkins Wixley (HW) Approx. Gamma UPL	50.14
		95% WH Approx. Gamma UTL with 90% Coverage	52.41
90% Percentile	23.98	95% HW Approx. Gamma UTL with 90% Coverage	74.35
95% Percentile	36.92		
99% Percentile	70.37		

ote: DL/2 is not a recommended method

itrite (as N)

General Statistics

Number of Valid Data	10	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	4
Tolerance Factor	2.355	Percent Non-Detects	40.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1	Minimum Detected	0
Maximum Detected	1.6	Maximum Detected	0.47
Mean of Detected	1.3	Mean of Detected	0.248
SD of Detected	0.237	SD of Detected	0.185
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 6 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Test Statistic	0.948
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
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	0.98	Mean (Log Scale)	-0.128
SD	0.449	SD (Log Scale)	0.505
95% UTL 90% Coverage	2.038	95% UTL 90% Coverage	2.891
95% UPL (t)	1.844	95% UPL (t)	2.324
90% Percentile (z)	1.556	90% Percentile (z)	1.681
95% Percentile (z)	1.719	95% Percentile (z)	2.02
99% Percentile (z)	2.025	99% Percentile (z)	2.85
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.085	Mean in Original Scale	1.088

SD	0.333	SD in Original Scale	0.331
95% UTL with 90% Coverage	1.87	95% UTL with 90% Coverage	2.169
		95% BCA UTL with 90% Coverage	1.6
		95% Bootstrap (%) UTL with 90% Coverage	1.6
95% UPL (t)	1.726	95% UPL (t)	1.896
90% Percentile (z)	1.512	90% Percentile (z)	1.553
95% Percentile (z)	1.633	95% Percentile (z)	1.739
99% Percentile (z)	1.861	99% Percentile (z)	2.149

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	17.92	Data appear Normal at 5% Significance Level	
Theta Star	0.0725		
nu star	215.1		
A-D Test Statistic	0.259	Nonparametric Statistics	
5% A-D Critical Value	0.697	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.193	Mean	1.18
5% K-S Critical Value	0.332	SD	0.223
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0771
		95% KM UTL with 90% Coverage	1.704
Assuming Gamma Distribution		95% KM Chebyshev UPL	2.198
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	1.608
Mean	0.891	90% Percentile (z)	1.465
Median	1.05	95% Percentile (z)	1.546
SD	0.58	99% Percentile (z)	1.698
k star	0.372		
Theta star	2.393	Gamma ROS Limits with Extrapolated Data	
Nu star	7.446	95% Wilson Hilferty (WH) Approx. Gamma UPL	3.858
95% Percentile of Chisquare (2k)	3.171	95% Hawkins Wixley (HW) Approx. Gamma UPL	5.343
		95% WH Approx. Gamma UTL with 90% Coverage	5.159
90% Percentile	2.548	95% HW Approx. Gamma UTL with 90% Coverage	7.73
95% Percentile	3.794		
99% Percentile	6.953		

Note: DL/2 is not a recommended method

o-Phosphate (as P)

General Statistics

Number of Valid Data	9	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	2.454	Percent Non-Detects	33.33%
Number of Missing Values	1		

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.1	Minimum Detected	0.0953
Maximum Detected	2.5	Maximum Detected	0.916
Mean of Detected	1.617	Mean of Detected	0.438
SD of Detected	0.531	SD of Detected	0.314
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 6 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.91
5% Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	1.244
SD	0.698
95% UTL 90% Coverage	2.958
95% UPL (t)	2.613
90% Percentile (z)	2.139
95% Percentile (z)	2.393
99% Percentile (z)	2.869
Maximum Likelihood Estimate(MLE) Method	
Mean	1.26
SD	0.674
95% UTL with 90% Coverage	2.915
95% UPL (t)	2.582
90% Percentile (z)	2.124
95% Percentile (z)	2.369
99% Percentile (z)	2.829

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	6.112
Theta Star	0.265
nu star	73.34
A-D Test Statistic	0.297
5% A-D Critical Value	0.698
K-S Test Statistic	0.236
5% K-S Critical Value	0.332

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	1.096
Median	1.2
SD	0.888

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.94
5% Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	0.061
SD (Log Scale)	0.618
95% UTL 90% Coverage	4.839
95% UPL (t)	3.567
90% Percentile (z)	2.346
95% Percentile (z)	2.936
99% Percentile (z)	4.473
Log ROS Method	
Mean in Original Scale	1.301
SD in Original Scale	0.636
95% UTL with 90% Coverage	4.01
95% BCA UTL with 90% Coverage	2.5
95% Bootstrap (%) UTL with 90% Coverage	2.5
95% UPL (t)	3.128
90% Percentile (z)	2.223
95% Percentile (z)	2.669
99% Percentile (z)	3.76

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	1.444
SD	0.465
SE of Mean	0.17
95% KM UTL with 90% Coverage	2.584
95% KM Chebyshev UPL	3.579
95% KM UPL (t)	2.355
90% Percentile (z)	2.04
95% Percentile (z)	2.209
99% Percentile (z)	2.525

k star	0.23		
Theta star	4.766	Gamma ROS Limits with Extrapolated Data	
Nu star	4.139	95% Wilson Hilferty (WH) Approx. Gamma UPL	6.411
95% Percentile of Chisquare (2k)	2.281	95% Hawkins Wixley (HW) Approx. Gamma UPL	9.737
		95% WH Approx. Gamma UTL with 90% Coverage	9.456
90% Percentile	3.305	95% HW Approx. Gamma UTL with 90% Coverage	16.13
95% Percentile	5.436		
99% Percentile	11.18		

Note: DL/2 is not a recommended method.

Phosphorus, Total

General Statistics

Number of Valid Data	10	Number of Detected Data	9
Number of Distinct Detected Data	7	Number of Non-Detect Data	1
Tolerance Factor	2.355	Percent Non-Detects	10.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.84	Minimum Detected	-0.174
Maximum Detected	380	Maximum Detected	5.94
Mean of Detected	182.9	Mean of Detected	3.349
SD of Detected	175.2	SD of Detected	2.904
Minimum Non-Detect	0.5	Minimum Non-Detect	-0.693
Maximum Non-Detect	0.5	Maximum Non-Detect	-0.693

Warning: There are only 9 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	0.763	Shapiro Wilk Test Statistic	0.725
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
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	164.6	Mean (Log Scale)	2.875
SD	174.9	SD (Log Scale)	3.121
95% UTL 90% Coverage	576.6	95% UTL 90% Coverage	27583
95% UPL (t)	501	95% UPL (t)	7154
90% Percentile (z)	388.8	90% Percentile (z)	967.5
95% Percentile (z)	452.4	95% Percentile (z)	3007
99% Percentile (z)	571.6	99% Percentile (z)	25223
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	

Mean	154.6	Mean in Original Scale	164.6
SD	180.1	SD in Original Scale	175
95% UTL with 90% Coverage	578.7	95% UTL with 90% Coverage	45068
		95% BCA UTL with 90% Coverage	380
		95% Bootstrap (%) UTL with 90% Coverage	380
95% UPL (t)	500.8	95% UPL (t)	10366
90% Percentile (z)	385.4	90% Percentile (z)	1173
95% Percentile (z)	450.8	95% Percentile (z)	4033
99% Percentile (z)	573.5	99% Percentile (z)	40886

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.314	Data do not follow a Discernable Distribution (0.05)	
Theta Star	582.4		
nu star	5.651		
A-D Test Statistic	1.322	Nonparametric Statistics	
5% A-D Critical Value	0.796	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.348	Mean	164.7
5% K-S Critical Value	0.299	SD	165.9
Data not Gamma Distributed at 5% Significance Level		SE of Mean	55.65
		95% KM UTL with 90% Coverage	555.4
Assuming Gamma Distribution		95% KM Chebyshev UPL	923.1
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	483.6
Mean	168.7	90% Percentile (z)	377.3
Median	160.7	95% Percentile (z)	437.6
SD	171.1	99% Percentile (z)	550.6
k star	0.333		
Theta star	506.4	Gamma ROS Limits with Extrapolated Data	
Nu star	6.663	95% Wilson Hilferty (WH) Approx. Gamma UPL	937.9
95% Percentile of Chisquare (2k)	2.946	95% Hawkins Wixley (HW) Approx. Gamma UPL	1172
		95% WH Approx. Gamma UTL with 90% Coverage	1345
90% Percentile	490.8	95% HW Approx. Gamma UTL with 90% Coverage	1823
95% Percentile	745.9		
99% Percentile	1400		

Note: DL/2 is not a recommended method.

Potassium

General Statistics

Total Number of Observations	18	Number of Distinct Observations	18
Tolerance Factor	1.974	Number of Missing Values	2

Raw Statistics		Log-Transformed Statistics	
Minimum	1160	Minimum	7.056
Maximum	3080	Maximum	8.033
Second Largest	2890	Second Largest	7.969
First Quartile	1453	First Quartile	7.279
Median	2015	Median	7.608
Third Quartile	2440	Third Quartile	7.8
Mean	2022	Mean	7.568

Geometric Mean	1935	SD	0.31
SD	600.6		
Coefficient of Variation	0.297		
Skewness	0.136		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk Test Statistic	0.943
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% UTL with 90% Coverage	3207	95% UTL with 90% Coverage	3567
95% UPL (t)	3095	95% UPL (t)	3366
90% Percentile (z)	2791	90% Percentile (z)	2878
95% Percentile (z)	3010	95% Percentile (z)	3221
99% Percentile (z)	3419	99% Percentile (z)	3978

Gamma Distribution Test		Data Distribution Test	
k star	9.65	Data appear Normal at 5% Significance Level	
Theta Star	209.5		
MLE of Mean	2022		
MLE of Standard Deviation	650.8		
nu star	347.4		
A-D Test Statistic	0.349	**Nonparametric Statistics**	
5% A-D Critical Value	0.739	90% Percentile	2806
K-S Test Statistic	0.137	95% Percentile	2919
5% K-S Critical Value	0.203	99% Percentile	3048
Data appear Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	3080
90% Percentile	2888	95% Percentile Bootstrap UTL with 90% Coverage	3080
95% Percentile	3197	95% BCA Bootstrap UTL with 90% Coverage	3080
99% Percentile	3834	95% UPL	3080
		95% Chebyshev UPL	4711
95% WH Approx. Gamma UPL	3246	Upper Threshold Limit Based upon IQR	3921
95% HW Approx. Gamma UPL	3273		
95% WH Approx. Gamma UTL with 90% Coverage	3406		
95% HW Approx. Gamma UTL with 90% Coverage	3441		

Selenium

General Statistics

Number of Valid Data	20	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	20

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

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

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

The data set for variable Selenium was not processed!

ilver

General Statistics

Number of Valid Data	20	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	20

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

The data set for variable Silver was not processed!

odium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	65.3	Minimum	4.179
Maximum	4190	Maximum	8.34
Second Largest	3690	Second Largest	8.213
First Quartile	186.5	First Quartile	5.228
Median	727.5	Median	6.568
Third Quartile	1583	Third Quartile	7.367
Mean	1198	Mean	6.438
Geometric Mean	625	SD	1.324
SD	1219		
Coefficient of Variation	1.017		
Skewness	1.263		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.839	Shapiro Wilk Test Statistic	0.933
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	3546	95% UTL with 90% Coverage	8010
95% UPL (t)	3358	95% UPL (t)	6531
90% Percentile (z)	2760	90% Percentile (z)	3412
95% Percentile (z)	3203	95% Percentile (z)	5520
99% Percentile (z)	4034	99% Percentile (z)	13612

Gamma Distribution Test

Data Distribution Test

k star	0.797
Theta Star	1504
MLE of Mean	1198
MLE of Standard Deviation	1342
nu star	31.88

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.361
5% A-D Critical Value	0.773
K-S Test Statistic	0.133
5% K-S Critical Value	0.2

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile	2997
95% Percentile	3715
99% Percentile	4095

Assuming Gamma Distribution

90% Percentile	2917
95% Percentile	3893
99% Percentile	6199
95% WH Approx. Gamma UPL	4106
95% HW Approx. Gamma UPL	4409
95% WH Approx. Gamma UTL with 90% Coverage	4570
95% HW Approx. Gamma UTL with 90% Coverage	4980

95% UTL with 90% Coverage	4190
95% Percentile Bootstrap UTL with 90% Coverage	4190
95% BCA Bootstrap UTL with 90% Coverage	4190
95% UPL	4165
95% Chebyshev UPL	6643
Upper Threshold Limit Based upon IQR	3677

TDS

General Statistics

Total Number of Observations	10
Tolerance Factor	2.355

Number of Distinct Observations	10

Raw Statistics

Minimum	164
Maximum	4900
Second Largest	4730
First Quartile	628
Median	1024
Third Quartile	3055
Mean	1940
Geometric Mean	1222
SD	1781
Coefficient of Variation	0.918
Skewness	0.887

Log-Transformed Statistics

Minimum	5.1
Maximum	8.497
Second Largest	8.462
First Quartile	6.433
Median	6.91
Third Quartile	8.015
Mean	7.109
SD	1.092

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.834
Shapiro Wilk Critical Value	0.842

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.939
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 90% Coverage	6135
95% UPL (t)	5365

Assuming Lognormal Distribution

95% UTL with 90% Coverage	16012
95% UPL (t)	9984

90% Percentile (z)	4223
95% Percentlle (z)	4870
99% Percentile (z)	6084

90% Percentile (z)	4957
95% Percentile (z)	7372
99% Percentile (z)	15519

Gamma Distribution Test

k star	0.922
Theta Star	2103
MLE of Mean	1940
MLE of Standard Deviation	2020
nu star	18.45
A-D Test Statistic	0.382
5% A-D Critical Value	0.744
K-S Test Statistic	0.197
5% K-S Critical Value	0.273

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile	4557
95% Percentile	5981
99% Percentile	9307
95% WH Approx. Gamma UPL	6755
95% HW Approx. Gamma UPL	7204
95% WH Approx. Gamma UTL with 90% Coverage	8752
95% HW Approx. Gamma UTL with 90% Coverage	9647

Nonparametric Statistics

90% Percentile	4747
95% Percentile	4824
99% Percentile	4885
95% UTL with 90% Coverage	4900
95% Percentile Bootstrap UTL with 90% Coverage	4900
95% BCA Bootstrap UTL with 90% Coverage	4900
95% UPL	4900
95% Chebyshev UPL	10084
Upper Threshold Limit Based upon IQR	6696

Sulfate

General Statistics

Number of Valid Data	9	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	2.454	Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	14	Minimum Detected	2.639
Maximum Detected	750	Maximum Detected	6.62
Mean of Detected	239.5	Mean of Detected	4.757
SD of Detected	276	SD of Detected	1.473
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Warning: There are only 6 Detected Values in this data

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.833
5% Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	161.3
SD	247.7
95% UTL 90% Coverage	769.3
95% UPL (t)	646.9
90% Percentile (z)	478.8
95% Percentile (z)	568.8
99% Percentile (z)	737.7
Maximum Likelihood Estimate(MLE) Method	
Mean	88.5
SD	313.3
95% UTL with 90% Coverage	857.3
95% UPL (t)	702.6
90% Percentile (z)	490
95% Percentile (z)	603.8
99% Percentile (z)	817.3

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.521
Theta Star	459.7
nu star	6.252
A-D Test Statistic	0.195
5% A-D Critical Value	0.719
K-S Test Statistic	0.156
5% K-S Critical Value	0.343

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	159.7
Median	37
SD	248.9
k star	0.155
Theta star	1029
Nu star	2.793
95% Percentile of Chisquare (2k)	1.697
90% Percentile	475.5
95% Percentile	872.9
99% Percentile	2018

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.972
5% Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean (Log Scale)	3.708
SD (Log Scale)	1.958
95% UTL 90% Coverage	4973
95% UPL (t)	1891
90% Percentile (z)	501
95% Percentile (z)	1020
99% Percentile (z)	3873
Log ROS Method	
Mean in Original Scale	160.7
SD in Original Scale	248.2
95% UTL with 90% Coverage	9618
95% BCA UTL with 90% Coverage	750
95% Bootstrap (%) UTL with 90% Coverage	750
95% UPL (t)	3038
90% Percentile (z)	623.7
95% Percentile (z)	1456
99% Percentile (z)	7140

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	164.3
SD	231.6
SE of Mean	84.56
95% KM UTL with 90% Coverage	732.7
95% KM Chebyshev UPL	1228
95% KM UPL (t)	618.3
90% Percentile (z)	461.1
95% Percentile (z)	545.3
99% Percentile (z)	703.1

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	1023
95% Hawkins Wixley (HW) Approx. Gamma UPL	1461
95% WH Approx. Gamma UTL with 90% Coverage	1607
95% HW Approx. Gamma UTL with 90% Coverage	2621

lote: DL/2 is not a recommended method

hallium

General Statistics

Number of Valid Data	20	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	20

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

The data set for variable Thallium was not processed!

KN

General Statistics

Total Number of Observations	10	Number of Distinct Observations	8
Tolerance Factor	2.355		

Raw Statistics		Log-Transformed Statistics	
Minimum	70	Minimum	4.248
Maximum	600	Maximum	6.397
Second Largest	320	Second Largest	5.768
First Quartile	130	First Quartile	4.868
Median	165	Median	5.102
Third Quartile	195	Third Quartile	5.272
Mean	204.4	Mean	5.127
Geometric Mean	168.6	SD	0.621
SD	155.5		
Coefficient of Variation	0.761		
Skewness	2.152		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.75	Shapiro Wilk Test Statistic	0.948
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	570.6	95% UTL with 90% Coverage	727.1
95% UPL (t)	503.4	95% UPL (t)	555.9
90% Percentile (z)	403.7	90% Percentile (z)	373.5
95% Percentile (z)	460.2	95% Percentile (z)	467.9
99% Percentile (z)	566.2	99% Percentile (z)	714.3

Gamma Distribution Test		Data Distribution Test
k star	1.992	Data appear Gamma Distributed at 5% Significance Level

Theta Star	102.6
MLE of Mean	204.4
MLE of Standard Deviation	144.8
nu star	39.85
A-D Test Statistic	0.487
5% A-D Critical Value	0.733
K-S Test Statistic	0.234
5% K-S Critical Value	0.269

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile	348
95% Percentile	474
99% Percentile	574.8

Assuming Gamma Distribution

90% Percentile	397.9
95% Percentile	485.4
99% Percentile	679.6
95% WH Approx. Gamma UPL	517.8
95% HW Approx. Gamma UPL	524.1
95% WH Approx. Gamma UTL with 90% Coverage	629
95% HW Approx. Gamma UTL with 90% Coverage	645.9

95% UTL with 90% Coverage	600
95% Percentile Bootstrap UTL with 90% Coverage	600
95% BCA Bootstrap UTL with 90% Coverage	600
95% UPL	600
95% Chebyshev UPL	915.4
Upper Threshold Limit Based upon IQR	292.5

Total Phosphate

General Statistics

Number of Valid Data	10	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	1
Tolerance Factor	2.355	Percent Non-Detects	10.00%

Raw Statistics

Minimum Detected	2.6
Maximum Detected	1200
Mean of Detected	558.6
SD of Detected	536.6
Minimum Non-Detect	1.5
Maximum Non-Detect	1.5

Log-transformed Statistics

Minimum Detected	0.956
Maximum Detected	7.09
Mean of Detected	4.464
SD of Detected	2.905
Minimum Non-Detect	0.405
Maximum Non-Detect	0.405

Warning: There are only 9 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	0.778
5% Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.727
5% Shapiro Wilk Critical Value	0.829

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution	
DL/2 Substitution Method	
Mean	502.9
SD	535.8
95% UTL 90% Coverage	1765
95% UPL (t)	1533
90% Percentile (z)	1190
95% Percentile (z)	1384
99% Percentile (z)	1749
Maximum Likelihood Estimate(MLE) Method	
Mean	472.3
SD	551.4
95% UTL with 90% Coverage	1771
95% UPL (t)	1532
90% Percentile (z)	1179
95% Percentile (z)	1379
99% Percentile (z)	1755

Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean (Log Scale)	3.989
SD (Log Scale)	3.124
95% UTL 90% Coverage	84599
95% UPL (t)	21912
90% Percentile (z)	2958
95% Percentile (z)	9202
99% Percentile (z)	77355
Log ROS Method	
Mean in Original Scale	502.8
SD in Original Scale	535.9
95% UTL with 90% Coverage	138262
95% BCA UTL with 90% Coverage	1200
95% Bootstrap (%) UTL with 90% Coverage	1200
95% UPL (t)	31759
90% Percentile (z)	3588
95% Percentile (z)	12347
99% Percentile (z)	125422

Gamma Distribution Test with Detected Values Only	
k star (bias corrected)	0.314
Theta Star	1780
nu star	5.648
A-D Test Statistic	1.299
5% A-D Critical Value	0.796
K-S Test Statistic	0.345
5% K-S Critical Value	0.299
Data not Gamma Distributed at 5% Significance Level	

Data Distribution Test with Detected Values Only
Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics	
Kaplan-Meier (KM) Method	
Mean	503
SD	508.1
SE of Mean	170.4
95% KM UTL with 90% Coverage	1700
95% KM Chebyshev UPL	2826
95% KM UPL (t)	1480
90% Percentile (z)	1154
95% Percentile (z)	1339
99% Percentile (z)	1685

Assuming Gamma Distribution	
Gamma ROS Statistics with Extrapolated Data	
Mean	514.7
Median	479.6
SD	524.7
k star	0.332
Theta star	1548
Nu star	6.648
95% Percentile of Chisquare (2k)	2.941
90% Percentile	1498
95% Percentile	2277
99% Percentile	4278

Gamma ROS Limits with Extrapolated Data	
95% Wilson Hilferty (WH) Approx. Gamma UPL	2863
95% Hawkins Wixley (HW) Approx. Gamma UPL	3574
95% WH Approx. Gamma UTL with 90% Coverage	4107
95% HW Approx. Gamma UTL with 90% Coverage	5562

Note: DL/2 is not a recommended method

Vanadium

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	9.82	Minimum	2.284
Maximum	45.5	Maximum	3.818
Second Largest	38.5	Second Largest	3.651
First Quartile	11.85	First Quartile	2.472
Median	18.4	Median	2.912
Third Quartile	27.63	Third Quartile	3.319
Mean	21.05	Mean	2.941
Geometric Mean	18.93	SD	0.472
SD	10.1		
Coefficient of Variation	0.48		
Skewness	0.874		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.907	Shapiro Wilk Test Statistic	0.943
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	40.5	95% UTL with 90% Coverage	46.98
95% UPL (t)	38.95	95% UPL (t)	43.68
90% Percentile (z)	33.99	90% Percentile (z)	34.66
95% Percentile (z)	37.66	95% Percentile (z)	41.14
99% Percentile (z)	44.55	99% Percentile (z)	56.75

Gamma Distribution Test		Data Distribution Test	
k star	4.18	Data appear Normal at 5% Significance Level	
Theta Star	5.035		
MLE of Mean	21.05		
MLE of Standard Deviation	10.29		
nu star	167.2		
A-D Test Statistic	0.437	Nonparametric Statistics	
5% A-D Critical Value	0.745	90% Percentile	32.2
K-S Test Statistic	0.139	95% Percentile	38.85
5% K-S Critical Value	0.194	99% Percentile	44.17
Data appear Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	34.84	95% UTL with 90% Coverage	45.5
95% Percentile	40.33	95% Percentile Bootstrap UTL with 90% Coverage	45.5
99% Percentile	52.02	95% BCA Bootstrap UTL with 90% Coverage	45.5
		95% UPL	45.15
		95% Chebyshev UPL	66.17
95% WH Approx. Gamma UPL	41.25	Upper Threshold Limit Based upon IQR	51.29
95% HW Approx. Gamma UPL	41.74		
95% WH Approx. Gamma UTL with 90% Coverage	43.66		
95% HW Approx. Gamma UTL with 90% Coverage	44.33		

Zinc

General Statistics

Total Number of Observations	20	Number of Distinct Observations	19
Tolerance Factor	1.926		

Raw Statistics		Log-Transformed Statistics	
Minimum	13.5	Minimum	2.603
Maximum	55.8	Maximum	4.022
Second Largest	54.9	Second Largest	4.006
First Quartile	18.75	First Quartile	2.929
Median	24.2	Median	3.186
Third Quartile	32.8	Third Quartile	3.49
Mean	27.45	Mean	3.231
Geometric Mean	25.31	SD	0.407
SD	11.95		
Coefficient of Variation	0.435		
Skewness	1.212		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.877	Shapiro Wilk Test Statistic	0.956
Shapiro Wilk Critical Value	0.905	Shapiro Wilk Critical Value	0.905
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	50.47	95% UTL with 90% Coverage	55.45
95% UPL (t)	48.62	95% UPL (t)	52.08
90% Percentile (z)	42.76	90% Percentile (z)	42.65
95% Percentile (z)	47.11	95% Percentile (z)	49.45
99% Percentile (z)	55.25	99% Percentile (z)	65.27

Gamma Distribution Test		Data Distribution Test
k star	5.407	Data appear Gamma Distributed at 5% Significance Level
Theta Star	5.076	
MLE of Mean	27.45	
MLE of Standard Deviation	11.8	
nu star	216.3	
A-D Test Statistic	0.383	Nonparametric Statistics
5% A-D Critical Value	0.744	90% Percentile 40.59
K-S Test Statistic	0.116	95% Percentile 54.95
5% K-S Critical Value	0.194	99% Percentile 55.63
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution			
90% Percentile	43.24	95% UTL with 90% Coverage	55.8
95% Percentile	49.3	95% Percentile Bootstrap UTL with 90% Coverage	55.8
99% Percentile	62.05	95% BCA Bootstrap UTL with 90% Coverage	55.8
		95% UPL	55.76
		95% Chebyshev UPL	80.82

				95% WH Approx. Gamma UPL	50.22			Upper Threshold Limit Based upon IQR			53.88
				95% HW Approx. Gamma UPL	50.59						
				95% WH Approx. Gamma UTL with 90% Coverage	52.85						
				95% HW Approx. Gamma UTL with 90% Coverage	53.37						