# *Sampling and Analytical Plan & Quality Assurance Project Plan*

*for the*

# *Superlon Plastics Site*
# *Tacoma, Washington*

## Revision 6

| | |
|---|---|
| Name: | Superlon Plastics Company, Inc. |
| Agreed Order: | DE 5940 |
| Cleanup Site ID: | 2096 |
| Facility Site ID: | 2776343 |

*Prepared For:*

White Birch, LLC
2116 Taylor Way
Tacoma, Washington 98401

and

The Chemours Company FC, LLC

May 2019

Jeffrey D. King, LG Project Manager

**Pacific Environmental and Redevelopment Corporation**
8424 East Meadow Lake Drive
Snohomish, Washington 98290
425.827.6867

## Project Manager Certification

I certify that the information contained in or accompanying this submittal is true, accurate, and complete. As to those portions of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared at my direction in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted.

Jeffrey D. King, L.G.
Project Manager

May 2019

## SAP/ QAPP Certification

This sampling and analysis plan (SAP), and the associated quality assurance project plan (QAPP), presents the Superlon Plastics Project approach to achieve data quality objectives (DQOs) for potential groundwater, perched water, surface water, soil, sediment, and debris sampling activities at the Superlon Site in Tacoma, Washington. This revised SAP/QAPP has been prepared in accordance with current standards of professional practice. No other warranty is expressed or implied.

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|---|---|
| Date: | May 2019 |
| Revision No. | 6 |

## Distribution List

Copies of this Quality Assurance Project Plan, and any subsequent revisions, will be sent to the following contacts:

Joyce Mercuri - Site Manager
Washington State Department of Ecology
TCP-SWRO
PO Box 47775
Olympia, WA 98504-7775
360-407-6259

Sebastian Bahr – Project Director
The Chemours Company FC, LLC
1007 Market Street
Wilmington, DE 19899
(302) 773-3274

Eivor Donahue – Project Director
White Birch LLC
2116 Taylor Way
Tacoma, WA 98421
(253) 383-4000

Jeffrey D. King, L.G. – Project Manager
Pacific Environmental and Redevelopment Corp.
8424 East Meadow Lake Drive
Snohomish, WA 98290
(425) 238-2212

Elaine Walker – Laboratory Project Manager
TestAmerica Laboratories, Inc.
5755 8th Street East
Tacoma, WA 98424
(253) 248-4972

Bradley A. Grimsted M.S., M.B.A. – Data Control Manager
Pioneer Technologies
5205 Corporate Center Ct. SE Ste. A
Olympia, WA 98503-5901
(360) 570-1700

James J. Mc Ateer, Jr. – Chemistry QA Manager
QA/QC Solutions, LLC
7532 Champion Hill Rd. SE
Salem, OR 97306
(503) 763-6948

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## ACRONYMS

| Acronym | Description/Definition |
|---|---|
| CCV | Continuing calibration verification |
| CFR | Code of Federal Regulations |
| Chemours | The Chemours Company FC, LLC |
| COC | Chain of custody |
| COPC | Constituent of potential concern |
| DOT | Department of Transportation |
| DQI | Data quality indicators |
| DQO | Data quality objective |
| Ecology | Washington State Department of Ecology |
| EDD | Electronic Data Delivery |
| EIM | Environmental Information Management |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| ID | Identification (number) |
| LCS | Laboratory control sample |
| L.G./L.Hg | Licensed Geologist/Licensed Hydrogeologist |
| MDL | Method detection limit |
| MS | Matrix spike |
| MSD | Matrix spike duplicate |
| NOAA | National Oceanic and Atmospheric Administration |
| OPR | Ongoing precision and recovery |
| OSHA | Occupational Safety and Health Administration |
| PCE | Tetrachloroethylene |
| %D | Percent difference or drift |
| %R | Percent recovery |
| PID | Portable photoionization detector |
| PARCC | Precision, accuracy, representativeness, comparability, and completeness |
| PERC | Pacific Environmental and Redevelopment Corporation |
| PIONEER | PIONEER Technologies Corporation |
| QA/QC | Quality assurance/quality control |
| QAPP | Quality Assurance Project Plan |
| RL | Reporting limit |
| RI | Remedial Investigation |
| RPD | Relative percent difference |
| RSD | Relative standard deviation |
| SAP | Sampling and Analysis Plan |
| SOP | Standard operating procedure |
| SVOC | Semi-volatile organic compound |
| TCLP | Toxicity Characteristics Leaching Procedure |
| USEPA | United States Environmental Protection Agency |

| Acronym | Description/Definition |
|---|---|
| VOC | Volatile organic compound |
| WAC | Washington Administrative Code |
| XRF | X-Ray Fluorescence |

# 1 Introduction

This revised sampling and analysis plan (SAP) and the associated qualtity assurance project plan (QAPP) has been prepared to describe the methods that will be used to conduct investigative and confirmation sampling at the Site. The White Birch Group, LLC and the Chemours Company FC LLC (Chemours), collectively known as the "Companies", are working with the Washington State Department of Ecology (Ecology) to supplement data previously collected for the Site, and to confirm the effectiveness of site remediation. This revised SAP/QAPP includes recommendations that were approved by Ecology (Ecology 2015). The SAP/QAPP was originally prepared as an appendix to the Remedial Investigation (RI) Work Plan (PERC 2010) which provide greater detail about the Site history, previous investigations, and previous interim actions. This documentwork also describes the purpose and scope of work to be completed. The processes descripbed in this document do not apply to waste designation sampling which may use similar but different methods.

The objective of this revised SAP/QAPP is to ensure that sample collection, handling, and analysis will result in data of known and acceptable quality.

## 2 Project Personnel and Their Responsibilities

Responsibilities of the Project team members, as well as laboratory project managers, are described in the following paragraphs. Since the individuals listed below may change over time, the revised SAP/QAPP assumes a “designee” as an alternate to the team members listed may be required from time to time. The following paragraphs define their functional responsibilities.

RI activities will continue to be conducted under the supervision of Pacific Environmental and Redevelopment Corporation (PERC) on behalf of the Companies. Mr. Jeffrey King is PERC’s project manager on the project and has responsibility for the day-to-day management and coordination of the project. Mr. King, as the Project Manager, will be responsible for implementation of this revised SAP/QAPP. Following plan approval by Ecology, the Project Manager will provide copies of the approved sampling plan to all sampling and testing sub-contractors to ensure that laboratory personnel use acceptable protocols for chemical and physical analysis, quality assurance/quality control (QA/QC), and reporting.

Field staff will continue to provide overall direction to the sampling program in logistics, personnel assignments, and field operations. The field staff will complete field collection of the surface and subsurface samples and will be responsible for ensuring accurate sample positioning; recording sample locations, depths, and identification; ensuring conformity to sampling and handling requirements, including field decontamination procedures; physical evaluation and logging the samples; and Chain of Custody (COC) of the samples. The field staff will be responsible for notifying the laboratory of sample delivery, ensuring samples are packaged properly for transportation, and ensuring sample delivery to the laboratory or sample pickup by the laboratory. Appropriate protocols for decontamination, sample compositing, sample preservation, and holding times will be observed. Field staff will be responsible for documenting sample preparation, observations, and COC up until the time the samples are delivered for analysis to the analytical laboratory. Field staff will be responsible for writing a daily report detailing field sampling activities.

Mr. Brad Grimsted of PIONEER Technologies Corporation (PIONEER) will continue to be the Project Data Control Manager for this project. PIONEER will coordinate the handling of data once they are received from the laboratory. PIONEER will designate a Laboratory QA/QC Coordinator who will complete an independent QA/QC review of the data. PIONEER will also handle all entry of data into the project database, the filing of field documentation in the main project file and the transfer of environmental data generated to Ecology’s Environmental Information Management System database, according to Ecology Toxics Cleanup Program Policy #840.

TestAmerica Laboratories, Inc. (TestAmerica Seattle) located in Tacoma, Washington will be the analytical laboratory for this project. Ms. Elaine Walker is the laboratory project manager and will serve as the laboratory's primary contact person. She will be responsible for physical and chemical analyses and will coordinate with TestAmerica’s Laboratory QA Manager on TestAmerica’s internal QA policies and practices. Ms. Walker will coordinate handling and analysis of the submitted samples in accordance with Ecology and EPA-approved analytical testing protocols, QA/QC requirements, and requirements as specified in this or a subsequently revised SAP/QAPP.

Mr. James J. Mc Ateer, Jr. of QA/QC Solutions, LLC located in Salem, Oregon will continue to be the chemistry quality assurance manager for analytical chemistry. He will be responsible for the following activities:

- Coordinate the activities of the laboratories and track laboratory progress.
- Verify the laboratories implement the requirements of the SAP and QAPP and address QA issues that may arise that are related to laboratory analyses.
- Address scheduling issues related to laboratory analyses.
- Complete data verification and validation of the chemical data reported.
- Communicate data quality issues that may be identified to the data users.
- Work with data users and Ecology to address any data limitations.

## 2.1 Special Training Requirements/Certifications

To ensure consistency, all field crew members will be fully trained in the collection and processing of perched water and surface and subsurface soil and groundwater, decontamination protocols, visual inspections, and COC procedures.

In addition, the 29 CFR 1910.120 Occupational Safety and Health Administration (OSHA) regulations and Chapter 296-843 of the Washington Administrative Code (WAC) require training to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA and WAC regulations.

# 3 Field Exploration and Sampling Procedures

## 3.1 Monitoring Well Installation

### 3.1.1 Drilling

Additional drilling and monitoring well installation may be completed in the future. Installation of new monitoring wells will be accomplished using a truck-mounted drill rig equipped with six-inch-diameter hollow-stem augers, a direct push “Geoprobe®” rig, or the equivalent. Additional RI borings and monitoring wells will be drilled to depths determined on the basis of: 1) a review of the available subsurface information and 2) the results produced by the previous boring program completed on the site. RI Work Plans will describe the work that will be done.

### 3.1.2 Monitoring Well Installation

Additional monitoring wells may be installed, and if they are, they will be constructed in accordance with Chapter 173-160 WAC Part Two, General Requirements for Resource Protection Wells and Geotechnical Soil Borings (September 2, 1998).

Monitoring wells, if installed, will be constructed of two-inch-diameter, Schedule 40, flush-threaded PVC pipe with 0.010-inch milled lot screen surrounded by a silica sand filter pack. The top of the screen in shallow wells will be installed approximately one to two feet above the water table to account for seasonal and tidal variation in groundwater elevation, if possible. Bentonite chips will be installed above the top of the filter pack to form a seal.

Each well that may be installed will be capped and protected using one of the following methods:

- Above Ground Wells:
    - If the well is installed in a low traffic area with PVC casing extending above the ground surface, a watertight cap with a lock to the top of the casing will be installed.
    - The well will be installed with a protective metal casing cover over and around the well. The protective casing will extend at least six inches above the top of the PVC well casing and will be cemented at least two feet into the ground. A cap with a lock will be attached to the top of the protective casing.
    - Each well completed above ground will be protected from damage by incidental traffic with three metal posts, at least three inches in diameter, in a triangular array around the casing and at least two feet from it. Each post will extend at least three feet above and be cemented in at least three feet below the land surface.
- Below Surface or flush mounted wells may be installed in high traffic areas:
    - A watertight cap with a lock will be attached to the top of the well casing. A metal monument or equivalent shall be installed over and around the well. The monument will serve as a protective cover and will be installed level with the land surface and will be equipped with a waterproof seal to prevent the inflow of water or contaminants. Drains will be provided, when feasible, to keep water away from the well site. The cover will be designed to withstand the anticipated loading by local traffic.

## 3.2 Well Development and Sampling

### 3.2.1 Development

Any new monitoring wells that may be installed will be developed by a combination of pumping and surging until the suspended particles resulting from the drilling and installation actives have been minimized.

The typical well development sequence is as follows:

- Measure and record depth to ambient water level. Using a peristaltic pump, pump groundwater and measure the initial pH, conductivity, and temperature.
- Surge well to loosen sediment within sand pack (as needed). Surging may be performed with a surge block that has a slightly smaller diameter than the PVC well casing.
- Pump water from well to remove sediment and groundwater. Measure pH, conductivity and temperature at five-gallon intervals.
- Terminate well development after the water is essentially sediment free and pH, conductivity, and temperature are stable. Typical water volume pumped from a two-inch monitoring well during development is 10 to 20 gallons. Measure water level after development is complete.

### 3.2.2 Groundwater Sample Collection

Prior to collecting groundwater samples, monitoring wells will be purged using "low flow" purging and sampling techniques. These sampling techniques will be used to minimize disturbance in the aquifer during purging and thereby provide a more representative groundwater sample. The initial groundwater samples will be collected at least two days after well development.

Groundwater samples will be collected in sample containers supplied by the laboratory directly from the pump discharge hose after removing the hose from the flow cell. Groundwater samples to be analyzed for dissolved metals will be placed in unpreserved sample bottles and filtered at the laboratory.

#### *3.2.2.1 Groundwater Sample Collection from Monitoring Wells*

Groundwater samples collected from monitoring wells will be purged using a peristaltic pump. Purge water will be directed through a flow cell to determine the field parameters of turbidity, pH, temperature, conductivity, and dissolved oxygen. Groundwater purging and parameter measurement techniques to be used for this project are described below:

- Measure water depth to the nearest 0.01 foot using a water-level sounder. Record depth to water measurement on the groundwater sampling form.
- Calibrate parameter measurement equipment per manufacturer's instructions as described below:
    - The electrical conductivity meter will be checked against factory supplied calibrator solutions prior to bringing the meter onsite.
    - The pH meter will be auto-calibrated daily prior to beginning sampling using the manufacturer supplied auto-calibration solution (pH 4.0).
    - The temperature probe will be checked against a mercury thermometer prior to bringing the meter onsite.
    - Dissolved Oxygen: The meter will be calibrated according to the procedures described in the factory manual.
    - The turbidity sensor will be auto-calibrated daily prior to beginning sampling using the manufacturer supplied auto-calibration solution (NTU 0.0).

- Lower the tubing into the well and connect to the pump and flow cell.
- Begin purging at a rate of no more than 1.0 liter per minute, directing purge water through the flow cell.
    - Monitor turbidity, pH, temperature, conductivity, dissolved oxygen, and water level and record readings between each purge interval. Purging intervals will be between three to five minutes long. Record parameter measurements on the groundwater sampling form.
    - Purging will be considered complete when parameters have stabilized within approximately five percent over at least two periods of measurements.
- Groundwater sampling will be conducted immediately after field parameters have stabilized.

- Groundwater samples to be analyzed for total metals arsenic, lead, and cadmium (every quarter), and mercury (3rd quarter 2013 only); gasoline and diesel-range, total petroleum hydrocarbons diesel- and residual-range petroleum hydrocarbons (3rd quarter 2013 only); pentachlorophenol (3rd quarter 2013 only); and, tetrachloroethene (i.e., perchloroethylene or PCE) and vinyl chloride (every quarter) will be collected in laboratory-supplied sample containers directly from the discharge tubing after removing the tubing from the flow cell.

- Groundwater samples to be analyzed for dissolved metals arsenic, lead, and cadmium (every quarter), and mercury (3rd quarter 2013 only). Samples will be placed into unpreserved sample bottles and filtered by the laboratory through a 0.45-micron filter and then preserved (if necessary) prior to analysis.

- Additional groundwater samples may be collected in the future.

#### 3.2.2.2 Groundwater Sample Collection from Direct Push/Temporary Wells

If new direct push/temporary wells are installed in the future, groundwater samples may be collected from borings as is described in the RI Work Plan. Groundwater samples will be collected using a groundwater sampler consisting of a 4-ft long, wire-wrapped, stainless-steel screen (0.010-inch slot size) with a retractable protective steel sheath. The groundwater sampler will be advanced to the sample depth and the protective sheath will be retracted to expose the stainless-steel screen to the formation. Groundwater will be sampled using disposable polyethylene tubing and a peristaltic pump. Low-flow purging will be performed for 10 minutes or until purge water is clear.

If collected, groundwater samples will be submitted to the laboratory for analysis of one or more of the analytes listed in Tables 1, 2B, 3, 4B, and 5. Sufficient volume will be collected to perform all analyses identified. Groundwater samples to be analyzed for dissolved metals will be filtered through a 0.45-micron filter by the laboratory, as discussed above in Section 3.2.2.1.

## 3.3 Survey

The locations and elevations of new and existing monitoring wells will be surveyed by a licensed surveyor. Each well location will be measured horizontally to the nearest 0.1 foot. The elevation of the top of each well casing will be marked and measured to the nearest 0.01 foot using an established Port of Tacoma datum.

## 3.4 Groundwater Level Monitoring

Groundwater level data collected to-date is sufficient information for determining groundwater flow direction, tidal influence, etc. for the groundwater RI (a requirement of the RI work plan) and are, apart from seasonal/tidal fluctuations, in a stable state condition. The need to collect additional water level data will be reviewed with Ecology following the remediation of On-Property soils and perched water. Groundwater level data will only be collected during the annual sampling events.

In the future, should it be determined that continuous monitoring of water levels be required in select wells they will be conducted using PT2X (Instrumentation Northwest), SDX or SDT (Stephens), or equivalent down-hole sensors.  This purpose of this activity is to evaluate the tidal influences on the subsurface water levels within the site. Predicted tidal information for the Tacoma Tidal flats area from the National Oceanic and Atmospheric Administration (NOAA) website will be consulted to confirm the times for water-level measurements over ensuing months of water-level measurements.

Prior to measuring water levels that may be needed in the future, the wells will be uncapped and allowed to equilibrate with atmospheric pressure for a period of 15 minutes. The water levels will then be measured using an electronic sounder within 30 minutes of uncapping each well.

Additional continuous water level monitoring devices may be installed, if required, at one or more wells to help better understand groundwater flow direction.  In-Situ Inc. Level Troll vented down-hole sensors (or another equivalent device which account for variations in barometric pressure) will measure the static water level within uncapped wells on a 15-minute interval for a duration to be determined by the project manager.  Data will be logged within the measurement control device, and downloaded to a laptop computer following completion of the measurement period.

## 3.5 Surface Water Sampling

Opportunistic surface water samples may be collected in the future to supplement the limited data available and to determine current conditions. Sample locations will be dependent upon available surface water at the time of sampling.

Surface water sampling procedures will follow those described in Ecology’s standard operating procedure (SOP) EAP015 generally as follows:

1. The container stopper/lid will be removed just before sampling as not to contaminate the cap, neck, or the inside of the bottle with your fingers, wind-blown particles, or dripping water from clothes, body, or overhanging structures.
2. If no preservative is present in the container proceed as follows:
    - Hold the container near the base, reach out in front of yourself as far as possible, and plunge it (mouth down) below the surface. **DO NOT DISTURB THE SEDIMENTS**.
    - Fill the bottle to the appropriate level depending on the analyte to be tested.
    - Pour out a small volume if needed to create a headspace for mixing in the lab. Do not create a headspace for volatile organics.
3. If preservative is present in the container and you can reach the water with your hand, use the following procedure:
    - Hold the container upright and place the lid over the mouth so that only a small area forms an opening.
    - Immerse the bottle while holding the cap in position with your fingers as far away from the opening as possible.

- Carefully observe the rate the container is filling and remove it from the water before the headspace area is reached or overfilling occurs.
- Securely replace the lid of the container. Invert it several times to evenly mix preservative with the sample.

4. Rinse any large amount of dirt or debris from the outside of the container.
5. Attach the ID tag. Place in appropriate storage.

Surface water samples may be analyzed for one or more of the analytes listed in Tables 1, 2B, 3, 4B, and 5.

## 3.6 Sediment Sampling

Grab samples of surface and subsurface sediment may be collected in the future to supplement available data. Samples will be collected using either a stainless steel hand trowel, or using modified direct-push technology when sediment samples at depth are inaccessible using typical direct-push technology. Samples collected using a hand trowel will be collected in the following manner:

- The sample location will be located in the field as indicated in RI Work Plans;
- The sampling equipment will be decontaminated prior to sampling;
- An approximately six-inch by four-inch by two-inch thick square section of sediment will be collected from the surface of each sample location;
- Samples that may be collected in the future for the analysis of gasoline-range petroleum hydrocarbons by Method NWTPH-Gx and for analysis of volatile organic compounds (VOCs) will be collected in accordance with USEPA Method 5035B. Soil samples to be submitted for chemical analysis of constituents other than VOCs and gasoline-range petroleum hydrocarbons will be placed into decontaminated stainless-steel bowls and homogenized using a decontaminated stainless-steel spoon.
- A representative sample of the sediment will be placed in laboratory-prepared glassware and placed in a storage cooler for transport to the laboratory.
- Observations (i.e., texture, odor, presence/absence of vegetation, debris, and any other distinguishing characteristics) will be recorded in the field log.

Samples collected using typical direct-push or modified direct-push technology will be collected in the following manner:

- Sediment samples at depth collected using modified direct-push technology will be logged and sampled based on depth interval, similar to soil boring samples described below in Section 3.7.2.1.

Sediment samples may be analyzed for one or more of the analytes listed in Tables 6, 7, 8, 9, and 10.

## 3.7 Soil Sampling

Additional soil samples may be collected in order to further refine the vertical and lateral extent of constituents of potential concern. Samples may be collected from various depths using a truck-mounted Geoprobe® rig, split-barrel samplers, hand-auger borings or modified direct-push in locations where access prevents using a Geoprobe® rig. Each sampled interval will be described in standard geologic terms in the field logbook as defined by the *Unified Soil Classification System* and supervised by the Project Geologist/Hydrogeologist licensed in the State of Washington. Sampled intervals are described below, where applicable, and may be modified in the field based on field observations by the Project Geologist/Hydrogeologist. Soil samples may be analyzed for one or more of the analytes listed in Tables 6, 7, 8, 9, and 10.

### 3.7.1 New Monitoring Wells

If necessary to gain additional information needed to complete the RI soil sampling will be done during the installation of any new monitoring wells. The soils encountered will be sampled at 1½ foot intervals by driving a split-barrel sampler 18 inches into undisturbed material ahead of the borehole bottom. Driving will be terminated when the full 18-inch drive is completed.

The following procedures will be used to collect soil samples from new monitoring wells:

- Driller retrieves split-barrel sampler from borehole;
- The split-barrel sampler is opened and sample recovery is measured in the barrel;
- A sample is placed into a laboratory-prepared sample jar if the sampled interval is to be submitted for analysis. Sample containers will be labeled, placed in a chilled cooler and secured with a chain-of-custody seal and associated documents. Samples collected for analysis of gasoline-range petroleum hydrocarbons by Method NWTPH-Gx and for analysis of VOCs will be collected in accordance with USEPA Method 5035B.
- Observations (i.e., texture, odor, presence/absence of vegetation, debris, and any other distinguishing characteristics) will be recorded in the field logbook.
- The contents of the sampler will be described in standard geologic terms in the field logbook.
- The split-barrel sampler will be decontaminated using the procedures described in Section 5 – Quality Assurance Procedures.

### 3.7.2 Borings

Borings, if required, will be used to characterize the subsurface lithology, to collect samples for chemical analyses, and to install temporary groundwater monitoring wells. Borehole drilling and sample collection methods and associated laboratory analyses to be conducted on the samples collected from the Property are described below. The number and depth intervals of samples to be collected during the RI are listed in the RI Work Plan.

If installed, boreholes for collecting soil samples and groundwater samples will be drilled using a truck-mounted Geoprobe® direct-push drilling rig, where available. Direct-push borings in areas inaccessible by Geoprobe® rigs will be advanced using modified direct-push technology. The direct-push borings will be advanced to and beyond the water table. Borings will be accomplished by a licensed driller in the State of Washington and will be supervised by the licensed Project Geologist/Hydrogeologist.

Prior to initiation of drilling, or any other invasive subsurface activity, the locations of each proposed drilling or sampling site will be checked in the field to locate aboveground utilities or physical limitations that would prevent drilling at the proposed location. In addition, a public utility locating service will be contacted to identify underground utilities at the perimeter or within the property, and a private utility location service will be contacted to clear explorations for underground utilities. The final location for each borehole will be based on the findings of the utilities check. Before and between drilling of each boring and at completion of the project, downhole drilling equipment will be decontaminated and cleaned using a liquid detergent (Alconox or similar), and a water or steam washing system.

#### *3.7.2.1 Soil Sampling Collection Methods*

Continuous samples may be collected from each boring that may be installed using a closed-piston sampling device with a 1.5-inch inside-diameter (ID) core sampler. The sampler will be advanced to the top of the sample interval with the piston in a locked position. The piston tip will then be loosened and the sampler will be advanced over the desired depth interval, thereby coring the material inside the sampler's disposable, single-use liner. The sampler will then be withdrawn to retrieve the liner and sample. The liner will be cut to remove the sample. A new liner will be placed in the core sampler and this process will be repeated until all desired samples have been obtained. Between locations, the core sampler, including the piston tip and rods, will be decontaminated as described above in Section 3.7.2 - Borings.

After the liner is cut, the material recovered will be evaluated and described in standard geologic terms in the field logbook by the Project Geologist/Hydrogeologist licensed in the State of Washington. Field-screening will be conducted by visually inspecting the material for staining and other evidence of environmental impact, and/or by monitoring vapors for VOCs using a portable photoionization detector (PID). Samples collected for analysis of gasoline-range petroleum hydrocarbons by Method NWTPH-Gx and for analysis of VOCs will be collected in accordance with USEPA Method 5035A. Samples to be submitted for chemical analysis of constituents other than VOCs and gasoline-range petroleum hydrocarbons will be placed into decontaminated stainless-steel bowls and homogenized using a decontaminated stainless-steel spoon.

### 3.7.3 Soil Sample Laboratory Analysis

Soil samples that may be collected may be analyzed for one or more of the analytes listed in Tables 6A, 6B, 7, 8, 9, and 10.

## 3.8 Debris Sampling

The regulatory status of debris either currently on site or which will be generated during site activities will need to be determined. The methods used to collect samples and the laboratory analyses of debris (e.g., metal and/or wood debris) or other building materials are described below.

Building materials including structural wooden beams, floor boards, and metal siding may also be sampled to determine their suitability for recycling. In addition, LeadCheck® screening will be done on painted surfaces of these building materials to determine if they contain lead-based paint. This screening will be peformed in order to notify recylers of the presence of lead-based paint, if it is found to be present. Debris samples that may be collected may be analyzed for one or more of the analytes listed in Table 11. Once the laboratory analyses are received, the data will be compared to the criteria listed in the Washington State Dangerous Waste Regulations (WAC 173-303) to determine if the materials can be recycled, or if they will require disposal at an approved landfill.

### 3.8.1 Other Building Materials

Building materials including structural wooden beams, floor boards, and metal siding may also be sampled to determine their suitability for recycling, and to determine disposal requirements. In addition, LeadCheck® screening will be done on painted surfaces of these building materials to determine if they contain lead-based paint. This screening will be peformed in order to notify recylers of the presence of lead-based paint, if it is found to be present.

### 3.8.2 Sampling

Sampling of building materials that may be collected will be done as follows:

1. Representative composite samples will be collected from wood, concrete, and painted surfaces located throughout on-site buildings.
2. The representative samples will be sent to the lab where they will be ground up, combined, and homogenized in order to prepare a representative sample.

3. If results of composite samples indicate material is a hazardous waste, grab samples from discrete locations will be taken and sent for analysis to minimize the focus on the area of contaminated material and minimize the amount of waste classified as hazardous.
4. Debris samples that may be collected may be analyzed for one or more of the analytes listed in Tables 6, 10, and 11 to determine the appropriate disposal requirements.

# 4 Chemical Analysis

Chemical analyses will be completed on groundwater samples that are to be collected on an annual basis only for the determination of dissolved arsenic and dissolved lead, as has been approved by Ecology (Ecology 2015). Additional chemical analyses may be completed at a later date on groundwater, perched water, surface water, sediment, soil, basement debris, or other building material samples on as-needed basis. All samples collected will be submitted to TestAmerica Seattle located in Tacoma, Washington for analysis. Analyses that may be conducted and the methods used are listed in Tables 1 through 11. Results for the analyses to be used in the RI will be submitted in both Level II (i.e., summary data package of results and QC measurements) and also a Level IV (i.e., complete data deliverable) report for this project. Samples submitted to the laboratory for disposal designation purposes will not be submitted for Level II and Level IV evaluation. These samples will also be submitted to Ecology and to the Tacoma Pierce County Health Department as a requirement of the disposal permit application.

Soil samples may also be analyzed in the field using a portable hand-held X-Ray Fluorescence (XRF). An XRF demonstration study has been previously completed and the methodology used in this study are described in a simplified version of the original work plan in Attachment 1 (*Superlon Plastics Site Remedial Design: Simplified XRF Demonstration Work Plan*) and Attachment 2 (*Superlon Plastics Site Design: Soil Volume Verification and XRF Demonstration Report).* The XRF can be used to generate real-time data and to characterize constituent levels and locations in a dynamic sampling strategy (EPA 2010a). The use of the portable hand-held XRF will be important during full-scale remediation activities because it will, in part, eliminate laboratory turn-around time limitations while still providing high quality reliable and valid data to facilitate the decision-making process. The XRF methodology used to obtain soil data was approved by Ecology in July 2017 (Ecology 2017).

# 5 Quality Assurance Procedures

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide technically and legally defensible results. This section discusses QA objectives and procedures for this project for samples to be used in the RI.

The QA procedures outlined in this section will be utilized for investigation samples collected as part of the RI, but will not be utilized for samples obtained for disposal purposes only (e.g., treated soil stockpile samples analyzed for Toxicity Characteristic Leaching Procedure waste disposal characterization). These samples will instead undergo review by Ecology and the Tacoma Pierce County Health Department prior to waste disposal application approval.

## 5.1 Data Quality Objectives and Criteria

The DQO for this project is to ensure that the data collected to be included in the RI are of known and acceptable quality, so that the project objectives described above can be achieved. The quality of the laboratory data is assessed by data quality indicators (DQIs) for precision, accuracy, representativeness, comparability, and completeness (PARCCs), which are commonly used to assess the quality of environmental data. Definitions of these parameters and the applicable QC procedures are given below. Applicable quantitative goals for these data quality parameters are listed or referenced below.

### 5.1.1 Precision

Precision is a measure of reproducibility of measurements of the same characteristic, usually under a given set of conditions. It is a measure of the variability, or random error, in sampling, sample handling, and in laboratory analysis. The American Society of Testing and Materials recognizes two levels of precision: repeatability—the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory, with the same apparatus, under constant operating conditions; and reproducibility—the random error associated with measurements made by different test operators, in different laboratories, using the same method but different equipment to analyze identical samples of test material.

In the laboratory, within-batch precision is measured using replicate samples or QC analyses, and is expressed as the relative percent difference (RPD) between the measurements. The batch-to-batch precision is determined from the variance observed in the analysis of standard solutions or laboratory control samples from multiple analytical batches. The frequency and target precision for all analysis methods to be conducted for the site are presented in Tables 12 and 13.

#### *5.1.1.1 Field Precision Objectives*

Field precision will be assessed by the collection and analysis of field duplicates, and will be expressed as an RPD. Duplicate samples are analyzed to check for matrix variability and analytical method reproducibility. One duplicate sample will be collected for every 20 samples collected, or one per sampling round, if less than 20 samples are collected.

Duplicate water and solid samples will be collected, as necessary, and will be analyzed for the same parameters as the original sample. Field chemistry duplicate precision will be screened against an RPD of 35 percent for water samples and an RPD of 50 percent for solid samples. However, no data will be qualified based solely on field duplicate samples.

### 5.1.1.2 Laboratory Precision Objectives

The control limits for accuracy automatically identify the precision of a method. In the analysis of samples in a batch, if the recoveries of the analytes of interest are within control limits, then the precision also is within control. Precision also may be calculated in terms of RPD. Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. The equation used to express precision is as follows:

$$\text{"RPD"} = \frac{|\text{"C}_1\text{"} - \text{"C}_2\text{"}|}{(\text{"C}_1\text{"} + \text{"C}_2)/2}) * 100$$

where:

$C_1$= concentration sample

$C_2$ = concentration duplicate sample

RPDs may be compared to the laboratory-established RPD control limits for the analysis. Precision control limits are outlined in Tables 14A, 14B, and 14C.

## 5.1.2 Accuracy

Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or "true" value and is a measure of bias in the system. The accuracy of a measurement system is impacted by errors introduced through the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analytical techniques.

Accuracy is determined by calculating the mean value of results from the analyses of laboratory-fortified blanks, standard reference materials, and standard solutions. In addition, laboratory-fortified (i.e., matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (%R) of the measured value, relative to the true or expected value. If a measurement process produces results whose mean is not the true or expected value, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories use several QC measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

### 5.1.2.1 Field Accuracy Objectives

The achievement of accurate data in the field will be addressed through the adherence to all sample handling, preservation, and holding times.

### 5.1.2.2 Laboratory Accuracy Objectives

Results for method blank and laboratory control samples will be the primary indicators of accuracy. These results will be used to control accuracy by requiring that they meet specific criteria. As spiked samples (i.e., matrix spikes) are analyzed, spike recoveries will be calculated and compared to acceptance limits. Spiked samples provide an indication of the bias of the analysis system.

Accuracy can be expressed as a percentage of the true or reference value, or as a %R in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%\mathrm{R} = \left(\frac{\text{spike sample result} - \text{sample result}}{\text{spike added}}\right) * 100$$

Accuracy control limits outlined in Tables 14A, 14B, and 14C will be based on previously established laboratory performance for similar samples. In this approach, the control limits reflect the minimum and maximum recoveries expected for individual measurements for an in-control system. Recoveries outside the established limits indicate some assignable cause, other than normal measurement error, and the possible need for corrective action. Corrective actions may include recalibration of the instrument, reanalysis of the QC sample, reanalysis of the samples in the batch, re-preparation of samples in the batch, or flagging the data as suspect, if the problems cannot be resolved. For contaminated samples, recovery of matrix spikes may depend on sample homogeneity, matrix interference, and dilution requirements for quantitation.

### 5.1.3 Representativeness

Representativeness qualitatively expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. For the Superlon site, the list of analytes has been identified to provide a thorough assessment of the constituents of potential concern (COPCs) stemming from historical activities at the Site.

Representativeness expresses the degree to which a sample represents a source material, an environmental media, or a geochemical process. Representativeness is a qualitative parameter, dependent on the proper design of the sampling program and proper choice of extraction and analytical methods.

The characteristic of representativeness cannot be quantified. Subjective factors to be taken into account are as follows:

- Degree of homogeneity of a site.
- Degree of homogeneity of a sample taken from one point in a site.
- Available information on which a sampling plan is based.

#### *5.1.3.1 Measures to Ensure Representativeness of Field Data*

Field duplication and field replication, as defined in Section 5.1.1 – Precision, also are used to assess representativeness. Two samples that are collected at the same location and at the same time are considered equally representative of this condition, at a given point in space and time.

#### *5.1.3.2 Measures to Ensure Representativeness of Laboratory Data*

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times, and analyzing and assessing field duplicate samples. Precautions are taken to extract from the sample container an aliquot representative of the whole sample. This includes premixing the sample and discarding foreign material (i.e., stones, twigs, pebbles, etc.) from soil samples.

### 5.1.4 Comparability

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and new analytical data will be comparable depends on the similarity of sampling and analytical methods.

#### *5.1.4.1 Measures to Ensure Comparability of Laboratory Data*

Planned analytical data will be comparable when similar sampling and analytical methods are used as documented in this SAP. Comparability is also dependent on similar QA objectives.

### 5.1.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected under normal conditions. Completeness will be calculated as the ratio of usable data to generated data, expressed as a percentage.

$$\%\text{Completeness} = (\text{Total Data Planned}/\text{Valid Data Obtained}) * 100$$

To be considered complete, the data sets must also contain all quality control check analyses that verify the precision and accuracy of the results.

#### *5.1.5.1 Field Completeness Objectives*

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Field completeness for this project will be greater than 90 percent.

#### *5.1.5.2 Laboratory Completeness Objectives*

The project laboratory will provide data meeting QC acceptance criteria for a minimum of 90 percent of the samples tested using the SW-846 and other standard methods. At the completion of sample analysis testing, the percent completeness will be calculated by the following equation:

$$\%\text{Completeness} = (\text{Number of Successful Analyses}/\text{Number of Requested Analyses}) * 100$$

Successful laboratory analyses can only be accomplished if both the field and laboratory portions of the project are successful. Factors that adversely affect completeness include:

- Receipt of samples in broken containers.
- Receipt of samples in which chain-of-custody or sample integrity is compromised in some way.
- Samples received with insufficient volume to perform initial analyses or repeat analyses, if initial efforts do not meet QC acceptance criteria.
- Samples held in the field or laboratory longer than expected, thereby jeopardizing holding time requirements.
- Improperly preserved samples.
- Samples that have unclear analysis request.

### 5.1.6 Sensitivity

Analytical sensitivities must be consistent with or lower than the regulatory criteria values in order to demonstrate compliance with this SAP. When they are achievable, target reporting limits specified in this SAP will be at least a factor of two less than the analytes corresponding regulated criteria value. If reporting limits lower than criteria are not achieved, the Laboratory QA/QC Coordinator will work with the laboratory to ensure that, if at all possible, re-analyses are performed and reporting limits lower than criteria are achieved.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Laboratory MDLs will be used to evaluate the method sensitivity and/or applicability prior to the acceptance of a method for this program. Laboratory reporting limits (RLs) are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions for that particular method.

The sample RLs will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g., dilution factor, percent moisture, sample volume, sparge volume). In the event that the RL is elevated for a sample due to matrix interferences then subsequent dilution or reduction in the sample aliquot data will be evaluated by the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., detection limits less than criteria achieved), Ecology will be contacted to discuss an acceptable resolution.

### 5.1.7 Ecology Coordination

Ecology will be informed promptly if there are any anomalous results observed with any of the chemical analyses performed for sample results to be used in the RI. Situations that might require coordination with Ecology include detection limit issues and/or control issues, but are not limited to these issues. In general, the default assumption will be to inform Ecology in a timely fashion of all issues that require non-routine interaction with the laboratory during chemical testing.

## 5.2 Field Quality Control

Sampling personnel will identify and label samples in a consistent manner to ensure that field samples are traceable and that labels provide all information necessary for the laboratory to conduct the required analyses properly. Samples will be placed in appropriate containers and preserved for shipment to the laboratory. Tables 15 and 16 present the required containers, preservation techniques, and holding times for soil and groundwater samples, respectively.

### 5.2.1 Field Quality Assurance Sampling

Field QA procedures will consist of following SOPs for acceptable practices for collecting and handling of samples. Adherence to these procedures will be complemented by periodic and routine equipment inspection.

Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA samples includes homogenized field duplicates and matrix spike/matrix spike duplicates (MS/MSD) as described below. Field duplicates will be collected for every 20 samples collected, or one per sampling round, if less than 20 samples are collected. MS/MSD samples will be collected for every 20 samples collected, or one per sampling round, if less than 20 samples are collected. See Tables 12 and 13 for the frequency of field quality assurance and quality control samples.

Field duplicate samples will be prepared by homogenizing sufficient sample volume for two sets: one field sample and one blind field duplicate. The blind field duplicate will be labeled with a unique sample location name and will be analyzed for the same constituent list as the original sample.

The MS/MSD samples will also include the collection of additional sample volume, to ensure that the laboratory has sufficient sample volume to run the program-required analytical QA/QC samples for analysis. MS/MSD samples will be identified as such on sample labels and the COC, and will retain the same sample identifier as the original sample. All field QA samples will be documented in the field logbook.

### 5.2.2 Field Instruments/Equipment

In accordance with the QA program, field staff shall maintain an inventory of field instruments and equipment. The frequency and types of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment. Table 17 presents the field measurement equipment quality control calibration frequency.

The Field Staff will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. The equipment maintenance information will be documented in the instrument's calibration log. The frequency of maintenance will be dependent on the type and stability of the equipment, the methods used, the intended use of the equipment, and the recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in specific manufacturer's instruction manuals.

All maintenance records will be verified prior to each sampling event. The Field Staff will be responsible for verifying that required maintenance has been performed prior to using the equipment in the field. Any problems will be noted in the field logbook and corrected prior to continuing sampling operations.

## 5.3 Laboratory Quality Control

Laboratory QC measurements, where applicable, will include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, MS, surrogate spikes, method blanks, and other required method-specific QC measurements. Results of the quality control samples from each sample group will be reviewed by the analyst immediately after a sample group has been analyzed. The quality control sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the Laboratory QA/QC Coordinator will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

### 5.3.1 Laboratory Instruments/Equipment

In accordance with the QA program, the laboratories shall maintain an inventory of instruments and equipment, and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment. Laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program.

### 5.3.2 Laboratory Replicates/Duplicates

Analytical replicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical replicates are subsamples of the original sample that are prepared and analyzed as a separate sample. Analytical duplicates are performed, for example, to confirm an analytical result. The analytical duplicates are therefore two separate tests of the sample run for comparison of results, and provide information on the precision of the method and the homogeneity of the sample matrix.

### 5.3.3 Matrix Spikes and Matrix Spike Duplicates

Analyses of MS/MSD samples provide information on the extraction efficiency of the method on the sample matrix. By performing duplicate matrix spike analyses, information on the precision of the method is also provided for organic analyses.

### 5.3.4 Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must contain less than five times the reporting limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of the analyte/compound in any of the samples is less than five times the concentration found in the blank, analyses must stop and the source of contamination must be eliminated or reduced.

### 5.3.5 Laboratory Control Samples

Laboratory control samples (LCSs) are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The LCS is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of sample and matrix spike samples. The LCS will provide information on the accuracy of the analytical process in the absence of matrix effects, and when analyzed in duplicate, will provide additional precision information, as well.

### 5.3.6 Laboratory Deliverables

Once data are received from the laboratory, a number of QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness. Both Level II (i.e., summary data package of results and QC measurements) and also a Level IV (i.e., complete data deliverable) report for this project will be the standard laboratory deliverable for this project and will include, at a minimum for Level IV report, the following information:

- Cover title page
- Table of Contents
- Case Narrative
- Description data laboratory-assigned data qualifiers
- COC documentation
- Sample preparation logs
- Laboratory summaries of analytical results
- Results for applicable instrument tuning, initial calibrations, and continuing calibration verification (CCV) results
- Results for applicable method blanks, continuing calibration blanks, and instrument blanks
- Results for applicable internal standard retention times and responses
- Results for applicable method-specific quality control measurements
- Results for applicable surrogate recoveries
- Results for applicable MS/MSD recoveries
- Results for applicable laboratory control sample recoveries
- Results for applicable laboratory duplicate sample results and RPDs
- Instrument printouts (e.g., chromatograms, mass spectra, and quantification reports)

- Summary of applicable detection limits and reporting limits
- Summary of reagent traceability
- Copies of certificate of analysis as are applicable

### 5.3.7 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the Laboratory QA/QC Coordinator upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures will be reviewed by the Laboratory QA/QC Coordinator to ensure compliance with this revised SAP/QAPP.

The laboratory must ensure that personnel engaged in analysis tasks have appropriate training. The laboratory will, as part of the audit process, provide for the project manager's review and written details of any and all method modifications planned. The laboratory is required to comply with their SOPs. TestAmerica's Laboratory QA Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this revised SAP/QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

TestAmerica's Laboratory QA Manager will be notified immediately if any QC sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. TestAmerica's Laboratory QA Manager will document the corrective action taken in a memorandum submitted to the Laboratory QA/QC Coordinator within five days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e. recalculation, reanalysis, and re-extraction) will be submitted with the data package in the form of a case narrative.

### 5.3.8 Data Validation and Usability

Data generated in the field and at the laboratories will be verified and validated according to criteria and procedures described in this section. Data quality and usability will be evaluated, and a discussion will be included in the applicable reports.

#### *5.3.8.1 Data, Review, Verification, and Validation*

Field and laboratory data for this project will undergo a verification and validation process. All errors found during the verification of field data, laboratory data, and the database will be corrected prior to release of the final data.

The first level of review will take place in the laboratory as the data are generated. TestAmerica's Laboratory Manager or designee will be responsible for ensuring that the data generated will meet minimum QA/QC requirements, and that the instruments were operating under acceptable conditions during generation of data. DQIs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability. Any deviations from the DQIs listed on the checklist will be brought to the attention of the Laboratory QA Manager to determine whether corrective action is needed, and to determine the impact on the reporting schedule.

All laboratory data will be reviewed and verified to determine whether all DQIs have been met and to verify that appropriate corrective actions have been taken, when necessary. The Laboratory QA/QC Coordinator or designee will be responsible for the final review of all data generated from analyses of samples.

During the independent third-party data validation process, analytical data will be evaluated for method quality control and laboratory quality control compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed. Data validation also includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the Field Staff and Laboratory QA Manager; review by the Project QA Manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. Any errors found will be corrected. Any errors in the raw data file will be corrected, and the database revised.

Data verification and validation will be conducted using the following applicable guidance and requirements:

- Guidance on Environmental Data Verification and Validation (USEPA 2002).
- USEPA Contract Laboratory Program, national functional guidelines for superfund organic methods data review (USEPA 2008)
- USEPA Contract Laboratory Program national functional guidelines for inorganic data superfund data review (USEPA 2010b)
- In the context of method-specific (USEPA 2018) and laboratory-established quality control requirements, as applicable.

Data validation procedures will be modified to accommodate QA/QC requirements for methods (e.g., petroleum hydrocarbon analyses) that are not specifically addressed by the USEPA functional guidelines. In this situation, method-specific and laboratory-established control limits will be used, as necessary, to determine if qualification of the data may be necessary.

Data validation procedures will include evaluating a summary of the sample results and applicable quality control results reported by the laboratory; this level of validation is also referred to as an abbreviated data review. The laboratory data deliverables that will be validated will include the following:

- Case narratives discussing analytical problems (if any) and procedures.
- Chain-of-custody documentation to verify completeness of the data set.
- Verifying that analytical holding times were met.
- Results for applicable method blanks, trip blanks, and field blanks to determine whether an analyte that was reported as detected in any sample was the result of possible contamination introduced at the laboratory, during transport of samples, or during field sampling, respectively.
- Results for an applicable internal standards performance to verify that instrument sensitivity and response was stable during the analysis of the samples.
- Results for applicable method-specific quality control measurements (i.e., serial dilutions and interference check samples for metal analyses) that may be reported to assess potential matrix interference effects.

- Results for applicable surrogate compound (or system monitoring compound for VOC analyses), LCS (i.e., blank spike), duplicate LCS, MS, and MSD recoveries to assess analytical accuracy.
- Results for applicable laboratory duplicate sample, duplicate LCS, and MSD analyses to assess analytical precision.
- Results for the field duplicate samples to provide additional information in support of the quality assurance review.
- Laboratory summaries of analytical results.

Verification of applicable laboratory calculations, transcriptions, review of instrument printouts, and review of bench sheets are not planned to be reviewed during the abbreviated data validation review. Instrument blanks, instrument tuning, instrument calibrations, and ongoing precision and recovery (OPR) analyses were conducted by TestAmerica during their tenure as the contract laboratory. These analyses were included as another measure of lab precision and sensitivity.

Performance based control limits established by the laboratory and control limits specified in applicable method protocols will be used to evaluate data quality and determine the need for data qualification. Applicable laboratory control limits (e.g., recoveries for surrogate compounds, LCSs and LCS duplicates, and MS/MSDs) will be used during data validation. Data qualifiers will be assigned during data validation to the electronic data delivery (EDD) when applicable QA/QC limits are not met and qualification of the data is warranted and will be assigned following guidance specified by USEPA (2002, 2008, and 2010b).

The results of the data quality review, including text assigning qualifiers in accordance with the Ecology's Environmental Information Management (EIM) system requirements and a tabular summary of qualifiers, will be generated by the Laboratory QA/QC Coordinator and assessed for confirmation of the validity of the data. A copy of the validation report will be submitted by the Laboratory QA/QC Coordinator and will be presented as an appendix to the final sampling and analysis results report. The validated dataset will be submitted to EIM and successful input verified concurrent with submission of the draft data report to Ecology.

## 5.4 Data Management

Field data sheets will be checked for completeness and accuracy by the Field Staff prior to delivery to the Project Manager. All data generated in the field will be documented on hard copy and provided to the Project Data Control Manager, who is responsible for the data entry into the database. All manually entered data will be checked by a second party. Field documentation will be filed in the main project file after data entry and checking are complete.

Laboratory data that are electronically provided and loaded into the database will undergo a 10% check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party.

## 5.5 Field Records

All documents generated during the field effort are controlled documents that become part of the project file.

### 5.5.1 Field Logs

Field team members will keep a daily record of significant events, observations, and measurements in a field log. All field activities will be recorded in a bound, paginated field logbook maintained by the Project Manager or a designee for each activity. Field logbooks will be the main source of field documentation for all field activities. The on-site field representative will record in the field logbook information pertinent to the investigation program. The sampling documentation will contain information on each sample collected, and may include the following information:

- Project name
- Field personnel on site
- Site visitors
- Weather conditions
- Field observations and any deviations from the SAP
- Maps and/or drawings
- Date and time samples collected
- Sampling method and description of activities
- Identification of instruments or equipment used
- Deviations from the SAP

Entries for each day will begin on a new page. The person recording information must enter the date and time, and initial each entry. Additional specific field reporting requirements and checklists for each study are defined in the SAP. In general, sufficient information will be recorded during sampling to permit reconstruction of the event without relying on the memory of the field personnel.

The field logbooks will be permanently bound and durable for adverse field conditions. The front and inside of each field logbook will be marked with the project name, number, and logbook number. The field logbooks will be stored in the project files when not in use, and upon completion of each sampling event. Sample collection checklists will be prepared prior to each sampling program. The checklist will include location designations, types of samples to be collected, and whether any QC samples are to be collected.

### 5.5.2 Analytical and Chemistry Records

Analytical data records will be retained by the laboratory and Project Data Control Manager. For all analyses, the data reporting requirements will include those items necessary to complete data validation, including copies of all raw data. Laboratories will be required to maintain all records relevant to project analyses for a minimum of seven years. Data validation reports will be maintained by the Project Data Control Manager with the analytical data reports.

EIM data deliverables (in the appropriate format) will be submitted and successful input verified concurrent with delivery of the draft data report to Ecology via electronic email.

# 6 Sample Containers, Custody Procedures, Shipping, and Sample Identification

## 6.1 Sample Containers

Sample bottles will be provided by the analytical laboratory. Tables 15 and 16 present the required containers, preservation techniques, and holding times for soil and groundwater samples, respectively, to be collected at the Superlon site. The containers will be kept closed and in their shipping boxes until used. After sampling, the containers will be labeled, secured with chain-of-custody seals, placed in coolers, chilled to 4°C (where chilling is required), and shipped to the laboratory.

## 6.2 Custody Procedures

A chain-of-custody protocol will be followed to maintain and document sample possession. Each sample will be labeled immediately after collection. Each label will include, at a minimum, the following information:

- Project name and number.
- Initials of the collector.
- Date and time of collection.
- Number that uniquely identifies the sample and collection location.
- Preservative (if any).

Samples will be kept in the sampler's custody until the end of each day, when they will be delivered to the laboratory, located less than 2.5 miles from the site.

Samples will be transported to the analytical laboratory with chain-of-custody records, establishing the documentation necessary to trace sample possession from the time of collection. The chain-of-custody records will contain, at a minimum, the following information:

- Sample number.
- Signature of collector.
- Date and time of collection.
- Place of collection.
- Sample matrix.
- Signatures of persons involved in the chain of possession.
- Inclusive dates of possession.
- Condition of samples.

The chain-of-custody record also will be used to indicate what analyses are required by checking the appropriate box(es) on the form. Following proper sealing and labeling, sample containers will be placed in a chilled cooler. The cooler will be closed and sealed with a custody seal.

## 6.3 Sample Transport

As described above, samples will be accompanied by a properly completed chain-of-custody form. The original and yellow copies will accompany the shipment, and the pink and gold copies will be retained by the sampler for PERC's project files. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the project laboratory, or to/from a secure storage area.

Samples will be properly packaged for transport and dispatched to the laboratory for analysis, with a separate, signed custody record enclosed in each sample cooler.

If shipped, shipping containers will be secured with strapping tape and custody seals will be attached for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

If the samples will be delivered directly to the analytical laboratory by the sampler the above method to secure the transport containers will not be necessary as the sample will be handed directly to the laboratory technician and not handled by any additional individual.

## 6.4 Sample Identification

Whenever a sample, to be used in the RI, is collected or a measurement is made, a description of the sample location will be recorded. The type of sampling equipment will be noted, along with sample time, sample description, sample depth, and volume and number of containers. Field duplicates will receive a "-(01)" suffix. This is omitted for all other samples. Samples will be labeled uniquely and sequentially as follows:

Sample Naming Scheme:
MediaCode-SiteID-DateCode-TopDepth-BotDepth-(PTCTypeCode) – Be sure to use Dashes and Not Underscores

- Media Code = 2 Letter Code for Media Sampled At Location (see below)
- Site ID = 1 to 10 Letter/Number Code for Site ID (with Dash between Site ID and Site # (e.g., MW-01)
- DateCode = 6 Number Code for Date (no slashes between monthdayyear)
- TopDepth = Optional but must have 1 decimal point max.
- BotDepth = Optional but must have 1 decimal point max.
- PTCSampTypeCode = Optional (see below)
    - (01) – For Field Duplicate/Replicate #1/Test Case #1
    - (02) – Replicate #2 or Test Case #2
    - (03) – Replicate #3 or Test Case #3
    - (04) – Replicate #4 or Test Case #4
    - (05) – Replicate #5 or Test Case #5
    - (06) – Replicate #6 or Test Case #6
    - (07) – Replicate #7 or Test Case #7
    - (08) – Replicate #8 or Test Case #8
    - (09) – Replicate #9 or Test Case #9
    - (10) – Leachate Sample
    - (20) – Dissolved Sample (i.e., filtered in the field)

Note: PTCSampTypeCodes can be combined. For example, a PTCSampTypeCode of "(11)" indicates that the sample is a field duplicate of a leachate sample and a PTCSampTypeCode of "(21)" indicates that the sample is a field duplicate of a dissolved/filtered sample.
Examples:

- EF-EF-01-100112 – No Depth Interval
- EF-EF-01-100112-(01) – No Depth Interval & Field Duplicate Sample of EF-EF01-100112
- GW-MW-01-100112-10.5-20.5 – With Depth Intervals (10.5 to 20.5 feet)
- SO-SS-01-100112-0-0.5 – With Depth Intervals (0 to 0.5 feet)

Note: Examples of leachate and dissolved samples that require field duplicates or replicates:

- SO-SS-01-100112-0-0.5-(11) – Field Duplicate of Leachate sample with depth Intervals (0 to 0.5 feet).
- SO-SS-01-100112-0-0.5-(14) – Replicate #4 of Leachate sample with depth Intervals (0 to 0.5 feet).
- GW-MW-01-100112-10.5-20.5-(21) – Field Duplicate of Dissolved/Filtered groundwater sample with depth intervals (10.5 to 20.5 feet)
- GW-MW-01-100112-10.5-20.5-(23) – Replicate #3 Triplicate of Dissolved/Filtered groundwater sample with depth Intervals (10.5 to 20.5 feet).

| Media Codes | Explanation |
|---|---|
| GW | Groundwater |
| PP | Perched water |
| SO | Soil |
| SD | Sediment |
| SW | Surface water |

The sample naming scheme may be revised by PIONEER if data management and data loading processes should indicate a revision being beneficial to the project's reporting goals. Sample naming scheme changes will be approved by the Project Manager, if used.

# 7 Equipment Decontamination

Equipment decontamination and waste control during sampling activities is important to prevent the spread of contaminants, to ensure that no cross contamination occurs during sampling, and to ensure integrity of the work in a manner protective of human health and the environment.

Specifically, the main objectives are to:

- Contain contaminated aqueous and solid materials on the Superlon Property so that work performed does not cause the spread of hazardous constituents within or off the Superlon Property.
- Decontaminate drilling and sampling equipment so that hazardous constituents are not introduced into the subsurface or samples through cross contamination.
- All waste will be designated and disposed of properly in accordance with Washington State Dangerous Waste regulations, WAC 173-303 and in a manner that is protective of human health and the environment, per WAC 173-340-820(3) (c) (vi).

## 7.1 Drilling Equipment

Drilling equipment, including the auger flights and sampling tools, will be decontaminated and cleaned using a liquid detergent (Alconox or similar), and a water or steam washing system.

## 7.2 Soil Sampling Equipment

The following decontamination procedures will be used to decontaminate the soil sampling equipment:

- Rinse and pre-clean with potable water.
- Wash and scrub with a non-phosphate based detergent (Alconox or similar) and potable water.
- Rinse with potable tap water.
- Rinse with de-ionized water.

Solutions will be renewed as needed. Sponges and nylon scrubbers will be used during the first three decontamination procedures. Equipment will be air dried, if possible, and held in clean plastic bags between uses.

## 7.3 Groundwater Sampling Equipment

Surge blocks used for well development will be decontaminated as described in Section 7.2 – Soil Sampling Equipment. Tubing used for groundwater sampling will be reused for each event, and dedicated to each well.

The tape from the water level indicator will be rinsed with potable water, washed with a non-phosphate based detergent and rinsed again with potable water between each well measurement.

# 8 Waste Control

All investigation-derived waste will be drummed and labeled pending appropriate disposal. Drummed soil, groundwater, and decontamination water will be designated and disposed of through a contractor that specializes in waste and dangerous waste disposal.

Specifically, soil generated during drilling and water generated during groundwater development and purging will be placed in Department of Transportation (DOT) certified 55-gallon drums. The drums will be sealed and labeled to identify the contents, volume, and date. PERC will arrange for appropriate disposal of the drummed materials in accordance with WAC 173-303 and WAC 173-340-820.

Other waste generated during soil sampling (rubber gloves, paper towels, etc.) will be placed in plastic garbage bags and sealed shut. The garbage bags will be placed in a commercial waste collection container at Superlon's office for ultimate disposal in a sanitary landfill.

## 9 References

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. U.S. EPA 2018. SW-846 on-line. Test methods for evaluating solid wastes, physical/chemical methods. https://www.epa.gov/hw-sw846/sw-846-compendium (last updated on October 15, 2018). U.S. Environmental Protection Agency, Office of Solid Waste, Washington, DC.

# Tables

## TABLE 1A
## TARGET ANALYTES –DISSOLVED METALS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Dissolved Arsenic | 6020A/3005A | 5 | 1.35 | ug/L |
| Dissolved Lead | 6020A/3005A | 4 | 0.995 | ug/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
ug/L – micrograms per liter
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 1B

## TARGET ANALYTES – TOTAL AND DISSOLVED METALS IN GROUNDWATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Total Arsenic | 6020A/3005A | 5 | 1.35 | ug/L |
| Total Lead | 6020A/3005A | 4 | 0.995 | ug/L |
| Total Cadmium | 6020A/3005A | 2 | 0.5 | ug/L |
| Total Mercury | 7470A/7470A prep | 0.3 | 0.15 | ug/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
ug/L – micrograms per liter
MDLs and RLs provided by TestAmerica Seattle as of June 2017. These are continually updated and subject to change.

## TABLE 2A
## TARGET ANALYTES – SITE-SPECIFIC VOLATILE ORGANIC COMPOUNDS FOR POTENTIAL FUTURE GROUNDWATER MONITORING WELL SAMPLING

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Tetrachloroethene | 8260CLL (Low Level)/5030B | 0.5 | 0.07 | ug/L |
| Vinyl Chloride | 8260CLL (Low Level)/5030B | 0.02 | 0.013 | ug/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
ug/L – micrograms per liter
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 2B
## TARGET ANALYTES – VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | SITE- SPECIFIC VOC? | RL | MDL | UNITS |
|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | 8260CLL/5030B | | 0.2 | 0.25 | ug/L |
| 1,1,1-Trichloroethane | 8260CLL/5030B | | 0.2 | 0.25 | ug/L |
| 1,1,2,2-Tetrachloroethane | 8260CLL/5030B | | 10.2 | .25 | ug/L |
| 1,1,2-Trichloroethane | 8260CLL/5030B | | 10.2 | .25 | ug/L |
| 1,1,2-Trichlorotrifluoroethane | 8260CLL/5030B | | 0.5 | 0.075 | ug/L |
| 1,1-Dichloroethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| 1,1-Dichloroethene | 8260CLL/5030B | | 0.1 | 0.018 | ug/L |
| 1,1-Dichloropropene | 8260CLL/5030B | | 0.1 | 0.015 | ug/L |
| 1,2,3-Trichlorobenzene | 8260CLL/5030B | | 0.5 | 0.1 | ug/L |
| 1,2,3-Trichloropropane | 8260CLL/5030B | | 0.2 | 0.05 | ug/L |
| 1,2,4-Trichlorobenzene | 8260CLL/5030B | | 0.2 | 0.04 | ug/L |
| 1,2,4-Trimethylbenzene | 8260CLL/5030B | | 0.2 | 0.03 | ug/L |
| 1,2-Dibromo-3-chloropropane | 8260CLL/5030B | | 2 | 0.44 | ug/L |
| 1,2-Dibromoethane (EDB) | 8260CLL/5030B | | 0.1 | 0.025 | ug/L |
| 1,2-Dichlorobenzene | 8260CLL/5030B | | 0.3 | 0.05 | ug/L |
| 1,2-Dichloroethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| 1,2-Dichloroethene (Total) | 8260CLL/5030B | | **TBD** | **TBD** | ug/L |
| 1,2-Dichloropropane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| 1,3,5-Trimethylbenzene | 8260CLL/5030B | | 0.5 | 0.0830 | ug/L |
| 1,3-Dichlorobenzene | 8260CLL/5030B | | 0.3 | 0.05 | ug/L |
| 1,3-Dichloropropane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| 1,4-Dichlorobenzene | 8260CLL/5030B | | 0.3 | 0.05 | ug/L |
| 2,2-Dichloropropane | 8260CLL/5030B | | 0.5 | 0.06 | ug/L |
| 2-Butanone (MEK) | 8260CLL/5030B | | 15 | 2.5 | ug/L |
| 2-Chloroethylvinyl ether | 8260CLL/5030B | | 6 | 0.13 | ug/L |
| 2-Chlorotoluene | 8260CLL/5030B | | 0.5 | 0.07 | ug/L |
| 2-Hexanone | 8260CLL/5030B | | 2 | 0.38 | ug/L |
| 2-Propanol | 8260C/5030B | | 200 | 41.7 | ug/L |
| 4-Chlorotoluene | 8260CLL/5030B | | 0.3 | 0.05 | ug/L |
| 4-Methyl-2-pentanone | 8260CLL/5030B | | 5 | 0.5 | ug/L |
| Acetone | 8260CLL/5030B | | 2 | 0.4 | ug/L |
| Acetonitrile | 8260C/5030B | | 50 | 10 | ug/L |
| Acrolein | 8260CLL/5030B | | 15 | 2.5 | ug/L |
| Acrylonitrile | 8260CLL/5030B | | 5 | 0.75 | ug/L |
| Allyl chloride | 8260C/5030B | | 1 | 0.22 | ug/L |
| Benzene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Bromobenzene | 8260CLL/5030B | | 0.2 | 0.035 | ug/L |
| Bromochloromethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Bromodichloromethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Bromoform | 8260CLL/5030B | | 0.5 | 0.08 | ug/L |
| Bromomethane | 8260CLL/5030B | | 1 | 0.16 | ug/L |
| Carbon disculfide | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Carbon tetrachloride | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |

## TABLE 2B
## TARGET ANALYTES – VOLATILE ORGANIC COMPOUNDS
## IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | SITE- SPECIFIC VOC? | RL | MDL | UNITS |
|---|---|---|---|---|---|
| Chlorobenzene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Chloroethane | 8260CLL/5030B | | 0.5 | 0.075 | ug/L |
| Chloroform | 8260CLL/5030B | | 0.2 | 0.03 | ug/L |
| Chloromethane | 8260CLL/5030B | | 0.5 | 0.075 | ug/L |
| **Chloroprene** | **TBD**8260C/5030B | | 5 | 0.77 | ug/L |
| Cyclohexane | **TBD**8260C/5030B | | 3 | 0.56 | ug/L |
| Dibromochloromethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Dibromomethane | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Dichlorodifluoromethane | 8260CLL/5030B | | 0.4 | 0.05 | ug/L |
| Diisopropyl ether | 8260C/5030B | | 2 | 0.35 | ug/L |
| Ethanol | 8260C/5030B | | **TBD** | **TBD** | ug/L |
| Ethyl methacrylate | 8260C/5030B | | **10** | **1.5** | ug/L |
| Ethyl-tert-butyl ether | 8260CLL/5030B | | 0.5 | 0.04 | ug/L |
| Ethylbenzene | 8260CLL/5030B | | 0.2 | 0.05 | ug/L |
| Hexachloro-1,3-butadiene | 8260CLL/5030B | | 0.5 | 0.075 | ug/L |
| Iodomethane | 8260CLL/5030B | | 0.5 | 0.07 | ug/L |
| Isobutanol | **TBD** | | TBD | TBD | ug/L |
| Isopropylbenzene (Cumene) | 8260CLL/5030B | | 0.5 | 0.06 | ug/L |
| Methacrylonitrile | 8260C/5030B | | 15 | 3.17 | ug/L |
| Methyl acetate | 8260C/5030B | | 15 | 3.10 | ug/L |
| Methyl methacrylate | 8260C/5030B | | 80 | 15.9 | ug/L |
| Methyl-tert-butyl ether | 8260CLL/5030B | | 0.2 | 0.25 | ug/L |
| Methylcyclohexane | 8260C/5030B | | 2 | 0.49 | ug/L |
| Methylene chloride | 8260CLL/5030B | | 0.5 | 0.11 | ug/L |
| Naphthalene | 8260CLL/5030B | | 0.5 | 0.1 | ug/L |
| Propionitrile | 8260C/5030B | | 50 | 10.5 | ug/L |
| Styrene | 8260CLL/5030B | | 0.5 | 0.1 | ug/L |
| Tetrachloroethene | 8260CLL/5030B | **YES** | 0.5 | 0.07 | ug/L |
| Toluene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Trichloroethene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| Trichlorofluoromethane | 8260CLL/5030B | | 0.5 | 0.025 | ug/L |
| Vinyl acetate | 8260CLL/5030B | | 1 | 0.125 | ug/L |
| Vinyl chloride | 8260CLL/5030B | **YES** | 0.02 | 0.013 | ug/L |
| Xylene (Total) | 8260CLL/5030B | | 0.5 | 0.06 | ug/L |
| cis-1,2-Dichloroethene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| cis-1,3-Dichloropropene | 8260CLL/5030B | | 0.5 | 0.09 | ug/L |
| m&p-Xylene | 8260CLL/5030B | | 0.5 | 0.05 | ug/L |
| n-Butylbenzene | 8260CLL/5030B | | 0.5 | 0.08 | ug/L |
| n-Hexane | 8260CLL/5030B | | 0.2 | 0.03 | ug/L |
| n-Propylbenzene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| o-Xylene | 8260CLL/5030B | | 0.5 | 0.06 | ug/L |
| p-Isopropyltoluene | 8260CLL/5030B | | 0.3 | 0.05 | ug/L |
| sec-Butylbenzene | 8260CLL/5030B | | 0.5 | 0.07 | ug/L |

# TABLE 2B
# TARGET ANALYTES – VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | SITE- SPECIFIC VOC? | RL | MDL | UNITS |
|---|---|---|---|---|---|
| tert-Amylmethyl ether | 8260CLL/5030B | | 0.5 | 0.05 | ug/L |
| tert-Butyl Alcohol | 8260CLL/5030B | | 10 | 0.8 | ug/L |
| tert-Butylbenzene | 8260CLL/5030B | | 0.5 | 0.1 | ug/L |
| trans-1,2-Dichloroethene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| trans-1,3-Dichloropropene | 8260CLL/5030B | | 0.2 | 0.025 | ug/L |
| trans-1,4-Dichloro-2-butene | 8260CLL/5030B | | 2 | 0.375 | ug/L |

**Notes:**

MDL – Method Detection Limit;
RL – Reporting Limit
TBD – To Be Determined if required for analysis
ug/L – micrograms per liter
VOC – Volatile Organic Compound
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 3
## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| 1,2,4,5-Tetrachlorobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 1,2,4-Trichlorobenzene | 8270D/3520C | 0.4 | 0.04 | ug/L |
| 1,2-Dichlorobenzene | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 1,2-Diphenylhydrazine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 1,3,5-Trinitrobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 1,3-Dichlorobenzene | 8270D/3520C | 0.4 | 0.04 | ug/L |
| 1,3-Dinitrobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 1,4-Dichlorobenzene | 8270D/3520C | 0.4 | 0.06 | ug/L |
| 1,4-Dioxane (p-Dioxane) | **TBD** | **TBD** | **TBD** | ug/L |
| 1,4-Naphthoquinone | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 1-Methylnaphthalene | 8270D/3520C | 1 | 0.03 | ug/L |
| 1-Naphthalenamine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 2,3,4,6-Tetrachlorophenol | 8270D/3520C | **0.7** | **0.11** | ug/L |
| 2,4,5-Trichlorophenol | 8270D/3520C | 0.4 | 0.1 | ug/L |
| 2,4,6-Trichlorophenol | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 2,4-Dichlorophenol | 8270D/3520C | 0.4 | 0.91 | ug/L |
| 2,4-Dimethylphenol | 8270D/3520C | 4 | 0.83 | ug/L |
| 2,4-Dinitrophenol | 8270D/3520C | 5 | 1 | ug/L |
| 2,4-Dinitrotoluene | 8270D/3520C | 1 | 0.24 | ug/L |
| 2,6-Dichlorophenol | 8270D/3520C | 0.4 | 1 | ug/L |
| 2,6-Dinitrotoluene | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 2-Acetylaminofluorene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 2-Chloronaphthalene | 8270D/3520C | 1 | 0.02 | ug/L |
| 2-Chlorophenol | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 2-Methylnaphthalene | 8270D/3520C | 0.4 | 0.02 | ug/L |
| 2-Methylphenol(o-Cresol) | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 2-Napthalenamine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 2-Nitroaniline | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 2-Nitrophenol | 8270D/3520C | 1 | 0.24 | ug/L |
| 3&4-Methlphenol (m- and p-cresol) | 8270D/3520C | 0.8 | 0.04 | ug/L |
| 3,3’-Dichlorobenzidine | 8270D/3520C | 15 | 3.12 | ug/L |
| 3,3’-Dimethlbenzidine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 3-Methylcholanthrene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 3-Nitroaniline | 8270D/3520C | 3 | 0.73 | ug/L |
| 4,6-Dinitro-2-methlphenol | 8270D/3520C | 5 | 1 | ug/L |
| 4-Aminobiphenyl | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 4-Bromophenylphenyl ether | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 4-Chloro-3-methylphenol | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 4-Chloroaniline | 8270D/3520C | 10 | 2.1 | ug/L |
| 4-Chlorophenylphenyl ether | 8270D/3520C | 0.4 | 0.1 | ug/L |
| 4-Nitroaniline | 8270D/3520C | 0.6 | 0.1 | ug/L |
| 4-Nitrophenol | 8270D/3520C | 15 | 3.73 | ug/L |
| 5-Nitro-o-toluidine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| 7,12-Dimethylbenz(a)anthracene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Acenaphthene | 8270D/3520C | 0.4 | 0.02 | ug/L |
| Acenaphthylene | 8270D/3520C | 1 | 0.02 | ug/L |

## TABLE 3
## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| | | | | |
|---|---|---|---|---|
| Acetophenone | 8270D/3520C | **0.6** | **0.14** | ug/L |
| Aniline | 8270D/3520C | **15** | **1.95** | ug/L |
| Anthracene | 8270D/3520C | 0.04 | 0.01 | ug/L |
| Azobenzene | 8270D/3520C | 2 | 0.27 | ug/L |
| Benzidine | 8270D/3520C | **5** | **1** | ug/L |
| Benzo(a)anthracene | 8270DSIM /3510 | 0.02 | 0.002 | ug/L |
| Benzo(a)pyrene | 8270DSIM /3510 | 0.02 | 0.003 | ug/L |
| Benzo(b)fluoranthene | 8270DSIM /3510 | 0.02 | 0.008 | ug/L |
| Benzo(g,h,i)perylene | 8270DSIM /3510 | 0.02 | 0.003 | ug/L |
| Benzo(k)fluoranthene | 8270DSIM /3510 | 0.03 | 0.009 | ug/L |
| Benzoic acid | 8270D/3520C | 3 | 0.6 | ug/L |
| Benzyl alcohol | 8270D/3520C | 0.6 | 0.1 | ug/L |
| Butylbenzylphthalate | 8270D/3520C | 10 | 1.74 | ug/L |
| Carbazole | 8270D/3520C | 0.6 | 0.1 | ug/L |
| Chlorobenzilate | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Chrysene | 8270DSIM /3510 | 0.02 | 0.006 | ug/L |
| Di-n-butylphthalate | 8270D/3520C | 3 | 0.55 | ug/L |
| Di-n-octylphthalate | 8270D/3520C | 1 | 0.18 | ug/L |
| Diallate | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Diazinon | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Dibenz(a,h)acridine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Dibenz(a,h)anthracene | 8270DSIM /3510 | 0.02 | 0.002 | ug/L |
| Dibenzofuran | 8270D/3520C | 0.4 | 0.06 | ug/L |
| Diethylphthalate | 8270D/3520C | 12 | 2.83 | ug/L |
| Disulfoton | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Ethyl methanesulfonate | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Famphur | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Hexachloro-1,3-butadiene | 8270D/3520C | 1 | 0.1 | ug/L |
| Hexachlorobenzene | 8270D/3520C | 0.6 | 0.1 | ug/L |
| Hexachlorocyclopentadiene | 8270D/3520C | 2 | 0.39 | ug/L |
| Hexachloroethane | 8270D/3520C | 1 | 0.1 | ug/L |
| Hexachloropropene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Indeno(1,2,3-cd)pyrene | 8270D/3520C | 1 | 0.05 | ug/L |
| Isodrin | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Isophorone | 8270D/3520C | 0.4 | 0.1 | ug/L |
| Isosafrole | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Kepone | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Lead, Tetraethyl | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Methapyrilene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Methyl methanesulfonate | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Methyl parathion | 8270D/3520C | **TBD** | **TBD** | ug/L |
| N-Nitroso-di-n-butylamine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| N-Nitro-di-n-propylamine | 8270D/3520C | 0.6 | 0.1 | ug/L |
| N-Nitrosoiethyamine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| N-Nitrosodimethylamine | 8270D/3520C | 4 | 0.2 | ug/L |
| N-Nitrosodiphenylamine | 8270D/3520C | 3 | 0.1 | ug/L |
| N-Nitrosoimethylethylamine | 8270D/3520C | **TBD** | **TBD** | ug/L |

## TABLE 3
## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| | | | | |
|---|---|---|---|---|
| N-Nitrosopiperidine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| N-Nitrosopyrrolidine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Naphthalene | 8270D/3520C | 0.4 | 0.1 | ug/L |
| Nitrobenzene | 8270D/3520C | 0.6 | 0.1 | ug/L |
| O,O,O-Triethylphosphoothidene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| O-Toluidine | 8270D/3520C | **TBD** | **TBD** | ug/L |
| P-Dimethylaminoazobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Parathion (Ethyl parathion) | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Pentachlorobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Pentachloronitrobenzene | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Pentachlorophenol | 8270D SIM/3510C | 0.08 | 0.08 | ug/L |
| Phenacetin | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Phenanthrene | 8270D SIM/3510C | 0.02 | 0.004 | ug/L |
| Phenol | 8270D/3520C | 4 | 0.05 | ug/L |
| Phorate | 8270D/3520C | TBD | TBD | ug/L |
| Pronamide | 8270D/3520C | TBD | TBD | ug/L |
| Pyrene | 8270D SIM/3510C | 0.02 | 0.004 | ug/L |
| Pyridine | 8270D/3520C | 3 | 0.6 | ug/L |
| Safrole | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Terpineol | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Thionazin | 8270D/3520C | **TBD** | **TBD** | ug/L |
| Bis(2-Chloroethoxy)methane | 8270D/3520C | 0.6 | 0.1 | ug/L |
| Bis(2-Chloroethyl) ether | 8270D/3520C | 0.6 | 0.1 | ug/L |
| Bis(2-Chloroisopropyl) ether | 8270D/3520C | 0.4 | 0.1 | ug/L |
| Bis(2-Ethylhexyl)phthalate | 8270D/3520C | 15 | 2.19 | ug/L |
| n-Decane | 8270D/3520C | 6 | 1.33 | ug/L |
| n-Ocatadecane | 8270D/3520C | 1 | 0.13 | ug/L |
| p-Phenylenediamine | 8270D/3520C | **TBD** | **TBD** | ug/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
TBD – To Be Determined if required for analysis
ug/L – micrograms per liter
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 4
## TARGET ANALYTES – DIESEL RANGE ORGANICS, HEAVY OIL RANGE ORGANICS, AND GASOLINE RANGE ORGANICS IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Diesel Range Organics | NWTPH-Dx/3510CB | 0.1 | 0.019 | mg/L |
| Heavy Oil Range Organics | NWTPH-Dx/3510CB | 0.25 | 0.0770 | mg/L |
| Gasoline Range Organics | NWTPH-Gx/**5035B** | 0.25 | 0.05 | mg/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
mg/L – milligrams per liter
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 5
## TARGET ANALYTES – ORGANOCHLORINE PESTICIDES AND PCBs IN GROUNDWATER, PERCHED WATER AND SURFACE WATER FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| **Organochlorine Pesticides:** | | | | |
| Aldrin | 8081B/3510C | 0.03 | 0.007 | ug/L |
| alpha-BHC | 8081B/3510C | 0.03 | 0.007 | ug/L |
| beta-BHC | 8081B/3510C | 0.05 | 0.012 | ug/L |
| delta-BHC | 8081B/3510C | 0.05 | 0.01 | ug/L |
| gamma-BHC (Lindane) | 8081B/3510C | 0.03 | 0.005 | ug/L |
| alpha-Chlordane | 8081B/3510C | 0.02 | 0.003 | ug/L |
| gamma-Chlordane | 8081B/3510C | 0.02 | 0.003 | ug/L |
| Chlordane (technical) | 8081B/3510C | 0.2 | 0.03 | ug/L |
| 4,4’-DDD | 8081B/3510C | 0.03 | 0.006 | ug/L |
| 4,4’-DDE | 8081B/3510C | 0.02 | 0.003 | ug/L |
| 4,4’-DDT | 8081B/3510C | 0.03 | 0.005 | ug/L |
| Dieldrin | 8081B/3510C | 0.03 | 0.005 | ug/L |
| Endosulfan I | 8081B/3510C | 0.02 | 0.003 | ug/L |
| Endosulfan II | 8081B/3510C | 0.02 | 0.002 | ug/L |
| Endosulfan sulfate | 8081B/3510C | 0.02 | 0.002 | ug/L |
| Endrin | 8081B/3510C | 0.02 | 0.003 | ug/L |
| Endrin aldehyde | 8081B/3510C | 0.2 | 0.034 | ug/L |
| Endrin ketone | 8081B/3510C | 0.02 | 0.002 | ug/L |
| Heptachlor | 8081B/3510C | 0.02 | 0.004 | ug/L |
| Heptachlor epoxide | 8081B/3510C | 0.02 | 0.003 | ug/L |
| Hexachlorobenzene | 8081B/3510C | 0.05 | 0.001 | ug/L |
| Hexachlorobutadiene | 8081B/3510C | 0.05 | 0.002 | ug/L |
| Methoxychlor | 8081B/3510C | 0.1 | 0.002 | ug/L |
| Toxaphene | 8081B/3510C | 1 | 0.22 | ug/L |
| **PCBS:** | | | | |
| PCB-1016[1] | 8082/3510C | 0.5 | 0.021 | ug/L |
| PCB-1221[1] | 8082/3510C | 0.5 | 0.03 | ug/L |
| PCB-1232[1] | 8082/3510C | 0.5 | 0.027 | ug/L |
| PCB-1242[1] | 8082/3510C | 0.5 | 0.028 | ug/L |
| PCB-1248[1] | 8082/3510C | 0.5 | 0.021 | ug/L |
| PCB-1254[1] | 8082/3510C | 0.5 | 0.02 | ug/L |
| PCB-1260[1] | 8082/3510C | 0.5 | 0.026 | ug/L |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
ug/L – micrograms per liter
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 6

## TARGET ANALYTES – TOTAL METALS IN SOIL/SEDIMENT/FILL/DEBRIS AND BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Arsenic | 6010C/3050B | 3 | 0.2 | mg/Kg |
| Barium | 6010C/3050B | 0.5 | 0.079 | mg/Kg |
| Cadmium | 6010C/3050B | 1 | 0.049 | mg/Kg |
| Chromium | 6010C/3050B | 1.3 | 0.038 | mg/Kg |
| Lead | 6010C/3050B | 1 .5 | 0.222 | mg/Kg |
| Mercury | 7471A/7471A prep | 0.02 | 0.0063 | mg/Kg |
| Selenium | 6010C/3050B | 5 | 0.2 | mg/Kg |
| Silver | 6010C/3050B | 2.5 | 0.56 | mg/Kg |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
mg/kg – milligrams per kilogram
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 7

## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS AND PCBS IN SOIL/SEDIMENT/FILL/DEBRIS AND BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| 1,2,4-Trichlorobenzene | 8270D/3550B | 50 | 6 | ug/kg |
| 1,2-Dichlorobenzene | 8270D/3550B | 50 | 12 | ug/kg |
| 1,2-Diphenylhydrazine | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| 1,3-Dichlorobenzene | 8270D/3550B | 50 | 4.8 | ug/kg |
| 1,4-Dichlorobenzene | 8270D/3550B | 50 | 8.3 | ug/kg |
| 1-Methylnaphthalene | 8270D/3550B | 30 | 5 | ug/kg |
| 2,3,4,6-Tetrachlorophenol | 8270D/3550B | 200 | 48 | ug/kg |
| 2,4,5-Trichlorophenol | 8270D/3550B | 200 | 45 | ug/kg |
| 2,4,6-Trichlorophenol | 8270D/3550B | 150 | 36 | ug/kg |
| 2,4-Dichlorophenol | 8270D/3550B | 100 | 15 | ug/kg |
| 2,4-Dimethylphenol | 8270D/3550B | 100 | 15 | ug/kg |
| 2,4-Dinitrophenol | 8270D/3550B | 1,000 | 200 | ug/kg |
| 2,4-Dinitrotoluene | 8270D/3550B | 200 | 43 | ug/kg |
| 2,6-Dinitrotoluene | 8270D/3550B | 150 | 34 | ug/kg |
| 2-Chlorobenzyl alcohol | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| 2-Chlorobenzyl chloride | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| 2-Chloronaphthalene | 8270D/3550B | 25 | 5 | ug/kg |
| 2-Chlorophenol | 8270D/3550B | 200 | 42 | ug/kg |
| 2-Methylnaphthalene | 8270D/3550B | 50 | 8.8 | ug/kg |
| 2-Methylphenol (o-Cresol) | 8270D/3550B | 150 | 37 | ug/kg |
| 2-Nitroaniline | 8270D/3550B | 100 | 15 | ug/kg |
| 2-Nitrophenol | 8270D/3550B | 200 | 46 | ug/kg |
| 3&4-Methylphenol (m- and p-cresol) | 8270D/3550B | 200 | 15 | ug/kg |
| 3,3’-Dichlorobenzidine | 8270D/3550B | 400 | 100 | ug/kg |
| 3-Nitroaniline | 8270D/3550B | 200 | 40 | ug/kg |
| 4,6-Dinitro-2-methylphenol | 8270D/3550B | 1,000 | 100 | ug/kg |
| 4-Bromophenylphenyl ether | 8270D/3550B | 200 | 41 | ug/kg |
| 4-Chloro-3-methylphenol | 8270D/3550B | 150 | 33 | ug/kg |
| 4-Chloroaniline | 8270D/3550B | 1500 | 400 | ug/kg |
| 4-Chlorophenylphenyl ether | 8270D/3550B | 200 | 41 | ug/kg |
| 4-Nitroaniline | 8270D/3550B | 100 | 20 | ug/kg |
| 4-Nitrophenol | 8270D/3550B | 1500 | 368 | ug/kg |
| 6-Methylchrysene | 8270D/3550B | TBD | TBD | ug/kg |
| 7,12-Dimethylbenz(a)anthracene | 8270D/3550B | TBD | TBD | ug/kg |
| Acenaphthene | 8270D/3550B | 25 | 5 | ug/kg |
| Acenaphthylene | 8270D/3550B | 25 | 5 | ug/kg |
| Acetophenone | 8270D/3550B | 300 | 15 | ug/kg |
| Acridine | 8270D/3550B | TBD | TBD | ug/kg |
| Aniline | 8270D/3550B | 1000 | 400 | ug/kg |
| Anthracene | 8270D/3550B | 25 | 5 | ug/kg |
| Azobenzene | 8270D/3550B | 200 | 42 | ug/kg |
| Benenethiol (Thiophenol) | 8270D/3550B | TBD | TBD | ug/kg |
| Benzidine | 8270D/3550B | 1000 | 153 | ug/kg |
| Benzo(a)anthracene | 8270D/3550B | 25 | 5 | ug/kg |
| Benzo(a)pyrene | 8270D/3550B | 60 | 13 | ug/kg |

## TABLE 7

## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS AND PCBS IN SOIL/SEDIMENT/FILL/DEBRIS AND BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Benzo(b)fluoranthene | 8270D/3550B | 25 | 5 | ug/kg |
| Benzo(g,h,i)perylene | 8270D/3550B | 60 | 15 | ug/kg |
| Benzo(k)fluoranthene | 8270D/3550B | 60 | 14 | ug/kg |
| Benzoic acid | 8270D/3550B | 2,500 | 1060 | ug/kg |
| Benzyl alcohol | 8270D/3550B | 4000 | 37 | ug/kg |
| Butylbenzylphthalate | 8270D/3550B | 200 | 50 | ug/kg |
| Carbazole | 8270D/3550B | 150 | 31 | ug/kg |
| Chrysene | 8270D/3550B | 60 | 13 | ug/kg |
| Di-n-butylphthalate | 8270D/3550B | 500 | 57 | ug/kg |
| Di-n-octylphthalate | 8270D/3550B | 1000 | 222 | ug/kg |
| Dibenz(a,h)acridine | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Dibenz(a,h)anthracene | 8270D/3550B | 50 | 12 | ug/kg |
| Dibenzofuran | 8270D/3550B | 150 | 36 | ug/kg |
| Diethyl phthalate | 8270D/3550B | 550 | 132 | ug/kg |
| Dimethyl phthalate | 8270D/3550B | 150 | 33 | ug/kg |
| Fluoranthene | 8270D/3550B | 25 | 5 | ug/kg |
| Fluorene | 8270D/3550B | 25 | 5 | ug/kg |
| Hexachloro-1,3-butadiene | 8270D/3550B | 50 | 15 | ug/kg |
| Hexachlorobenzene | 8270D/3550B | 50 | 5 | ug/kg |
| Hexachlorocyclopentadiene | 8270D/3550B | 100 | 26 | ug/kg |
| Hexachloroethane | 8270D/3550B | 150 | 38 | ug/kg |
| Indene | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Indeno(1,2,3-cd)pyrene | 8270D/3550B | 40 | 5 | ug/kg |
| Isophorone | 8270D/3550B | 150 | 37 | ug/kg |
| Lead, Tetraethyl | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| N-Nitro-di-n-propylamine | 8270D/3550B | 200 | 44 | ug/kg |
| N-Nitrosodimethylamine | 8270D/3550B | 2000 | 412 | ug/kg |
| N-Nitrosodiphenylamine | 8270D/3550B | 60 | 15 | ug/kg |
| Naphthalene | 8270D/3550B | 25 | 5 | ug/kg |
| Nitrobenzene | 8270D/3550B | 200 | 42 | ug/kg |
| Pentachlorobenzene | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Pentachlorophenol | 8270D/3550B | 400 | 91 | ug/kg |
| Phenanthrene | 8270D/3550B | 60 | 12 | ug/kg |
| Phenol | 8270D/3550B | 150 | 38 | ug/kg |
| Pyrene | 8270D/3550B | 60 | 15 | ug/kg |
| Pyridine | 8270D/3550B | 2000 | 600 | ug/kg |
| Quinoline | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Bis(2-Chloroethoxy)methane | 8270D/3550B | 200 | 41 | ug/kg |
| Bis(2-Chloroethyl) ether | 8270D/3550B | 100 | 15 | ug/kg |
| Bis(2-Chloroisopropyl) ether | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Bis(2-Ethylhexyl)adipate | 8270D/3550B | **TBD** | **TBD** | ug/kg |
| Bis(2-Ethylhexyl)phthalate | 8270D/3550B | 600 | 136 | ug/kg |
| **PCBS:** | | | | |
| PCB-1016[1] | 8082A/3546 | 0.01 | 0.0032 | mg/kg |
| PCB-1221[1] | 8082A/3546 | 0.011 | 0.008 | mg/kg |

## TABLE 7

## TARGET ANALYTES – SEMIVOLATILE ORGANIC COMPOUNDS AND PCBS IN SOIL/SEDIMENT/FILL/DEBRIS AND BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| PCB-1232[1] | 8082A/3546 | 0.011 | 0.0049 | mg/kg |
| PCB-1242[1] | 8082A/3546 | 0.01 | 0.0016 | mg/kg |
| PCB-1248[1] | 8082A/3546 | 0.01 | 0.0029 | mg/kg |
| PCB-1254[1] | 8082A/3546 | 0.01 | 0.0015 | mg/kg |
| PCB-1260[1] | 8082A/3546 | 0.01 | 0.0019 | mg/kg |

**Notes:**

[1] Analysis will only be conducted on painted surfaces of metal walls
MDL – Method Detection Limit;
RL – Reporting Limit
TBD – To Be Determined if required for analysis
ug/kg – micrograms per kilogram
mg/kg – milligrams per kilogram
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 8
## TARGET ANALYTES – DIESEL AND GASOLINE RANGE ORGANICS IN SOIL/SEDIMENT/FILL FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Diesel Range Organics | NWTPH-Dx/3546 | 50 | 12.3 | mg/Kg |
| Motor Oil Range Organics | NWTPH-Dx/3546 | 50 | 9.1 | mg/kg |
| Gasoline Range Organics | NWTPH-Gx/5035A | 4 | 2.09 | mg/Kg |

**Notes:**
MDL – Method Detection Limit;
RL – Reporting Limit
mg/kg – milligrams per kilogram
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 9
## TARGET ANALYTES – VOLATILE ORGANIC COMPOUNDS IN SOIL/SEDIMENT/FILL/DEBRIS/BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | SITE SPECIFIC VOC | RL | MDL | UNITS |
|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | 8260C/5035A | | 1 | 0.24 | ug/Kg |
| 1,1,1-Trichloroethane | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| 1,1,2,2-Tetrachloroethane | 8260C/5035A | | 4 | 0.9 | ug/Kg |
| 1,1,2-Trichloroethane | 8260C/5035A | | 2 | 00.25 | ug/Kg |
| 1,1,2-Trichlorotrifluoroethane | 8260C/5035A | | **3** | 0.52 | ug/Kg |
| 1,1-Dichloroethane | 8260C/5035A | | 1 | 0.19 | ug/Kg |
| 1,1-Dichloroethene | 8260C/5035A | | 5 | 0.5 | ug/Kg |
| 1,1-Dichloropropene | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| 1,2,3-Trichlorobenzene | 8260C/5035A | | 3 | 0.6 | ug/Kg |
| 1,2,3-Trichloropropane | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| 1,2,4-Trichlorobenzene | 8260C/5035A | | 2 | 0.4 | ug/Kg |
| 1,2,4-Trimethylbenzene | 8260C/5035A | | 2 | 0.16 | ug/Kg |
| 1,2-Dibromo-3-chloropropane | 8260C/5035A | | 10 | 1.6 | ug/Kg |
| 1,2-Dibromoethane (EDB) | 8260C/5035A | | 1 | 0.2 | ug/Kg |
| 1,2-Dichlorobenzene | 8260C/5035A | | 2 | 0.31 | ug/Kg |
| 1,2-Dichloroethane | 8260C/5035A | | 1 | 0.15 | ug/Kg |
| 1,2-Dichloroethene (Total) | 8260C/5035A | | **TBD** | **TBD** | ug/Kg |
| 1,2-Dichloropropane | 8260C/5035A | | 20 | 2.4 | ug/Kg |
| 1,3,5-Trimethylbenzene | 8260C/5035A | | 5 | 0.17 | ug/Kg |
| 1,3-Dichlorobenzene | 8260C/5035A | | 2 | .26 | ug/Kg |
| 1,3-Dichloropropane | 8260C/5035A | | 2 | 0.23 | ug/Kg |
| 1,4-Dichlorobenzene | 8260C/5035A | | 1 | 0.2 | ug/Kg |
| 2,2-Dichloropropane | 8260C/5035A | | 5 | 0.9 | ug/Kg |
| 2-Butanone (MEK) | 8260C/5035A | | 40 | 8.9 | ug/Kg |
| 2-Chlorotoluene | 8260C/5035A | | 2 | 0.17 | ug/Kg |
| 2-Hexanone | 8260C/5035A | | 20 | 3.9 | ug/Kg |
| 4-Chlorotoluene | 8260C/5035A | | 2 | 0.2 | ug/kg |
| 4-Methyl-2-pentanone | 8260C/5035A | | 10 | 1.5 | ug/Kg |
| Acetone | 8260C/5035A | | 15 | 2.4 | ug/Kg |
| Benzene | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Bromobenzene | 8260C/5035A | | 10 | 2.3 | ug/Kg |
| Bromochloromethane | 8260C/5035A | | 2 | 0.25 | ug/Kg |
| Bromodichloromethane | 8260C/5035A | | 1 | 0.18 | ug/Kg |
| Bromoform | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Bromomethane | 8260C/5035A | | 1 | 0.2 | ug/Kg |
| Carbon disculfide | 8260C/5035A | | 1 | 0.2 | ug/Kg |
| Carbon tetrachloride | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Chlorobenzene | 8260C/5035A | | 2 | 0.4 | ug/Kg |
| Chloroethane | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| Chloroform | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Chloromethane | 8260C/5035A | | 1 | 0.14 | ug/Kg |
| Dibromochloromethane | 8260C/5035A | | 2 | 0.27 | ug/Kg |
| Dibromomethane | 8260C/5035A | | 1 | 0.17 | ug/Kg |
| Dichlorodifluoromethane | 8260C/5035A | | 2 | 0.49 | ug/Kg |

# TABLE 9
# TARGET ANALYTES – VOLATILE ORGANIC COMPOUNDS IN SOIL/SEDIMENT/FILL/DEBRIS/BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | SITE SPECIFIC VOC | RL | MDL | UNITS |
|---|---|---|---|---|---|
| Diisopropyl ether | 8260C/5035A | | 10 | 0.3 | ug/Kg |
| Ethanol | 8260C/5035A | | **TBD** | **TBD** | ug/Kg |
| Ethyl-tert-butyl ether | 8260C/5035A | | 10 | 0.3 | ug/Kg |
| Ethylbenzene | 8260C/5035A | | 2 | 0.4 | ug/Kg |
| Hexachloro-1,3-butadiene | 8260C/5035A | | 3 | 0.6 | ug/Kg |
| Isopropylbenzene (Cumene) | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| Methyl-tert-butyl ether | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Methylene chloride | 8260C/5035A | | 15 | 0.24 | ug/Kg |
| Naphthalene | 8260C/5035A | | 10 | 1.8 | ug/Kg |
| Styrene | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| Tetrachloroethene | 8260C/5035A | **YES** | 2 | 0.4 | ug/Kg |
| Toluene | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Trichloroethene | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Trichlorofluoromethane | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| Vinyl chloride | 8260C/5035A | **YES** | 2 | 0.3 | ug/Kg |
| Xylene (Total) | 8260C/5035A | | 2 | 0.26 | ug/Kg |
| cis-1,2-Dichloroethene | 8260C/5035A | | 2 | 0.3 | ug/Kg |
| cis-1,3-Dichloropropene | 8260C/5035A | | 1 | 0.2 | ug/Kg |
| m&p-Xylene | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| n-Butylbenzene | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| n-Hexane | 8260C/5035A | | 5 | 0.75 | ug/Kg |
| n-Propylbenzene | 8260C/5035A | | 2 | 0.32 | ug/Kg |
| o-Xylene | 8260C/5035A | | 2 | 0.26 | ug/Kg |
| p-Isopropyltoluene | 8260C/5035A | | **2** | **0.4** | ug/Kg |
| sec-Butylbenzene | 8260C/5035A | | 2 | 0.25 | ug/Kg |
| tert-Amylmethyl ether | 8260C/5035A | | 10 | 0.2 | ug/Kg |
| tert-Butyl Alcohol | 8260C/5035A | | 600 | 126 | ug/Kg |
| tert-Butylbenzene | 8260C/5035A | | 2 | 0.2 | ug/Kg |
| trans-1,2-Dichloroethene | 8260C/5035A | | 2 | 0.4 | ug/Kg |
| trans-1,3-Dichloropropene | 8260C/5035A | | 10 | 1.4 | ug/Kg |

**Notes:**
MDL – Method Detection Limit
RL – Reporting Limit
TBD – To Be Determined if required for analysis
ug/kg – micrograms per kilogram
VOC – Volatile Organic Compound
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 10
## TARGET ANALYTES – ORGANOCHLORINE PESTICIDES AND PCBS IN SOIL/SEDIMENT FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| **Organochlorine Pesticides:** | | | | |
| Aldrin | 8081B/3546 | 1.0 | 0.09 | ug/Kg |
| alpha-BHC | 8081B/3546 | 1.0 | 0.16 | ug/Kg |
| beta-BHC | 8081B/3546 | 2 | 0.47 | ug/Kg |
| delta-BHC | 8081B/3546 | 1.0 | 0.1 | ug/Kg |
| gamma-BHC (Lindane) | 8081B/3546 | 1.0 | 0.03 | ug/Kg |
| alpha-Chlordane | 8081B/3546 | 1.0 | 0.12 | ug/Kg |
| gamma-Chlordane | 8081B/3546 | 1.0 | 0.19 | ug/Kg |
| Chlordane (technical) | 8081B/3546 | 10 | 0.77 | ug/Kg |
| 4,4'-DDD | 8081B/3546 | 2.0 | 0.09 | ug/Kg |
| 4,4'-DDE | 8081B/3546 | 2.0 | 0.06 | ug/Kg |
| 4,4'-DDT | 8081B/3546 | 2.0 | 0.14 | ug/Kg |
| Dieldrin | 8081B/3546 | 2.0 | 0.35 | ug/Kg |
| Endosulfan I | 8081B/3546 | 1 | 0.13 | ug/Kg |
| Endosulfan II | 8081B/3546 | 2.0 | 0.05 | ug/Kg |
| Endosulfan sulfate | 8081B/3546 | 2.0 | 0.8 | ug/Kg |
| Endrin | 8081B/3546 | 2.0 | 0.12 | ug/Kg |
| Endrin aldehyde | 8081B/3546 | 2.0 | 0.48 | ug/Kg |
| Endrin ketone | 8081B/3546 | 2.0 | 0.36 | ug/Kg |
| Heptachlor | 8081B/3546 | 2.0 | 0.06 | ug/Kg |
| Heptachlor epoxide | 8081B/3546 | 1 | 0.3 | ug/Kg |
| Hexachlorobenzene | 8081B/3546 | 1.00 | 0.08 | ug/Kg |
| Hexachlorobutadiene | 8081B/3546 | 1.00 | 0.1 | ug/Kg |
| Methoxychlor | 8081B/3546 | 10 | 0.37 | ug/Kg |
| Toxaphene | 8081B/3546 | 100 | 6.76 | ug/Kg |
| **Polychlorinated Biphenyls:** | | | | |
| PCB-1016[1] | 8082A/3546 | 0.5 | 0.065 | ug/Kg |
| PCB-1221[1] | 8082A/3546 | 0.5 | 0.068 | ug/Kg |
| PCB-1232[1] | 8082A/3546 | 0.5 | 0.055 | ug/Kg |
| PCB-1242[1] | 8082A/3546 | 0.5 | 0.078 | ug/Kg |
| PCB-1248[1] | 8082A/3546 | 0.5 | 0.06 | ug/Kg |
| PCB-1254[1] | 8082A/3546 | 0.5 | 0.079 | ug/Kg |
| PCB-1260[1] | 8082A/3546 | 0.5 | 0.057 | ug/Kg |

**Notes:**
MDL – Method Detection Limit
RL – Reporting Limit
ug/kg – micrograms per kilogram
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 11

## TARGET ANALYTES – TCLP ANALYSIS OF DEBRIS AND BUILDING MATERIALS FOR POTENTIAL FUTURE SAMPLING EVENTS

| ANALYTE | METHOD | RL | MDL | UNITS |
|---|---|---|---|---|
| Arsenic | 6010C | 0.06 | 0.003 | mg/L |
| Lead | 6010C | 0.03 | 0.0026 | mg/L |
| Cadmium | 6010C | 0.02 | 0.0005 | mg/L |
| Mercury | 7470A | 0.0003 | 0.00015 | mg/L |
| Pentachlorophenol | 8270D | 0.005 | 0.00077 | mg/L |

**Notes:**
MDL – Method Detection Limit
RL – Reporting Limit
mg/L – milligrams per liter
TCLP – Toxicity Characteristic Leaching Procedure
MDLs and RLs provided by TestAmerica Seattle as of December 2013. These are continually updated and subject to change.

## TABLE 12
## QUALITY CONTROL PARAMETERS – INORGANIC ELEMENTS, VOLATILES, AND SEMIVOLATILES

| QUALITY CONTROL PARAMETERS | INORGANIC ELEMENTS | VOLATILES | SEMIVOLATILES + Organochlorine Pesticides + PCBs | MERCURY |
|---|---|---|---|---|
| Equipment Blank | One every 20 samples (minimum of one per day per matrix)<br><RL | One every 20 samples (minimum of one per day per matrix)<br><RL | One every 20 samples (minimum of one per day per matrix)<br><RL | One every 20 samples (minimum of one per day per matrix)<br><RL |
| Field Duplicate | One every 20 samples<br>≤30 RPD | One every 20 samples<br>≤30 RPD | One every 10 samples<br>≤30 RPD | One every 20 samples<br>≤30 RPD |
| Trip Blank | N/A | 1 Trip Blank per sample cooler submitted to lab<RL | N/A | N/A |
| Method (Laboratory) Blank | Daily per batch per matrix<br><RL | Daily per batch<br><RL (<5 x RL for common lab contaminants) | Daily per batch per matrix<br><RL | <ML; per batch per day per matrix |
| Laboratory Control Sample | One per 20 samples per matrix<br>%Recovery | One per 20 samples per matrix<br>%Recovery | One per 10 samples per matrix<br>%Recovery | One per 20 samples per matrix<br>% Recovery |
| Laboratory Control Sample Duplicate | One per 20 samples per matrix<br>% Recovery<br>RPD | One per 20 samples per matrix<br>% Recovery<br>RPD | One per 10 samples per matrix<br>%Recovery<br>RPD | One per 20 samples per matrix<br>% Recovery<br>RPD |
| Surrogate | N/A | All samples, standards and blanks. | N/A | N/A |
| Matrix Spike | One per 20 samples per matrix<br>%Recovery | One per 20 samples per matrix<br>%Recovery | One per 10 samples per matrix<br>%Recovery | N/A |
| Matrix Spike Duplicate | One per 20 samples per matrix<br>% Recovery<br>RPD | One per 20 samples per matrix<br>% Recovery<br>RPD | One per 10 samples per matrix<br>%Recovery<br>RPD | N/A |

**Notes:**
N/A – Not Applicable
ML – Minimum Level – level at which the entire analytical system must give a recognizable signal and acceptable calibration point.
RPD – Relative Percent Difference

## TABLE 13
## QUALITY CONTROL PARAMETERS - DIESEL AND GASOLINE RANGE ORGANICS

| QUALITY CONTROL PARAMETERS | DIESEL-RANGE ORGANICS | GASOLINE-RANGE ORGANICS |
|---|---|---|
| Equipment Blank | One every 20 samples (minimum of one per day per matrix)<br><RL | One every 20 samples (minimum of one per day per matrix)<br><RL |
| Field Duplicate | One every 20 samples<br>≤30 RPD | One every 20 samples<br>≤30 RPD |
| Trip Blank | N/A | 1 Trip Blank per sample cooler submitted to lab |
| Method (Laboratory) Blank | One with each extraction batch | One with each extraction batch |
| Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD) | One pair per extraction batch<br>% Recovery<br>RPD | LCS only - LCSD if there is no MS/MSD<br>% Recovery<br>RPD |
| Surrogate | All samples, standards, and blanks | All samples, standards, and blanks |
| Matrix Spike (MS) | One with each extraction batch<br>% Recovery | One with each extraction batch<br>% Recovery |
| Matrix Spike Duplicate (MSD) | One with each extraction batch<br>% Recovery<br>RPD | One with each extraction batch<br>% Recovery<br>RPD |

**Notes:**
N/A – Not Applicable
RPD – Relative Percent Difference

## TABLE 14A
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR ANNUAL GROUNDWATER MONITORING WELL SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| **Metals-6010C and 6020A** | | | | |
| Arsenic | 80-120 | 20 | 80-120 | 20 |
| Cadmium | 80-120 | 20 | 80-120 | 20 |
| Lead | 80-120 | 20 | 80-120 | 20 |
| **Mercury 7470A** | | | | |
| Mercury | 80-120 | 20 | 80-120 | 20 |
| **GC/MS VOLATILE ORGANIC COMPOUNDS-8260B (low-level)** | | | | |
| Vinyl chloride | 80-112 | 20 | 47-160 | 20 |
| Tetrachloroethene | 65-140 | 20 | 64-161 | 20 |
| **GC/MS SEMI-VOLATILE ORGANIC COMPOUNDS-8270D** | | | | |
| Pentachlorophenol | 20-145 | 20 | 20-145 | 20 |
| **PETROLEUM COMPOUNDS – DIESEL RANGE-NWTPH-Dx w/Silica Gel Cleanup** | | | | |
| Diesel Range Organics | 70-140 | 27 | 70-140 | 27 |
| Heavy Oil Range Organics | 66-125 | 27 | 66-125 | 27 |
| **PETROLEUM COMPOUNDS – GASOLINE RANGE-NWTPH-Gx** | | | | |
| Gasoline Range Organics | 79-110 | 20 | 50-150 | 35 |

**Notes:**
LCS – Laboratory Control Sample
%R – Percent Recovery
RPD – Relative Percent Difference
MS/MSD – Matrix Spike/Matrix Spike Duplicate
GC/MS – Gas Chromatograph/Mass Spectrometry
N/A - Not Applicable
QC limits provided by TestAmerica Seattle, but are continually updated and subject to change; the QC limits listed above are representative of historical laboratory values and the most current in-house generated limits will be reported as data are generated.
[a] – additional compounds may or may not be used in LCS and MS/MSD analyses

## TABLE 14B
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR POTENTIAL AQUEOUS SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| **Metals-6010C and 6020A** | | | | |
| Arsenic | 80-120 | 20 | 80-120 | 20 |
| Barium | 80-120 | 20 | 80-120 | 20 |
| Cadmium | 80-120 | 20 | 80-120 | 20 |
| Chromium | 80-120 | 20 | 80-120 | 20 |
| Lead | 80-120 | 20 | 80-120 | 20 |
| Selenium | 80-120 | 20 | 80-120 | 20 |
| Silver | 80-120 | 20 | 80-120 | 20 |
| **Mercury 7470A** | | | | |
| Mercury | 80-120 | 20 | 80-120 | 20 |
| **GC/MS VOLATILE ORGANIC COMPOUNDS-8260 B** | | | | |
| 1,1,1,2-Tetrachloroethane | 80-130 | 30 | 80-130 | 30 |
| 1,1,1-Trichloroethane | 65-130 | 30 | 65-130 | 30 |
| 1,1,2,2-Tetrachloroethane | 65-130 | 30 | 65-130 | 30 |
| 1,1,2-Trichloroethane | 75-125 | 30 | 75-125 | 30 |
| 1,1-Dichloroethane | 70-135 | 30 | 70-135 | 30 |
| 1,1-Dichloroethene | 70-130 | 30 | 70-130 | 30 |
| 1,1-Dichloropropene | 75-130 | 30 | 75-130 | 30 |
| 1,2,3-Trichlorobenzene | 55-140 | 30 | 55-140 | 30 |
| 1,2,3-Trichloropropane | 75-125 | 30 | 75-125 | 30 |
| 1,2,4-Trichlorobenzene | 65-135 | 30 | 65-135 | 30 |
| 1,2,4-Trimethylbenzene | 75-130 | 30 | 75-130 | 30 |
| 1,2-Dibromo-3-Chloropropane | 50-130 | 30 | 50-130 | 30 |
| 1,2-Dichlorobenzene | 70-120 | 30 | 70-120 | 30 |
| 1,2-Dichloroethane | 70-130 | 30 | 70-130 | 30 |
| 1,2-Dichloropropane | 75-125 | 30 | 75-125 | 30 |
| 1,3,5-Trimethylbenzene | 75-130 | 30 | 75-130 | 30 |
| 1,3-Dichlorobenzene | 75-125 | 30 | 75-125 | 30 |
| 1,3-Dichloropropane | 75-125 | 30 | 75-125 | 30 |
| 1,4-Dichlorobenzene | 75-125 | 30 | 75-125 | 30 |
| 2,2-Dichloropropane | 70-135 | 30 | 70-135 | 30 |
| 2-Chlorotoluene | 75-125 | 30 | 75-125 | 30 |
| 4-Chlorotoluene | 75-130 | 30 | 75-130 | 30 |
| 4-Isopropyltoluene | 75-130 | 30 | 75-130 | 30 |
| Benzene | 80-120 | 30 | 80-120 | 30 |
| Bromobenzene | 75-125 | 30 | 75-125 | 30 |
| Bromoform | 70-130 | 30 | 70-130 | 30 |
| Bromomethane | 30-145 | 30 | 30-145 | 30 |
| Carbon tetrachloride | 65-140 | 30 | 65-140 | 30 |
| Chlorobenzene | 80-120 | 30 | 80-120 | 30 |
| Chlorobromomethane | 65-130 | 30 | 65-130 | 30 |
| Chlorodibromomethane | 60-135 | 30 | 60-135 | 30 |
| Chloroethane | 60-135 | 30 | 60-135 | 30 |
| Chloroform | 65-135 | 30 | 65-135 | 30 |
| Chloromethane | 40-125 | 30 | 40-125 | 30 |
| cis-1,2-Dichloroethene | 70-125 | 30 | 70-125 | 30 |

## TABLE 14B
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR POTENTIAL AQUEOUS SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| cis-1,3-Dichloropropene | 70-130 | 30 | 70-130 | 30 |
| Dibromomethane | 75-125 | 30 | 75-125 | 30 |
| Dichlorobromomethane | 75-120 | 30 | 75-120 | 30 |
| Ethylbenzene | 75-125 | 30 | 75-125 | 30 |
| Ethylene Dibromide | 80-120 | 30 | 80-120 | 30 |
| Hexachlorobutadiene | 50-140 | 30 | 50-140 | 30 |
| Isopropylbenzene | 75-125 | 30 | 75-125 | 30 |
| Methyl tert-butyl ether | 65-125 | 30 | 65-125 | 30 |
| Methylene Chloride | 55-140 | 30 | 55-140 | 30 |
| m-Xylene & p-Xylene | 75-130 | 30 | 75-130 | 30 |
| Naphthalene | 55-140 | 30 | 55-140 | 30 |
| n-Butylbenzene | 70-135 | 30 | 70-135 | 30 |
| N-Propylbenzene | 70-130 | 30 | 70-130 | 30 |
| o-Xylene | 80-120 | 30 | 80-120 | 30 |
| sec-Butylbenzene | 70-125 | 30 | 70-125 | 30 |
| Styrene | 65-135 | 30 | 65-135 | 30 |
| tert-Butylbenzene | 70-130 | 30 | 70-130 | 30 |
| Tetrachloroethene | 45-150 | 30 | 45-150 | 30 |
| Toluene | 75-120 | 30 | 75-120 | 30 |
| trans-1,2-Dichloroethene | 60-140 | 30 | 60-140 | 30 |
| trans-1,3-Dichloropropene | 55-140 | 30 | 55-140 | 30 |
| Trichloroethene | 70-125 | 30 | 70-125 | 30 |
| Trichlorofluoromethane | 60-145 | 30 | 60-145 | 30 |
| Vinyl chloride | 50-145 | 30 | 50-145 | 30 |
| **GC/MS SEMI-VOLATILE ORGANIC COMPOUNDS-8270D** | | | | |
| 1,2,4-Trichlorobenzene | 40-125 | 20 | 40-125 | 20 |
| 1,2-Dichlorobenzene | 45-125 | 20 | 45-125 | 20 |
| 1,3-Dichlorobenzene | 40-125 | 20 | 40-125 | 20 |
| 1,4-Dichlorobenzene | 40-125 | 20 | 40-125 | 20 |
| 1-Methylnaphthalene | 60-125 | 20 | 60-125 | 20 |
| 2,4,5-Trichlorophenol | 75-125 | 20 | 75-125 | 20 |
| 2,4,6-Trichlorophenol | 55-140 | 20 | 55-140 | 20 |
| 2,4-Dichlorophenol | 50-140 | 20 | 50-140 | 20 |
| 2,4-Dimethylphenol | 30-135 | 20 | 30-135 | 20 |
| 2,4-Dinitrophenol | 50-130 | 20 | 50-130 | 20 |
| 2,4-Dinitrotoluene | 75-125 | 20 | 75-125 | 20 |
| 2,6-Dinitrotoluene | 75-125 | 20 | 75-125 | 20 |
| 2-Chloronaphthalene | 60-125 | 20 | 60-125 | 20 |
| 2-Chlorophenol | 60-130 | 20 | 60-130 | 20 |
| 2-Methylnaphthalene | 60-125 | 20 | 60-125 | 20 |
| 2-Methylphenol | 70-130 | 20 | 70-130 | 20 |
| 2-Nitroaniline | 75-140 | 20 | 75-140 | 20 |
| 2-Nitrophenol | 55-140 | 20 | 55-140 | 20 |
| 3 & 4 Methylphenol | 65-130 | 20 | 65-130 | 20 |
| 3,3'-Dichlorobenzidine | 20-175 | 20 | 20-175 | 20 |
| 3-Nitroaniline | 75-140 | 20 | 75-140 | 20 |

## TABLE 14B
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR POTENTIAL AQUEOUS SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| 4,6-Dinitro-2-methylphenol | 75-140 | 20 | 75-140 | 20 |
| 4-Bromophenyl phenyl ether | 75-125 | 20 | 75-125 | 20 |
| 4-Chloro-3-methylphenol | 65-145 | 20 | 65-145 | 20 |
| 4-Chloroaniline | 35-175 | 20 | 35-175 | 20 |
| 4-Chlorophenyl phenyl ether | 70-125 | 20 | 70-125 | 20 |
| 4-Nitroaniline | 70-125 | 20 | 70-125 | 20 |
| 4-Nitrophenol | 35-145 | 20 | 35-145 | 20 |
| Acenaphthene | 65-125 | 20 | 65-125 | 20 |
| Acenaphthylene | 65-125 | 20 | 65-125 | 20 |
| Anthracene | 50-125 | 20 | 50-125 | 20 |
| Benzo[a]anthracene | 65=-125 | 20 | 65=-125 | 20 |
| Benzo[a]pyrene | 45-125 | 20 | 45-125 | 20 |
| Benzo[b]fluoranthene | 70-125 | 20 | 70-125 | 20 |
| Benzo[g,h,i]perylene | 75-125 | 20 | 75-125 | 20 |
| Benzo[k]fluoranthene | 70-125 | 20 | 70-125 | 20 |
| Benzoic acid | 20-140 | 20 | 20-140 | 20 |
| Benzyl alcohol | 65-125 | 20 | 65-125 | 20 |
| bis (2-chloroisopropyl) ether | 65-125 | 20 | 65-125 | 20 |
| Bis(2-chloroethoxy)methane | 75-125 | 20 | 75-125 | 20 |
| Bis(2-chloroethyl)ether | 65-125 | 20 | 65-125 | 20 |
| Bis(2-ethylhexyl) phthalate | 20-175 | 20 | 20-175 | 20 |
| Butyl benzyl phthalate | 60-150 | 20 | 60-150 | 20 |
| Carbazole | 75-125 | 20 | 75-125 | 20 |
| Chrysene | 70-125 | 20 | 70-125 | 20 |
| Dibenz(a,h)anthracene | 75-130 | 20 | 75-130 | 20 |
| Dibenzofuran | 60-125 | 20 | 60-125 | 20 |
| Diethyl phthalate | 60-150 | 20 | 60-150 | 20 |
| Dimethyl phthalate | 65-155 | 20 | 65-155 | 20 |
| Di-n-butyl phthalate | 55-155 | 20 | 55-155 | 20 |
| Di-n-octyl phthalate | 55-150 | 20 | 55-150 | 20 |
| Fluoranthene | 70-125 | 20 | 70-125 | 20 |
| Fluorene | 70-125 | 20 | 70-125 | 20 |
| Hexachlorobenzene | 70-125 | 20 | 70-125 | 20 |
| Hexachlorobutadiene | 25-125 | 20 | 25-125 | 20 |
| Hexachlorocyclopentadiene | 20-125 | 20 | 20-125 | 20 |
| Hexachloroethane | 30-125 | 20 | 30-125 | 20 |
| Indeno[1,2,3-cd]pyrene | 75-125 | 20 | 75-125 | 20 |
| Isophorone | 75-125 | 20 | 75-125 | 20 |
| Naphthalene | 60-125 | 20 | 60-125 | 20 |
| Nitrobenzene | 70-125 | 20 | 70-125 | 20 |
| N-Nitrosodi-n-propylamine | 70-130 | 20 | 70-130 | 20 |
| N-Nitrosodiphenylamine | 40-135 | 20 | 40-135 | 20 |
| Pentachlorophenol | 20-145 | 20 | 20-145 | 20 |
| Phenanthrene | 75-125 | 20 | 75-125 | 20 |
| Phenol | 65-130 | 20 | 65-130 | 20 |
| Pyrene | 70-125 | 20 | 70-125 | 20 |

## TABLE 14B
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR POTENTIAL AQUEOUS SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| **PETROLEUM COMPOUNDS – DIESEL RANGE-NWTPH-Dx w/Silica Gel Cleanup** | | | | |
| Diesel Range Organics | 70-140 | 27 | 70-140 | 27 |
| Heavy Oil Range Organics | 66-125 | 27 | 66-125 | 27 |
| **PETROLEUM COMPOUNDS – GASOLINE RANGE-NWTPH-Gx** | | | | |
| Gasoline Range Organics | 79-110 | 20 | 50-150 | 35 |
| **GC/ECD Organochlorine Pesticides-8081B** | | | | |
| 4,4'-DDD | 71-125 | 47 | 71-125 | 47 |
| 4,4'-DDE | 66-125 | 45 | 66-125 | 45 |
| 4,4'-DDT | 54-136 | 49 | 54-136 | 49 |
| Aldrin | 60-125 | 38 | 60-125 | 38 |
| alpha-BHC | 57-125 | 41 | 57-125 | 41 |
| alpha-Chlordane | 66-125 | 43 | 66-125 | 43 |
| Chlordane (technical) | 45-131 | - | 45-131 | 30 |
| beta-BHC | 54-125 | 34 | 54-125 | 34 |
| delta-BHC | 39-124 | 49 | 39-124 | 49 |
| Dieldrin | 71-124 | 39 | 71-124 | 39 |
| Endosulfan I | 70-125 | 40 | 70-125 | 40 |
| Endosulfan II | 70-128 | 37 | 70-128 | 37 |
| Endosulfan sulfate | 63-125 | 34 | 63-125 | 34 |
| Endrin | 72-130 | 41 | 72-130 | 41 |
| Endrin aldehyde | 73-125 | 43 | 73-125 | 43 |
| Endrin ketone | 70-133 | 37 | 70-133 | 37 |
| gamma-BHC (Lindane) | 59-125 | 42 | 59-125 | 42 |
| gamma-Chlordane | 65-125 | 40 | 65-125 | 40 |
| Heptachlor | 34-128 | 39 | 34-128 | 39 |
| Heptachlor epoxide | 69-125 | 35 | 69-125 | 35 |
| Methoxychlor | 62-149 | 37 | 62-149 | 37 |
| Toxaphene | 55-141 | 40 | 55-141 | 40 |
| **GC/ECD PCBs-8082A** | | | | |
| Aroclor® 1016 | 25-145 | 27 | 25-145 | 27 |
| Aroclor® 1221 | 25-145 | - | 25-145 | - |
| Aroclor® 1232 | 25-145 | - | 25-145 | - |
| Aroclor® 1242 | 25-145 | 27 | 25-145 | 27 |
| Aroclor® 1248 | 44-127 | - | 44-127 | - |
| Aroclor® 1254 | 30-145 | - | 30-145 | - |
| Aroclor® 1260 | 30-145 | 22 | 30-145 | 22 |
| **Conventional Parameters** | | | | |
| Total Dissolved Solids | 80-120 | - | - | 20 |
| Total Suspended Solids | 80-120 | 20 | - | 20 |
| Salinity | 80-120 | - | - | 20 |

**Notes:**

GC/ECD–gas chromatography/electron capture detection
LCS – Laboratory Control Sample
%R – Percent Recovery
PCBs – polychlorinated biphenyls
RPD – Relative Percent Difference
MS/MSD – Matrix Spike/Matrix Spike Duplicate

GC/MS – Gas Chromatograph/Mass Spectrometry
N/A - Not Applicable
QC limits provided by TestAmerica Seattle, but are continually updated and subject to change; the QC limits listed above are representative of historical laboratory values and the most current in-house generated limits will be reported as data are generated.
[a] – additional compounds may or may not be used in LCS and MS/MSD analyses

## TABLE 14C
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR SOIL/SEDIMENT SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| **Metals-6010C and 6020A** | | | | |
| Arsenic | 80-120 | 20 | 80-120 | 20 |
| Barium | 80-120 | 20 | 80-120 | 20 |
| Cadmium | 80-120 | 20 | 80-120 | 20 |
| Chromium | 80-120 | 20 | 80-120 | 20 |
| Lead | 80-120 | 20 | 80-120 | 20 |
| Selenium | 80-120 | 20 | 80-120 | 20 |
| Silver | 80-120 | 20 | 80-120 | 20 |
| **Mercury 7471A** | | | | |
| Mercury | 80-120 | 20 | 80-120 | 20 |
| **GC/MS VOLATILE ORGANIC COMPOUNDS-8260B** | | | | |
| 1,1,1,2-Tetrachloroethane | 72-123 | 20 | 75—125 | 30 |
| 1,1,1-Trichloroethane | 63-135 | 20 | 70-135 | 30 |
| 1,1,2,2-Tetrachloroethane | 73-125 | 22 | 55-130 | 30 |
| 1,1,2-Trichloroethane | 77-124 | 18 | 60-125 | 30 |
| 1,1-Dichloroethane | 70-128 | 21 | 75-125 | 30 |
| 1,1-Dichloroethene | 70-133 | 23 | 65-135 | 30 |
| 1,1-Dichloropropene | 77-123 | 16 | 70-135 | 30 |
| 1,2,3-Trichlorobenzene | 61-130 | 23 | 60-135 | 30 |
| 1,2,3-Trichloropropane | 77-123 | 23 | 65-130 | 30 |
| 1,2,4-Trichlorobenzene | 61-130 | 22 | 65-135 | 30 |
| 1,2,4-Trimethylbenzene | 79-124 | 18 | 65-135 | 30 |
| 1,2-Dibromo-3-Chloropropane | 53-132 | 27 | 40-135 | 30 |
| 1,2-Dichlorobenzene | 79-117 | 17 | 75-120 | 30 |
| 1,2-Dichloroethane | 71-128 | 18 | 70-135 | 30 |
| 1,2-Dichloropropane | 76-161 | 15 | 65-135 | 30 |
| 1,3,5-Trimethylbenzene | 80-125 | 18 | 70-125 | 30 |
| 1,3-Dichlorobenzene | 79-119 | 17 | 70-125 | 30 |
| 1,3-Dichloropropane | 77-123 | 19 | 75-125 | 30 |
| 1,4-Dichlorobenzene | 79-117 | 18 | 70-125 | 30 |
| 2,2-Dichloropropane | 56-144 | 21 | 65-135 | 30 |
| 2-Chlorotoluene | 79-122 | 18 | 70-130 | 30 |
| 4-Chlorotoluene | 80-122 | 18 | 75-125 | 30 |
| 4-Isopropyltoluene | 78-126 | 18 | 75-135 | 30 |
| Benzene | 70-128 | 19 | 75-125 | 30 |
| Bromobenzene | 80-120 | 19 | 65-120 | 30 |
| Bromoform | 50-124 | 25 | 55-135 | 30 |
| Bromomethane | 57-148 | 29 | 30-160 | 30 |
| Carbon tetrachloride | 59-145 | 19 | 65-135 | 30 |
| Chlorobenzene | 75-120 | 21 | 75-125 | 30 |
| Chlorobromomethane | 78-123 | 19 | 70-125 | 30 |
| Chlorodibromomethane | 69-129 | 23 | 65-130 | 30 |
| Chloroethane | 48-167 | 53 | 40-155 | 30 |
| Chloroform | 78-125 | 17 | 70-125 | 30 |
| Chloromethane | 55-136 | 26 | 40-155 | 30 |
| cis-1,2-Dichloroethene | 70-130 | 19 | 65-126 | 30 |
| cis-1,3-Dichloropropene | 69-129 | 19 | 70-125 | 30 |

## TABLE 14C
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR SOIL/SEDIMENT SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| Dibromomethane | 78-126 | 18 | 75-130 | 30 |
| Dichlorobromomethane | 58-133 | 19 | 70-130 | 30 |
| Ethylbenzene | 78-126 | 23 | 75-125 | 30 |
| Ethylene Dibromide | 69-126 | 21 | 70-125 | 30 |
| Hexachlorobutadiene | 68-134 | 21 | 55-140 | 30 |
| Isopropylbenzene | 79-127 | 20 | 75-130 | 30 |
| Methylene Chloride | 57-146 | 21 | 55-140 | 30 |
| m-Xylene & p-Xylene | 78-126 | 23 | 80-125 | 30 |
| Naphthalene | 14-170 | 50 | 55-140 | 30 |
| n-Butylbenzene | 78-128 | 17 | 65-140 | 30 |
| N-Propylbenzene | 81-127 | 20 | 65-135 | 30 |
| o-Xylene | 77-127 | 22 | 75-125 | 30 |
| sec-Butylbenzene | 78-128 | 17 | 65-130 | 30 |
| Styrene | 79-127 | 21 | 75-125 | 30 |
| tert-Butylbenzene | 71-136 | 27 | 65-130 | 30 |
| Tetrachloroethene | 56-150 | 27 | 65-140 | 30 |
| Toluene | 75-126 | 27 | 70-125 | 30 |
| trans-1,2-Dichloroethene | 76-131 | 18 | 65-135 | 30 |
| trans-1,3-Dichloropropene | 72-129 | 20 | 65-125 | 30 |
| Trichloroethene | 83-124 | 17 | 75-125 | 30 |
| Trichlorofluoromethane | 47-165 | 54 | 25-185 | 30 |
| Vinyl chloride | 67-131 | 22 | 60-125 | 30 |
| **GC/MS SEMI-VOLATILE ORGANIC COMPOUNDS-8270D** | | | | |
| 1,2,4-Trichlorobenzene | 63-128 | 28 | 70-125 | 28 |
| 1,2-Dichlorobenzene | 68-118 | 60 | 75-125 | 60 |
| 1,3-Dichlorobenzene | 64-124 | 60 | 75-125 | 60 |
| 1,4-Dichlorobenzene | 62-132 | 32 | 75-125 | 32 |
| 1-Methylnaphthalene | 48-148 | 30 | 75-125 | 30 |
| 2,4,5-Trichlorophenol | 64-124 | 60 | 75-125 | 60 |
| 2,4,6-Trichlorophenol | 66-131 | 60 | 65-140 | 60 |
| 2,4-Dichlorophenol | 59-124 | 60 | 65-130 | 60 |
| 2,4-Dimethylphenol | 58-133 | 60 | 65-140 | 60 |
| 2,4-Dinitrophenol | 65-125 | 60 | 60-135 | 60 |
| 2,4-Dinitrotoluene | 57-122 | 31 | 75-125 | 31 |
| 2,6-Dinitrotoluene | 65-125 | 60 | 75-125 | 60 |
| 2-Chloronaphthalene | 69-129 | 25 | 75-125 | 25 |
| 2-Chlorophenol | 65-125 | 27 | 65-135 | 27 |
| 2-Methylnaphthalene | 65-125 | 27 | 75-125 | 27 |
| 2-Methylphenol (o-cresol) | 56-121 | 25 | 75-130 | 25 |
| 2-Nitroaniline | 58-133 | 60 | 75-135 | 60 |
| 2-Nitrophenol | 58-128 | 60 | 65-140 | 60 |
| 3 & 4 Methylphenol (m- & p-cresol) | 61-126 | 27 | 75-130 | 27 |
| 3,3'-Dichlorobenzidine | 73-163 | 60 | 20-160 | 60 |
| 3-Nitroaniline | 80-165 | 60 | 60-140 | 60 |
| 4,6-Dinitro-2-methylphenol | 38-143 | 60 | 50-135 | 60 |
| 4-Bromophenyl phenyl ether | 64-134 | 60 | 75-125 | 60 |
| 4-Chloro-3-methylphenol | 58-128 | 27 | 75-135 | 27 |

## TABLE 14C
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR SOIL/SEDIMENT SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| 4-Chloroaniline | 20-181 | 60 | 20-160 | 60 |
| 4-Chlorophenyl phenyl ether | 65-130 | 60 | 75-125 | 60 |
| 4-Nitroaniline | 70-150 | 60 | 65-125 | 60 |
| 4-Nitrophenol | 47-172 | 33 | 65-125 | 33 |
| Acenaphthene | 65-130 | 27 | 75-125 | 27 |
| Acenaphthylene | 69-129 | 28 | 75-125 | 28 |
| Anthracene | 73-123 | 27 | 75-125 | 27 |
| Benzo[a]anthracene | 64-124 | 27 | 75-125 | 27 |
| Benzo[a]pyrene | 68-128 | 30 | 75-125 | 30 |
| Benzo[b]fluoranthene | 66-136 | 31 | 75-125 | 31 |
| Benzo[g,h,i]perylene | 57-142 | 28 | 75-125 | 28 |
| Benzo[k]fluoranthene | 63-143 | 31 | 75-125 | 31 |
| Benzoic acid | 10-130 | 60 | 20-175 | 60 |
| Benzyl alcohol | 42-147 | 60 | 55-125 | 60 |
| Bis(2-chloroethoxy)methane | 63-128 | 60 | 75-125 | 60 |
| Bis(2-chloroethyl)ether | 57-122 | 60 | 70-125 | 60 |
| Bis(2-ethylhexyl) phthalate | 64-144 | 60 | 55-145 | 60 |
| Butyl benzyl phthalate | 65-140 | 60 | 55-145 | 60 |
| Carbazole | 88-158 | 60 | 75-125 | 60 |
| Chrysene | 71-126 | 26 | 75-125 | 26 |
| Dibenz(a,h)anthracene | 57-142 | 30 | 75-125 | 30 |
| Dibenzofuran | 70-125 | 60 | 75-125 | 60 |
| Diethyl phthalate | 64-129 | 26 | 60-155 | 26 |
| Dimethyl phthalate | 65-125 | 60 | 60-160 | 60 |
| Di-n-butyl phthalate | 69-124 | 60 | 55-145 | 60 |
| Di-n-octyl phthalate | 58-148 | 31 | 55-145 | 31 |
| Fluoranthene | 61-121 | 36 | 70-125 | 36 |
| Fluorene | 68-128 | 31 | 75-125 | 31 |
| Hexachlorobenzene | 61-136 | 60 | 75-125 | 60 |
| Hexachlorobutadiene | 59-134 | 60 | 75-125 | 60 |
| Hexachlorocyclopentadiene | 30-132 | 60 | 30-125 | 60 |
| Hexachloroethane | 56-131 | 60 | 75-125 | 60 |
| Indeno[1,2,3-cd]pyrene | 59-139 | 29 | 75-125 | 29 |
| Isophorone | 53-118 | 60 | 75-125 | 60 |
| Naphthalene | 64-129 | 26 | 75-125 | 26 |
| Nitrobenzene | 59-134 | 60 | 75-125 | 60 |
| N-Nitrosodi-n-propylamine | 52-127 | 28 | 75-140 | 28 |
| N-Nitrosodiphenylamine | 88-153 | 60 | 75-125 | 60 |
| Pentachlorophenol | 29-124 | 68 | 55-125 | 68 |
| Phenanthrene | 65-125 | 28 | 75-125 | 28 |
| Phenol | 66-126 | 26 | 70-140 | 26 |
| Pyrene | 54-134 | 31 | 75-125 | 31 |
| **PETROLEUM COMPOUNDS – DIESEL RANGE-NWTPH-Dx w/Silica Gel Cleanup** | | | | |
| Diesel Range Organics | 70-1125 | 16 | 70-125 | 16 |
| Heavy Oil Range Organics | 64-127 | 17 | 64-127 | 17 |
| **PETROLEUM COMPOUNDS – GASOLINE RANGE-NWTPH-Gx** | | | | |
| Gasoline Range Organics | 68-120 | 25 | 50-150 | 35 |

## TABLE 14C
## LCS, MS/MSD PRECISION AND ACCURACY[a] FOR SOIL/SEDIMENT SAMPLES

| | LCS/LCS Duplicate | | MS/MSD | |
|---|---|---|---|---|
| **ANALYTE** | **%R** | **RPD** | **%R** | **RPD** |
| **GC/ECD Organochlorine Pesticides**-8081B | | | | |
| 4,4'-DDD | 48-137 | 41 | 48-137 | 30 |
| 4,4'-DDE | 53-128 | 40 | 53-128 | 30 |
| 4,4'-DDT | 43-144 | 47 | 43-144 | 30 |
| Aldrin | 54-128 | 24 | 54-128 | 30 |
| alpha-BHC | 49-124 | 28 | 49-124 | 30 |
| alpha-Chlordane | 54-134 | 33 | 54-134 | 30 |
| beta-BHC | 51-129 | 32 | 51-129 | 30 |
| Chlordane (technical) | 45-131 | 30 | 45-131 | 30 |
| delta-BHC | 36-139 | 36 | 36-139 | 30 |
| Dieldrin | 56-131 | 32 | 56-131 | 30 |
| Endosulfan I | 50-130 | 31 | 50-130 | 30 |
| Endosulfan II | 44-142 | 36 | 44-142 | 30 |
| Endosulfan sulfate | 47-129 | 43 | 47-129 | 30 |
| Endrin | 49-147 | 36 | 49-147 | 30 |
| Endrin aldehyde | 52-136 | 47 | 52-136 | 30 |
| Endrin ketone | 52-148 | 32 | 52-148 | 30 |
| gamma-BHC (Lindane) | 54-128 | 29 | 54-128 | 30 |
| gamma-Chlordane | 52-131 | 32 | 52-131 | 30 |
| Heptachlor | 36-137 | 31 | 36-137 | 30 |
| Heptachlor epoxide | 57-130 | 31 | 57-130 | 30 |
| Hexachlorobenzene | 10-188 | 37 | 10-188 | 30 |
| Hexachlorobutadiene | 37-119 | 39 | 37-119 | 30 |
| Methoxychlor | 51-149 | 46 | 51-149 | 30 |
| Toxaphene | 48-141 | 100 | 48-141 | 30 |
| **GC/ECD PCBs**-8082A | | | | |
| Aroclor® 1016 | 40-140 | 20 | 40-140 | 20 |
| Aroclor® 1221 | - | | - | |
| Aroclor® 1232 | 50-150 | 20 | 50-150 | 20 |
| Aroclor® 1242 | 57-128 | 20 | 57-128 | 20 |
| Aroclor® 1248 | - | | - | |
| Aroclor® 1254 | 65-132 | 20 | 65-132 | 20 |
| Aroclor® 1260 | 60-130 | 20 | 60-130 | 20 |
| **Conventional Parameters** | | | | |
| Total Organic Carbon | 27.8-170 | 35 | 50-140 | 35 |
| Percent Solids | 80-120 | 20 | - | - |

**Notes:**
GC/ECD–gas chromatography/electron capture detection
LCS – Laboratory Control Sample
%R – Percent Recovery
PCBs – polychlorinated biphenyls
RPD – Relative Percent Difference
MS/MSD – Matrix Spike/Matrix Spike Duplicate
GC/MS – Gas Chromatograph/Mass Spectrometry
N/A - Not Applicable
QC limits provided by TestAmerica Seattle, but are continually updated and subject to change; the QC limits listed above are representative of historical laboratory values and the most current in-house generated limits will be reported as data are generated.
[a] – additional compounds may or may not be used in LCS and MS/MSD analyses

## TABLE 15
## GROUNDWATER: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

| ANALYTE | ANALYTICAL METHOD [1] | SAMPLE CONTAINER | CHEMICAL PRESERVATIVE | PRESERVATION TEMPERATURE | EXTRACTION TIME | ANALYSIS TIME |
|---|---|---|---|---|---|---|
| Total Metals | 6010C/6020A | 250 mL poly [2] | HNO3 | Cool ≤6°C | N/A | 6 months |
| Total Mercury | 7470A | 250 mL poly [2] | HNO3 | Cool ≤6°C | N/A | 28 days |
| Dissolved Metals | 6020A | 250 mL poly [2] | None [4] | Cool ≤6°C | N/A | 6 months |
| Dissolved Mercury | 7470A | 250 mL poly [2] | None [4] | Cool ≤6°C | N/A | 28 days |
| VOCs | 8260C | 3x 40 mL VOA vial | HCl [3] | Cool ≤6°C | N/A | 14 days |
| SVOCs | 8270D | 1L amber glass | N/A | Cool ≤6°C | 7 days | 40 days |
| TPH - Gasoline | NWTPH-Gx | 3x 40 mL VOA vial | HCl [3] | Cool ≤6°C | N/A | 14 days |
| TPH - Diesel and Heavy Oil | NWTPH-Dx | 1L amber glass | HCl | Cool ≤6°C | 14 days | 40 days |
| Organochlorine Pesticides | 8081B | 1L amber glass | N/A | Cool ≤6°C | 7 days | 40 days |
| PCBs | 8082A | 1L amber glass | N/A | Cool ≤6°C | 7 days | 40 days |
| Total Dissolved Solids | SM 2540C | 250 mL poly [2] | None [4] | Cool ≤6°C | N/A | 7 days |
| Total Suspended Solids | SM 2540D | 250 mL poly [2] | None [4] | Cool ≤6°C | N/A | 7 days |
| Salinity | SM 2520B | 250 mL glass | N/A | Cool ≤6°C | N/A | Immediately (or up to 6 months if use wax seal) |

**Notes:**

[1] Analytical method refers to EPA SW-846 or other EPA-approved analytical methods; Washington State Department of Ecology analytical methods; or as noted.

[2] One 250 mL poly is sufficient volume for all inorganic analytes (one each for total and dissolved). All digestion and analysis must be completed within six months for arsenic, cadmium, and lead; and 28 days for mercury.

[3] NWTPH-Gx and 8260B VOCs can be analyzed from the same set of 3 x 40 mL VOA vials.

[4] A chemical preservative is not required if the analytical laboratory is instructed to filter the dissolved samples. If field filtering is conducted, HNO3 is required in the 250 mL poly bottle.

PCBs = polychlorinated biphenyls
SVOCs = Semivolatile organic compounds
VOA = Volatile organic analysis
VOCs = Volatile organic compounds

## TABLE 16
## SOIL/SEDIMENT: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

| ANALYTE | ANALYTICAL METHOD[1] | SAMPLE CONTAINER | CHEMICAL PRESERVATIVE | PRESERVATION TEMPERATURE | EXTRACTION TIME | ANALYSIS TIME |
|---|---|---|---|---|---|---|
| Metals | 6010C/6020A | 4 oz. wide-mouth glass jar[3] | N/A | Cool ≤6°C | N/A | 6 months |
| Mercury | 7471B | 4 oz. wide-mouth glass jar[3] | N/A | Cool ≤6°C | N/A | 28 days |
| VOCs | 8260C | Terracore Kits[2] | Methanol, Sodium Bisulfate | Cool ≤6°C | N/A | 14 days |
| SVOCs | 8270D | 8 oz. wide-mouth glass jar | N/A | Cool ≤6°C | 14 days | 40 days |
| TPH - Diesel and Heavy Oil | NWTPH-Dx | 4 oz. wide-mouth glass jar | N/A | Cool ≤6°C | 14 days | 40 days |
| TPH - Gasoline | NWTPH-Gx | Terracore Kits[2] | Methanol, Sodium Bisulfate | Cool ≤6°C | N/A | 14 days |
| Extractable Petroleum Hydrocarbons | NWTPH-EPH | 8 oz. wide-mouth glass jar | N/A | Cool ≤6°C | 14 days | 40 days |
| Organochlorine Pesticides | 8081B | 8 oz. wide-mouth glass jar | N/A | Cool ≤6°C | 14 days | 40 days |
| PCBs | 8082A | 8 oz. wide-mouth glass jar | N/A | Cool ≤6°C | 14 days | 40 days |
| TOC | 9060/PSEP | 4 oz. wide-mouth glass jar[3] | N/A | Cool ≤6°C | N/A | 14 days |
| Total Solids | 160.3 | 4 oz. wide-mouth glass jar[3] | N/A | Cool ≤6°C | N/A | 14 days |
| Grain Size | SM D422 | 8 oz. wide-mouth glass jar | N/A | Cool ≤6°C | N/A | 6 months |

**Notes:**

[1] Analytical method refers to EPA SW-846 or other EPA-approved analytical methods; Washington State Department of Ecology analytical methods; or as noted.

[2] One set of Terracore Kit vials covers both NWTPH-Gx and 8260 volatile organic compounds. If samples received in Terracore Kits, NWTPH-Gx and 8260B volatile organic compounds skip the extraction step.

[3] One 4oz. wide-mouth glass jar is sufficient for all inorganic analytes (arsenic, cadmium, lead, mercury). All digestion and analysis must be completed within six months for arsenic, cadmium, and lead; and within 28 days for mercury.

N/A = not applicable
PCBs = polychlorinated biphenyls
SVOCs = Semivolatile organic compounds
TOC = Total organic carbon
VOCs = Volatile organic compounds

## TABLE 17
## FIELD MEASUREMENT EQUIPMENT QUALITY CONTROL

| DEVICE | CALIBRATION | METHOD | FREQUENCY | CONTROL LIMIT |
|---|---|---|---|---|
| Organic Vapor Meter | Standardize using a known isobutylene gas standard. | Read measured concentration from meter. | Daily | Non-applicable |
| Horiba U-22 Groundwater Monitoring Flow-Cell | Standardize using a pH 4.0 solution | Read measured concentration from meter and ensure calibration procedure finished. | Daily | Non-applicable |

**Notes:**

Recalibrate instrument when control limits are exceeded.

# Attachment 1

# Memo

PIONEER
TECHNOLOGIES CORPORATION

5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

**To:** Superlon Team

**From:** Brad Grimsted

**Date:** February 15, 2019

**Subject:** Composite Soil Sampling SOP

---

The purpose of this memo is to provide a standard operating procedure for collecting multi-point composite samples at the Superlon Plastics Site. This memo is designed to supplement the Sampling and Analysis/Quality Assurance Project Plan (SAP/QAPP).

## Multi-Point Composite Sampling

Composite samples will consist of discrete aliquots of equal volumes of soil. Each discrete soil grab sample will be deposited into a single clean container, such as a stainless steel bowl or disposable plastic container, before being thoroughly mixed. This procedure ensures that each composite sample is representative of soil concentrations present within each sample grid.

After mixing, the composite sample will be transferred to a clean sample container (provided by the applicable laboratory) and prepared for transport to the laboratory. Remaining soil materials will be placed back into the soil core locations from where they were collected.

To ensure the integrity of the composite, all discrete grab samples must be collected in an identical manner and in equal volumes.

## Five-Point Composite Sampling

Five-point composite sampling consists of taking five discrete soil grab samples of equal volume and homogenizing the soil in a single container.

Five-point composite samples will be taken associated with Waste Characterization and Drilling.

### *Waste Characterization*

Five-point composite samples related to waste characterization will be taken from stockpiles. The five-point composite method involves taking a discrete sample at each corner, as well as in the center, of a grid. Samples will be collected using a stainless steel trowel, shovel, or similar tool. The grab samples will be placed into a stainless steel bowl or disposable plastic bucket after being collected, where they will then be thoroughly mixed to homogenize the sample.

Once mixed, a representative composite sample will be taken from the bowl or bucket using a trowel or similar tool and placed into a clean sample container provided by the lab.

Remaining soil will be placed back into the holes grab samples were collected from in the stockpile.

### *Drilling*

Five-point composite samples related to drilling will involve collecting five grab samples from cores as drilling takes place. The discrete aliquots of equal volume will be collected with a stainless steel trowel or similar tool before being placed into a stainless steel bowl or disposable plastic container, where the grab samples will be thoroughly mixed to homogenize the sample.

Once mixed, a representative composite sample will be taken from the bowl or bucket using a trowel or similar tool and placed into a clean sample container provided by the lab.

Remaining soil will be placed with soil waste from the same drilling activity.

# Attachment 2

# Memo

PIONEER
TECHNOLOGIES CORPORATION

5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

**To:** Superlon XRF Operators

**From:** Brad Grimsted

**Cc:** Jeff King, Kenny King

**Date:** February 5, 2019

**Subject:** Olympus DELTA Classic Plus XRF Operation Setup Procedures

---

The purpose of this memo is to familiarize operators of the Olympus X-Ray Fluorescence (XRF) soil analysis system at the Superlon Plastics Site with its setup, training requirements, safeguards and standard operating procedures. This memo is designed to supplement the radiation health and safety component of the Superlon Health & Safety Plan (HASP) and the Simplified XRF Demonstration Work Plan component of the Sampling and Analysis / Quality Assurance Project Plan (SAP/QAPP).

## Equipment & Software Setup

- Turn on the lab computer, login to your personalized account, and then launch the Innov-X Delta Advanced PC Software application (icon on desktop).
- Turn on the XRF, and wait ~30 seconds for it to finish startup. Then plug the USB connection for the XRF into the computer. The Windows Mobile Device Center (WMDC) will launch, click "connect without setting up device", then close the WMDC.
- The PC Software will prompt you to click the "close the device app", and then "start" buttons to launch the XRF software. If any errors appear, turn off the XRF and unplug it, then restart it and plug it back in.
- Login info for the XRF software :

| UID | PW |
|---|---|
| Admi | 1234 |
| Innovx | 1776 |

## XRF Setup

If it is a new XRF or first time use, you may need to:

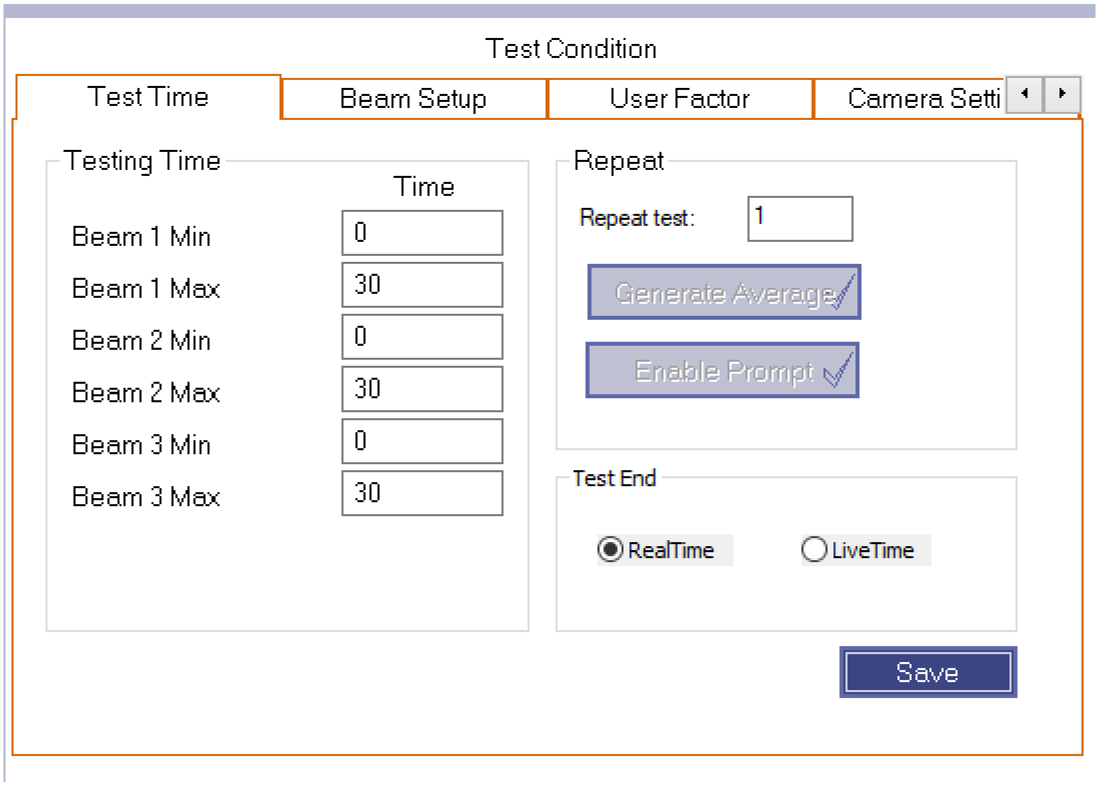
Select the **.....Import to PC**. This will load the software for the new XRF to the PC. Once it is loaded, the new Serial number will show up in the profile. Then, select that Serial number, select **... Close Device App**, and then select **...Start**.

Profiles (SN) on PC

550120
571366

Connected Instrument SN: 550120

Once you are in the PC Software, check the Test Condition. The Testing Time should be set to 30 seconds for Beam 1 and 30 seconds for Beam 2. Select the **...Save** button to retain changes.



Testing Time

| | Time |
|---|---|
| Beam 1 Min | 0 |
| Beam 1 Max | 30 |
| Beam 2 Min | 0 |
| Beam 2 Max | 30 |
| Beam 3 Min | 0 |
| Beam 3 Max | 30 |

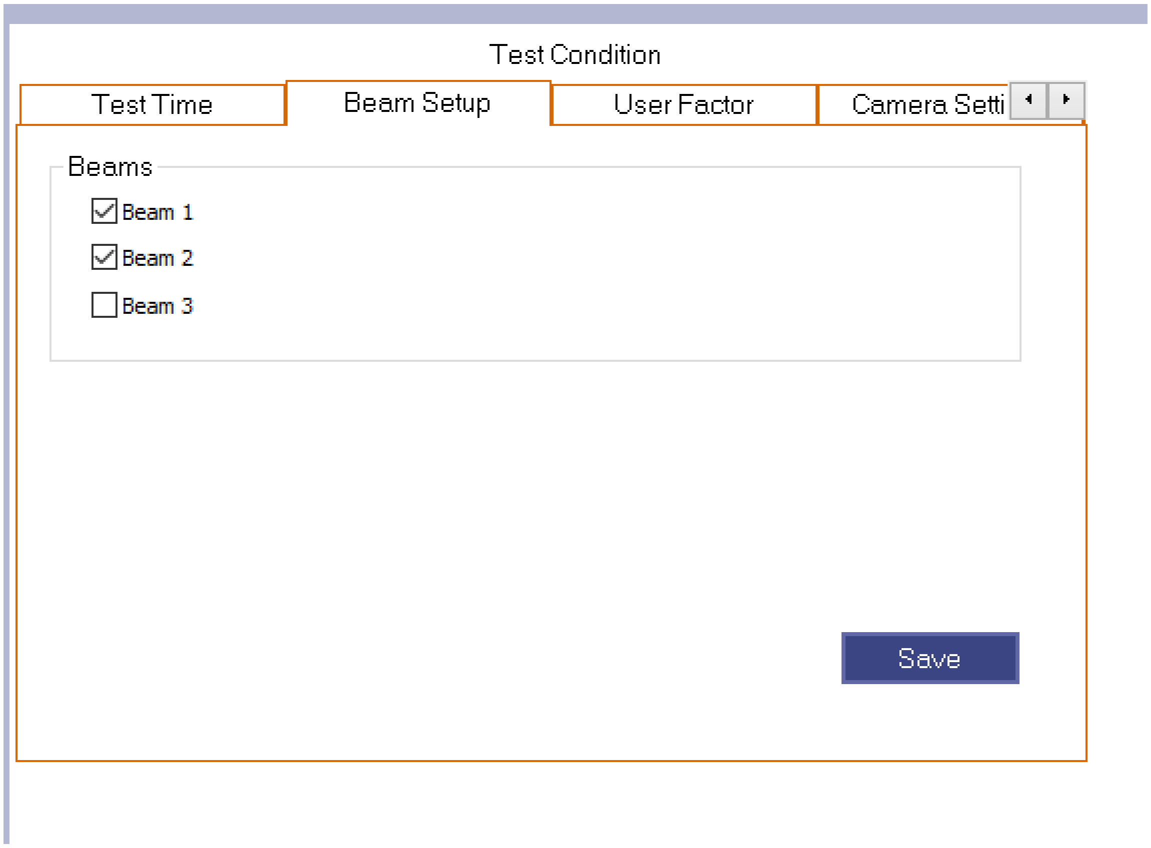
Repeat

Repeat test: 1

Test End

● RealTime ○ LiveTime

The Beam Setup should have Beam 1 and Beam 2 selected.  Select the **...Save** button to retain changes.



Beams

☑ Beam 1

☑ Beam 2

☐ Beam 3

## Cal Check (Standardization)

- The unit will always ask you to perform a Cal Check before performing any other analyses.  Place the small metal Alloy 316 disk in the test stand, to perform the Cal Check.
    - Place the 316 Alloy disk on the analysis window.
    - Close the test stand hood.
    - Click "Cal Check" in the PC Software
- Once you've successfully standardized, you can proceed with shooting other SRMs, or samples.

## Shooting Standard Reference Materials (SRMs)

- Copy the first four rows from the spreadsheet from the previous day.  The rows are color coded as they have different formulas in them.  The fourth row can be copied down for successive sample results.
- SRM 2711A is our standard SRM to shoot, along with the silica sand blank.
- Open the hood, center the SRM on the analysis window, then close the hood.
- Shoot each SRM 7 times (see the Simplified XRF Demonstration Work Plan section of the SAP/QAPP for further details on QA/QC shots) and evaluate the output to determine if the sample “passes”.

  - SRM 2711A passes if the “As % Difference” cell is less than 10% and if the “Pb % Difference” cell is less than 10%.
  - The Blank SRM passes if the “Arsenic Reporting Limit” cell is less than 20 and if the “Lead Reporting Limit” cell is less than 20.
  - If either SRM fails, re-shoot the SRM that failed 7 additional times.

## Shooting Samples

- Prepare your sample in accordance with the sample preparation steps described in the Simplified XRF Demonstration Work Plan in the SAP/QAPP.
- Open the hood, center the 1st quadrant of the sample over the analysis window, close the hood, then click "Start" in the XRF software.
- Record the As/Pb concentrations for the sample in notes, then proceed with shooting the 2nd, 3rd, and 4th quadrants of the sample.

Attachment 3

# Superlon Plastics Site:

# Remedial Design:

# Simplified XRF Demonstration Work Plan

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Prepared for:

***The Chemours Company LLC***

and

***The White Birch Group LLC***

May 2019

Jeffrey D. King, L.G., Project Manager

***Pacific Environmental & Redevelopment Corporation***
***8424 E. Meadow Lake Drive***
***Snohomish, WA 98290***

and

***PIONEER Technologies Corporation***
***5205 Corporate Center Court SE, Suite A***
***Olympia, WA  98503***

## Table of Contents

### *Figures:*

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# 1. Introduction

An X-Ray Fluorescence (XRF) soil analysis method demonstration has been prepared for use on the on-property portion of the Superlon Plastics Site (Property). This method demonstration is being conducted to demonstrate that the XRF analytical method is appropriate for use at the Property. The purpose of this work plan is to describe the XRF scope of work, safety measures, reporting requirements, and a proposed schedule to complete the work.

This work plan was prepared on behalf of the White Birch Group, LLC (White Birch) and the Chemours Company FC, LLC (Chemours) hereafter referred to as the “Companies.” The Companies (or their authorized agent) will complete the sampling activities described in this work plan in accordance with the Model Toxics Control Act (MTCA) Chapter 173-340 of the Washington Administrative Code (WAC) under Agreed Order No. DE 5940. The Agreed Order requires that the Companies develop a draft work plan whenever work is to be completed at the Property.

## 1.1. Property Location and Description

The Property is located at 2116 Taylor Way, Tacoma, Washington in a highly industrial area of the Tacoma Tidal Flats between the Blair and Hylebos Waterways (see Figure 1). The Property is bordered to the northeast by Taylor Way, to the north by a curved rail road right-of-way owned by the City of Tacoma Public Works, to the northwest by Lincoln Avenue and a warehouse operation, and to the southeast by property leased and operated by Gardner-Fields Products, a roofing and waterproofing products manufacturing business, to the southwest by a ditch that separates the Property and Port of Tacoma property which was formerly leased and operated as the Holbrook Log Yard (see Figure 2).

## 1.2. Background

A Remedial Investigation (RI) for on-Property Soils and Surface Water (OSS) and a Feasibility Study (FS) for on-Property Soils and Perched Water (OSP) were conducted as part of the site investigation (PERC/PIONEER 2013, 2014a). Approximately 1,300 soil samples were evaluated in the RI-OSS. Site-specific soil and perched water remediation levels (RELs) were determined in the FS-OSP, and arsenic and lead were identified as constituents of concern for the Property (PERC/PIONEER 2014a). A preferred cleanup alternative for remediating arsenic and lead in soils and perched water on the Property was presented in the FS-OSP, which was approved by the Washington State Department of Ecology (Ecology) on January 26, 2015 (Ecology 2015).

## 1.3. Objectives

The objective of this work plan is to demonstrate that the Environmental Protection Agency (EPA) Analytical Method SW846-6200 (i.e., Field XRF analysis) is suitable for use during the full-scale remediation program. If successful, documentation of procedures will be incorporated into the Sampling and Analysis Plan / Quality Assurance Project Plan (SAP/QAPP) (PERC/PIONEER 2014b).

The XRF can be used to generate real-time data and to characterize constituent levels and locations in a dynamic sampling strategy (EPA 2010). The use of the XRF will be important during full-scale remediation activities because it will eliminate the laboratory turn-around time limitations while still providing high quality data.

## 2. XRF Analysis Scope of Work

A minimum of 10 samples from each OU will be analyzed using the XRF by EPA Method 6200. Sample preparation procedures (drying and homogenizing) and quality control procedures were developed using EPA Method SW846-6200 (EPA 2007), the Olympus Innov-X Delta manufacturer user instruction manual, and the EPA and Intrastate Technology Regulatory Council (ITRC) Advanced Design Application & Data Analysis for Field-Portable XRF guidance (EPA 2010).

The Innov-X Delta unit (or equivalent) was recommended by Ecology and meets Method 6200 requirements. The vendor supplying the unit will be consulted prior to providing the unit to ensure it is calibrated for analysis of arsenic and lead in soil.

### 2.1. XRF Sample Preparation – Drying

Soil XRF analytical results can be biased low due to excess moisture because as soil moisture content increases, XRF-estimated metal concentrations will decrease. Therefore, soil samples will be dried to less than 20% moisture content in order to increase data quality (EPA 2010).

Samples selected for XRF analysis will be placed into a convection-oven-safe metal pie pan (or equivalent) container. Samples will be dried in a convection oven before being homogenized and placed into plastic baggies for analysis. Samples will be dried in the convection oven at 150 degrees Celsius until the measured moisture content of the sample is less than 20%. Samples are expected to dry to less than 20% moisture in 30 minutes to 1 hour. Drying times will be reduced if faster moisture reduction is observed. Moisture will be measured in samples that have been removed from the oven and cooled to the ambient air temperature using a decontaminated moisture probe. Samples with moisture content greater than 20% following drying will be dried further until moisture readings for the samples are below 20%.

### 2.2. XRF Sample Preparation – Homogenizing

To ensure that soil XRF analytical results are not biased high or low, the soil samples will be homogenized to increase data quality[1]. Dried samples will be crushed using a decontaminated mortar and pestle in order to achieve a uniform particle size. Large debris (e.g., sticks, roots, rocks, trash) that cannot be crushed will be discarded. Following crushing, the samples will fall onto a piece of butcher or parchment paper. To homogenize the samples, the paper will be folded over by lifting alternating corners, one at a time, for a minimum of 20 corner lifts. Following homogenization by folding, the dried, crushed, homogenized samples will be placed into clear plastic sandwich baggies. Prior to sealing the baggies, a moisture reading will be collected from the samples to ensure the moisture content is below 20%. Further homogenization may be performed, if required, by kneading and turning the bags over.

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[1] Sieving was originally included in the sampling homogenization procedures, and is recommended in Method SW846-6200, but many soils at the Site are a very dense matrix (i.e., the hydrated lime that is found throughout most of OU3) that will not cleanly pass through a sieve. As a result, sieving was removed from the homogenization procedures and additional homogenization and pulverizing using a decontaminated mortar and pestle was performed instead.

## 2.3. XRF Procedures

To ensure that quality arsenic and lead samples are collected, the XRF unit will be secured in a “cradle” that will hold it in place and reduce the chance for operator error. Square sample baggies will be “shot” by the XRF four times, once in each quadrant. Each sample reading will be allowed to run for 60 seconds. Two readings will be collected from diagonal quadrants, then the bag will be flipped over and readings will be collected from the other two quadrants. All readings (and the detection limits for those readings) will be recorded. Any quadrants readings with a difference greater than 40% will need to be re-homogenized and confirmation readings will be collected. If readings between quadrants still have a difference greater than 40%, it will be assumed that the variability was due to arsenic and lead heterogeneity in soil.

Consistent with EPA/ITRC guidance, the representative arsenic and lead concentrations will be determined by calculating the 95% Upper Confidence Limit on the mean using the four readings (EPA 2010). This method accounts for variability and should result in representative sample concentrations.

## 2.4. XRF Quality Control Procedures

Data collection procedures and quality control (QC) procedures were identified to address the following XRF performance factors:

- Bias – does the instrument systematically under- or over-estimate element concentrations?
- Precision – how much “scatter” solely attributable to analytics is present in repeated measurements of the same sample?
- Accuracy – ability for unit to correctly measure a known concentration.
- Detection Limits – at what concentrations can the instrument reliably identify the presence of an element?
- Quantitation Limits – at what concentrations can the instrument reliably measure an element?
- Representativeness – how representative is the XRF result of information required to make a decision?
- Comparability – how do XRF results compare with standard laboratory results?

The QC procedures presented in Table 1 will be performed at the frequency indicated and logged in the daily field notes. All QC procedures that require readings be collected using the XRF will be run for 60 seconds or until field observations indicate shorter readings provide the necessary precision/accuracy.

Standard reference materials with the range of concentrations likely to be observed at the Property will be utilized during calibration procedures to ensure precision and accuracy in the data generated. Standard reference materials will be obtained from the Olympus XRF unit manufacturer and/or the National Institute of Standards and Technology.

Innov-X instruments have a correction algorithm that accounts for overlap in the arsenic and lead signals. The interference in signals occurs when the lead/arsenic ratio is greater than 10 to 1; however, these soil concentration ratios are uncommon at the Property. Consequently, lead/arsenic interference may result in the arsenic results being biased high.

# 3. Safety

Safety procedures to be used during work activities associated with this work plan are presented in the HASP (PERC/PIONEER 2016). The purpose of the HASP is to assign responsibilities, establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during work activities. In addition, a project safety analysis (PSA) will be completed prior to project start-up for project-specific maintenance activities. The PSA is a process to identify field safety and health hazards, which may be known or anticipated and the associated control measures to be implemented. It includes a review of the physical hazards, chemical hazards, process safety hazards, non-regulated process hazards, and other hazards. It also includes pertinent background information regarding project staffing and documentation.

## 4. References

Ecology. 2015. Electronic mail from Marv Coleman to Jeff King, Brad Grimsted, and Tim Bingman regarding Ecology approval of the Final on-Property Feasibility Study. January 26.

EPA. 2007. Method 6200. Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment. February.

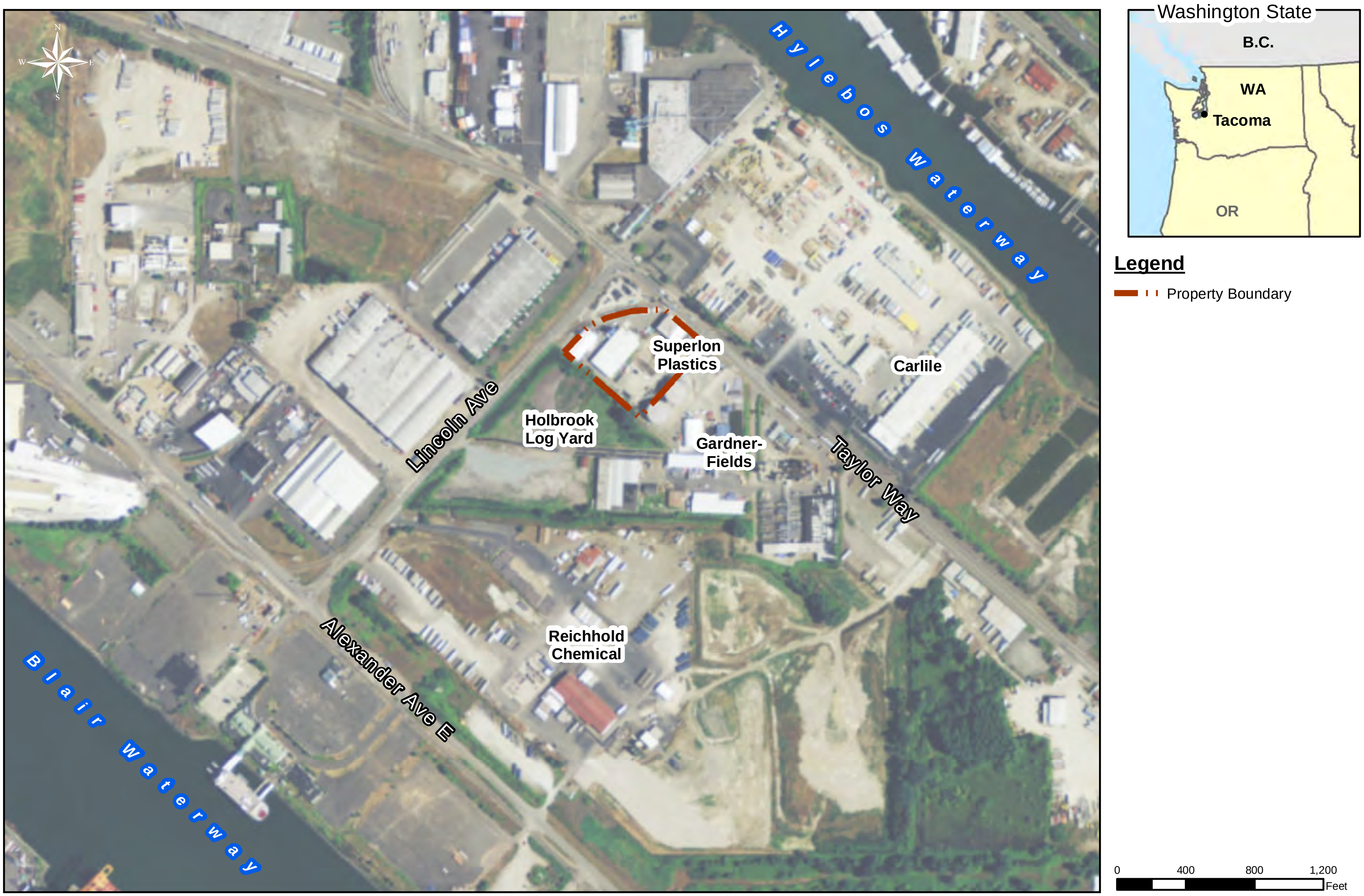
EPA. 2010. Advanced Design Application & Data Analysis for Field-Portable XRF.

PERC/PIONEER. 2013. Remedial Investigation Report for On-Property Soils and Surface Water at the Superlon Plastics Property, Tacoma, Washington. August.

PERC/PIONEER. 2014a. Feasibility Study Report for On-Property Soils and Perched Water at the Superlon Plastics Property, Tacoma, Washington. December.

PERC/PIONEER. 2014b. Sampling and Analytical Plan & Quality Assurance Project Plan. June.

PERC/PIONEER. 2016. Health and Safety Plan for the Superlon Plastics Site, Tacoma, Washington. May.



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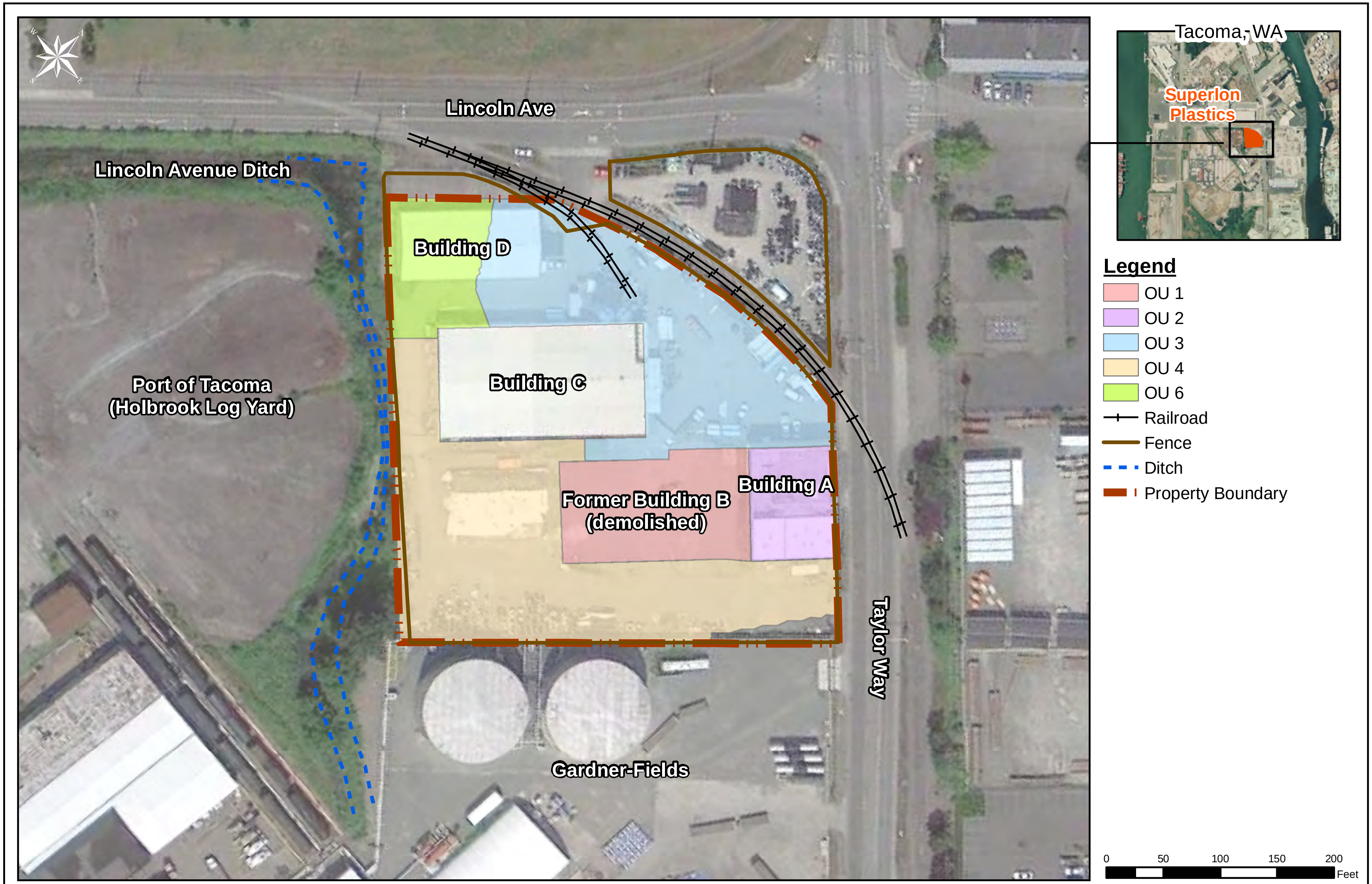
Property Location
Remedial Design: Soil Volume Verification and XRF Demonstration Work Plan
Superlon Plastics Property, Tacoma, Washington

Figure 1

Document Path: G:\Projects\Superlon\Maps\2016\April 2016\Figure 1_Superlon Site Location.mxd; Author: SM; Date Saved: 5/5/2016



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Property Features
Remedial Design: Soil Volume Verification and XRF Demonstration Work Plan
Superlon Plastics Property, Tacoma, Washington

Figure 2

## Table 1: XRF Quality Assurance Procedures

| Procedure Name | Purpose | Procedure Notes | Frequency | |
|---|---|---|---|---|
| | | | Every Sample | Beginning of Day |
| Sample Drying | Reduce bias by reducing soil moisture content to an acceptable level | Dry sample to less than 20% moisture content | X | |
| Sample Homogenization | Reduce bias by homogenizing sample | Grind (mortar & pestle) to achieve a uniform particle size. Homogenize by folding the soil over on itself. | X | |
| Default Instrument Calibration Procedure | Accuracy | Self-calibration is conducted during Innov-X Delta startup using Standard Alloy 316 will be supplied by the XRF manufacturer. | | X |
| Instrument Calibration Procedure Using Standard Reference Materials | Precision, Accuracy, and Quantitation Limits | SRMs will be sourced from standards agencies and arsenic and lead concentrations will be consistent with Site conditions. Seven readings will be taken of all SRMs. SRM readings will be no greater than 20% different. Note: The XRF unit has been consistently less than this criteria. If, variability increases and this criteria is not met, then this procedure will be run every four hours or every 20 samples. | | X |
| Determining Detection Limits | Detection Limits | Take readings of blank sample material (silicon dioxide sand) 7 times, find standard deviation, multiply by 3.143 to determine the minimum detection limits for As/Pb and make sure they are less than action levels. | | X |
| XRF Shot Duration | Precision | Each XRF shot will be for 60 seconds. Using Beams 1 and 2 and each will be set for 30 seconds. | X | |
| Number of XRF Shots per Sample | Accuracy | Four shots per sample | X | |
| Instrument Correction Factor for lead/arsenic interference | Quantitation Limit | Innov-X Delta algorithm is run automatically. | X | |

# Attachment 4

# *Superlon Plastics Site*

# *Remedial Design: Soil Volume Verification and XRF Demonstration Report*

Prepared for:

***The Chemours Company LLC***

and

***The White Birch Group LLC***

January 2016

Jeffrey D. King, L.G., Project Manager

PERC

***Pacific Environmental & Redevelopment Corporation***
***8424 E. Meadow Lake Drive***
***Snohomish, WA 98290***

and

PIONEER TECHNOLOGIES CORPORATION

***PIONEER Technologies Corporation***
***5205 Corporate Center Court SE, Suite A***
***Olympia, WA 98503***

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## Appendices:

Appendix A: Photographic Log

Appendix B: Boring Logs

Appendix C: Laboratory Data Validation and Results

Appendix D: XRF Data Validation and Results

Appendix E: Approach for Calculating Sensitivity and Specificity

# 1. Introduction

A soil sampling event was conducted at the on-Property portion of the Superlon Plastics Site (Property) as part of the remedial design process. The sampling was performed to verify the estimated volume of soil to be excavated during cleanup actions and to demonstrate that the X-Ray Fluorescence (XRF) analytical method is appropriate for use at the Property. Sampling was performed in accordance with the approved Remedial Design: Soil Volume Verification and XRF Demonstration Work Plan (Work Plan; Pacific Environmental and Redevelopment Corporation [PERC] and PIONEER Technologies Corporation [PIONEER]).[1,2] The purpose of this report is to document the soil sampling event and the XRF demonstration and results.

This report was prepared on behalf of the White Birch Group, LLC (White Birch) and the Chemours Company FC, LLC (Chemours) hereafter referred to as the "Companies." The Companies' authorized agents, PERC and PIONEER, conducted the described scope of work in accordance with the Model Toxics Control Act (MTCA) Chapter 173-340 of the Washington Administrative Code (WAC) under Agreed Order No. DE 5940.

## 1.1. Property Location and Description

The Property is located at 2116 Taylor Way, Tacoma, Washington in a highly industrial area of the Tacoma Tidal Flats between the Blair and Hylebos Waterways (see Figure 1). The Property is bordered to the northeast by Taylor Way, to the north by a curved rail road right-of-way owned by the City of Tacoma Public Works, to the northwest by Lincoln Avenue and a warehouse operation, to the southeast by property leased and operated by Gardner-Fields Products, a roofing and waterproofing products manufacturing business, and to the southwest by a ditch that separates the Property and Port of Tacoma property which was formerly leased and operated as the Holbrook Log Yard (see Figure 2).

## 1.2. Background

A Remedial Investigation (RI) for on-Property Soils and Surface Water (OSS) and a Feasibility Study (FS) for on-Property Soils and Perched Water (OSP) were conducted as part of the site investigation (PERC/PIONEER 2013, 2014). Approximately 1,300 soil samples were evaluated in the RI-OSS. Site-specific soil and perched water remediation levels (RELs) were determined in the FS-OSP, and arsenic and lead were identified as constituents of concern for the Property (PERC/PIONEER 2014). A preferred cleanup alternative for remediating arsenic and lead in soils and perched water on the Property was presented in the FS-OSP, which was approved by the Ecology on January 26, 2015.

Remedial design activities associated with the FS-OSP are being conducted to address remedial-implementation questions and provide information that will be incorporated into the Remedial Design Report.

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[1] Additional sampling (Phase II) was anticipated in the Work Plan and may be conducted in the future.

[2] The Work Plan was approved in an email from Marv Coleman of the Washington State Department of Ecology (Ecology) to Jeff King of PERC dated May 13, 2016.

## 1.3. Report Organization

The remainder of the report is organized as follows:

- Section 2: Sampling Activities
- Section 3: Data Overview
- Section 4: Soil Volume Verification and XRF Demonstration
- Section 5: Conclusions
- Section 6: References

# 2. Sampling Activities

The soil sampling event was performed at the Property on May 23 - 25, 2016. A total of 184 soil samples were collected at 24 boring locations (Figure 3). Samples were collected using a GeoProbe® direct-push drill rig in accordance with the approved Work Plan. In addition, a black shot sample (MC-01) and a log debris sample (LD-01) were collected, and a silicon sand equipment blank (EB-01) was provided by the XRF vendor. Field activities were documented in a Photo Log, which is presented in Appendix A. Sample location lithology was documented in borings logs, which are presented in Appendix B.

All samples (187) were sent to the laboratory (lab) for analyses; a subset of the samples (77 of the 187) were analyzed for arsenic and lead in the field using the XRF.

## 2.1. Lab Analysis

All samples were sent to TestAmerica Laboratories, Inc. in Tacoma, Washington for analyses under Job ID 580-59923 using the methods described in Appendix C. The samples were analyzed for the following:

- Total arsenic and lead by ICP-AES using USEPA SW-846 Methods 3050B and 6010C;
- Diesel- and oil-range petroleum hydrocarbons using Ecology NWTPH-Dx (extended) method;
- pH using USEPA SW-846 Method 9045C; and
- Total solids/percent moisture based on ASTM Method D 2216.

## 2.2. XRF Analysis

Seventy-seven samples were analyzed for arsenic and lead in the field using the Innov-X Delta XRF[3] prior to being sent to the laboratory for analyses. The XRF sample locations are presented in Figure 3. Photographs of the equipment setup used to dry, homogenize, and analyze the samples are presented in Appendix A. XRF field reports are presented in Appendix D.

Soil sample preparation methods for XRF analysis included the following steps:

- **Step 1**: The samples were dried in a convection oven at 150°C until the moisture content was determined to be less than 20%. Moisture content was measured using a Decagon EC-5 moisture probe.[4]
- **Step 2**: The samples were partially homogenized by hand using a dedicated mortar and pestle.
- **Step 3**: The samples were further homogenized by being placed on a dedicated piece of parchment paper and mixed by folding over and lifting alternating corners of the paper, one at a time, for a minimum of 20 corner lifts.
- **Step 4**: The samples were transferred to a square plastic baggie for analysis.
- **Step 5**: The samples in square sample plastic baggies were shot by the XRF four times, yielding a total of four readings per total arsenic and total lead sample. Two XRF readings were collected from diagonal quadrants of the sample, then the sample bag was flipped over and two additional readings were collected from the other two quadrants.

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[3] http://www.olympus-ims.com/en/xrf-xrd/delta-handheld/delta-env/
[4] https://www.decagon.com/en/soils/volumetric-water-content-sensors/ec-5-lowest-cost-vwc/

- **Step 6**: The samples with quadrant readings that differed by more than 40% were re-homogenized and re-analyzed. If readings between quadrants still had a difference greater than 40%, it was assumed that the variability was due to arsenic and lead heterogeneity[5] in soil and the final result was recorded.
- **Step 7**: The samples were sent to the lab for total arsenic and total lead analyses.

The XRF instrument was calibrated at the beginning of each day and at regular intervals (every 20 samples), as described in the Work Plan and summarized below (PERC/PIONEER 2014):

- Default Instrument Calibration: Self-calibration was conducted during Innov-X Delta startup using Standard Alloy 316 supplied by the XRF manufacturer.
- Instrument Calibration Procedure Using Standard Reference Materials (SRMs): SRMs were sourced from standards agencies, and arsenic and lead concentrations were consistent with Site conditions (see Appendix D). Seven readings were collected from the SRMs and were used to inform the data quality review, which is presented in Appendix D.

| SRM | Arsenic | Lead |
|---|---|---|
| SRM 2702 | 43.5 ± 1.8 | 132.8 ± 1.1 |
| SRM 2781 | 7.81 ± 0.67 | 200.8 ± 4.2 |
| SRM 2711 | 105 ± 8 | 1162 ± 31 |

- Detection Limit Determination: Seven blank sample material (silicon dioxide sand) readings were collected (see Appendix D). The standard deviation was multiplied by 3.143 to determine the minimum detection limits for arsenic and lead.

## 2.3. Deviations from Work Plan

The following deviations from the Work Plan were noted during the soil sampling event:

1. No samples were collected at locations where the zero-to-one foot interval contained only asphalt and gravel.
2. No samples were collected between borings SL-80 and SL-82 (see Figure 3) due to an obstruction believed to be buried concrete debris. The GeoProbe was moved several times to attempt to collect a sample, but an unobstructed location was never identified.
3. Soil was not homogenized using a #60-mesh sieve. The field team attempted to pass dried soil from several samples through the #60-mesh sieve screen; however, it was not possible due to the high clay and silt content in the soil.

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[5] As documented in the Remedial Investigation report, at least three waste types were identified at the Property and the subsurface materials encountered consist of up to 10 feet of non-native, unconsolidated fill material (PERC/PIONEER 2013). Soil within the fill material consists of gray to dark-gray silt and clay mixed with variable percentages of sand and fine gravel. Construction and other debris make up approximately 35% of the fill material, and consist of wood and brick fragments, metal chain and piping, large wood pilings, porcelain fragments and imported wastewater treatment sludge, gypsum, and industrial byproducts. The fill material was observed throughout the Property (PERC/PIONEER 2013).

# 3. Data Overview

## 3.1. Data Summary

Three sets of data were generated from this soil sampling event:

- Total arsenic, total lead, diesel and oil-range petroleum hydrocarbons, and pH analyzed by the lab
- Toxicity Characteristic Leaching Procedure (TCLP) arsenic and lead analyzed by the lab
- Arsenic and lead analyzed using the XRF

Soil samples were collected from three of the six Operable Units (OU) at the Property and analyzed as follows.

| | Number of Samples for Each Analysis | | | | |
|---|---|---|---|---|---|
| **Location** | **Total Arsenic and Total Lead (Lab)** | **Total Arsenic and Total Lead (XRF)** | **Arsenic and Lead TCLP[6]** | **Diesel- and Oil-range petroleum hydrocarbons** | **pH** |
| **OU 3** | 91 | 30 | 11 | 1 | 91 |
| **OU 4** | 81 | 34 | 19 | 1 | 2 |
| **OU 6** | 12 | 11 | 7 | | 12 |
| **Black shot, Log debris, Silicon Sand** | 3 | 2 | 0 | 0 | 0 |
| **Total** | **187** | **77** | **37** | **2** | **105** |

Soil samples were collected at each boring location at different depths and the results are presented in Table 1. The XRF results are summarized in Table 2.

## 3.2. Third Party Data Quality Review

A third-party data quality review was conducted for data quality parameters including precision, accuracy, representativeness, and completeness. The validated data packages for the lab and XRF data are presented in Appendix C and Appendix D, respectively.

### *3.2.1. Lab Data Quality*

Overall, the data were of good quality and the results of the lab quality assurance/quality control (QA/QC) procedures were generally acceptable. Selected sample results required qualification during data validation because method-specific QA/QC criteria were not met (results may have been qualified for more than one reason).

- A total of 39 results were qualified as estimated (assigned a J qualifier). Data qualified as estimated included 35 lead results, two arsenic results, and the diesel- and oil-range petroleum hydrocarbons results in one sample.

Lab results are presented in Table 1 and the lab analytical reports are presented in Appendix C.

---

[6] TCLP analysis was performed for select samples based on location and total arsenic and total lead concentrations.

### 3.2.2. TCLP Data Quality

Overall, the data were of good quality and the results of the applicable lab QA/QC procedures were generally acceptable. Selected sample results required qualification during data validation because method-specific QA/QC criteria were not met (results may have been qualified for more than one reason). During data validation, one arsenic result was qualified as estimated (assigned a J qualifier). Lab results are presented in Table 1 and the lab analytical reports are presented in Appendix C.

### 3.2.3. XRF Data Quality

Overall, the data were of good quality and the results of the applicable QA/QC procedures were generally acceptable. Selected sample results required qualification during data validation because method-specific QA/QC criteria were not met (results may have been qualified for more than one reason).

- All 56 arsenic results reported as detected for SRM 2781 analysis were qualified as estimated (assigned a J qualifier) due to spectral overlap interferences due to a higher lead concentration.
- The results reported for arsenic and lead in two samples (four measurements on each sample for a total of 8 results) were qualified as either estimated (J) or were qualified as non-detect and estimated (UJ) because the percent moisture content was greater than 20 percent.
- A total of 89 sample and blank results reported as detected for lead at concentrations less than 25 mg/kg were qualified as non-detect (assigned a U qualifier). A reporting limit of 25 mg/kg was used for all of these restated results.
- A total of 136 results reported as detected for lead were qualified as estimated (J) if the concentrations were >25 mg/kg and ≤100 mg/kg.

The XRF results are presented in Table 2, lab and XRF data are presented together in Table 3, and the XRF data review and results are presented in Appendix D.

# 4. Soil Volume Verification and XRF Demonstration

An evaluation was performed to verify the volume of soil to be excavated during remediation activities and to demonstrate that the XRF analytical method is appropriate for use at the Property. The soil volume verification and XRF demonstration evaluations are presented in this section.

## 4.1. Soil Volume Verification

Soil volume verification consisted of collecting samples in areas that were not characterized during previous investigations. These analytical data are presented in Table 1 and will be incorporated into the upcoming Remedial Design Report. The following soil characteristics were observed during the soil sampling event:

- The top six inches to one foot of soil consisted of asphalt and introduced gravel;
- The next eight to 10 feet consisted of introduced fill materials (i.e., construction debris mixed with sand, construction debris mixed with hydrated lime, or pure black shot); and
- The soil below the fill materials was a clay-rich silt with varying degrees of sand.

No significant changes in soil characteristics from previous investigations were noted in the geological lithology (see Appendix B).

## 4.2. XRF Demonstration

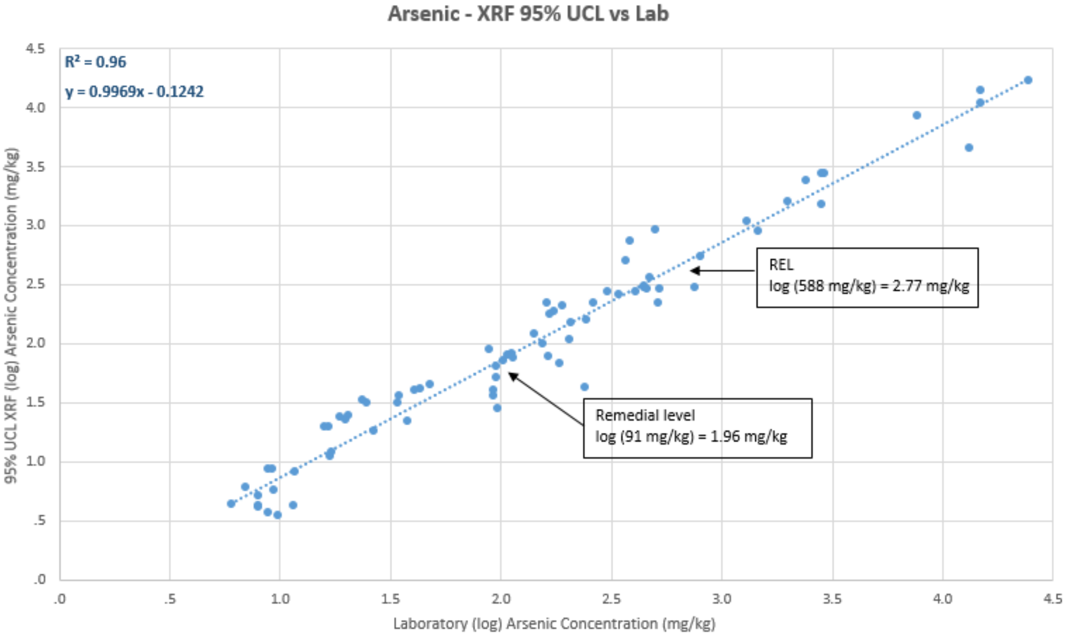
The XRF demonstration was conducted to determine if the XRF method can provide reliable and valid data for measuring lead and arsenic concentrations in soil during full-scale remediation activities to eliminate the lab turn-around time. Seventy-seven samples were analyzed for total arsenic and total lead using both XRF and lab methods and the data from these two methods were compared (see Table 3). These two sets of data were evaluated to:

- Determine the linear correlation between the two methods by calculating a correlation coefficient ($R^2$)
- Assess the validity of the XRF method for identifying soil concentrations greater than and less than the arsenic RELs of 91 mg/kg and 588 mg/kg and the lead RELs of 679 mg/kg and 1,000 mg/kg [PERC/PIONEER 2014] by calculating sensitivity and specificity.

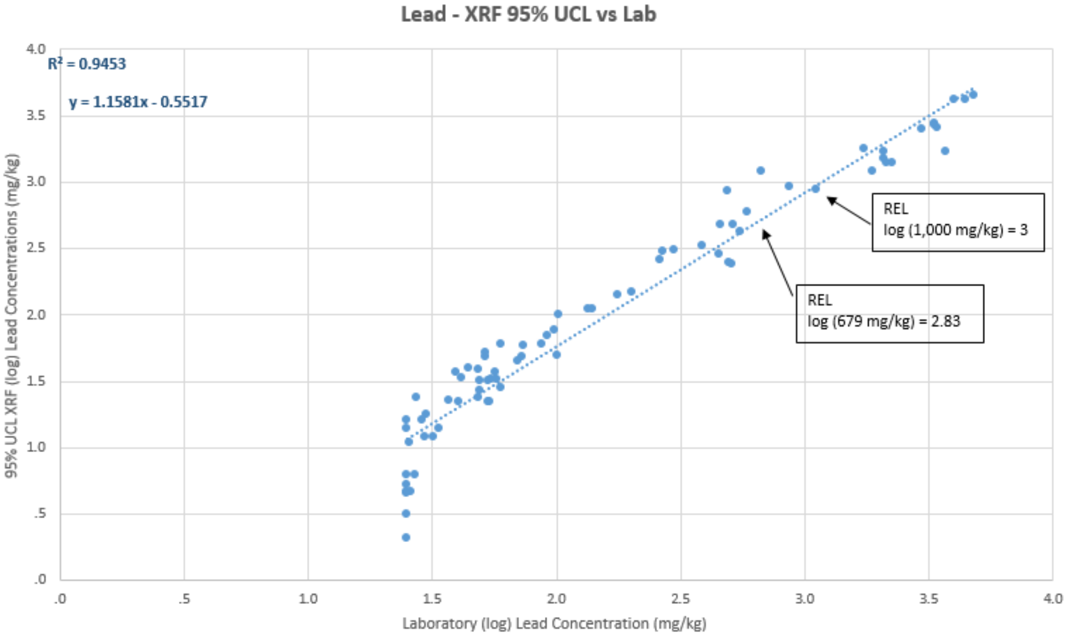
### *4.2.1. Correlation Coefficients*

To determine the linear correlation between XRF and lab methods, correlation coefficients ($R^2$) were calculated. The 95% Upper Confidence Limit on the mean was calculated to determine representative arsenic and lead concentrations using the four XRF readings collected for each sample to account for variability. This approach is consistent with USEPA and Intrastate Technology Regulatory Council (ITRC) guidance (USEPA 2010). Data were log transformed prior to calculating the correlation coefficients to account for the results spanning several orders of magnitude. Data were analyzed using the linear regression function in Excel and results were graphed.

The regression line for the 95% UCL XRF arsenic concentrations versus the lab-derived concentrations is presented in the following graph. A correlation coefficient ($R^2$) of 0.96 for arsenic was calculated. A perfect linear relationship would result in a $R^2$ of one. The $R^2$ and graph indicate that the XRF and lab results are highly correlated and have good linearity.



The regression line for the 95% UCL XRF lead concentrations versus the lab-derived concentrations is presented in the following graph. An $R^2$ of 0.95 for lead was calculated. The $R^2$ and graph indicate that the XRF and lab results are highly correlated and have good linearity.



Note: One lead shot and one log debris sample were included in the correlation calculations.

### *4.2.2. Sensitivity and Specificity*

Sensitivity and specificity were calculated to assess the validity and reliability of the XRF method for identifying soil concentrations greater than and less than the arsenic and lead RELs compared to lab-derived measurements. Determining the sensitivity and specificity of a screening test is a common approach used to assess the validity of new testing methods (see Appendix E). For the purposes of this evaluation, sensitivity and specificity are defined as follows:

- Sensitivity is the probability of an XRF-tested soil concentration being greater than the REL if the lab-tested soil concentration is greater than the REL. Sensitivity can range from zero to 100%. A sensitivity of 100% indicates that all XRF-tested soil concentrations would yield the same remedial decision as the lab-tested concentrations for results greater than RELs. As the sensitivity increases, the chance of an XRF-tested soil concentration being less than the REL when the lab-tested soil concentration is greater than the REL decreases (false negatives).
- Specificity is the probability of an XRF-tested soil concentration being less than the REL if the lab-tested soil concentration is less than the REL. Specificity can range from zero to 100%. A specificity of 100% indicates that all XRF-tested soil concentrations would yield the same as all lab-tested soil concentrations for results less than RELs. As the specificity increases, the chance of an XRF-tested soil concentration being greater than the REL when the lab-tested soil concentration is less than REL decreases (false positives).

Sensitivity and specificity were calculated by comparing (1) XRF results with the lab results, and (2) primary lab results with duplicate lab results. For the XRF results versus lab results comparison, lab-tested soil concentrations were used to represent actual soil concentrations. For the primary lab results versus duplicate lab results comparison, the primary lab-measured results were used to represent the actual soil concentrations.

#### XRF Results versus Lab Results

To compare the XRF results with the lab results, XRF-tested soil concentrations were compared to the lab-tested soil concentrations. Sensitivity and specificity were calculated for the two arsenic RELs (91 mg/kg and 588 mg/kg) and two lead RELs (679 mg/kg and 1,000 mg/kg). The sensitivity and specificity values are presented in Table 5 and are summarized below.

For arsenic, the XRF method yielded sensitivities of 100% and 86% for the 91 mg/kg REL and the 588 mg/kg REL, respectively. Based on these percentages, soil concentrations greater than the arsenic REL were similarly identified 100% of the time for the REL of 91 mg/kg and 86% of the time for the REL of 588 mg/kg using the XRF method. The XRF method yielded specificities of 71% and 97% for the 91 mg/kg REL and the 588 mg/kg REL, respectively. Based on these percentages, soil concentrations less than the RELs were similarly identified 71% of the time for the 91 mg/kg REL and 97% of the time for the 588 mg/kg REL using the XRF method.

For lead, the XRF method yielded sensitivities of 89% and 93% for the 679 mg/kg REL and the 1,000 mg/kg REL, respectively. These percentages indicate that soil concentrations greater than the lead RELs were similarly identified 89% of the time for the 679 mg/kg REL and 93% of the time for the 1,000 mg/kg REL using the XRF method. The XRF method yielded specificities of 100% and 98% for the 679 mg/kg REL and the 1,000 mg/kg REL, respectively. Based on these percentages, soil concentrations less than the RELs were similarly identified 100% of the time for the 679 mg/kg REL and 98% of the time for the 1,000 mg/kg REL.

**XRF vs Lab Data: Sensitivity and Specificity**

| Constituent | REL (mg/kg) | Sensitivity | Specificity |
|---|---|---|---|
| Arsenic | 91 | 100% | 71% |
| Arsenic | 588 | 86% | 97% |
| Lead | 679 | 89% | 100% |
| Lead | 1,000 | 93% | 98% |

## Primary Lab Result versus Duplicate Lab Result

To determine intra-sample variability, primary lab samples were compared to field duplicate lab samples (see Table 4) by calculating the sensitivity and specificity for the two arsenic RELs (91 mg/kg and 588 mg/kg) and two lead RELs (679 mg/kg and 1,000 mg/kg). The primary lab versus duplicate lab sensitivity and specificity values are presented in Table 6 and summarized below.

For arsenic, the duplicate lab results yielded sensitivities of 84% and 90% for the 91 mg/kg REL and 588 mg/kg REL, respectively. These percentages indicate that soil concentrations greater than the arsenic RELs were similarly identified 84% of the time for the 91 mg/kg REL and 90% percent of the time for the 588 mg/kg REL. The duplicate lab results yielded specificities of 92% and 95% for the 91 mg/kg REL and 588 mg/kg REL, respectively. These percentages indicate that soil concentrations less than the arsenic RELs were similarly identified 92% of the time for the 91 mg/kg REL and 95% of the time for the 588 mg/kg REL.

For lead, the duplicate lab results yielded sensitivities of 100% and 88% for the RELs of 679 mg/kg and 1,000 mg/kg, respectively. These percentages indicate that soil concentrations greater than the lead RELs were similarly identified 100% of the time for the 679 mg/kg REL and 88% of the time for the 1,000 mg/kg REL. The duplicate lab results yielded specificities of 91% for both the 679 mg/kg REL and the 1,000 mg/kg REL. This percentage indicates that soil concentrations less than the lead RELs were similarly identified 91% of the time.

**Primary Lab vs Duplicate Lab Data: Sensitivity and Specificity**

| Constituent | REL (mg/kg) | Sensitivity | Specificity |
|---|---|---|---|
| Arsenic | 91 | 84% | 92% |
| Arsenic | 588 | 90% | 95% |
| Lead | 679 | 100% | 91% |
| Lead | 1,000 | 88% | 91% |

The duplicate lab results were NOT expected to match perfectly with the primary lab results (i.e., sensitivities and specificities of 100% were not expected) because the soil at the Property is highly heterogeneous. The heterogeneity is due to the different types of fill, soil, and debris found at the Property. In addition, a “nugget effect” in Property soil is likely. The nugget effect occurs when constituents preferentially attach to certain particles, resulting in highly-concentrated constituent concentrations within a matrix surrounded by areas of low or no constituent concentrations.[7]

The sensitivities and specificities observed for the duplicate lab data were similar to the sensitivities and specificities for the XRF data. The XRF method had lower specificity (71%) for the arsenic REL of 91 mg/kg. This percentage indicates that the XRF method would identify more samples with concentrations greater than the REL when the concentrations were actually below the REL, resulting in more cleanup decisions, not less. These results demonstrate that the XRF method is comparable to the laboratory method for identifying sample concentrations greater than and less than the REL and are appropriate for use when making remedial decisions.

## Summary

This evaluation demonstrated that:

- The XRF method was as sensitive as duplicate lab data when determining if sample concentrations were greater than the REL. These results indicate that the XRF method provides valid results for accurately identifying soil concentrations for remedial decisions.
- The XRF method was as specific as the laboratory method for identifying soil concentrations less than the RELs for the arsenic REL of 588 mg/kg and for the two lead RELs. The XRF method had lower specificity (71%) for the arsenic REL of 91 mg/kg. This percentage indicates that the XRF method would identify more samples with concentrations greater than the REL when the concentrations were actually below the REL, resulting in more cleanup decisions, not less.

The XRF results versus lab results sensitivity and specificity values and the primary lab results versus the duplicate lab results sensitivity and specificity values were comparable, demonstrating that the XRF is a valid method for determining arsenic and lead concentrations and for making remedial decisions. As expected, observed soil heterogeneity at the Property can impact intra-sample variability regardless of the analytical method.

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[7] The physical and chemical contaminant properties combined with different soil particles, contaminant atoms, and molecules bind to some particles loosely and to other particles tightly, resulting in “nuggets” (Interstate Technology Regulatory Council [ITRC] 2017).

## 5. Conclusions

The sampling and evaluation activities reported in this document were performed to provide additional data for use in verifying the estimated volume of soil to be excavated during cleanup actions. The soil volume verification sampling data will be used in the upcoming Remedial Design Report. In addition, soil samples were analyzed using an XRF analytical method to demonstrate its use at the Property. The following conclusions can be drawn based on the data evaluations presented in this report:

- The geologic characteristics of the soil sampled during this event were similar to the characteristics encountered during previous soil sampling events.
- Property soil is heterogeneous (consisting of different types of fill, soil, and debris) and is subject to the "nugget effect," which contribute to variability in soil sampling results.
- The XRF total arsenic and total lead soil concentrations were highly, positively correlated with lab-tested concentrations.
- The XRF method had sensitivity values greater than or equal to 86%, indicating that the XRF produces valid analytical data for identifying soil concentrations greater than the RELs.
- XRF method sensitivities and specificities were similar to duplicate lab sensitivities and specificities.
- The results of the XRF demonstration indicates that the XRF field procedures and analytical method produced valid total arsenic and total lead measurements.
- The results of the XRF demonstration indicates that XRF can be used during future sampling efforts without the need for lab confirmation analysis.

# 6. References

ITRC. 2017. Incremental Sampling Methodology: 2.2 Soil Heterogeneity and Variation in Contaminant Concentrations. http://www.itrcweb.org/ism-1/2_2_Soil_Heterogeneity_and_Variation.html

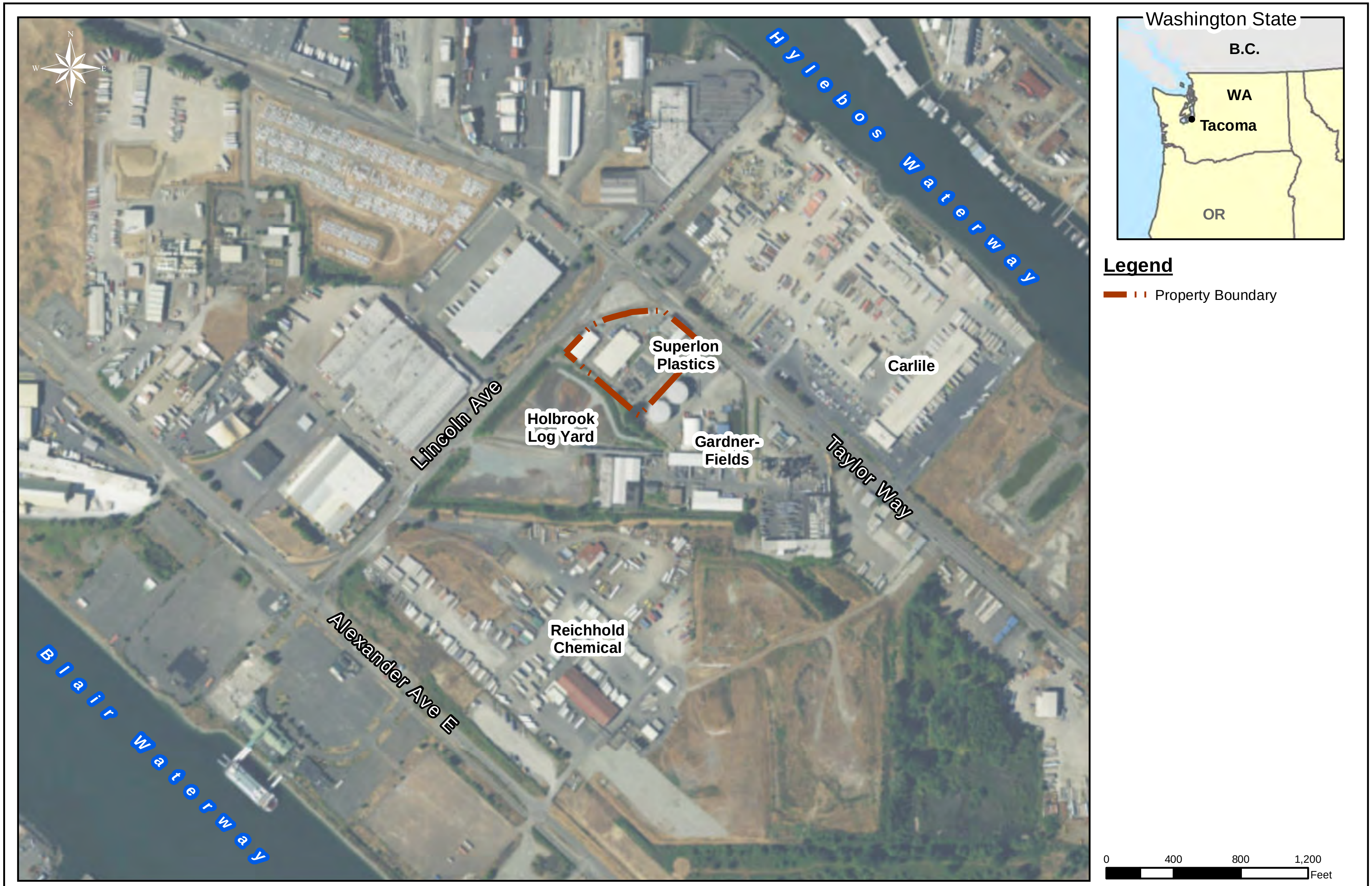
PERC/PIONEER. 2013. Remedial Investigation Report for On-Property Soils and Surface Water. Superlon Plastics Site. Tacoma, Washington. September.

PERC/PIONEER. 2014. Final Feasibility Study for On-Property Soils and Perched Water. Superlon Plastics Property Tacoma, WA. December 17.

PERC/PIONEER. 2016. Superlon Plastics Site: Remedial Design: Soil Volume and XRF Demonstration Work Plan. May.

USEPA. 2010. Advanced Design Application & Data Analysis for Field-Portable XRF.

# Figures



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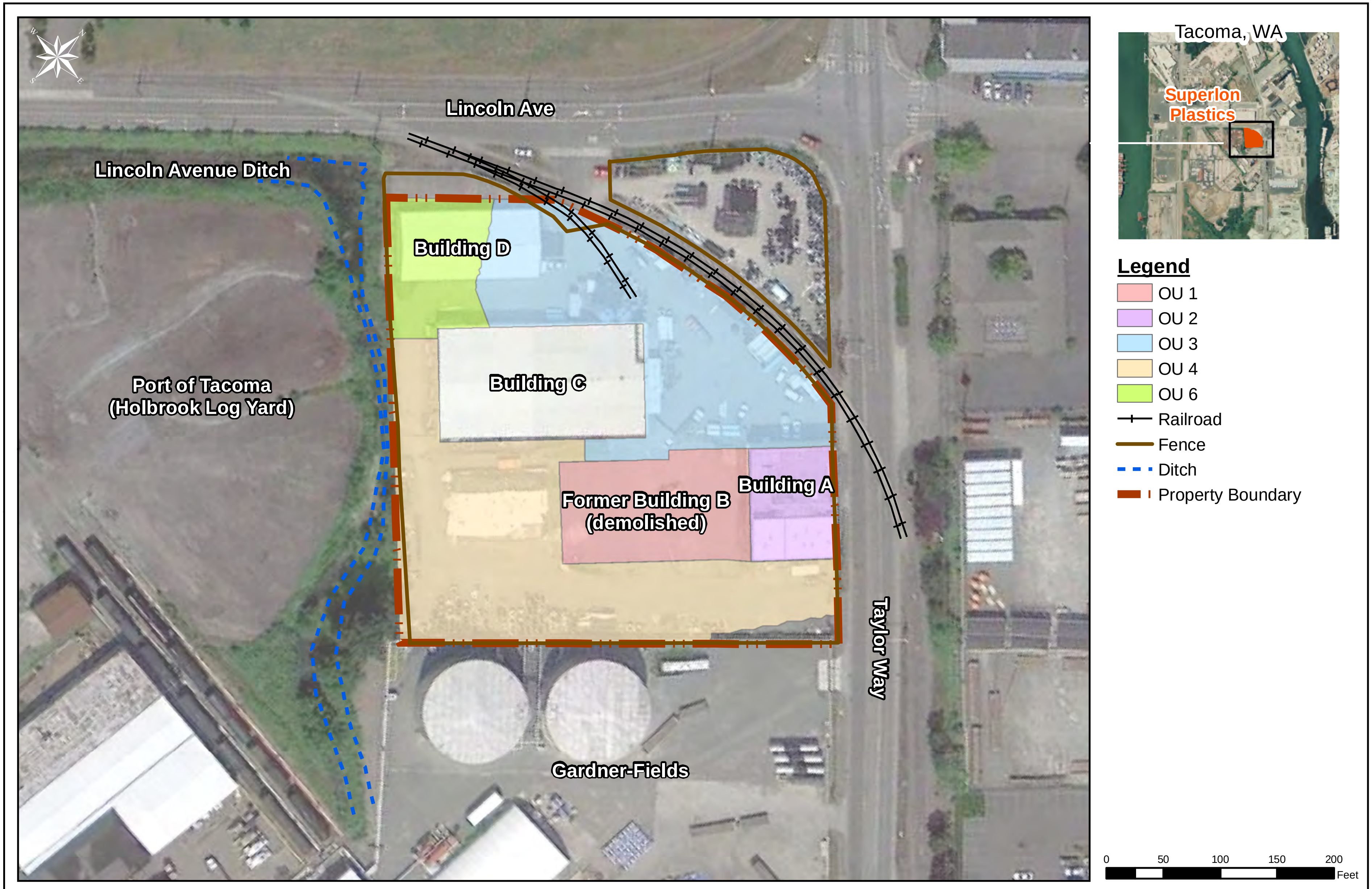
# Property Location
# Remedial Design: Soil Volume Verification and XRF Demonstration Report
# Superlon Plastics Property, Tacoma, Washington

Figure 1

*Document Path: G:\Projects\Superlon\Maps\2016\Soil Volume Verification and XRF Report\Figure 1_Superlon Site Location.mxd; Author: SM; Date Saved: 11/22/2016*



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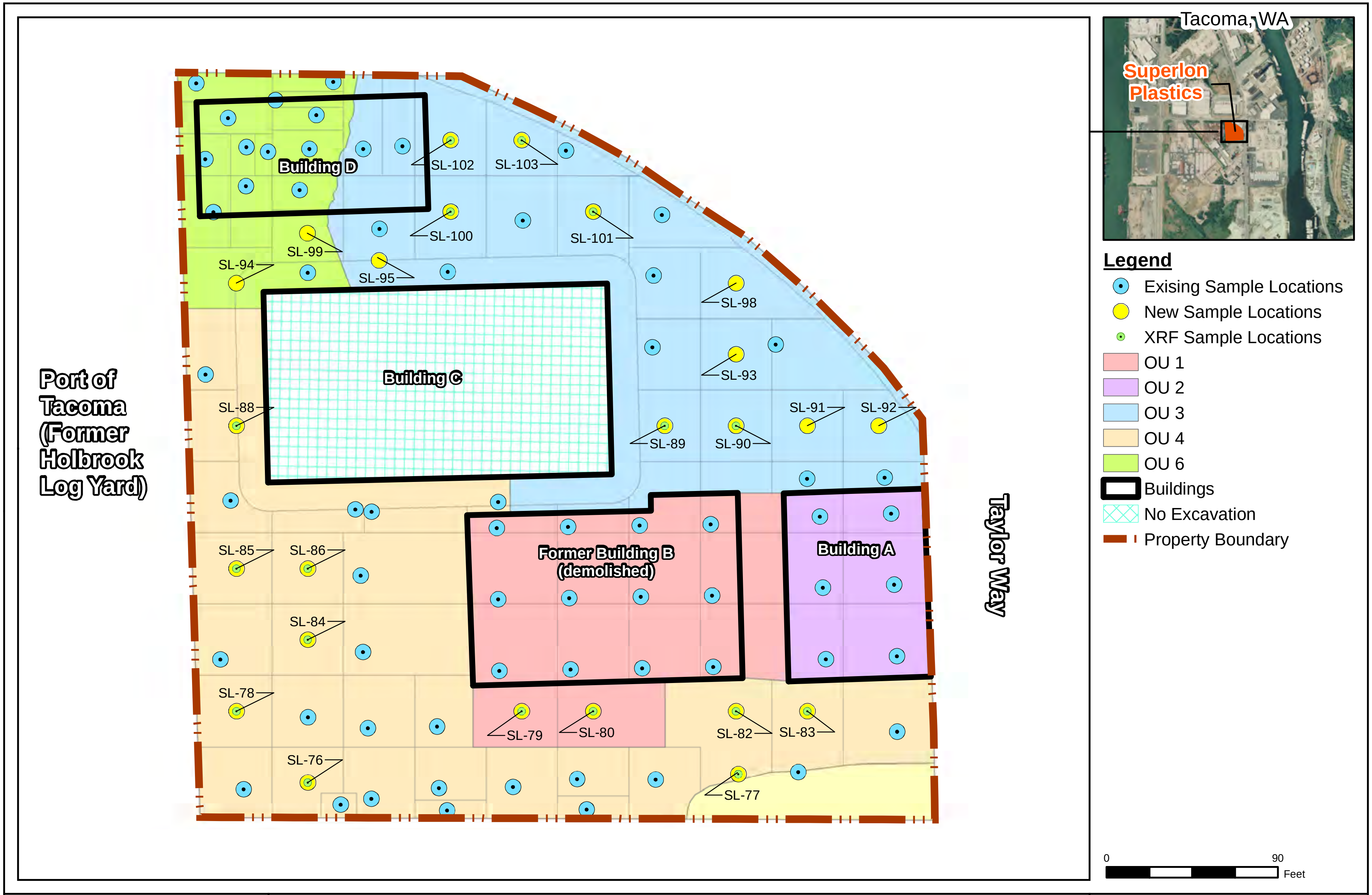
## Property Features
## Remedial Design: Soil Volume Verification and XRF Demonstration Report
## Superlon Plastics Property, Tacoma, Washington

Figure 2

*Document Path: G:\Projects\Superlon\Maps\2016\Soil Volume Verification and XRF Report\Figure 2_Site Features.mxd; Author: SM; Date Saved: 11/22/2016*



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Sample Locations
Remedial Design: Soil Volume Verification and XRF Demonstration Report
Superlon Plastics Property, Tacoma, WA

Figure 3

Document Path: G:\Projects\Superlon\Maps\2016\Soil Volume Verification and XRF Report\Figure_3_XRF.mxd; Author: VN; Date Saved: 12/5/2016

# Tables

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-EB-01-052616 | SO-LD-01-052316 | SO-MC-01-052316 | SO-SL-100-052516-1-2 | SO-SL-100-052516-2-4 | SO-SL-100-052516-4-6 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 0.0400 | 5.30 | 14.0 | 18.0 | 19.7 | 20.6 |
| Percent Solids (%) | 100 | 94.7 | 86.0 | 82.0 | 80.3 | 79.4 |
| pH (SU) | | | | 10.3 | 12.0 | 12.4 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 2.60 U | 290 | 2400 | 6.20 | 3.80 | 4.20 |
| Lead and Compounds | 1.30 U | 39.0 | 2800 | 18.0 | 14.0 | 10.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-100-052516-6-8 | SO-SL-100-052516-8-10 | SO-SL-100-052516-10-12 | SO-SL-100-052516-12-14 | SO-SL-100-052516-14-15 | SO-SL-101-052316-1-2 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 36.7 | 0.0800 | 1.00 | 0.500 | 22.1 | 4.00 |
| Percent Solids (%) | 63.3 | 99.9 | 99.0 | 99.5 | 77.9 | 96.0 |
| pH (SU) | 12.2 | 12.4 | 10.4 | 9.90 | 9.60 | 10.3 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 84.0 | 11.0 | 83.0 | 32.0 | 9.60 | 5.80 |
| Lead and Compounds | 40.0 | 28.0 | 12.0 | 4.70 | 2.40 | 32.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-101-052316-2-4 | SO-SL-101-052316-4-6 | SO-SL-101-052316-6-8 | SO-SL-101-052316-8-10 | SO-SL-101-052316-10-12 | SO-SL-101-052316-12-14 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 23.5 | 28.7 | 31.1 | 17.0 | 14.6 | 20.5 |
| Percent Solids (%) | 76.5 | 71.3 | 68.9 | 83.0 | 85.4 | 79.5 |
| pH (SU) | 11.9 | 12.3 | 12.4 | 11.1 | 10.3 | 9.90 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 3.50 U | 3.70 U | 35.0 | 32.0 | 76.0 | 45.0 |
| Lead and Compounds | 28.0 | 55.0 | 27.0 | 49.0 | 6.30 | 4.60 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-101-052316-14-15 | SO-SL-102-052516-1-2 | SO-SL-102-052516-2-4 | SO-SL-102-052516-4-6 | SO-SL-102-052516-6-8 | SO-SL-102-052516-8-10 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | 1.30 | 0.470 |
| Lead and Compounds | | | | | 0.940 | 0.0300 U |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 29.3 | 9.70 | 20.4 | 23.3 | 1.40 | 3.70 |
| Percent Solids (%) | 70.7 | 90.3 | 79.6 | 76.7 | 98.6 | 96.3 |
| pH (SU) | 9.40 | 12.4 | 12.3 | 12.4 | 9.30 | 10.1 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 9.80 | 2.70 U | 4.00 | 74.0 | 280 | 120 |
| Lead and Compounds | 3.60 | 17.0 | 14.0 | 23.0 | 600 | 480 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-102-052516-10-12 | SO-SL-102-052516-12-14 | SO-SL-102-052516-14-15 | SO-SL-103-052516-1-2 | SO-SL-103-052516-2-4 | SO-SL-103-052516-4-6 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 0.0600 U | | | | | |
| Lead and Compounds | 0.0300 U | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 40.3 | 28.1 | 23.0 | 11.7 | 22.4 | 32.5 |
| Percent Solids (%) | 59.7 | 71.9 | 77.0 | 88.3 | 77.6 | 67.5 |
| pH (SU) | 9.90 | 9.40 | 9.50 | 9.50 | 12.3 | 12.4 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 130 | 3.40 | 3.50 U | 8.20 | 3.90 | 3.90 U |
| Lead and Compounds | 160 | 4.00 | 3.70 | 37.0 | 21.0 | 23.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-103-052516-6-8 | SO-SL-103-052516-8-10 | SO-SL-103-052516-10-12 | SO-SL-103-052516-12-14 | SO-SL-103-052516-14-15 | SO-SL-76-052516-2-4 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 0.0600 U | | 0.0600 U | | | |
| Lead and Compounds | 0.330 | | 0.0330 | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 32.8 | 9.90 | 17.4 | 39.8 | 28.2 | 30.3 |
| Percent Solids (%) | 67.2 | 90.1 | 82.6 | 60.2 | 71.8 | 69.7 |
| pH (SU) | 11.4 | 10.6 | 10.3 | 9.70 | 9.50 | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 200 | 41.0 | 190 | 83.0 | 67.0 | 450 |
| Lead and Compounds | 4300 | 260 | 150 F1 | 20.0 | 19.0 | 230 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | 41.0 U | | |
| Motor Oil Range Organics [>C24-C36] | | | | 230 | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-76-052516-4-6 | SO-SL-76-052516-6-8 | SO-SL-76-052516-8-10 | SO-SL-76-052516-10-12 | SO-SL-76-052516-12-14 | SO-SL-76-052516-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | 1.30 | | | | |
| Lead and Compounds | | 0.0860 | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 3.00 | 53.6 | 4.40 | 36.0 | 30.4 | 22.2 |
| Percent Solids (%) | 97.0 | 46.4 | 95.6 | 64.0 | 69.6 | 77.8 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 290 | 470 | 300 | 65.0 | 3.70 U | 3.30 U |
| Lead and Compounds | 290 | 290 | 140 | 33.0 F1 | 2.70 | 2.40 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-77-052616-1-2 | SO-SL-77-052616-2-4 | SO-SL-77-052616-4-6 | SO-SL-77-052616-6-8 | SO-SL-77-052616-8-10 | SO-SL-77-052616-10-12 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 7.90 | 15.6 | 19.1 | 2.40 | 2.30 | 39.3 |
| Percent Solids (%) | 92.1 | 84.4 | 80.9 | 97.6 | 97.7 | 60.7 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 210 | 260 | 1500 | 1500 | 910 | 240 |
| Lead and Compounds | 310 | 370 | 1700 | 1700 | 1700 | 170 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-77-052616-12-14 | SO-SL-77-052616-14-15 | SO-SL-78-052516-2-4 | SO-SL-78-052516-4-6 | SO-SL-78-052516-6-8 | SO-SL-78-052516-8-10 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | 0.710 |
| Lead and Compounds | | | | | | 0.0300 U |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 34.8 | 18.1 | 3.60 | 4.30 | 17.4 | 40.7 |
| Percent Solids (%) | 65.2 | 81.9 | 96.4 | 95.7 | 82.6 | 59.3 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 13.0 | 3.50 | 80.0 | 72.0 | 65.0 | 1900 F2 |
| Lead and Compounds | 14.0 | 5.90 | 69.0 | 61.0 | 50.0 | 210 F1 F2 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-78-052516-10-12 | SO-SL-78-052516-12-14 | SO-SL-78-052516-14-15 | SO-SL-79-052516-1-2 | SO-SL-79-052516-2-4_DC | SO-SL-79-052516-4-6 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | 0.230 | 2.10 | |
| Lead and Compounds | | | | 0.150 | 0.800 | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 9.40 | 22.4 | 22.1 | 4.70 | 16.9 | 15.1 |
| Percent Solids (%) | 90.6 | 77.6 | 77.9 | 95.3 | 83.2 | 84.9 |
| pH (SU) | | | | | 7.60 | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 310 | 3.40 U | 3.50 U | 110 | 1600 | 14000 |
| Lead and Compounds | 48.0 | 2.40 | 2.30 | 110 | 930 | 4200 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

# Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-79-052516-6-8 | SO-SL-79-052516-8-10 | SO-SL-79-052516-10-12 | SO-SL-79-052516-12-14 | SO-SL-79-052516-14-15 | SO-SL-80-052516-2-4 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 30.0 | 41.0 | 13.0 | | 9.80 | |
| Lead and Compounds | 0.510 | 0.0300 U | 0.160 | | 0.0300 U | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 15.7 | 11.6 | 37.1 | 38.3 | 22.5 | 7.70 |
| Percent Solids (%) | 84.3 | 88.4 | 62.9 | 61.7 | 77.5 | 92.3 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 17000 | 8500 | 3100 | 1400 | 740 | 78.0 |
| Lead and Compounds | 4500 | 18.0 | 530 | 23.0 | 3.20 | 22.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-80-052516-4-6 | SO-SL-80-052516-6-8 | SO-SL-80-052516-8-10 | SO-SL-80-052516-10-12 | SO-SL-80-052516-12-14_DC | SO-SL-80-052516-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 5.90 | 8.80 | 12.0 | 4.10 | 0.680 | |
| Lead and Compounds | 2.50 | 0.980 | 0.0300 U | 0.0300 U | 0.0300 U | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 16.1 | 6.40 | 18.9 | 49.9 | 5.00 | 17.6 |
| Percent Solids (%) | 83.9 | 93.6 | 81.1 | 50.1 | 95.0 | 82.4 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 9400 | 4500 | 11000 | 6200 | 265 | 65.0 |
| Lead and Compounds | 19000 | 4200 | 480 | 36.0 | 3.20 | 1.90 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-82-052416-1-2 | SO-SL-82-052416-2-4 | SO-SL-82-052416-4-6 | SO-SL-82-052416-6-8 | SO-SL-82-052416-8-10 | SO-SL-82-052416-10-12 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | 0.300 | | 2.30 | | |
| Lead and Compounds | | 0.350 | | 1.50 | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 3.10 | 17.5 | 33.8 | 17.6 | 47.7 | 7.40 |
| Percent Solids (%) | 96.9 | 82.5 | 66.2 | 82.4 | 52.3 | 92.6 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 19.0 | 280 | 200 | 1100 | 28.0 | 18.0 |
| Lead and Compounds | 33.0 | 420 | 87.0 | 1800 | 7.50 | 14.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-82-052416-12-14 | SO-SL-82-052416-14-15 | SO-SL-83-052516-1-2 | SO-SL-83-052516-2-4 | SO-SL-83-052516-4-6 | SO-SL-83-052516-6-8 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 22.2 | 18.9 | 9.90 | 16.3 | 52.2 | 14.3 |
| Percent Solids (%) | 77.8 | 81.1 | 90.1 | 83.7 | 47.8 | 85.7 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 4.40 | 3.10 U | 220 | 64.0 | 45.0 | 75.0 |
| Lead and Compounds | 2.10 | 1.50 U | 300 | 110 | 70.0 | 98.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-83-052516-8-10 | SO-SL-83-052516-10-12 | SO-SL-83-052516-12-14 | SO-SL-83-052516-14-15 | SO-SL-84-052516-2-4 | SO-SL-84-052516-4-6 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 16.1 | 15.5 | 29.5 | 18.6 | 1.20 | 5.40 |
| Percent Solids (%) | 83.9 | 84.5 | 70.5 | 81.4 | 98.8 | 94.6 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 52.0 | 160 | 4.80 | 2.50 U | 9.00 | 89.0 |
| Lead and Compounds | 32.0 | 33.0 | 3.50 | 1.20 U | 6.50 | 77.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-84-052516-6-8 | SO-SL-84-052516-8-10 | SO-SL-84-052516-10-12 | SO-SL-84-052516-12-14 | SO-SL-85-052516-2-4 | SO-SL-85-052516-4-6 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | 0.0600 U |
| Lead and Compounds | | | | | | 0.410 |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 10.4 | 30.2 | 7.00 | 23.4 | 1.50 | 29.3 |
| Percent Solids (%) | 89.6 | 69.8 | 93.0 | 76.6 | 98.5 | 70.7 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 40.0 | 54.0 | 12.0 | 2.80 U | 36.0 | 1300 |
| Lead and Compounds | 22.0 | 9.50 | 5.20 | 2.20 | 12.0 | 1300 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-85-052516-6-8 | SO-SL-85-052516-8-10 | SO-SL-85-052516-10-12_DC | SO-SL-85-052516-12-14 | SO-SL-85-052516-14-15 | SO-SL-86-052516-2-4 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 1.10 | 34.2 | 42.1 | 39.8 | 20.0 | 0.700 |
| Percent Solids (%) | 98.9 | 65.8 | 57.9 | 60.2 | 80.0 | 99.3 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 100 | 110 | 155 | 6.20 | 3.20 U | 68.0 |
| Lead and Compounds | 330 | 660 | 280 | 7.20 | 2.90 | 250 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-86-052516-4-6 | SO-SL-86-052516-6-8 | SO-SL-86-052516-8-10 | SO-SL-86-052516-10-12 | SO-SL-86-052516-12-14_DC | SO-SL-86-052516-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 0.0600 U | | 0.0600 U | | | |
| Lead and Compounds | 0.0430 | | 0.500 | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 1.50 | 1.60 | 28.6 | 32.1 | 24.7 | 29.7 |
| Percent Solids (%) | 98.5 | 98.4 | 71.4 | 67.9 | 75.3 | 70.3 |
| pH (SU) | | | | | | |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 43.0 | 28.0 | 55.0 | 49.0 | 3.50 U | 14.0 |
| Lead and Compounds | 1400 | 240 | 1800 | 82.0 | 3.70 | 2.70 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-88-052516-2-4 | SO-SL-88-052516-4-6 | SO-SL-88-052516-6-8 | SO-SL-88-052516-8-10 | SO-SL-89-052316-1-2 | SO-SL-89-052316-2-4_DC |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | 0.390 | | | | |
| Lead and Compounds | | 0.0300 U | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 0.500 | 2.40 | 50.8 | 43.5 | 18.1 | 31.4 |
| Percent Solids (%) | 99.5 | 97.6 | 49.2 | 56.5 | 81.9 | 68.7 |
| pH (SU) | | | | | 10.5 | 12.4 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 300 | 360 | 110 | 64.0 | 4.10 | 4.50 |
| Lead and Compounds | 1200 | 880 | 42.0 | 7.90 | 24.0 | 20.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-89-052316-4-6 | SO-SL-89-052316-6-8 | SO-SL-89-052316-8-10 | SO-SL-89-052316-10-12 | SO-SL-89-052316-12-14 | SO-SL-89-052316-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | 0.0600 U | | | | |
| Lead and Compounds | | 0.0300 U | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 30.0 | 45.9 | 28.1 | 31.9 | 32.6 | 7.20 |
| Percent Solids (%) | 70.0 | 54.1 | 71.9 | 68.1 | 67.4 | 92.8 |
| pH (SU) | 12.4 | 12.4 | 12.4 | 10.2 | 9.30 | 9.90 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 3.70 U | 810 | 24.0 | 31.0 | 8.20 | 25.0 |
| Lead and Compounds | 84.0 | 300 | 24.0 | 27.0 | 8.50 | 16.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-90-052316-1-2 | SO-SL-90-052316-2-4 | SO-SL-90-052316-4-6 | SO-SL-90-052316-6-8 | SO-SL-90-052316-8-10 | SO-SL-90-052316-10-12 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | 0.0600 U | 0.0600 U | 0.0600 U | |
| Lead and Compounds | | | 0.0300 U | 0.0300 U | 0.0300 U | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 18.5 | 29.0 | 26.2 | 23.7 | 50.6 | 46.2 |
| Percent Solids (%) | 81.5 | 71.0 | 73.8 | 76.3 | 49.4 | 53.8 |
| pH (SU) | 11.2 | 12.3 | 12.3 | 12.4 | 12.4 | 11.1 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 62.0 | 3.70 U | 110 | 510 | 570 | 810 |
| Lead and Compounds | 110 | 7.40 | 9.70 | 6.30 | 250 | 7.80 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-90-052316-12-14 | SO-SL-90-052316-14-15 | SO-SL-91-052316-1-2 | SO-SL-91-052316-2-4 | SO-SL-91-052316-4-6 | SO-SL-91-052316-6-8 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 32.2 | 23.1 | 10.7 | 21.3 | 30.0 | 36.2 |
| Percent Solids (%) | 67.8 | 76.9 | 89.3 | 78.7 | 70.0 | 63.8 |
| pH (SU) | 9.90 | 9.40 | 10.6 | 12.3 | 12.3 | 12.4 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 19.0 | 3.40 U | 5.20 | 11.0 | 3.80 U | 16.0 |
| Lead and Compounds | 5.80 | 1.70 U | 22.0 | 18.0 | 24.0 | 17.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-91-052316-8-10 | SO-SL-91-052316-10-12 | SO-SL-91-052316-12-14 | SO-SL-91-052316-14-15 | SO-SL-92-052316-1-2 | SO-SL-92-052316-2-4 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | 0.340 | | | | |
| Lead and Compounds | | 0.0300 U | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 34.6 | 41.3 | 29.0 | 20.4 | 11.1 | 27.6 |
| Percent Solids (%) | 65.4 | 58.7 | 71.0 | 79.6 | 88.9 | 72.4 |
| pH (SU) | 12.4 | 10.6 | 9.10 | 9.30 | 9.80 | 12.3 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 28.0 | 95.0 | 6.30 | 3.20 U | 6.40 | 7.40 |
| Lead and Compounds | 19.0 | 13.0 | 4.60 | 1.60 | 33.0 | 36.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-92-052316-4-6 | SO-SL-92-052316-6-8 | SO-SL-92-052316-8-10_DC | SO-SL-92-052316-10-12 | SO-SL-92-052316-12-14 | SO-SL-92-052316-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | 0.370 | | | |
| Lead and Compounds | | | 0.0300 U | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 33.5 | 25.3 | 20.2 | 37.2 | 30.9 | 23.3 |
| Percent Solids (%) | 66.5 | 74.7 | 79.8 | 62.8 | 69.1 | 76.7 |
| pH (SU) | 12.4 | 12.4 | 11.7 | 9.10 | 8.70 | 8.40 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 10.0 | 3.70 U | 126 | 4.90 | 3.90 U | 3.50 U |
| Lead and Compounds | 29.0 | 37.0 | 124 | 5.40 | 2.60 | 2.00 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-93-052316-1-2 | SO-SL-93-052316-2-4 | SO-SL-93-052316-4-6 | SO-SL-93-052316-6-8 | SO-SL-93-052316-8-10 | SO-SL-93-052316-10-12 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 17.4 | 9.20 | 33.7 | 22.7 | 14.3 | 15.9 |
| Percent Solids (%) | 82.6 | 90.8 | 66.3 | 77.3 | 85.7 | 84.1 |
| pH (SU) | 11.3 | 12.4 | 12.4 | 12.4 | 11.2 | 11.1 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 3.50 | 4.20 | 3.90 U | 8.80 | 36.0 | 180 |
| Lead and Compounds | 45.0 | 50.0 | 4.00 | 52.0 | 100 | 59.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-93-052316-12-14 | SO-SL-93-052316-14-15 | SO-SL-94-052516-1-2 | SO-SL-94-052516-2-4 | SO-SL-94-052516-4-6 | SO-SL-94-052516-6-10 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | 0.130 | | 0.180 |
| Lead and Compounds | | | | 0.180 | | 0.0300 U |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 42.9 | 29.4 | 3.90 | 6.20 | 25.2 | 2.10 |
| Percent Solids (%) | 57.1 | 70.6 | 96.1 | 93.8 | 74.8 | 97.9 |
| pH (SU) | 9.60 | 9.10 | 9.40 | 9.70 | | 10.0 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 34.0 | 4.10 | 22.0 | 550 | | 220 |
| Lead and Compounds | 7.40 | 3.30 | 27.0 | 2500 | | 1400 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | 12000 | |
| Motor Oil Range Organics [>C24-C36] | | | | | 20000 | |

## Table 1: Laboratory Data

| **Constituent** **Sample ID:** | SO-SL-95-052316-1-2 | SO-SL-95-052316-2-4_DC | SO-SL-95-052316-4-6 | SO-SL-95-052316-6-8 | SO-SL-95-052316-8-10 | SO-SL-95-052316-10-12 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 11.8 | 20.0 | 13.7 | 37.5 | 25.4 | 14.9 |
| Percent Solids (%) | 88.2 | 80.1 | 86.3 | 62.5 | 74.6 | 85.1 |
| pH (SU) | 9.90 | 10.9 | 10.8 | 9.50 | 9.40 | 11.2 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 20.0 | 4.20 | 42.0 | 20.0 | 8.80 | 8.60 |
| Lead and Compounds | 40.0 | 33.5 | 16.0 | 5.50 | 2.70 | 23.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-95-052316-12-14 | SO-SL-95-052316-14-15 | SO-SL-98-052316-1-2 | SO-SL-98-052316-2-4 | SO-SL-98-052316-4-6 | SO-SL-98-052316-6-8 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | | |
| Lead and Compounds | | | | | | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 32.8 | 33.3 | 10.9 | 26.2 | 34.0 | 26.9 |
| Percent Solids (%) | 67.2 | 66.7 | 89.1 | 73.8 | 66.0 | 73.1 |
| pH (SU) | 10.6 | 10.1 | 10.6 | 12.4 | 12.5 | 12.5 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 28.0 | 200 | 15.0 | 3.70 | 4.10 U | 6.10 |
| Lead and Compounds | 75.0 | 7.60 | 19.0 | 18.0 | 13.0 | 14.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-98-052316-8-10 | SO-SL-98-052316-10-12 | SO-SL-98-052316-12-14 | SO-SL-98-052316-14-15 | SO-SL-99-052516-1-2 | SO-SL-99-052516-2-4_DC |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | | | | | 0.0600 U | 1.30 |
| Lead and Compounds | | | | | 0.0300 U | 0.390 |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 30.2 | 27.3 | 26.7 | 26.2 | 3.30 | 7.00 |
| Percent Solids (%) | 69.8 | 72.7 | 73.3 | 73.8 | 96.7 | 93.1 |
| pH (SU) | 12.5 | 10.6 | 9.90 | 9.50 | 10.0 | 9.90 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 33.0 | 23.0 | 15.0 | 6.90 | 220 | 2800 |
| Lead and Compounds | 33.0 | 4.70 | 3.50 | 2.60 | 1500 | 2550 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

## Table 1: Laboratory Data

| Constituent Sample ID: | SO-SL-99-052516-4-6 | SO-SL-99-052516-6-8 | SO-SL-99-052516-8-10 | SO-SL-99-052516-10-12 | SO-SL-99-052516-12-14 | SO-SL-99-052516-14-15 |
|---|---|---|---|---|---|---|
| **TCLP Soil (mg/L)** | | | | | | |
| Arsenic, Inorganic | 0.820 | | | 0.300 | 0.340 | |
| Lead and Compounds | 0.560 | | | 0.0300 U | 0.0300 U | |
| **Conventional** | | | | | | |
| Percent Moisture (%) | 0.0800 | 5.50 | 4.10 | 2.90 | 5.10 | 0.900 |
| Percent Solids (%) | 99.9 | 94.5 | 95.9 | 97.1 | 94.9 | 99.1 |
| pH (SU) | 10.3 | 11.4 | 11.3 | 10.5 | 10.5 | 10.6 |
| **Metals (mg/Kg)** | | | | | | |
| Arsenic, Inorganic | 2800 | 150 | 89.0 | 930 | 740 | 20.0 |
| Lead and Compounds | 2700 | 77.0 | 61.0 | 1200 | 860 | 11.0 |
| **Petroleum Hydrocarbons (mg/Kg)** | | | | | | |
| Diesel Range Organics [C10-C24] | | | | | | |
| Motor Oil Range Organics [>C24-C36] | | | | | | |

**Notes:**

The following qualifiers may be used in this table:

J - Constituent present, reported value is estimated

U - Constituent not detected at or above reporting limit

UJ - Constituent not detected; reporting limit is estimated

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 76 4-6 | 1 | 446 | | 428 | |
| 76 4-6 | 2 | 303 | | 270 | |
| 76 4-6 | 3 | 395 | | 275 | |
| 76 4-6 | 4 | 412 | | 416 | |
| 76 8-10 | 1 | 316 | | 111 | |
| 76 8-10 | 2 | 281 | | 110 | |
| 76 8-10 | 3 | 334 | | 130 | |
| 76 8-10 | 4 | 465 | | 186 | |
| 77 1-2 | 1 | 160 | | 232 | |
| 77 1-2 | 2 | 137 | | 220 | |
| 77 1-2 | 3 | 150 | | 224 | |
| 77 1-2 | 4 | 194 | | 310 | |
| 77 6-8 | 1 | 2,848 | | 3,612 | |
| 77 6-8 | 2 | 2,854 | | 3,724 | |
| 77 6-8 | 3 | 2,830 | | 3,637 | |
| 77 6-8 | 4 | 2,684 | | 3,581 | |
| 77 6-8 | 5 | 2,689 | | 3,705 | |
| 77 6-8 | 6 | 2,722 | | 3,638 | |
| 77 8-10 | 1 | 1,314 | | 1,678 | |
| 77 8-10 | 2 | 1,371 | | 2,106 | |
| 77 8-10 | 3 | 1,421 | | 1,915 | |
| 77 8-10 | 4 | 1,091 | | 1,745 | |
| 78 10-12 | 1 | 324 | | 47 | J |
| 78 10-12 | 2 | 312 | | 49 | J |
| 78 10-12 | 3 | 329 | | 67 | J |
| 78 10-12 | 4 | 469 | | 70 | J |
| 78 2-4 | 1 | 84 | | 73 | J |
| 78 2-4 | 2 | 91 | | 74 | J |
| 78 2-4 | 3 | 96 | | 73 | J |
| 78 2-4 | 4 | 108 | | 95 | J |
| 78 4-6 | 1 | 90 | | 50 | J |
| 78 4-6 | 2 | 103 | | 88 | J |
| 78 4-6 | 3 | 86 | | 58 | J |
| 78 4-6 | 4 | 97 | | 72 | J |
| 79 1-2 | 1 | 204 | | 134 | |
| 79 1-2 | 2 | 187 | | 119 | |
| 79 1-2 | 3 | 171 | | 132 | |
| 79 1-2 | 4 | 194 | | 137 | |
| 79 2-4 | 1 | 2,012 | | 905 | |
| 79 2-4 | 2 | 1,625 | | 677 | |
| 79 2-4 | 3 | 1,309 | | 514 | |
| 79 2-4 | 4 | 1,663 | | 576 | |
| 79 4-6 | 1 | 9,633 | | 2,213 | |
| 79 4-6 | 2 | 12,243 | | 3,286 | |
| 79 4-6 | 3 | 15,254 | | 4,421 | |
| 79 4-6 | 4 | 11,120 | | 3,602 | |
| 79 6-8 | 1 | 25,139 | | 3,545 | |
| 79 6-8 | 2 | 21,916 | | 5,024 | |
| 79 6-8 | 3 | 20,185 | | 3,146 | |
| 79 6-8 | 4 | 21,341 | | 3,562 | |
| 79 8-10 | 1 | 7,510 | | 31 | J |
| 79 8-10 | 2 | 7,330 | | 25 | U |
| 79 8-10 | 3 | 6,481 | | 25 | U |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 79 8-10 | 4 | 6,066 | | 25 | U |
| 80 12-14 | 1 | 294 | | 25 | U |
| 80 12-14 | 2 | 298 | | 25 | U |
| 80 12-14 | 3 | 347 | | 25 | U |
| 80 12-14 | 4 | 303 | | 25 | U |
| 80 2-4 | 1 | 167 | | 45 | J |
| 80 2-4 | 2 | 99 | | 32 | J |
| 80 2-4 | 3 | 133 | | 49 | J |
| 80 2-4 | 4 | 128 | | 50 | J |
| 80 6-8 | 1 | 5,119 | | 1,737 | |
| 80 6-8 | 5 | 6,449 | | 2,660 | |
| 80 6-8 | 6 | 9,588 | | 3,830 | |
| 80 6-8 (Replicate 1) | 2 | 6,462 | | 3,278 | |
| 80 6-8 (Replicate 2) | 3 | 6,370 | | 3,287 | |
| 80 6-8 (Replicate 3) | 4 | 6,440 | | 3,307 | |
| 80 6-8 (Reshoot after homog) | 1 | 6,341 | | 2,550 | |
| 80 6-8 (Reshoot after homog) | 2 | 13,598 | | 4,043 | |
| 80 6-8 (Reshoot after homog) | 3 | 10,435 | | 3,038 | |
| 80 6-8 (Reshoot after homog) | 4 | 7,823 | | 3,432 | |
| 80 8-10 | 1 | 13,204 | | 320 | |
| 80 8-10 | 2 | 14,119 | | 230 | |
| 80 8-10 | 3 | 10,904 | | 352 | |
| 80 8-10 | 4 | 13,943 | | 463 | |
| 82 10-12 | 1 | 8 | U | 28 | J |
| 82 10-12 | 2 | 14 | | 31 | J |
| 82 10-12 | 3 | 29 | | 34 | J |
| 82 10-12 | 4 | 13 | | 28 | |
| 82 12-14 | 1 | 6 | U | 25 | U |
| 82 12-14 | 2 | 6 | U | 25 | U |
| 82 12-14 | 3 | 6 | U | 25 | U |
| 82 12-14 | 4 | 6 | U | 25 | U |
| 82 2-4 | 1 | 275 | | 225 | |
| 82 2-4 | 2 | 382 | | 568 | |
| 82 2-4 | 3 | 392 | | 379 | |
| 82 2-4 | 4 | 306 | | 356 | |
| 82 6-8 | 1 | 1,247 | | 1,363 | |
| 82 6-8 | 2 | 1,101 | | 1,466 | |
| 82 6-8 | 3 | 1,283 | | 1,792 | |
| 82 6-8 | 4 | 1,145 | | 1,289 | |
| 83 10-12 | 1 | 175 | | 42 | J |
| 83 10-12 | 2 | 236 | | 58 | J |
| 83 10-12 | 3 | 102 | | 33 | J |
| 83 10-12 | 4 | 199 | | 47 | J |
| 83 1-2 | 1 | 116 | | 213 | |
| 83 1-2 | 2 | 169 | | 275 | |
| 83 1-2 | 3 | 121 | | 225 | |
| 83 1-2 | 4 | 102 | | 185 | |
| 83 2-4 | 1 | 89 | | 139 | |
| 83 2-4 | 2 | 57 | | 92 | J |
| 83 2-4 | 3 | 38 | | 72 | J |
| 83 2-4 | 4 | 84 | | 101 | |
| 83 8-10 | 1 | 82 | | 39 | J |
| 83 8-10 | 2 | 93 | | 51 | J |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 83 8-10 | 3 | 61 | | 35 | J |
| 83 8-10 | 4 | 82 | | 39 | J |
| 84 10-12 | 1 | 10 | | 25 | U |
| 84 10-12 | 2 | 16 | | 25 | U |
| 84 10-12 | 3 | 12 | | 25 | U |
| 84 10-12 | 4 | 16 | | 25 | U |
| 84 6-8 | 1 | 73 | | 45 | J |
| 84 6-8 | 2 | 55 | | 31 | J |
| 84 6-8 | 3 | 94 | | 54 | J |
| 84 6-8 | 4 | 71 | | 34 | J |
| 85 2-4 | 1 | 60 | | 29 | J |
| 85 2-4 | 2 | 85 | | 28 | J |
| 85 2-4 | 3 | 62 | | 27 | J |
| 85 2-4 (Replicate 1) | 4 | 97 | | 32 | J |
| 85 2-4 (Replicate 2) | 5 | 90 | | 34 | J |
| 85 2-4 (Replicate 3) | 6 | 86 | | 32 | J |
| 85 6-8 | 1 | 85 | | 227 | |
| 85 6-8 | 2 | 148 | | 377 | |
| 85 6-8 | 3 | 141 | | 348 | |
| 85 6-8 | 4 | 109 | | 255 | |
| 86 2-4 | 1 | 158 | | 249 | |
| 86 2-4 | 2 | 119 | | 272 | |
| 86 2-4 | 3 | 146 | | 505 | |
| 86 2-4 | 4 | 187 | | 399 | |
| 86 4-6 | 4 | 170 | | 1,662 | |
| 86 4-6 | 5 | 251 | | 2,201 | |
| 86 4-6 | 6 | 187 | | 1,511 | |
| 86 4-6 (replicate 1) | 1 | 181 | | 1,719 | |
| 86 4-6 (replicate 2) | 2 | 190 | | 1,762 | |
| 86 4-6 (replicate 3) | 3 | 163 | | 1,751 | |
| 86 6-8 | 1 | 59 | | 468 | |
| 86 6-8 | 2 | 57 | | 365 | |
| 86 6-8 | 3 | 70 | | 505 | |
| 86 6-8 | 4 | 103 | | 393 | |
| 88 2-4 | 1 | 667 | | 1,746 | |
| 88 2-4 | 2 | 710 | | 1,374 | |
| 88 2-4 | 3 | 511 | | 1,445 | |
| 88 2-4 | 4 | 690 | | 1,829 | |
| 88 4-6 | 1 | 457 | | 1,018 | |
| 88 4-6 | 2 | 444 | | 1,112 | |
| 88 4-6 | 3 | 350 | | 977 | |
| 88 4-6 | 4 | 404 | | 907 | |
| 89 1-2 | 1 | 8 | U | 47 | J |
| 89 1-2 | 2 | 8 | U | 38 | J |
| 89 1-2 | 3 | 8 | U | 39 | J |
| 89 1-2 | 4 | 8 | U | 47 | J |
| 89 14-15 | 1 | 15 | | 25 | U |
| 89 14-15 | 2 | 15 | | 25 | U |
| 89 14-15 | 3 | 17 | | 25 | U |
| 89 14-15 | 4 | 21 | | 25 | U |
| 89 8-10 | 1 | 16 | | 26 | J |
| 89 8-10 | 2 | 19 | | 25 | U |
| 89 8-10 | 3 | 16 | | 27 | J |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 89 8-10 | 4 | 17 |  | 27 | J |
| 90 6-8 | 1 | 369 |  | 25 | U |
| 90 6-8 | 2 | 348 |  | 25 | U |
| 90 6-8 | 3 | 354 |  | 25 | U |
| 90 6-8 | 4 | 358 |  | 25 | U |
| 91 1-2 | 1 | 8 | U | 32 | J |
| 91 1-2 | 2 | 8 | U | 38 | J |
| 91 1-2 | 3 | 8 | U | 39 | J |
| 91 1-2 | 4 | 8 | U | 37 | J |
| 92 6-8 | 1 | 8 | U | 35 | J |
| 92 6-8 | 2 | 8 | U | 29 | J |
| 92 6-8 | 3 | 8 | U | 34 | J |
| 92 6-8 | 4 | 9 | U | 39 | J |
| 93 10-12 | 1 | 164 |  | 57 | J |
| 93 10-12 | 2 | 161 |  | 72 | J |
| 93 10-12 | 3 | 166 |  | 67 | J |
| 93 10-12 | 4 | 161 |  | 49 | J |
| 93 1-2 | 1 | 10 | U | 73 | J |
| 93 1-2 | 2 | 9 | U | 55 | J |
| 93 1-2 | 3 | 9 | U | 54 | J |
| 93 1-2 | 4 | 9 | U | 49 | J |
| 93 2-4 | 1 | 9 | U | 45 | J |
| 93 2-4 | 2 | 9 | U | 47 | J |
| 93 2-4 | 3 | 9 | U | 43 | J |
| 93 2-4 | 4 | 12 | U | 112 |  |
| 93 6-8 | 1 | 8 | U | 39 | J |
| 93 6-8 | 2 | 8 | U | 39 | J |
| 93 6-8 | 3 | 9 | U | 53 | J |
| 93 6-8 | 4 | 8 | U | 44 | J |
| 93 8-10 | 1 | 34 |  | 62 | J |
| 93 8-10 | 2 | 28 |  | 66 | J |
| 93 8-10 | 3 | 32 |  | 60 | J |
| 93 8-10 | 4 | 33 |  | 109 |  |
| 94 1-2 | 1 | 36 |  | 48 | J |
| 94 1-2 | 2 | 30 |  | 43 | J |
| 94 1-2 | 3 | 27 |  | 40 | J |
| 94 1-2 | 4 | 36 |  | 48 | J |
| 94 2-4 | 1 | 648 |  | 2,789 |  |
| 94 2-4 | 2 | 791 |  | 2,866 |  |
| 94 2-4 | 3 | 535 |  | 2,438 |  |
| 94 2-4 | 4 | 729 |  | 2,848 |  |
| 94 6-10 | 1 | 492 |  | 1,915 |  |
| 94 6-10 | 2 | 483 |  | 2,277 |  |
| 94 6-10 | 3 | 475 |  | 2,097 |  |
| 94 6-10 | 4 | 389 |  | 1,930 |  |
| 95 10-12 | 1 | 8 | U | 36 | J |
| 95 10-12 | 2 | 8 | U | 35 | J |
| 95 10-12 | 3 | 9 | U | 35 | J |
| 95 10-12 | 4 | 9 | U | 37 | J |
| 95 1-2 | 1 | 9 | U | 41 | J |
| 95 1-2 | 2 | 8 | U | 41 | J |
| 95 1-2 | 3 | 10 |  | 41 | J |
| 95 1-2 | 4 | 17 |  | 45 | J |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 95 2-4 | 1 | 8 | U | 41 | J |
| 95 2-4 | 2 | 8 | U | 38 | J |
| 95 2-4 | 3 | 8 | U | 35 | J |
| 95 2-4 | 4 | 8 | U | 40 | J |
| 95 4-6 | 1 | 44 | | 27 | J |
| 95 4-6 | 2 | 33 | | 28 | J |
| 95 4-6 | 3 | 30 | | 27 | J |
| 95 4-6 | 4 | 37 | | 29 | J |
| 98 10-12 | 1 | 16 | | 25 | U |
| 98 10-12 | 2 | 17 | | 25 | U |
| 98 10-12 | 3 | 20 | | 25 | U |
| 98 10-12 | 4 | 14 | | 25 | U |
| 98 10-12 (WET) | 1 | 10 | J | 25 | UJ |
| 98 10-12 (WET) | 2 | 10 | J | 25 | UJ |
| 98 10-12 (WET) | 3 | 11 | J | 25 | UJ |
| 98 10-12 (WET) | 4 | 13 | J | 25 | UJ |
| 98 6-8 | 1 | 7 | U | 25 | U |
| 98 6-8 | 2 | 7 | U | 25 | U |
| 98 6-8 | 3 | 7 | U | 25 | U |
| 98 6-8 | 4 | 7 | U | 25 | U |
| 98 8-10 | 1 | 17 | | 37 | J |
| 98 8-10 | 2 | 14 | | 56 | J |
| 98 8-10 | 3 | 16 | | 43 | J |
| 98 8-10 | 4 | 25 | | 31 | J |
| 99 10-12 | 1 | 503 | | 656 | |
| 99 10-12 | 2 | 333 | | 480 | |
| 99 10-12 | 3 | 395 | | 561 | |
| 99 10-12 | 4 | 440 | | 606 | |
| 99 1-2 | 1 | 249 | | 2,058 | |
| 99 1-2 | 2 | 203 | | 1,832 | |
| 99 1-2 | 3 | 217 | | 1,591 | |
| 99 1-2 | 4 | 478 | | 1,785 | |
| 99 1-2 (Reshoot after rehomog) | 1 | 238 | | 1,870 | |
| 99 1-2 (Reshoot after rehomog) | 2 | 239 | | 1,878 | |
| 99 1-2 (Reshoot after rehomog) | 3 | 217 | | 1,997 | |
| 99 1-2 (Reshoot after rehomog) | 4 | 263 | | 1,482 | |
| 99 12-14 | 1 | 243 | | 290 | |
| 99 12-14 | 2 | 194 | | 234 | |
| 99 12-14 | 3 | 402 | | 509 | |
| 99 12-14 | 4 | 270 | | 354 | |
| 99 14-15 | 1 | 13 | | 25 | U |
| 99 14-15 | 5 | 13 | | 25 | U |
| 99 14-15 | 6 | 10 | | 25 | U |
| 99 14-15 (replicate 1) | 2 | 17 | | 25 | U |
| 99 14-15 (replicate 2) | 3 | 18 | | 25 | U |
| 99 14-15 (replicate 3) | 4 | 16 | | 27 | J |
| 99 2-4 | 1 | 2,949 | | 3,355 | |
| 99 2-4 | 2 | 2,659 | | 2,965 | |
| 99 2-4 | 3 | 2,781 | | 3,302 | |
| 99 2-4 | 4 | 2,785 | | 3,115 | |
| 99 4-6 | 1 | 2,697 | | 3,236 | |
| 99 4-6 | 2 | 2,849 | | 3,245 | |
| 99 4-6 | 3 | 2,746 | | 3,208 | |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 99 4-6 | 4 | 2,583 | | 2,891 | |
| 99 4-6 (wet shot) | 1 | 2,434 | | 2,700 | |
| 99 4-6 (wet shot) | 2 | 2,264 | | 2,408 | |
| 99 4-6 (wet shot) | 3 | 2,386 | | 2,837 | |
| 99 4-6 (wet shot) | 4 | 2,234 | | 2,744 | |
| 99 6-8 | 1 | 171 | | 96 | J |
| 99 6-8 | 2 | 191 | | 93 | J |
| 99 6-8 | 3 | 202 | | 77 | J |
| 99 6-8 | 4 | 148 | | 82 | J |
| 99 8-10 | 1 | 73 | | 53 | J |
| 99 8-10 | 2 | 79 | | 53 | J |
| 99 8-10 | 3 | 90 | | 61 | J |
| 99 8-10 | 4 | 65 | | 55 | J |
| 100 10-12 | 1 | 92 | | 26 | J |
| 100 10-12 | 2 | 91 | | 25 | U |
| 100 10-12 | 3 | 116 | | 30 | J |
| 100 10-12 | 4 | 92 | | 27 | J |
| 100 12-14 | 1 | 25 | | 25 | U |
| 100 12-14 | 2 | 35 | | 25 | U |
| 100 12-14 | 3 | 27 | | 26 | J |
| 100 12-14 | 4 | 29 | | 25 | U |
| 100 8-10 | 1 | 12 | | 52 | J |
| 100 8-10 | 2 | 11 | | 46 | J |
| 100 8-10 | 3 | 18 | | 29 | J |
| 100 8-10 | 4 | 11 | U | 56 | J |
| 101 10-12 | 4 | 66 | | 26 | J |
| 101 10-12 | 5 | 124 | | 25 | U |
| 101 10-12 | 6 | 54 | | 27 | J |
| 101 10-12 (replicate 1) | 1 | 54 | | 25 | U |
| 101 10-12 (replicate 2) | 2 | 53 | | 25 | U |
| 101 10-12 (replicate 3) | 3 | 47 | | 25 | U |
| 101 1-2 | 1 | 9 | U | 47 | J |
| 101 1-2 | 2 | 9 | U | 44 | J |
| 101 1-2 | 3 | 9 | U | 54 | J |
| 101 1-2 | 4 | 8 | U | 43 | J |
| 101 12-14 | 1 | 48 | | 25 | U |
| 101 12-14 | 2 | 27 | | 25 | U |
| 101 12-14 | 3 | 36 | | 25 | U |
| 101 12-14 | 4 | 40 | | 25 | U |
| 101 8-10 | 1 | 26 | | 50 | J |
| 101 8-10 | 2 | 16 | | 48 | J |
| 101 8-10 | 3 | 15 | | 52 | J |
| 101 8-10 | 4 | 18 | | 48 | J |
| 102 6-8 | 1 | 287 | | 469 | |
| 102 6-8 | 2 | 293 | | 609 | |
| 102 6-8 | 3 | 241 | | 429 | |
| 102 6-8 | 4 | 210 | | 434 | |
| 102 8-10 | 1 | 110 | | 516 | |
| 102 8-10 | 2 | 121 | | 469 | |
| 102 8-10 | 3 | 121 | | 437 | |
| 102 8-10 | 4 | 144 | | 405 | |
| 103 10-12 | 1 | 187 | | 109 | |
| 103 10-12 | 2 | 113 | | 106 | |

## Table 2: XRF Data

| Sample ID | Shot # | Arsenic (mg/kg) | Qualifier | Lead (mg/kg) | Qualifier |
|---|---|---|---|---|---|
| 103 10-12 | 3 | 112 | | 94 | |
| 103 10-12 | 4 | 110 | | 219 | |
| 103 1-2 | 1 | 9 | U | 50 | J |
| 103 1-2 | 2 | 10 | U | 54 | J |
| 103 1-2 | 3 | 12 | | 46 | J |
| 103 1-2 | 4 | 8 | U | 33 | J |
| 103 8-10 | 1 | 40 | | 231 | |
| 103 8-10 | 2 | 27 | | 230 | |
| 103 8-10 | 3 | 35 | | 244 | |
| 103 8-10 | 4 | 20 | | 159 | |
| Black Shot (MC-01) | 1 | 2,399 | | 3,166 | |
| Black Shot (MC-01) | 2 | 2,390 | | 3,281 | |
| Black Shot (MC-01) | 3 | 2,359 | | 3,269 | |
| Black Shot (MC-01) | 4 | 2,374 | | 3,000 | |

**Notes:**

SRM: Standard Reference Material.

Blank SiO2: Silicone dioxide blank provided by XRF vendor.

## Table 3: Laboratory and XRF Data

| | Laboratory Data | | | XRF Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| OU | Soil Sample ID | Arsenic (mg/kg) | Lead (mg/kg) | XRF Sample ID | Arsenic Average (mg/kg) | Arsenic Maximum (mg/kg) | Arsenic 95% UCL (mg/kg) | Lead Average (mg/kg) | Lead Maximum (mg/kg) | Lead 95% UCL (mg/kg) |
| NA | SO-LD-01-052316 | 290 | 39 | Log Debris | 423 | 505 | 519 | 38 | | 49 |
| NA | SO-MC-01-052316 | 2,400 | 2,800 | MC-01 | 2,381 | 2,399 | 2,401 | 3,179 | 3,281 | 3,332 |
| 4 | SO-SL-76-052516-4-6 | 290 | 290 | 76 4-6 | 389 | 446 | 461 | 347 | 428 | 449 |
| 4 | SO-SL-76-052516-8-10 | 300 | 140 | 76 8-10 | 349 | 465 | 444 | 134 | 186 | 176 |
| 4 | SO-SL-77-052616-1-2 | 210 | 310 | 77 1-2 | 160 | 194 | 189 | 247 | 310 | 297 |
| 4 | SO-SL-77-052616-6-8 | 1,500 | 1,700 | 77 6-8 | 2,735 | 2,844 | 2,823 | 3,645 | 3,705 | 3,706 |
| 4 | SO-SL-77-052616-8-10 | 910 | 1,700 | 77 8-10 | 1,299 | 1,421 | 1,471 | 1,861 | 2,106 | 2,086 |
| 4 | SO-SL-78-052516-10-12 | 310 | 48 | 78 10-12 | 359 | 469 | 446 | 58 | 70 | 72 |
| 4 | SO-SL-78-052516-2-4 | 80 | 69 | 78 2-4 | 95 | 108 | 107 | 79 | 95 | 92 |
| 4 | SO-SL-78-052516-4-6 | 72 | 61 | 78 4-6 | 94 | 103 | 103 | 67 | 88 | 87 |
| 4 | SO-SL-79-052516-1-2 | 110 | 110 | 79 1-2 | 189 | 204 | 205 | 131 | 137 | 140 |
| 4 | SO-SL-79-052516-2-4 | 1,600 | 930 | 79 2-4 | 1,652 | 2,012 | 1,991 | 668 | 905 | 870 |
| 4 | SO-SL-79-052516-4-6 | 14,000 | 4,200 | 79 4-6 | 12,063 | 15,524 | 14,864 | 3,381 | 4,421 | 4,455 |
| 4 | SO-SL-79-052516-6-8 | 17,000 | 4,500 | 79 6-8 | 22,145 | 25,139 | 24,642 | 3,819 | 5,024 | 4,791 |
| 4 | SO-SL-79-052516-8-10 | 8,500 | 18 | 79 8-10 | 6,847 | 7,510 | 7,655 | 27 | | 30 |
| 4 | SO-SL-80-052516-12-14 | 265 | 3.2 | 80 12-14 | 311 | 347 | 340 | 25 | | 25 |
| 4 | SO-SL-80-052516-2-4 | 78 | 22 | 80 2-4 | 132 | 167 | 165 | 44 | 50 | 54 |
| 4 | SO-SL-80-052516-6-8 | 4,500 | 4,200 | 80 6-8 | 9,549 | 13,598 | 13,298 | 3,266 | 4,043 | 4,009 |
| 4 | SO-SL-80-052516-8-10 | 11,000 | 480 | 80 8-10 | 13,043 | 14,119 | 14,784 | 341 | 463 | 455 |
| 4 | SO-SL-82-052416-10-12 | 18 | 14 | 82 10-12 | 16 | 29 | 27 | 30 | 34 | 34 |
| 4 | SO-SL-82-052416-12-14 | 4.4 | 2.1 | 82 12-14 | 6.0 | 6.0 | 6.0 | 25 | | 25 |
| 4 | SO-SL-82-052416-2-4 | 280 | 420 | 82 2-4 | 339 | 392 | 406 | 382 | 568 | 548 |
| 4 | SO-SL-82-052416-6-8 | 1,100 | 1,800 | 82 6-8 | 1,194 | 1,283 | 1,294 | 1,478 | 1,792 | 1,739 |
| 4 | SO-SL-83-052516-10-12 | 160 | 33 | 83 10-12 | 178 | 236 | 245 | 45 | 58 | 57 |
| 4 | SO-SL-83-052516-1-2 | 220 | 300 | 83 1-2 | 127 | 169 | 161 | 225 | 275 | 269 |
| 4 | SO-SL-83-052516-2-4 | 64 | 110 | 83 2-4 | 67 | 89 | 95 | 101 | 139 | 134 |
| 4 | SO-SL-83-052516-8-10 | 52 | 32 | 83 8-10 | 80 | 93 | 95 | 41 | 51 | 49 |
| 4 | SO-SL-84-052516-10-12 | 12 | 5.2 | 84 10-12 | 14 | 16 | 17 | 25 | | 25 |
| 4 | SO-SL-84-052516-6-8 | 40 | 22 | 84 6-8 | 73 | 94 | 92 | 41 | 54 | 53 |
| 4 | SO-SL-85-052516-2-4 | 36 | 12 | 85 2-4 | 75 | 91 | 93 | 29 | 33 | 32 |
| 4 | SO-SL-85-052516-6-8 | 100 | 330 | 85 6-8 | 121 | 148 | 155 | 302 | 377 | 387 |
| 4 | SO-SL-86-052516-2-4 | 68 | 250 | 86 2-4 | 153 | 187 | 186 | 356 | 505 | 496 |
| 4 | SO-SL-86-052516-4-6 | 43 | 1,400 | 86 4-6 | 197 | 251 | 240 | 1,780 | 2,201 | 2,129 |
| 4 | SO-SL-86-052516-6-8 | 28 | 240 | 86 6-8 | 72 | 103 | 97 | 433 | 505 | 509 |
| 4 | SO-SL-88-052516-2-4 | 300 | 1,200 | 88 2-4 | 645 | 710 | 751 | 1,599 | 1,829 | 1,861 |

## Table 3: Laboratory and XRF Data

| OU | Laboratory Data | | | XRF Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Soil Sample ID | Arsenic (mg/kg) | Lead (mg/kg) | XRF Sample ID | Arsenic Average (mg/kg) | Arsenic Maximum (mg/kg) | Arsenic 95% UCL (mg/kg) | Lead Average (mg/kg) | Lead Maximum (mg/kg) | Lead 95% UCL (mg/kg) |
| 4 | SO-SL-88-052516-4-6 | 360 | 880 | 88 4-6 | 414 | 457 | 470 | 1,004 | 1,112 | 1,104 |
| 3 | SO-SL-89-052316-1-2 | 4.1 | 24 | 89 1-2 | 8.0 | 8.0 | 8.0 | 43 | 47 | 49 |
| 3 | SO-SL-89-052316-14-15 | 25 | 16 | 89 14-15 | 17 | 21 | 20 | 25 | | 25 |
| 3 | SO-SL-89-052316-8-10 | 24 | 24 | 89 8-10 | 17 | 19 | 19 | 26 | | 27 |
| 3 | SO-SL-90-052316-6-8 | 510 | 6.3 | 90 6-8 | 357 | 369 | 368 | 25 | | 25 |
| 3 | SO-SL-91-052316-1-2 | 5.2 | 22 | 91 1-2 | 8.0 | 8.0 | 8.0 | 37 | 39 | 40 |
| 3 | SO-SL-92-052316-6-8 | 3.7 | 37 | 92 6-8 | 8.3 | 9.0 | 8.8 | 34 | 39 | 39 |
| 3 | SO-SL-93-052316-10-12 | 180 | 59 | 93 10-12 | 163 | 166 | 166 | 61 | 72 | 73 |
| 3 | SO-SL-93-052316-1-2 | 3.5 | 45 | 93 1-2 | 9.3 | 10.0 | 9.8 | 58 | 73 | 70 |
| 3 | SO-SL-93-052316-2-4 | 4.2 | 50 | 93 2-4 | 9.8 | 12 | 12 | 62 | 112 | 101 |
| 3 | SO-SL-93-052316-6-8 | 8.8 | 52 | 93 6-8 | 8.3 | 9.0 | 8.8 | 44 | 53 | 52 |
| 3 | SO-SL-93-052316-8-10 | 36 | 100 | 93 8-10 | 32 | 34 | 35 | 74 | 109 | 102 |
| 6 | SO-SL-94-052516-1-2 | 22 | 27 | 94 1-2 | 32 | 36 | 38 | 45 | 48 | 49 |
| 6 | SO-SL-94-052516-2-4 | 550 | 2,500 | 94 2-4 | 676 | 791 | 806 | 2,735 | 2,866 | 2,972 |
| 6 | SO-SL-94-052516-6-10 | 220 | 1,400 | 94 6-10 | 460 | 492 | 516 | 2,055 | 2,277 | 2,254 |
| 3 | SO-SL-95-052316-10-12 | 8.6 | 23 | 95 10-12 | 8.5 | 9.0 | 9.2 | 36 | 37 | 37 |
| 3 | SO-SL-95-052316-1-2 | 20 | 40 | 95 1-2 | 11 | 17 | 16 | 42 | 45 | 44 |
| 3 | SO-SL-95-052316-2-4 | 4.2 | 34 | 95 2-4 | 8.0 | 8.0 | 8.0 | 39 | 41 | 42 |
| 3 | SO-SL-95-052316-4-6 | 42 | 16 | 95 4-6 | 36 | 44 | 43 | 28 | 29 | 29 |
| 3 | SO-SL-98-052316-10-12 | 23 | 4.7 | 98 10-12 | 17 | 20 | 20 | 25 | | 25 |
| 3 | SO-SL-98-052316-6-8 | 6.1 | 14 | 98 6-8 | 7.0 | 7.0 | 7.0 | 25 | | 25 |
| 3 | SO-SL-98-052316-8-10 | 33 | 33 | 98 8-10 | 18 | 25 | 24 | 42 | 56 | 54 |
| 6 | SO-SL-99-052516-10-12 | 930 | 1,200 | 99 10-12 | 418 | 503 | 502 | 576 | 656 | 664 |
| 6 | SO-SL-99-052516-1-2 | 220 | 1,500 | 99 1-2 | 239 | 263 | 261 | 1,807 | 1,997 | 2,071 |
| 6 | SO-SL-99-052516-12-14 | 740 | 860 | 99 12-14 | 277 | 402 | 382 | 347 | 509 | 487 |
| 6 | SO-SL-99-052516-14-15 | 20 | 11 | 99 14-15 | 13 | 17 | 17 | 25 | | 26 |
| 6 | SO-SL-99-052516-2-4 | 2,800 | 2,550 | 99 2-4 | 2,794 | 2,949 | 2,934 | 3,184 | 3,355 | 3,395 |
| 6 | SO-SL-99-052516-4-6 | 2,800 | 2,700 | 99 4-6 | 2,719 | 2,849 | 2,849 | 3,145 | 3,245 | 3,345 |
| 6 | SO-SL-99-052516-6-8 | 150 | 77 | 99 6-8 | 178 | 202 | 206 | 87 | 96 | 98 |
| 6 | SO-SL-99-052516-8-10 | 89 | 61 | 99 8-10 | 77 | 90 | 89 | 56 | 61 | 60 |
| 3 | SO-SL-100-052516-10-12 | 83 | 12 | 100 10-12 | 98 | 116 | 112 | 27 | 30 | 30 |
| 3 | SO-SL-100-052516-12-14 | 32 | 4.7 | 100 12-14 | 29 | 35 | 34 | 25 | | 26 |
| 3 | SO-SL-100-052516-8-10 | 11 | 28 | 100 8-10 | 13 | 18 | 17 | 46 | 56 | 60 |
| 3 | SO-SL-101-052316-10-12 | 76 | 6.3 | 101 10-12 | 74 | 124 | 114 | 26 | | 27 |
| 3 | SO-SL-101-052316-1-2 | 5.8 | 32 | 101 1-2 | 8.8 | 9.0 | 9.3 | 47 | 54 | 53 |

## Table 3: Laboratory and XRF Data

| OU | Laboratory Data |  |  | XRF Data |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
|  | Soil Sample ID | Arsenic (mg/kg) | Lead (mg/kg) | XRF Sample ID | Arsenic Average (mg/kg) | Arsenic Maximum (mg/kg) | Arsenic 95% UCL (mg/kg) | Lead Average (mg/kg) | Lead Maximum (mg/kg) | Lead 95% UCL (mg/kg) |
| 3 | SO-SL-101-052316-12-14 | 45 | 4.6 | 101 12-14 | 38 | 48 | 48 | 25 |  | 25 |
| 3 | SO-SL-101-052316-8-10 | 32 | 49 | 101 8-10 | 19 | 26 | 25 | 50 | 52 | 52 |
| 3 | SO-SL-102-052516-6-8 | 280 | 600 | 102 6-8 | 258 | 293 | 304 | 485 | 609 | 585 |
| 3 | SO-SL-102-052516-8-10 | 120 | 480 | 102 8-10 | 124 | 144 | 141 | 457 | 516 | 513 |
| 3 | SO-SL-102-052516-10-12 | 190 | 150 | 103 10-12 | 131 | 187 | 175 | 132 | 219 | 201 |
| 3 | SO-SL-103-052516-1-2 | 8.2 | 37 | 103 1-2 | 9.8 | 12 | 12 | 46 | 54 | 56 |
| 3 | SO-SL-103-052516-8-10 | 41 | 260 | 103 8-10 | 31 | 40 | 41 | 216 | 244 | 261 |

## Table 4: Comparison of Primary and Field Duplicate Soil Sample Laboratory Results

| Superlon Soil Primary and Field Dup data for Arsenic and Lead (09/23/2016) | | | Arsenic (mg/kg) | | Lead (mg/kg) | |
|---|---|---|---|---|---|---|
| **CROP Sample No.** | **Primary Sample No.** | **Field Duplicate Sample No.** | **Field Duplicate** | **Primary** | **Field Duplicate** | **Primary** |
| SUP_SL_8 1-2_08/02/10_SO_DC | SUP_SL_8 1-2_08/02/10_SO | SUP_SL_8 1-2_DUPE_08/02/10_SO | 3,600 | 1,300 | 12,000 | 310 |
| SUP_SL_42 14-16_08/12/10_SO_DC | SUP_SL_42 14-16_08/12/10_SO | SUP_SL_42 14-16_DUPE_08/12/10_SO | 1,500 | 19 | 1,400 | 7.6 |
| SUP_SL_33_2-4_11/15/10_SO_DC | SUP_SL_33_2-4_11/15/10_SO | SUP_SL_33_DUP_11/15/10_SO | 3.4 | 24 | 9.2 | 62 |
| SUP_SL_34_8-10_11/15/10_SO_DC | SUP_SL_34_8-10_11/15/10_SO | SUP_SL_34_DUP_11/15/10_SO | 210 | 150 | 11 | 45 |
| SUP_SL_39_12-14_11/15/10_SO_DC | SUP_SL_39_12-14_11/15/10_SO | SUP_SL_39_DUP_11/15/10_SO | 3.5 | 1,300 | 16 | 4.5 |
| SUP_SL_11 6-8_051011_DC | SUP_SL_11 6-8_051011 | SUP_SL_11 DUP_051011 | 1,270 | 950 | 548 | 556 |
| SUP_SL_24  6-8_051111_DC | SUP_SL_24  6-8_051111 | SUP_SL_24 DUP_051111 | 144 | 177 | 89 | 82 |
| SUP_SL_46 8-10_080111_DC | SUP_SL_46 8-10_080111 | SUP_SL_46_DUP_080111 | 6,940 | 11,100 | 1,480 | 1,810 |
| SUP_SL_50 12-14_080211_DC | SUP_SL_50 12-14_080211 | SUP_SL_50_DUP_080211 | 32 | 69 | 3.6 | 101 |
| SUP_SL_56  14-16_080411_DC | SUP_SL_56  14-16_080411 | SUP_SL_56  DUP_080411 | 2.1 | 2.5 | 4.2 | 3.2 |
| SUP_SL_8 8-10_081511_DC | SUP_SL_8 8-10_081511 | SUP_SL_8_DUP_081511 | 156 | 207 | 63 | 153 |
| SUP_OCCI_SP1_D_111011_DC | SUP_OCCI_SP1_D_111011 | SUP_OCCI_SP1_D_111011_D | 360 | 380 | 470 | 410 |
| SUP_SL_63_4-6_111511_DC | SUP_SL_63_4-6_111511 | SUP_SL_63_4-6_111511_D | 2,810 | 3,360 | 3,930 | 3,830 |
| SUP_SL_65_8-10_111511_DC | SUP_SL_65_8-10_111511 | SUP_SL_65_8-10_111511_D | 13 | 16 | 10 | 11 |
| SUP_SL_67_2-4_111511_DC | SUP_SL_67_2-4_111511 | SUP_SL_67_2-4_111511_D | 1.3 | 46 | 16 | 12 |
| SUP_SL_68_1-2_111511_DC | SUP_SL_68_1-2_111511 | SUP_SL_68_1-2_111511_D | 1,510 | 1,820 | 3,240 | 3,020 |
| SUP_SL_OCCI_C_110211_DC | SUP_SL_OCCI_C_110211 | SUP_SL_OCCI_C_110211_D | 43 | 46 | 80 | 61 |
| SUP_SL_69_8-10_082412_DC | SUP_SL_69_8-10_082412 | SUP_SL_69_8-10_082412_9 | 2,620 | 2,350 | 3,360 | 3,060 |
| SUP_SL_71_6-8_082412_DC | SUP_SL_71_6-8_082412 | SUP_SL_71_6-8_082412_9 | 822 | 670 | 1,500 | 1,320 |
| SUP_SL_73_14-16_082412_DC | SUP_SL_73_14-16_082412 | SUP_SL_73_14-16_082412_9 | 134 | 136 | 4.0 | 3.9 |
| SUP_SL_75_4-6_061813_DC | SUP_SL_75_4-6_061813 | SUP_SL_75_4-6_061813_9 | 21 | 23 | 18 | 39 |
| SO-SLTS-28-110713-2-4_DC | SO-SLTS-28-110713-2-4 | SO-SLTS-28-110713-2-4-(01) | 86 | 94 | 1,200 | 1,500 |
| SO-SLTS-22-112613-1-2_DC | SO-SLTS-22-112613-1-2 | SO-SLTS-22-112613-1-2-(01) | 27 | 30 | 8.0 | 5.6 |
| SO-SL-80-052516-12-14_DC | SO-SL-80-052516-12-14 | SO-SL-80-052516-12-14-(01) | 290 | 240 | 3.1 | 3.2 |
| SO-SL-79-052516-2-4_DC | SO-SL-79-052516-2-4 | SO-SL-79-052516-2-4(01) | 1,400 | 1,800 | 760 | 1,100 |
| SO-SL-85-052516-10-12_DC | SO-SL-85-052516-10-12 | SO-SL-85-052516-10-12-(01) | 170 | 140 | 280 | 280 |
| SO-SL-86-052516-12-14_DC | SO-SL-86-052516-12-14 | SO-SL-86-052516-12-14-(01) | 3.5 | 3.7 | 2.6 | 4.8 |
| SO-SL-89-052316-2-4_DC | SO-SL-89-052316-2-4 | SO-SL-89-052316-2-4-(01) | 3.7 | 4.5 | 20 | 20 |
| SO-SL-92-052316-8-10_DC | SO-SL-92-052316-8-10 | SO-SL-92-052316-8-10(01) | 22 | 230 | 48 | 200 |

## Table 4: Comparison of Primary and Field Duplicate Soil Sample Laboratory Results

| Superlon Soil Primary and Field Dup data for Arsenic and Lead (09/23/2016) | | | Arsenic (mg/kg) | | Lead (mg/kg) | |
|---|---|---|---|---|---|---|
| **CROP Sample No.** | **Primary Sample No.** | **Field Duplicate Sample No.** | **Field Duplicate** | **Primary** | **Field Duplicate** | **Primary** |
| SO-SL-95-052316-2-4_DC | SO-SL-95-052316-2-4 | SO-SL-95-052316-2-4-(01) | 4.3 | 4.1 | 33 | 34 |
| SO-SL-99-052516-2-4_DC | SO-SL-99-052516-2-4 | SO-SL-99-052516-2-4-(01) | 2,900 | 2,700 | 2,300 | 2,800 |

## Table 5: XRF versus Lab Sensitivity and Specificity Evaluation

| **Arsenic REL 91 mg/kg** | | **Lab Data** | | |
|---|---|---|---|---|
| | | **Lab Data > 91** | **Lab Data ≤ 91** | **Total:** |
| **XRF 95% UCL** | **XRF 95% UCL > 91** | 36 | 12 | **48** |
| | **XRF 95% UCL ≤ 91** | 0 | 29 | **29** |
| **Total:** | | **36** | **41** | **77** |
| **Sensitivity:** | | **100%** | | |
| **Specificity:** | | | **71%** | |

| **Arsenic REL 588 mg/kg** | | **Lab Data** | | |
|---|---|---|---|---|
| | | **Lab Data > 588** | **Lab Data ≤ 588** | **Total:** |
| **XRF 95% UCL** | **XRF 95% UCL > 588** | 12 | 2 | **14** |
| | **XRF 95% UCL ≤ 588** | 2 | 61 | **63** |
| **Total:** | | **14** | **63** | **77** |
| **Sensitivity:** | | **86%** | | |
| **Specificity:** | | | **97%** | |

| **Lead REL 679 mg/kg** | | **Lab Data** | | |
|---|---|---|---|---|
| | | **Lab Data > 679** | **Lab Data ≤ 679** | **Total:** |
| **XRF 95% UCL** | **XRF 95% UCL > 679** | 16 | 0 | **16** |
| | **XRF 95% UCL ≤ 679** | 2 | 59 | **61** |
| **Total:** | | **18** | **59** | **77** |
| **Sensitivity:** | | **89%** | | |
| **Specificity:** | | | **100%** | |

| **Lead REL 1,000 mg/kg** | | **Lab Data** | | |
|---|---|---|---|---|
| | | **Lab Data > 1,000** | **Lab Data ≤ 1,000** | **Total:** |
| **XRF 95% UCL** | **XRF 95% UCL > 1,000** | 14 | 1 | **15** |
| | **XRF 95% UCL ≤ 1,000** | 1 | 61 | **62** |
| **Total:** | | **15** | **62** | **77** |
| **Sensitivity:** | | **93%** | | |
| **Specificity:** | | | **98%** | |

## Table 6: Lab versus Lab Sensitivity and Specificity Evaluation

| **Arsenic REL 91 mg/kg** | | **Lab Data** | | **Total:** |
|---|---|---|---|---|
| | | **Primary Sample > 91** | **Primary Sample <= 91** | |
| **Lab Data** | **Field Duplicate > 91** | 16 | 1 | **17** |
| | **Field Duplicate ≤ 91** | 3 | 11 | **14** |
| | **Total:** | **19** | **12** | **31** |
| | **Sensitivity:** | **84%** | | |
| | **Specificity:** | | **92%** | |

| **Arsenic REL 588 mg/kg** | | **Lab Data** | | **Total:** |
|---|---|---|---|---|
| | | **Primary Sample > 588** | **Primary Sample <= 588** | |
| **Lab Data** | **Field Duplicate > 588** | 9 | 1 | **10** |
| | **Field Duplicate ≤ 588** | 1 | 20 | **21** |
| | **Total:** | **10** | **21** | **31** |
| | **Sensitivity:** | **90%** | | |
| | **Specificity:** | | **95%** | |

| **Lead REL 679 mg/kg** | | **Lab Data** | | **Total:** |
|---|---|---|---|---|
| | | **Primary Sample > 679** | **Primary Sample ≤ 679** | |
| **Lab Data** | **Field Duplicate > 679** | 8 | 2 | **10** |
| | **Field Duplicate ≤ 679** | 0 | 21 | **21** |
| | **Total:** | **8** | **23** | **31** |
| | **Sensitivity:** | **100%** | | |
| | **Specificity:** | | **91%** | |

| **Lead REL 1,000 mg/kg** | | **Lab Data** | | **Total:** |
|---|---|---|---|---|
| | | **Primary Sample > 1,000** | **Primary Sample ≤ 1,000** | |
| **Lab Data** | **Field Duplicate > 1,000** | 7 | 2 | **9** |
| | **Field Duplicate ≤1,000** | 1 | 21 | **22** |
| | **Total:** | **8** | **23** | **31** |
| | **Sensitivity:** | **88%** | | |
| | **Specificity:** | | **91%** | |