Final Feasibility Study for On-Property Soils and Perched Water

Superlon Plastics Property
Tacoma, WA

Prepared for:

E.I. duPont de Nemours and Company

And

White Birch LLC

Pacific Environmental & Redevelopment Corporation
and PIONEER Technologies Corporation

12/17/2014

This page has been left blank intentionally to allow for double-sided printing.

EXECUTIVE SUMMARY

ES.1. Introduction

This Feasibility Study (FS) for on-Property Soils and Perched Water[1] (FS-OSP) was developed for the Superlon Plastics Property (Property) on behalf of White Birch, LLC (White Birch) and E. I. duPont de Nemours and Company (DuPont). Under the direction of DuPont and White Birch, their authorized agents, Pacific Environmental and Redevelopment Corporation (PERC) and PIONEER Technologies Corporation (PIONEER) conducted the work necessary to complete this FS-OSP in accordance with the State of Washington 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 this draft FS-OSP for Washington State Department of Ecology (Ecology) review and approval in accordance with WAC 173-340-350(8). Under MTCA, Ecology provides guidance and criteria for the selection of cleanup actions and general information on the content of an FS (WAC 173-340-360; WAC 173-340-350). MTCA specifies criteria for selecting cleanup actions, which include the permanence of the action, protectiveness, cost, long-term effectiveness, management of short-term risks, implementability, and consideration of public concerns.

The purpose of this FS-OSP is to develop and evaluate remedial alternatives in accordance with WAC 173-340-350(8) to enable a cleanup action to be selected for the Property. Once complete, Ecology will review the draft FS-OSP, including proposed cleanup levels (CLs) and remediation levels (RELs) and the point or points at which they must be complied, in accordance with the procedures provided for in WAC 173-340-700 through 173-340-760.

The Property, located at 2116 Taylor Way in Tacoma, Washington, covers 3.1 acres. The Property is currently owned by White Birch, LLC and operated by Superlon Plastics Company, Incorporated, an extruded plastic pipe manufacturer. Since its original development as a lead arsenate manufacturing facility in 1925, the Property has supported a number of industrial uses throughout its history. During that history, the Property has also been filled with various industrial and non-industrial wastes and soils.

This FS-OSP presents the technical approach proposed to be undertaken to remediate soils and perched water on the Property only. Definition of the Site (per MTCA) and an evaluation of data from other off-Property media will be presented in a future Remedial Investigation/Feasibility Study (RI/FS). This approach, which has been approved by Ecology, was adopted in order to continue progress toward a final remedy for on-Property media, while continuing to investigate off-Property issues and to define the Site boundary (Ecology 2013).

Since 2009, several interim actions (IAs) have been completed, or are on-going on the Property. These IAs were aimed at removing potential sources of constituents and preparing the Property for investigation and final remediation. As a result of these efforts, this is a focused FS, which addresses the residual constituents remaining in soil and perched water following completion of the interim actions.

[1]Surface water was the term used in the RI-OSS report and has been changed to perched water in this FS-OSP report to better reflect the nature of that media.

A graphical depiction of the major elements of this FS-OSP, and their relationship to one another, is shown in Figure ES-1.

ES.2. Summary of On-Property Soil and Surface Water Characterization

In the RI for the on-Property Soils and Surface Water (RI-OSS), sufficient information regarding the Property was collected, developed, and evaluated to complete this FS-OSP. The RI-OSS characterized the nature and extent of constituents in the context of past activities at the Property and presented the analytical data, fill characteristics, and other information that has been collected on the Property. Generally, the RI-OSS concluded that it is the presence of fill materials, along with residual materials associated with the historic production of lead and calcium arsenate pesticides that represent the major sources of environmental contamination on the Property. Specifically, the RI-OSS found that:

- Arsenic and lead are present in soil throughout the Property at concentrations exceeding industrial land use direct contact screening levels.
- Arsenic, cadmium, lead, pentachlorophenol and vinyl chloride in soil may be contributing to the presence of these constituents in the surficial aquifer.
- Total petroleum hydrocarbon (TPH) gasoline fraction, diesel fraction, and heavy oil fraction soil concentrations are greater than the industrial land use direct contact screening levels in a few isolated locations. In all cases these occurrences are co-mingled with arsenic and/or lead exceedances.
- VOCs (in particular TCE and vinyl chloride) were associated with the wastewater treatment sludge formerly located in the western corner of the Property. An IA removed the VOC-containing wastewater treatment sludge, with the exception of a thin lens of the material at the excavation limits along the southern property boundaries in two directions - toward the Gardner-Fields property and toward the off-Property drainage ditch.
- Arsenic, cadmium, lead, mercury, TPH heavy oil fraction, pentachlorophenol, 1,2-cis-dichloroethylene, and TCE have been detected in perched water above drinking water screening levels.

In addition, the RI-OSS identified six soil operable unit (OU) areas based upon their fill types. These six areas have distinct characteristics, and have been grouped based on their need for different remedial technologies.

ES.3. Conceptual Site Model Development

A central element in the assessment of any contaminated property involves the development of a conceptual site model (CSM). The CSM for the Property was developed in order to identify the current/future land use, sources of constituents, fate and transport pathways, potentially exposed populations, and potentially complete exposure pathways. This information was then used to define the particular media that must be addressed in order to ensure the selection of a remedy that is protective of public health and the environment. Finally, the CSM also formed the basis for the development of remedial action objectives (RAOs), CLs, and RELs that set the qualitative and quantitative remediation goals for the project.

The starting point for the CSM is an understanding of current and future land use. In the case of the Superlon Property, the CSM is based on continuing industrial land use. This is consistent with previous and current land use, as well as the City of Tacoma zoning map which has zoned the Property and the surrounding land as industrial (City of Tacoma 2012). A change in this designation is unlikely. In addition, in 2011, a conceptual future land use plan was developed for the Property. The Plan identified the intended future industrial use of the Property and the location of buildings and other site features that are consistent with that use.

Another important consideration in development of the CSM is the fact that groundwater at the Property is brackish and non-potable (PERC 2013). Additionally, the perched water is also non-potable and inaccessible.

The CSM identified one exposure pathway by which industrial workers could indirectly contact constituents in on-Property perched water. This involves the migration of constituents from perched water to groundwater, with the underlying groundwater used as part of a future process cooling water system. Under this scenario, exposure of industrial workers could occur as a part of maintenance activities on the cooling water system.

Two potentially complete exposure pathways were identified for soil including, (1) the soil-to-perched water pathway where constituents in soil affect perched water; and, (2) direct contact with soils by a future utility worker.

ES.4. Remedial Action Objectives

The RAOs were identified in order to guide the development of remedial alternatives that will protect people and the environment from risks associated with hazardous constituents in on-Property soils and perched water. The overarching RAO for the Property is to protect people and the environment from risks associated with hazardous constituents in on-Property soils and perched water.

Based on the two potentially complete pathways for human exposure identified in the CSM (i.e. direct contact with soils by future utility workers, and contact with groundwater (impacted by perched water) by industrial workers during maintenance of a future process cooling water system), the following Property-specific RAOs were also applied in this FS-OSP:

- Soil
  - Achieve 10^{-5} residual cancer risk across entire Property
  - Protect on-Property perched water and groundwater
- Perched Water
  - Prevent contact with contaminated on-Property perched water
  - Protect on-Property groundwater

These objectives will be met by:

- Achieving CLs and RELs that will be protective of human health and the environment;
- Complying with chemical-, location-, and action-specific applicable, relevant, and appropriate requirements (ARARs); and,
- Complying with Ecology policies.

ES.5. Cleanup Level and Remediation Level Development

Cleanup levels and RELs establish the quantitative goals for evaluating the effectiveness of the preferred remedy. CLs and RELs were determined in accordance with the Model Toxics Control Act (MTCA) regulations in Washington Administrative Code (WAC)-173-340-357, -708, -720, -730, -740, -745, and -747. In the MTCA regulation, Ecology acknowledges that site-specific RELs are necessary and useful in the site cleanup remedy selection process. Based on the CSM, CLs and RELs were developed for perched water, soils-to-perched water, and direct contact with soils.

ES.5.1. Perched Water RELs

As noted in the CSM, all current and future on-Property perched water exposure pathways are incomplete. However, due to the potential for the perched water to impact the underlying groundwater, non-potable groundwater CLs were first identified to serve as the basis for on-Property perched water and soil-to-perched water RELs. Consistent with MTCA, a site-specific risk assessment was performed to identify the reasonable maximum exposure scenario and calculate non-potable groundwater CLs and (by extension) perched water RELs. This risk assessment considered the potential for an industrial worker (e.g. a Superlon employee) to come in contact with groundwater in the course of maintaining a groundwater-fed process cooling water system. Specific exposure parameters for the frequency and duration of such contact were based on site-specific information collected from Superlon's management. Based on this assessment, the non-potable groundwater CLs (and hence the perched water RELs) for arsenic, cadmium and lead were calculated to be 0.67, 1.05 and 1.65 mg/l, respectively.

ES.5.2. Soil-to-Perched Water RELs

Constituents in soil may be transported to on-Property perched water through infiltration/percolation of water and subsequently to groundwater. Soil samples were analyzed using the synthetic precipitation leaching procedure (SPLP) to estimate the soil concentration that would produce leachate that could impact groundwater above the non-potable groundwater CLs (WAC 173-340-747(7)(b)(i)). In instances where the soil pH is less than six, the Toxic Characteristic Leaching Procedure (TCLP) was used rather than the SPLP (WAC 173-340-747(7)(b)(ii)). The arsenic and lead SPLP and TCLP results were compared to the perched water RELs to determine a corresponding soil concentration that would be protective of perched water, and (by extension) groundwater for each OU. These values, which vary by OU depending on the leachability of the material in each area, were developed for arsenic and lead.

ES.5.3 Direct Contact Soil RELs

Arsenic and lead were the only COPCs with concentrations greater than the default MTCA Method C soil direct contact CLs, and hence were identified as soil direct contact constituents of concern (COCs). Consistent with MTCA (WAC 173-340-708(3)), a site-specific reasonable maximum exposure scenario expected to occur under both current and potential future site use conditions was used to determine the REL for arsenic. The exposure scenario considered future site use by a utility worker involved in underground utility work. Operations managers for organizations that may perform utility work at properties in the Tacoma Tide Flats were surveyed to determine the frequency and duration of work visits by utility workers to Tide Flats properties. This utility worker exposure information was then used to determine the soil direct contact REL for arsenic of 588 mg/kg. An REL was not specifically calculated for lead, since arsenic and lead are typically co-located, and remediation of arsenic soils will address lead to below the industrial CL for lead of 1,000 mg/kg.

ES.6. Estimating Volumes of Impacted Soil and Perched Water

After the development of the appropriate CLs and RELs for the COCs in on-Property media, these levels were combined with on-Property characterization data from the RI-OSS to estimate the volumes of impacted soil and perched water that will need to be addressed as part of the proposed remedy. These estimated volumes were used as the basis for:

- Developing the scope for treatability studies;
- Identifying and screening remedial alternatives; and,
- Performing a detailed analysis of remedial alternatives.

ES.6.1. Soil Volumes

Estimates of soil volume were based on interpretation of sample data collected during the RI-OSS and subsequent IAs, or other characterization efforts. SPLP information developed by MT2 indicates that virtually all of the soils in OUs 4,5, and 6 are not expected to leach COCs at concentrations in excess of their perched water RELs. This information indicates that soils in these OUs are not expected to result in groundwater impacts. As such, the volume of soils to be remediated in these OUs is based on soils with COC concentrations greater than its direct contact REL. By contrast, soils in OUs 1,2, and 3 do leach COCs above the perched water RELs. As such, the development of impacted soil volumes in these OUs was based on the amount of material expected to leach COCs at concentrations above the perched water RELs.

ES.6.2. Perched Water Volume

Since the current perched water COC concentrations exceed the perched water REL, the entire volume of perched water on the Property was assumed to be impacted. Due to the discontinuous nature of the perched water body, developing an accurate perched water volume estimate was difficult. A set of assumptions were made to create an estimate range of the volumes of impacted perched water on the Property. From this effort, the volume of impacted perched water requiring remediation was estimated to range between roughly 850,000 and 1.5 million (MM) gallons.

ES.7. Identification and Screening of Remediation Technologies

Remedial technologies and processes were identified for both soil and perched water. Remedial options consisted of general remediation technologies identified for the purpose of potentially meeting the RAOs or to act as a component of an alternative that would meet RAOs for each medium and/or waste type. Potential technologies were screened against effectiveness, implementability, and cost criteria, per WAC 173-340-360 (3)(b)).

Effectiveness screening criteria including Protectiveness, Permanence, Long-Term Effectiveness, Management of Short-Term Risks, and Consideration of Public Concerns were used to evaluate the technology, the ability to protect human health and the environment, and the potential negative impacts associated with the technology. Implementability screening considered the technical and administrative feasibility of constructing, operating, and maintaining a particular remediation technology. To assess technical implementability, emphasis was placed on the institutional aspects of implementability, such as the ability to obtain the necessary permits, the availability of treatment, storage, and disposal services, and the availability of necessary equipment and skilled workers to implement the technology. The cost screening criteria for remediation work included such items as installation and operation of process equipment, excavation, and disposal fees.

A list of these prospective technologies and processes were presented to Ecology who made the determination that the retained list was appropriate for further evaluation in the FS (Ecology 2014).

ES.8. Detailed Analysis of Remedial Alternatives

None of the individual media-specific technologies met all Property RAOs and Ecology policies. Therefore, the retained technologies were combined into the following remedial alternatives for further evaluation:

- Alternative 1: No action
- Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil Above the Direct Contact Remediation Level (> DCREL), Cap and Cover Property, Apply Deed Restriction
- Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils Above the Soil-to-Perched Water Remediation Level (> SPWREL) in OUs 1,2, and 3, Cover Property, Apply Deed Restriction
- Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction
- Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate Soil Above MTCA Defaults, Cover Property, Apply Deed Restriction

At the beginning of the detailed analysis of alternatives, it was determined that Alternative 1: No Action, and Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL, Cap and Cover Property, Apply Deed Restriction did not meet the RAOs, and hence were not retained for further consideration in the analysis.

A comparative detailed analysis of the three remaining remedial alternatives was conducted based on their performance against the MTCA criteria of protectiveness, permanence, effectiveness over the long-term, management of short-term risks, technical and administrative implementability, cost, restoration time frame, and consideration of public concerns. The remaining alternatives were also ranked with respect to their environmental sustainability and their implementation safety.

The results of the comparative detailed analysis were quantified by assigning a numeric score between 1 and 5 to each alternative for each of the evaluation criteria. A score of 1 was assigned to the best alternative while a larger numeric score (up to 5) was assigned to the worst performing alternative. Generally, an alternative was only assigned a score of 4 or 5 if it significantly underperformed relative to the other alternatives for a given criteria. In cases where it was not possible to distinguish performance between remedial alternatives, those remedial alternatives were discussed together and given equal scores.

The outcome of the numeric scoring, which reflects the comparative detailed analysis indicates that the preferred remedial alternative to protect people and the environment from risks associated with hazardous constituents in on-Property soils and perched water is Alternative 3.

Alternative 3 consists of:

- Installing a Slurry or Grout Wall Around the Property Perimeter;
- Treating Perched Water to the Perched Water REL;
- Excavating and Disposing of Soil Greater Than Direct Contact RELs in OUs 4 and 6;
- Excavating and Stabilizing Soils Greater Than Soil-to Perched Water RELs in OUs 1,2, and 3;
- Covering the Property; and,
- Applying a Deed Restriction to Ensure On-Going Industrial Land Use.

Of the three alternatives, Alternative 3, with an overall score of 20, can be implemented in 2.4 years at an estimated cost of $4.8MM, has the lowest potential for public concerns, and is the most environmentally sustainable alternative. Alternative 4, with an overall score of 23, can be implemented in 3.8 years at an estimated cost of $5.6MM, has similar potential for public concerns with Alternative 3, and is similar to Alternative 3 in terms of sustainability. Alternative 5, with an overall score of 41, can be implemented in 6.4 years (over twice as long as the other alternatives) at an estimated cost of $11.2MM, has the highest potential for public concerns, and is by far the least sustainable alternative.

A conceptual design for Alternative 3 has been developed, and will be refined during the remedial design process.

ES.9. References for the Executive Summary

City of Tacoma (GovMe). 2012. http://www.govme.org/Common/gMap/MGMain.aspx

Ecology. 2013. Electronic mail from Marv Coleman to Tim Bingman Regarding Ecology Approval to Separate On-Property Soils into a Separate Remedial Investigation and Feasibility Study Track. January 13, 2013.

Ecology. 2014. Verbal Communication from Marv Coleman to Tim Bingman Regarding Ecology Approval of the Initial Screening of Technologies. July 7, 2014.

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

Figure ES-1: Feasibility Study for On-Property Soils and Perched Water

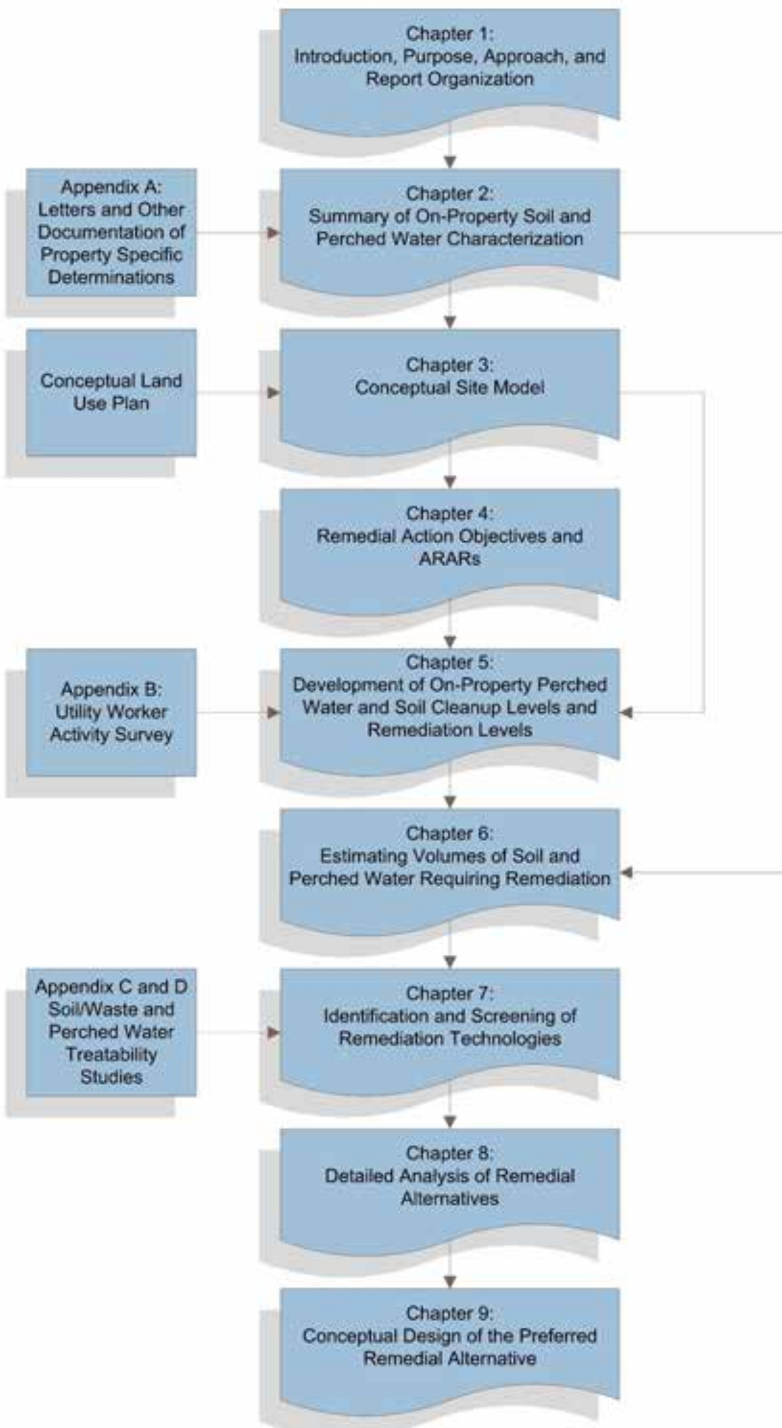


Table of Contents

Tables

Figures

Appendices

This page has been left blank intentionally to allow for double-sided printing.

Abbreviations and Acronyms

Acronym	Description
AKART	All Known Available and Reasonable Treatment
ALM	Adult Lead Model
AO	Agreed Order
AOC	Area of Contamination
ARARs	Applicable, Relevant, and Appropriate Requirements
ASILS	Ambient air Source Impact Levels
Bgs	Below ground surface
CDC	Center for Disease Control and Prevention
Cgs	Current Ground Surface
CLs	Cleanup Levels
CMRA	Cross-Media Remedial Alternatives
Companies	White Birch and DuPont
COC	Constituent of Concern
COPC	Constituent of Potential Concern
COPI	Constituent of Potential Interest
CSEM	Conceptual Site Exposure Model
CSFTM	Conceptual Site Fate and Transport Model
CSM	Conceptual Site Model
CY	Cubic yards
DCREL	Direct contact remediation level
DOT	Department of Transportation
DuPont	E.I. DuPont de Nemours and Company
DTSC	California Department of Toxic Substances Control
DW	Dangerous waste
Ecology	Washington State Department of Ecology
EC	Electrocoagulation
EHW	Extremely hazardous waste
FS-OSP	Feasibility Study for On-Property Soils and Perched Water
FS	Feasibility Study
GIS	Geographic Information Systems
gpm/ft^2	Gallons per minute per square foot
Grasselli	Grasselli Chemicals Company
GW	Ground water
IA	Interim action
LA	Landau Associates
Latimer-Goodwin	Latimer-Goodwin Chemical Company
LDRs	Land Disposal Restrictions
mg/kg	Milligram per kilogram
mg/L	Milligram per Liter
MM	Million
MTCA	Model Toxics Control Act
NHPA	National Historic Preservation Act

Acronym	Description
NPL	National Priorities List
OU	Operable Unit
O&M	Operations and Maintenance
PCE	Tetrachloroethylene
PERC	Pacific Environmental and Redevelopment Corporation
PIONEER	PIONEER Technologies Corporation
Plan	Future Land Use Plan
PPE	Personal Protective Equipment
Property	Land occupied by Superlon Plastics Inc., (Parcel A)
PSCAA	Puget Sound Clean Air Agency
PW	Perched Water
QA/QC	Quality Assurance/Quality Control
RAOs	Remedial Action Objectives
RELs	Remediation Levels
RI	Remedial Investigation
RI-OSS	Remedial Investigation for On-Property Soils and Surface Water
SARA	Superfund Amendment and Reauthorization Act
Site	Superlon Plastics Site as defined in WAC 173-340-200
SPLP	Synthetic Precipitation Leaching Procedure
SW	Surface Water
SPWREL	Soil-to-Perched Water Remediation Level
SVOC	Semi-Volatile Organic Constituents
T-BACT	Best Available Control Technologies for Toxics
TCE	Trichloroethylene
TCLP	Toxic Characterization Leaching Procedure
TDS	Total Dissolved Solids
T/E	Threatened or Endangered
TPH	Total Petroleum Hydrocarbons
TPH-D	Total Petroleum Hydrocarbons Diesel fraction
TPH-G	Total Petroleum Hydrocarbons Gasoline fraction
TPH-HO	Total Petroleum Hydrocarbons Heavy Oil fraction
ug/dL	Micrograms per deciliter
ug/L	Micrograms per Liter
US	United States
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
White Birch	White Birch, LLC
WWL	Water and Waste Water Laboratories
XRF	X-Ray Fluorescence instrument

Chapter 1. INTRODUCTION, PURPOSE, APPROACH, AND REPORT ORGANIZATION

1.1. Introduction

This Feasibility Study (FS) for on-Property Soils and Perched Water (FS-OSP) was developed for On-Property soil and perched water at the Superlon Plastics Property (Property) on behalf of White Birch, LLC (White Birch) and E. I. duPont de Nemours and Company (DuPont). Under the direction of DuPont and White Birch, their authorized agents, Pacific Environmental and Redevelopment Corporation (PERC) and PIONEER Technologies Corporation (PIONEER) conducted the work necessary to complete this FS-OSP in accordance with the State of Washington 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 this Draft FS-OSP for the Washington State Department of Ecology (Ecology) review and approval in accordance with WAC 173-340-350(8). Under MTCA, Ecology provides guidance and criteria for the selection of cleanup actions (WAC 173-340-360). MTCA specifies criteria for selecting cleanup actions, which include the permanence of the action, protectiveness, cost, long-term effectiveness, management of short-term risks, implementability and consideration of public concerns. Also under MTCA, Ecology also provides general information on the content of a FS (WAC 173-340-350). This FS-OSP follows that guidance.

The purpose of the FS-OSP is to develop and evaluate remedial alternatives in accordance with WAC 173-340-350(8) to enable a cleanup action to be selected for the Property. Once complete, Ecology will review the draft FS-OSP, including proposed cleanup levels (CLs) and remediation levels (RELs) and the point or points at which they must be complied, in accordance with the procedures provided for in WAC 173-340-700 through 173-340-760. Ecology requires that a cleanup action on a site meet the cleanup standards for the Property's land use designation. To meet a cleanup standard the cleanup action must:

- Be protective of human health and the environment;
- Meet cleanup or remediation levels for hazardous substances present at a Property (constituent concentrations in affected media) at the point(s) of compliance; and,
- Address and/or meet the regulatory requirements of all applicable state and federal laws.

The primary focus of this FS-OSP is to address soils and perched water impacted by lead and arsenic. Soils impacted by other contaminants and contaminated debris occur on Property, but impact relatively small volumes of these media.

1.2. Property Description and History

The Property, located at 2116 Taylor Way in Tacoma, Washington (Figure 1-1), covers 3.1 acres and is listed as tax parcel number 0321351042. The Property is currently owned by White Birch, LLC and operated by Superlon Plastics Company, Incorporated, an extruded plastic pipe manufacturer. Taylor Way borders the northeast edge of the Property (Figure 1-2). Beyond Taylor Way is a property owned by the Port of Tacoma. The Property is bounded to the north by a railroad right-of-way owned by the City of Tacoma Public Works. Beyond this right-of-way is a vacant triangle shaped parcel of land owned by the Port of Tacoma. To the northwest are Lincoln Avenue and a warehouse operation. To the south and southwest is Port of Tacoma property, which until recently was leased and operated as the Haub Log Yard. The Property to the southeast is owned by RTH

Tacoma, LLC and leased and operated by Gardner – Fields Products, a roofing and waterproofing products manufacturing business.

The Property is located in a highly industrial area of the Tacoma Tidal Flats located between the Blair and Hylebos Waterways and is surrounded by approximately 562 other properties. Several known Ecology and United States Environmental Protection Agency (USEPA) hazardous waste cleanup sites are within 0.25 miles of the Property including the Reichhold Chemical/SSA Container site, owned by SSA Containers and the Puyallup Tribe, and the Arkema site, the US Gypsum/Thermafiber Plant site (US Gypsum Site), the Atofina (formerly ELF Atochem) site and the former Murray Pacific Log Yard #1, all of which are owned by the Port of Tacoma. The Hylebos Waterway National Priorities List (NPL) site is located less than 0.5 miles to the northeast.

The Tacoma tidal flats were filled and developed in the early 1900s. Fill materials on-Property occur as at least three layers: fill material introduced between 1959 and 1972, and two layers of dredge sands (both placed in the early 1900's). These three layers are separated by layers of silty clay. The fill materials are made up of various types of waste and debris. On-Property, these waste materials are generally of three types: waste related to the manufacture of lead arsenate and calcium arsenate; black shot waste from the US Gypsum Site; and mixed waste including, wastewater treatment sludge and white gypsum/lime material, associated with the filling of the Property in the 1960s and 1970s. The origins of other components of the mixed waste are unknown (PERC 2013).

1.2.1. Property Ownership History:

The Property has had numerous owners and uses since its initial development. A history of Property ownership is listed below.

- In 1925, Latimer-Goodwin purchased an approximately 5-acre parcel from Buffelen Lumber & Manufacturing Company. Latimer-Goodwin developed it for the manufacture of lead arsenate pesticides.
- In 1944, Grasselli, a subsidiary of DuPont, purchased Latimer-Goodwin's land parcel and the pesticide manufacturing facilities located there. Grasselli manufactured lead arsenate and calcium arsenate insecticides until 1946, and performed product mixing and agricultural chemical warehousing operations until 1949.
- In 1951, DuPont sold the Property to V.C. Monahan, who operated the Cabin Creek Lumber Company.
- In 1968, V.C. Monahan in turn sold the Property to Justus Company, Inc., who operated a wood treatment facility there.
- In 1972, Frank B. Lynott, of Justus Cedar Homes and Lindal Cedar Homes sold the Property to Mr. Ragnar M. Nars, to be used for Superlon Plastics Company, Incorporated.
- In 1992, the Property was subdivided evenly into thirds, all of which were re-consolidated and granted through a series of quit claim deeds to White Birch Group, LLC. White Birch continues to own the Property.

1.2.2. Interim Actions

In accordance with MTCA (WAC 173-340-430) and Ecology-approved work plans, interim actions (IA) have been conducted to remove soil, waste, and/or debris from discrete locations throughout the Property. This work began in 2009 and is on-going. Actions were conducted for five primary reasons:

- To remove soil and/or debris with high concentrations of constituents to improve the safety and environmental conditions at the Property;
- To minimize the potential for transport of residual constituents in soil by removing the sources, protect groundwater, and thereby minimize potential future environmental impacts;
- To remove debris (such as drums and other demolition material) to facilitate a more complete and accurate RI;
- To facilitate completion of the Remedial Investigation for On-Property Soils and Surface Water[1] (RI-OSS) and FS-OSP process; and,
- To prepare for the final remediation of the Property.

Three IAs were completed between 2009 and 2012 and a fourth IA is on-going. The first three IAs have been summarized in an IA Memoranda issued to Ecology presenting the results and providing additional details of each activity. They are as follows:

- Interim Action Phase I - Property Preparation and Building B Demolition (PERC 2012a)
- Occidental Sludge Removal and Disposal (PERC 2012b)
- Building D Sub-Soil Removal and Disposal (PERC 2014)

The fourth IA, begun in 2012 and to be completed in 2016, will be summarized in an IA report to be issued to Ecology in the future:

- Building B Soil Removal, Stabilization, and Disposal

All four of the IAs have removed, or will be removing, soils and/or wastes impacted with Property Constituents of Potential Interest (COPIs[2]). The total volume of materials removed from the Property (through August 31, 2014) included approximately 4,500 tons of soil and waste mixtures, 1,200 tons of waste water treatment sludge, 700 tons of building debris, and 10 cubic yards (CY) of asbestos-containing material. All materials were sent to approved landfills.

As a result of these efforts, this is a focused FS, addressing the residual constituents remaining in soil and perched water following completion of the IAs.

1.3. FS Approach

This FS-OSP presents the technical approach proposed to be undertaken to remediate on-Property soils and perched water on the Superlon Plastics Property only, and is based upon information collected during several phases of the RI for On-Property Soil and Surface Water[1] (RI-OSS) completed for these media (PERC 2013). Definition of the Site and the results of samples from other media and off-Property samples will be presented in a future RI/FS. This approach, which has been approved by Ecology, was adopted in order to continue progress toward a final remedy for on-Property media, while continuing to investigate off-Property issues and to define the Site boundary (Ecology 2013; see Appendix A). This FS-OSP report is a companion document to the RI-OSS which should be reviewed in conjunction with this report.

This FS-OSP uses the following sequential analyses to determine the preferred alternative for remediation of On-Property Soils and Perched Water:

- Conceptual Site Model (CSM) Development: Using data from the RI-OSS, the determination of the preferred alternative begins with the development of a CSM. This model describes the sources and chemical release mechanisms, environmental transport media, routes by which human and environmental exposure to site COPCs could occur, and begins to focus the process on the media that will need to be considered in the FS.
- Remedial Action Objective (RAO) Development: From the CSM, RAOs are developed to define protectiveness goals, and to ensure that the selected remedy will be consistent with MTCA requirements.
- Cleanup Level and Remediation Level Development: With risk management goals defined in the RAOs, specific CLs and site-specific RELs are developed for the various media that need to be addressed in the FS. These CLs and RELs are used to estimate the volumes of on-Property soils and perched water that will need to be addressed in the FS, and also serve as quantitative goals to evaluate the ability of prospective technologies to meet the RAOs.
- Affected Media Volume Calculation: Using data from the RI-OSS and the CLs and RELs, the volumes of on-Property soils and perched water requiring further consideration in the FS are calculated.
- Technology Screening: Remedial technologies and process options are reviewed and analyzed to determine their applicability to meet RAOs.
- Selection of the Preferred Alternative: The various remedial alternatives are evaluated in terms of their ability to meet the RAOs, schedule, public concerns, and cost-effectiveness. Then the most appropriate alternative for the remediation of on-Property soils and perched water is proposed as the preferred alternative.

1.4. Additional Key Considerations

1 Future Land Use

This evaluation of remediation technologies and, ultimately, of remedial alternatives in this FS-OSP is based on continuing industrial land use for the Property. This is consistent with previous and current land use, as well as the City of Tacoma zoning map which has zoned the Property and the surrounding land as industrial (City of Tacoma 2012). A change in this designation is unlikely. In addition, in 2011, a conceptual future land use plan was developed for the Property. The Plan identifies the intended future industrial use of the Property and the location of buildings and other site features that are consistent with that use (see Figure 1-3). Industrial land use was used as a basis to develop exposure scenarios for the determination of applicable land use-specific and chemical-specific CLs and RELs.

1.4.2. Area of Contamination Designation

The Area of Contamination (AOC) policy developed by Ecology (Ecology 1991) clarifies the definitions of generation and disposal as they apply to soil and debris found on MTCA sites. In 2009, Ecology determined that an AOC designation was appropriate for the Property allowing for on-Property consolidation, handling, and treatment of soil and debris from various areas on the Property (Ecology 2011; see Appendix A).

1.5. Report Organization

The remainder of this FS-OSP report is organized as follows, and presented graphically in Figure 1-4:

- Chapter 2 presents a summary of the on-Property characterization. It includes a summary of the RI-OSS, as well as a description of the on-Property Operable Units (OUs) to be addressed in the FS.
- Chapter 3 presents the CSM that describes the potential for human and ecological exposure to the various Property media. It forms the basis for the RAOs described in Chapter 4, and is used to develop Property-specific RELs and CLs in Chapter 5.
- Chapter 4 summarizes RAOs designed to protect human health and the environment. The RAOs take into consideration RELs and CLs, and relevant state and federal regulations and relevant Ecology policies.
- Chapter 5 describes the development of the Property-specific RELs that are protective of human health and the environment at the Property. These RELs take into account current/future land use, and the benefits of engineering controls associated with remedial alternatives. These CLs and RELs form the basis of the estimate of impacted soil volumes, and are also used to assess the feasibility of potential remedial alternatives. Chapter 5 also discusses the proposed points of compliance where the success of the proposed remedy will be judged.
- Chapter 6 discusses the methods used to estimate volumes of impacted soils and perched water that will be addressed by the cleanup action for each OU.
- Chapter 7 identifies the screening criteria that are used to evaluate the various technologies that were considered for the Property. In addition, this section presents the results of the initial screening of technologies and associated process options. Preliminary screening was performed based on the

effectiveness, implementability, and cost of the technology and process options to remediate Property soil and perched water. This screening was presented to Ecology in April 2014, as required under WAC 173-340-350(8)(c)(i). Ecology reviewed the list and approved the selection of technologies/processes retained for further evaluation in Chapter 8 of this FS-OSP.

- Chapter 8 describes the detailed analysis of remedial alternatives for remediation of both Property soils and perched water. This chapter includes an analysis and ranking of the alternatives based on the evaluation criteria. A comparative analysis identifies the performance of the retained alternatives for each criterion. The cost of each alternative is also considered in this analysis. The preferred alternative for the remediation of both soil and perched water on-Property is presented at the conclusion of this chapter.
- Chapter 9 describes the recommended conceptual design of the preferred alternative for the Property cleanup action.

Throughout this report, tables, figures, and references are presented at the end of each chapter in which they are discussed. These chapters are supplemented by appendices, which provide supporting documentation of items discussed in the text.

1.6. References for Chapter 1

City of Tacoma (GovMe). 2012. http://www.govme.org/Common/gMap/MGMain.aspx PERC. 2010. Phase I Remedial Investigation Work Plan for the Superlon Plastics Site, Tacoma, Washington. February.

Ecology. 1991. Inter-program Policy Memorandum on Contamination, Washington State Department of Ecology Toxics Cleanup Program, August 20.

Ecology. 2011. Letter from Marv Coleman to Tim Bingman Regarding Area of Contamination Designation for the Superlon Property, March 7.

Ecology. 2013. Electronic mail from Marv Coleman to Tim Bingman Regarding Ecology Approval to Separate On-Property Soils into a Separate Remedial Investigation and Feasibility Study Track. January 13, 2013.

PERC. 2012a. Phase I Interim Action Report for the Superlon Plastics Site, Tacoma, Washington. January 2012.

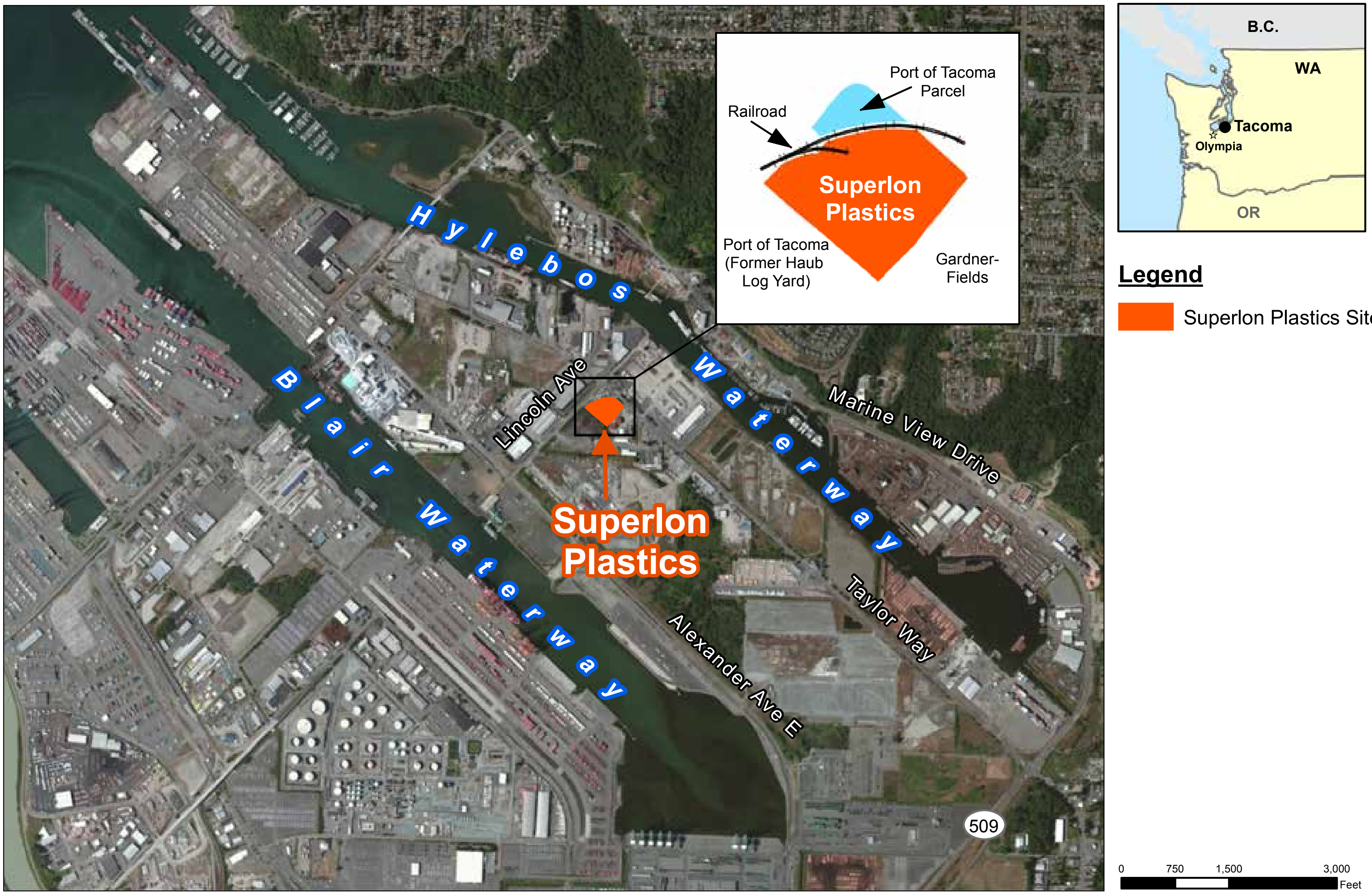
PERC. 2012b. Sludge Excavation and Disposal Report for the Superlon Plastics Site, Tacoma, Washington. March 2012.

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

PERC. 2014. Soil Excavation and Disposal Report – Building D Subsoil for the Superlon Plastics Site, Tacoma, Washington. January 2014.

Chapter 1 Figures

This page has been left blank intentionally to allow for double-sided printing.



PIONEER TECHNOLOGIES CORPORATION

Site Location
Superlon Plastics Site
Tacoma, Washington

Figure 1-1

Legend

- Railroad
- Fence
- Ditch
- Property Boundary

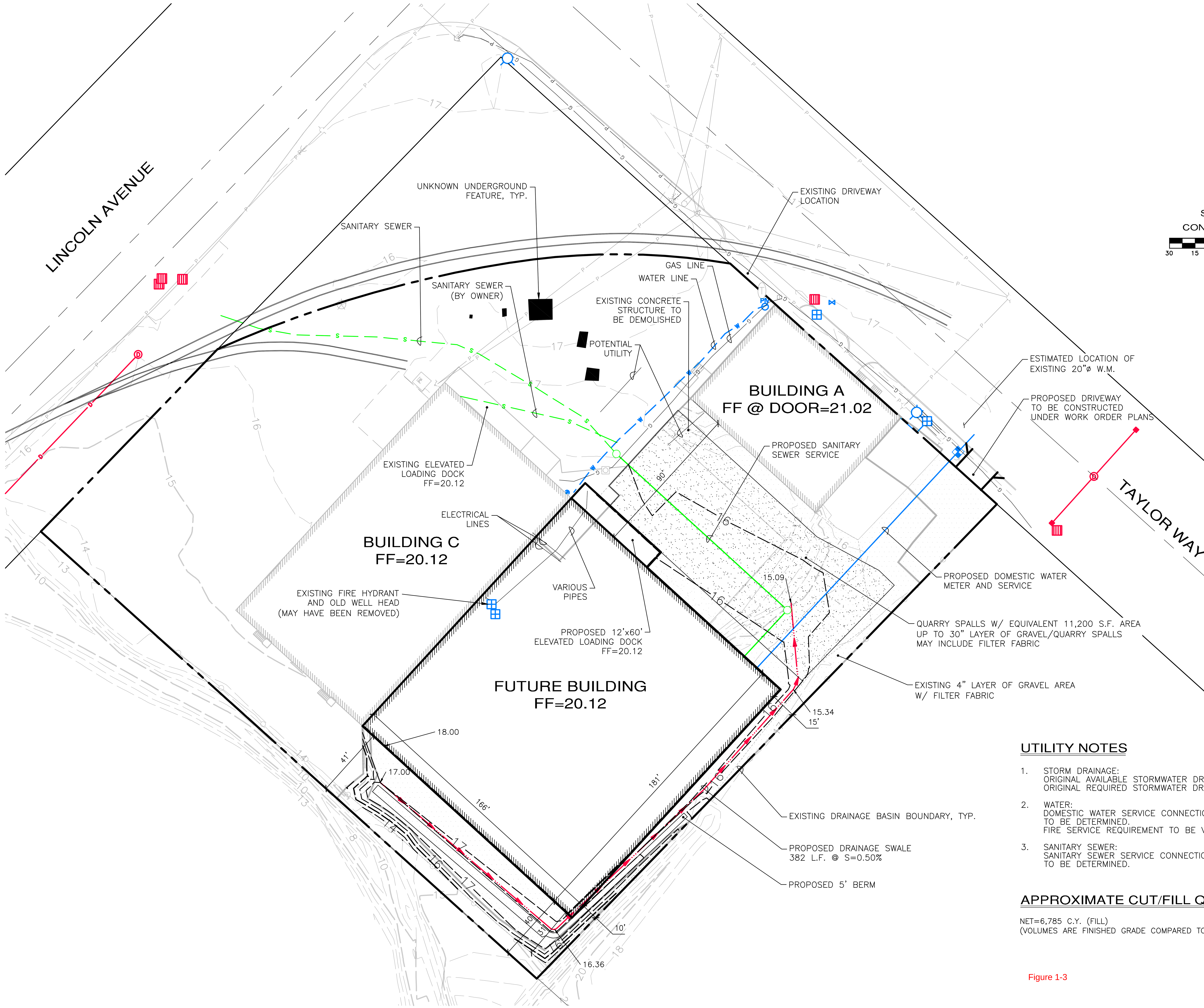
0 50 100 150 200 Feet

PIONEER TECHNOLOGIES CORPORATION

Site Features
Feasibility Study for On-Property Soils and Perched Water
Superlon Plastics Site, Tacoma, Washington

Figure 1-2

A PORTION OF THE NE 1/4 OF THE NE 1/4 OF SECTION 35, TOWNSHIP 21N, RGE 3E, W.M. CITY OF TACOMA, PIERCE COUNTY, WASHINGTON



n

SCALE: 1"=30' HORIZ. 1"=5' VERT.

CONTOUR INTERVAL = 1'

30 15 0 30 60

UTILITY NOTES

1. STORM DRAINAGE:
   ORIGINAL AVAILABLE STORMWATER DRAINAGE RUNOFF VOLUME: 8,400 C.F.
   ORIGINAL REQUIRED STORMWATER DRAINAGE RUNOFF VOLUME: 7,381 C.F.
2. WATER:
   DOMESTIC WATER SERVICE CONNECTION LOCATION TO BE VERIFIED AND SIZE TO BE DETERMINED.
   FIRE SERVICE REQUIREMENT TO BE VERIFIED.
3. SANITARY SEWER:
   SANITARY SEWER SERVICE CONNECTION LOCATION TO BE VERIFIED AND SIZE TO BE DETERMINED.

APPROXIMATE CUT/FILL QUANTITIES

NET=6,785 C.Y. (FILL)
(VOLUMES ARE FINISHED GRADE COMPARED TO PHASE 1 GRADING)

Figure 1-3

REVISIONS		
NO.	DESCRIPTION/DATE	BY

ESM CONSULTING ENGINEERS L.L.C.
33915 1st Way South, Suite 200
Federal Way, WA 98003
www.esmcivil.com
Civil Engineering | Public Works | Land Surveying | Project Management | Land Planning | Landscape Architecture

PACIFIC ENVIRONMENTAL AND REDEVELOPMENT CORPORATION

SUPERLON PLASTICS

CONCEPTUAL LAND USE PLAN

CITY OF TACOMA WASHINGTON

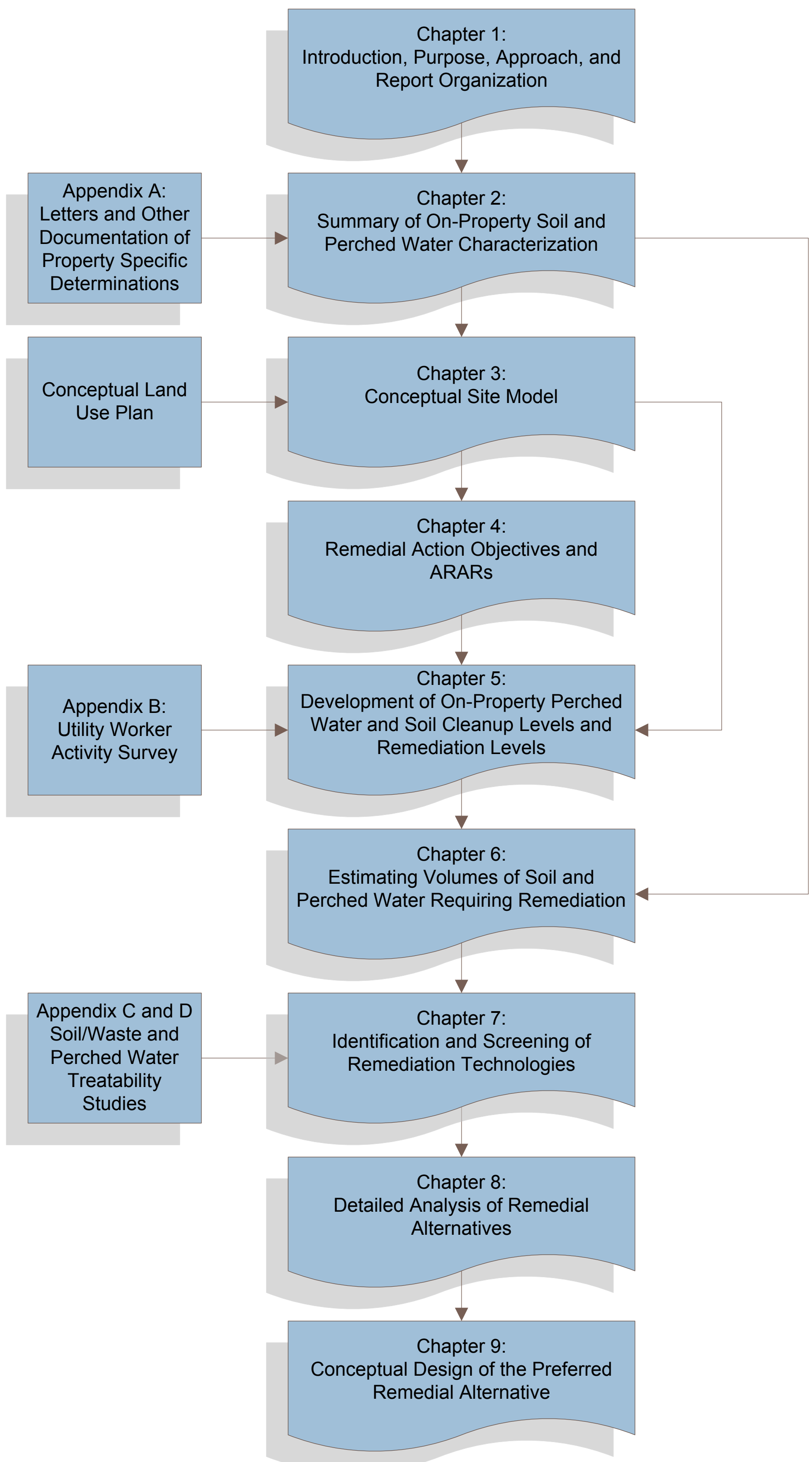
JOB NO.:	1624-001-009
DWG. NAME:	EN-09
DESIGNED BY:	LGC
DRAWN BY:	LGC
CHECKED BY:	
DATE:	2011-03-24
DATE OF PRINT:	

1 OF 1 SHEETS

File: I:\ESM-JOBS\1624\001\009\exhibits\EN-09.dwg
Plotted: 3/24/2011 4:40 PM Plotted By: Laura Cocioru

This page has been left blank intentionally to allow for double-sided printing.

Figure 1-4: Feasibility Study for On-Property Soils and Perched Water



This page has been left blank intentionally to allow for double-sided printing.

Chapter 2. SUMMARY OF RI ON-PROPERTY SOIL AND PERCHED WATER CHARACTERIZATION

2.1. Summary of the RI-OSS

The purpose of the RI-OSS was to collect, develop, and evaluate sufficient information regarding the Property to enable the completion of the FS-OSP. The RI-OSS characterizes the nature and extent of contamination in the context of past activities at the Property and presents the analytical data, fill characteristics, and other information that has been collected on the Property through the completion of three RI phases.

The first three phases of the RI for the Superlon Plastics Site investigated five media (i.e., soil, surface water, perched water, groundwater, and sediment). Since the characterization of groundwater and sediment will require additional, and more time consuming work, the project was bifurcated into two sections:

- The evaluation and remediation of On-Property soil and perched water; and,
- The characterization, evaluation and (potentially remediation) of groundwater and off-Property sediment and surface water.

This approach, which has been approved by Ecology, will accelerate the remediation of the Property while work focusing on defining the Site boundary and determining a remedy for the Site continues (Ecology 2013).

The RI-OSS identified six OU areas of impacted soil, based upon their waste types. Additionally, the on-Property perched water has been designated as a separate OU. Since each of these seven areas, due to their distinct characteristics, will require a different, or grouping of different remedial technologies, they are addressed individually in this FS-OSP. These areas are further described in Section 2.2, in the definition of OUs for the Property.

2.1.1. Soil

A total of 1,294 on-Property soil samples were collected during Phase I, II and III of the RI. Screening[2] of on-Property COPIs indicate that the COPC in on-Property soils are arsenic, lead, cadmium, select volatile organic compounds (VOCs), pentachlorophenol, total petroleum hydrocarbons-heavy oil fraction (TPH-HO), total petroleum hydrocarbons-diesel fraction (TPH-D), and total petroleum hydrocarbons-gasoline fraction (TPH-G). While this list represents the full range of COPCs encountered in the on-Property soils, the primary Property COPCs are arsenic and lead.

2.1.2. Perched Water

[2] Media concentrations were compared to screening criteria in order to identify constituents that may be of potential concern.

Five on-Property perched water samples were collected from the former Building B Basement footprint and under Building A. Laboratory analyses performed on perched water samples included total and dissolved arsenic, lead, cadmium, and mercury and VOCs, and semi-volatile organic constituents (SVOCs). Of the COPIs detected, only arsenic, cadmium, lead, mercury, TPH-HO, pentachlorophenol, 1,2-cis-dichloroethylene, trichloroethylene (TCE) and vinyl chloride were detected above the screening levels in the RI-OSS. These chemicals are the COPCs for on-Property perched water.

Soil removal IAs in the Building B basement have improved the perched water conditions and lowered COPC concentrations. Two perched water samples were collected in March 2014 in support of treatability studies and to determine current COPC concentrations. These recently collected data are presented and included in additional perched water evaluations in Section 5.

The Property meets the criteria of an industrial property as specified in WAC 173-340-745, and Ecology has determined that the groundwater is non-potable (Ecology 2008). On-Property perched water is non-potable and is not accessible, as there is an exposure barrier present. MTCA Method C Industrial non-potable groundwater (WAC 173-340-720) criteria have been developed and are included in the calculation of Property-specific CLs and RELs in Chapter 5.

2.1.3. Debris

Contaminated debris identified during IAs was disposed of off-Property based on characterization sample analytical results. Additional debris remains in-situ and will be addressed in this FS-OSP and during the final cleanup action.

2.1.4. Groundwater

Groundwater was not discussed in the RI-OSS and will not be addressed directly in this FS-OSP. A description of groundwater conditions will be presented in a future RI/FS for that medium.

2.1.5. RI-OSS Conclusions and Recommendations

The RI-OSS concluded that the nature and extent of COPCs in soil have been adequately characterized and that the on-Property COPCs are presented in Table 2-1. In addition, the RI-OSS concluded that:

- Arsenic and lead are present in soil throughout the Property and concentrations exceed industrial land use direct contact screening levels.
- Arsenic, cadmium, lead, pentachlorophenol and vinyl chloride in soil may be contributing to the groundwater concentrations in the surficial aquifer.
- TPH-G, TPH-D and TPH-HO soil concentrations are greater than the industrial land use direct contact screening levels in a few isolated locations. In all cases these occurrences are co-mingled, with arsenic and/or lead exceedances.
- VOCs (in particular TCE and vinyl chloride) were associated with the wastewater treatment sludge formerly located in the western corner of the Property. An IA removed the VOC-containing wastewater treatment

sludge, with the exception of a thin lens of the material at the excavation limits along the southern property boundaries in two directions - toward the Gardner – Fields property and toward the off-Property drainage ditch.

- Arsenic, cadmium, lead, mercury, TPH-HO, pentachlorophenol, 1,2-cis-dichloroethylene, and TCE have been detected in perched water above drinking water screening levels.

2.1.6. Potential Sources

Impacts to the on-Property soil and perched water appear to have come from two types of sources: the manufacturing of lead arsenate and calcium arsenate pesticides, and the importation of non-native fill. The impacts associated with the lead arsenate and calcium arsenate pesticide manufacturing appears to be isolated to the perched water and the soils within and immediately adjacent to the Building A and B footprints.

Impacts from the introduction of imported fill are more wide-spread and consist of three distinct fill types, including:

- Wastewater Treatment Sludge: This material was discreetly located in a discrete area of the western quarter of the Property, and was largely removed in an IA (see Occidental Sludge Removal and Disposal [PERC 2012a]).
- Black Shot: Black spherical crystalline particles, believed to be "shot," likely originating from the operations at the adjacent US Gypsum Site, located at 2301 Taylor Way. This material occurs in two locations on-Property: in the extreme eastern corner of the Property and in the general vicinity of Building D.
- General Fill: Fill was discovered during IAs which contained many types of materials including creosote-covered wood, discarded oil containers, and mixed metal of various types including lead pipe. This fill also contained typical construction debris, soil, and white gypsum/lime like material. This material is located in the northern portion of the Property and appears to be either off-spec hydrated lime or a gypsum manufacturing by-product.

2.1.7. RI-OSS Recommendations for the Feasibility Study

The RI-OSS recommended that the following actions be addressed in this FS-OSP:

- Conduct additional leachability and treatability studies to determine the physiochemical and environmental transport characteristics of on-Property soil COPCs, in particular arsenic, lead and cadmium, for each COPC grouping.
- Identify potential human exposure pathways.
- Develop recommended RELs for COPCs in soil.
- Determine the Property-specific CLs for COPCs in non-potable perched water once additional information is developed.
- Determine the points of compliance for soil and perched water.
- Identify areas of the Property that, based on the RELs and the future Property Land Use Plan, will require further remediation beyond that accomplished in the IAs.

- Identify, based on a consideration of model remedies and the future Property Land Use Plan, potentially viable remedial technologies to be used for each COPC grouping.

2.2. Identification and Definition of Operable Units

Based on the understanding of the potential on-Property sources developed in the RI-OSS described in Section 2.1, the Property was segregated into seven discrete OUs. The OUs were developed to more specifically address the residual contamination, and to determine volumes of soil and perched water requiring remediation. OUs are generally defined in this FS-OSP as areas of the Property with similar waste types (see Figure 2-1). The exception is perched water, which is treated as an OU on its own. The names and descriptions of the OUs that are used throughout this FS-OSP report are provided below.

- **OU1 - Building B**: This OU is located within the footprint of the former Building B foundation. The waste footprint is approximately 15,454 square feet in size and an average of five feet thick. The waste type in this OU consists of silty clay intermixed with construction debris.
- **OU2 - Building A**: This OU is located under Building A. The waste footprint is approximately 7,344 **s**quare feet in size and an average of five feet thick. The waste type in this OU consists of silty clay intermixed with construction debris.
- **OU3 – Mixed Waste with White Gypsum/Lime Material:** This OU is located below the parking lot of the Property generally north of Building A. It is approximately 35,090 square feet in size and is of varying thickness ranging from 2 to 10 feet thick. The waste in this OU consists of many types of materials, including soil, creosote-covered wood, discarded oil containers, mixed metal of various types including lead pipe and construction debris overlain by a thick (up to 6 feet in thickness) layer of white gypsum-like material believed to be either hydrated lime or a gypsum manufacturing by-product.
- **OU4 – General Mixed Waste**: This OU is located in the southwest half and southeast eighth of the Property behind the former building B footprint and behind Building C (Figure 2-1). It is approximately 45,527 square feet in size and is of varying thickness ranging from 1 to 13 feet thick. The wastes in this OU consist of many types of materials, including soil, creosote-covered wood, discarded oil containers, mixed metal of various types including lead pipe, and typical construction debris intermixed with fine sands and silty clay.
- **OU5 – Shot Area 1**: This OU is located in the extreme eastern corner of the Property along the Property boundary with Gardner – Fields. It is approximately 1,931 square feet in size and an average of five feet thick. The waste type in this OU consists of black spherical crystalline particles believed to be “shot”, likely originating from the former adjacent US Gypsum Rock Wool production facility, located at 2301 Taylor Way.
- **OU6 – Shot Area 2**: This OU is located in the general vicinity of Building D. It is approximately 10,073 square feet in size and an average of five feet thick. The waste type in this OU consists of black spherical crystalline particles believed to be “shot” likely originating from the former adjacent US Gypsum Rock Wool production facility, located at 2301 Taylor Way. The majority of the visual “shot” (black, spherical particles) was removed in this OU during an IA, leaving an estimated 1,900 CY of residual material.
- **OU7 – Perched Water:** This OU consists of the discontinuous perched water in the fill zone that previously periodically daylighted as surface water. This OU has been identified sporadically throughout the Property, but predominately in the areas of OU1 and OU2. This OU is not shown on Figure 2-1.

2.3. References for Chapter 2

Ecology. 2008. Reichhold / SSA Containers Inc. Cleanup Action Plan. October 2008.

Ecology. 2013. Electronic mail from Marv Coleman to Tim Bingman Regarding Ecology Approval to Separate On-Property Soils into a Separate Remedial Investigation and Feasibility Study Track. January 13, 2013.

PERC. 2012a. Phase I Interim Action Report for the Superlon Plastics Site, Tacoma, Washington. March 2012.

This page has been left blank intentionally to allow for double-sided printing.

Chapter 2 Tables

Table 2-1: Soil and Perched Water COPCs

Soil COPCs		Perched Water COPCs
COPC based on exceedence of drinking water criteria in the surficial aquifer[1]	COPCs based on exceedence of MTCA Industrial Method C Direct Contact Screening Levels	COPC based on exceedence of drinking water criteria[2]
Arsenic	Arsenic	Arsenic
Cadmium	--	Cadmium
Lead	Lead	Lead
--	--	Mercury
Pentachlorophenol	--	Pentachlorophenol
--	TPH-D	--
--	TPH-G	--
--	TPH-HO	TPH-HO
--	--	cis-1,2-Dichloroethylene
--	--	Trichloroethylene
Vinyl Chloride	--	--

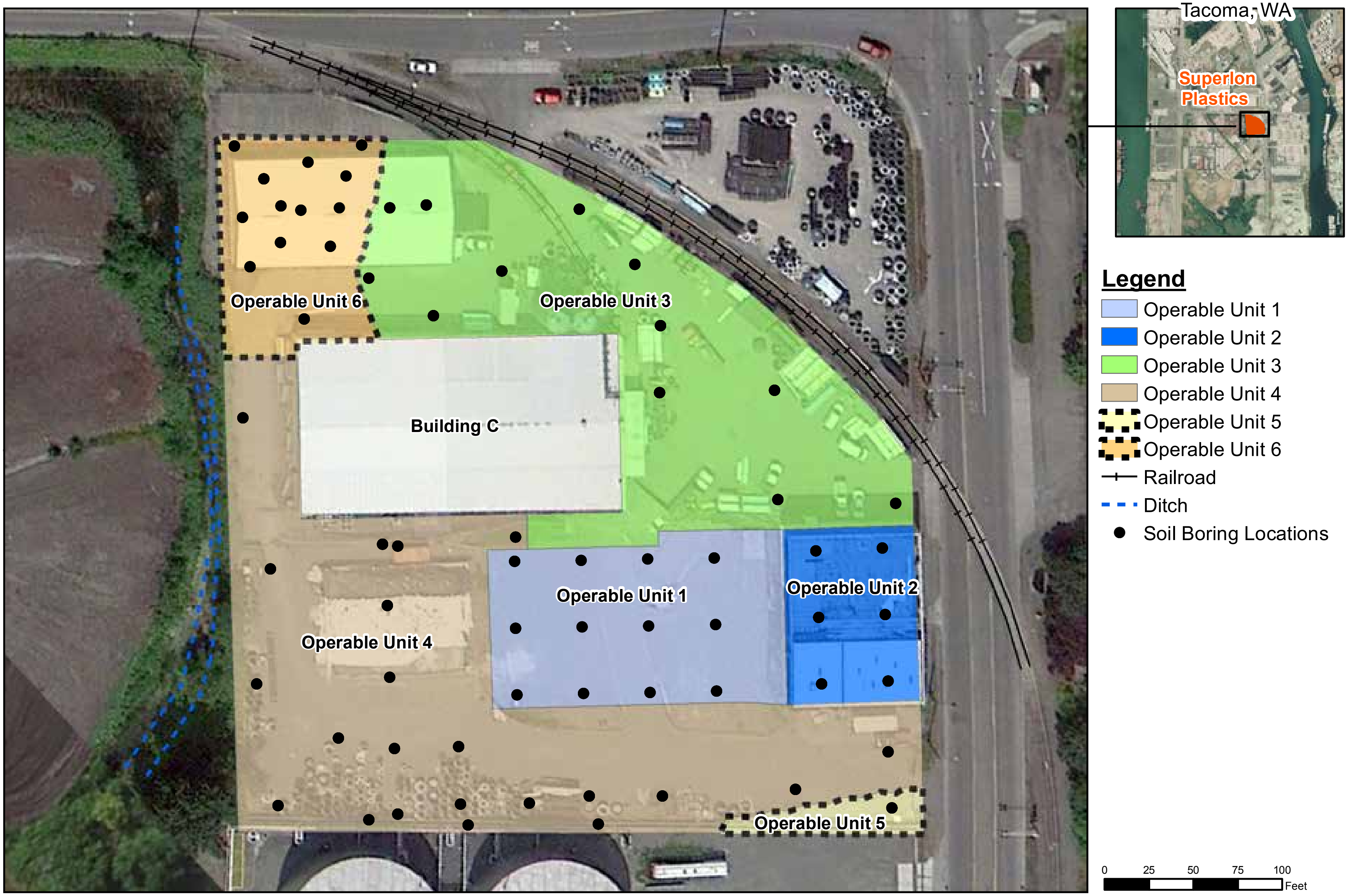
Notes:

[1]The perched water and the aquifers beneath the Property are brackish and non-potable. As such, they cannot serve as a source of drinking water. However, the use of drinking water criteria for the purposes of COPC identification ensures that constituents will not be prematurely eliminated from further consideration in the FS-OSP.

[2]Perched waters on the Property exist only beneath Building A and underneath quarry spalls in the former Building B footprint. As such, they cannot serve as a source of drinking water. However, the use of drinking water criteria for the purposes of COPC identification ensures that constituents will not be prematurely eliminated from further consideration in the FS-OSP.

Chapter 2 Figures

This page has been left blank intentionally to allow for double-sided printing.



PIONEER TECHNOLOGIES CORPORATION

Operable Units
Superlon Plastics Site, Tacoma, Washington

Figure 2-1

This page has been left blank intentionally to allow for double-sided printing.

Chapter 3. CONCEPTUAL SITE MODEL

3.1. Introduction

A CSM consists of a conceptual site fate and transport model (CSFTM) and a conceptual site exposure model (CSEM). Potentially complete exposure pathways consist of four necessary elements:

- A source and mechanism of chemical release;
- An environmental transport medium;
- A point of potential contact (i.e., an exposure medium), with a receptor; and,
- A feasible route of exposure at the exposure point.

The CSM for the Superlon Site identifies potential exposure pathways based on current and future industrial land use at the Property and is presented in Figure 3-1.

3.2. Land Use

The Property has been used for industrial purposes (e.g., processing or manufacturing of various materials) since 1925 (see Figure 3-2). Superlon Plastics has been manufacturing polyethylene pipe at the Property since 1972.

The Property and all of the surrounding properties are zoned for Port Maritime and Industrial use by the City of Tacoma (City of Tacoma 2014). The Superlon property will continue to be used for industrial purposes in the future. In 2011, a conceptual Future Land Use Plan (Plan) for the property was developed based on Superlon's business plans and objectives. The Plan identifies the intended future use of the property and the location of buildings and other site features (see Figure 1-3). The Plan indicates that the Property will be entirely covered with buildings, asphalt/concrete parking lots, and gravel, all of which will minimize the potential for exposure to soil and perched water.

The Property meets the industrial criteria specified in WAC 173-340-200 in that (1) the Property has been consistently used for traditional industrial manufacturing purposes and, (2) the Property is zoned industrial by the City of Tacoma. Therefore, industrial land use was used to develop current and future exposure scenarios and chemical-specific MTCA Method C CLs and RELs.

3.3. COPC Sources and Affected Media

Industrial operations and fill material are the sources of COPCs on the Tacoma Tide Flats. The source materials on the Property resulted from industrial operations (e.g. pesticide production) and historical filling activities. The on-Property source materials used as fill consist of waste water treatment sludge, shot material from the production of rock wool, white gypsum/lime material, and other general fill. The surficial layer of soil at the Property consists of the fill material. COPCs from the source materials have affected the following media on and off the Property:

- on-Property perched water and soil;
- on-Property groundwater;
- off-Property surface water; and,
- off-Property sediment, and potentially off-Property groundwater.

The on-Property soil and perched water are the potential exposure media presented in this FS.

3.4. Receptors

Industrial soil cleanup levels are based on an adult worker exposure scenario. For the Property, the adult worker is a current or future industrial worker (i.e., Superlon employee). In addition, a future utility worker exposure scenario was evaluated. The future utility worker scenario is a municipality, public, or private utility worker (e.g., Tacoma Fire Department, Tacoma Police Department, Tacoma Water Department, Tacoma Rail, or Puget Sound Energy) who may potentially contact Property soil during work-related activities.

3.5. Human Health Exposure Pathways

The complete exposure pathways that were included in the identification of COCs, CLs, and RELs are presented in the following sections.

3.5.1. Soil Exposure

Potential industrial worker and future utility worker exposures were evaluated during the CSM process for the Property. Superlon representatives were interviewed and indicated that routine business activities do not require industrial workers (i.e., Superlon workers) to dig or contact soil (PERC 2014). Also, the Plan indicates that the Property will be entirely covered with buildings, asphalt/concrete parking lots, and gravel therefore minimizing potential exposure.

Currently, no complete exposure pathway exists for an industrial worker. However, a future utility worker potentially could be exposed to soil during underground utility work (e.g., phone or gas line). Therefore, on-Property contact with soil is considered to be a potentially-complete exposure pathway for a future utility worker.

3.5.2. Perched Water Exposure

Prior to the start of the RI-OSS, on-Property perched water consisted of a zone of discontinuous perched water that intermittently daylighted in the footprint of Building A and former Building B. Placement of quarry spalls within the footprint of Building B following its demolition eliminated the potential for exposure to perched water. Perched water may be present at other limited areas of the Property, but parking lots, buildings, and quarry spalls prevent contact with it (see Figure 3-3). Moreover, perched water on the Property is non-potable [3].

The on-Property remedy consists of a planned cover and institutional controls that will limit potential future exposure to perched water. Therefore, there are no current or future complete perched water exposure pathways. On-Property perched water was used in a closed loop system for cooling during the manufacturing process. This system was eliminated as part of the Building B demolition; however, a similar system could be developed in the future and groundwater may be used as process cooling water. Therefore, contact with groundwater as process cooling water is a potentially-complete exposure pathway for future industrial workers.

3.5.3. Terrestrial and Aquatic Biota Exposure Pathways

Quarry spalls and a geotextile exposure barrier (see Figure 3-3) eliminate on-Property perched water exposure for aquatic biota. Consequently, the aquatic biota exposure pathways are incomplete. Terrestrial ecological exposure pathways are also incomplete, and the Property qualified for an exclusion from a terrestrial ecological evaluation under WAC 173-340-7491 (PERC 2013).

3.6. References for Chapter 3

City of Tacoma. 2014. http://wspdsmap.ci.tacoma.wa.us/samples/zoning.pdf

Ecology. 2008. Reichhold / SSA Containers Inc. Cleanup Action Plan. October 2008.

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

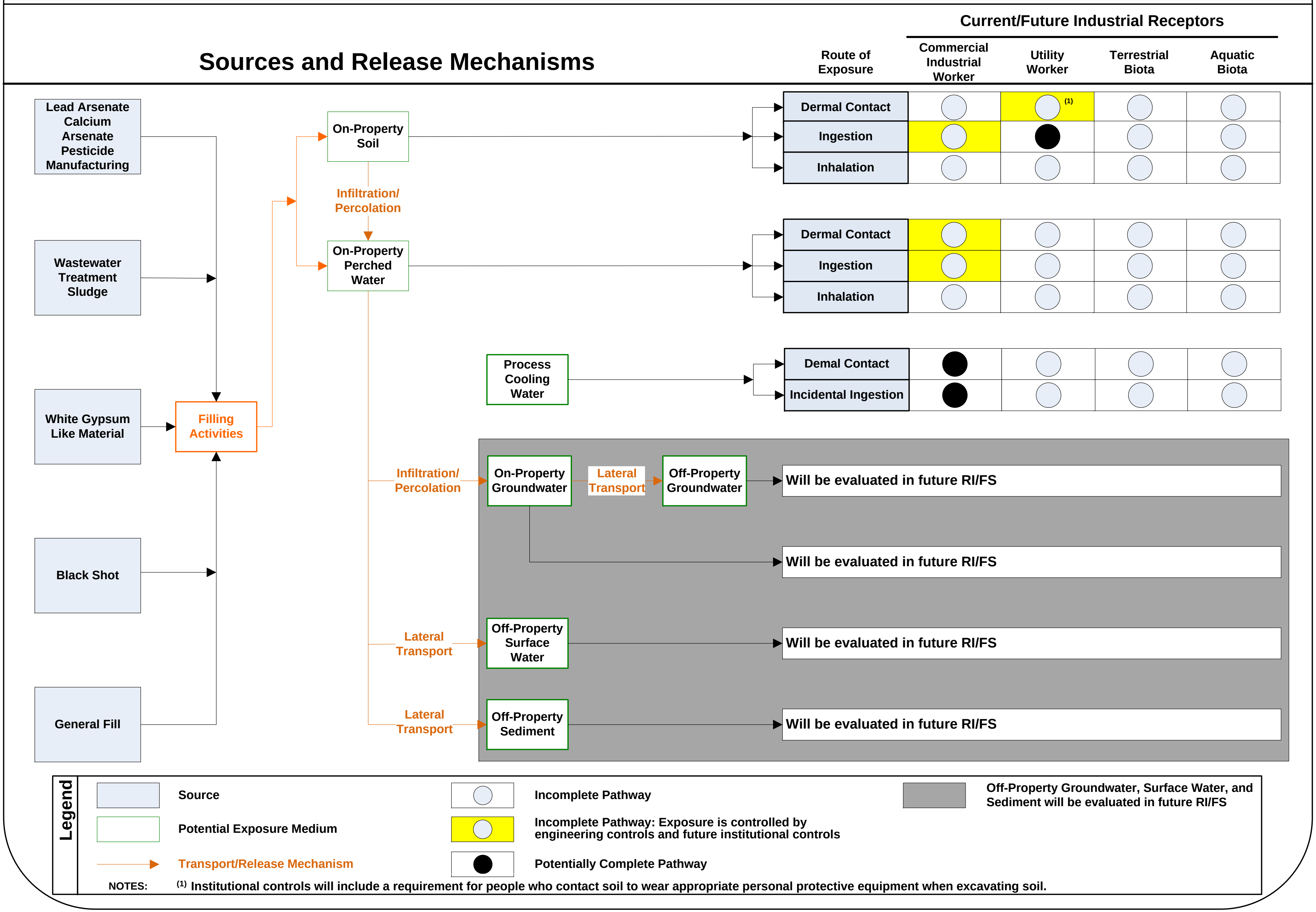
[3] Groundwater underlying the Property is non-potable under WAC 173-340-720(2). Ecology confirmed this assumption in the Cleanup Action Plan for the Reichold Chemical Site, an adjacent property by stating "The site is underlain by three aquifers and two confining layers or 'aquitards'…. and that "….these three aquifers are brackish and non-potable…." (Ecology, 2008). This also has been confirmed by groundwater sampling at the Property, which has demonstrated that it is brackish and therefore, non-potable (PERC 2013).

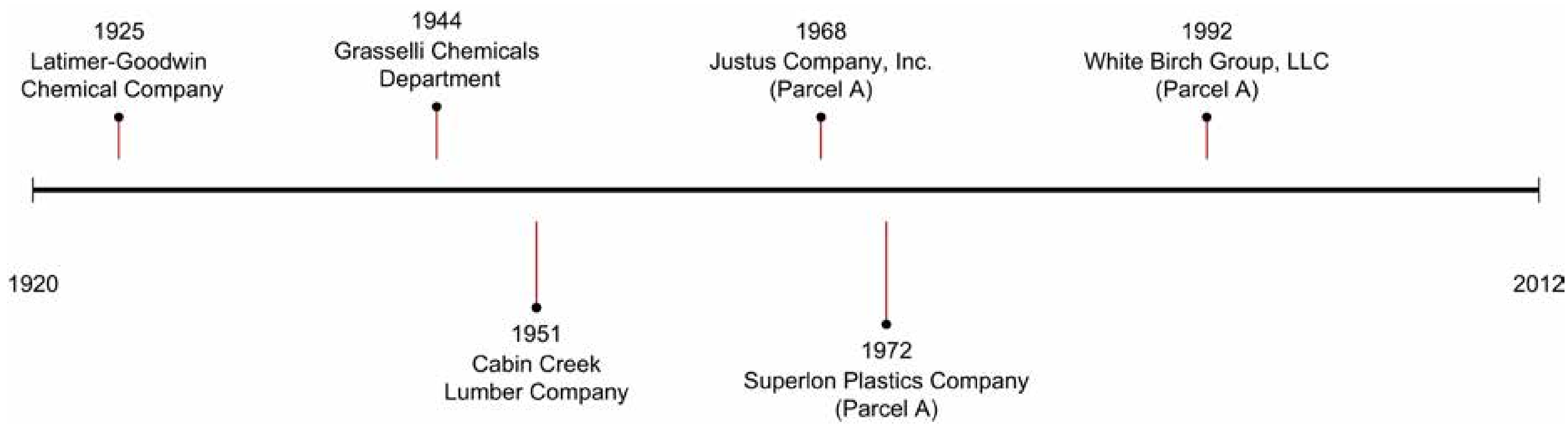
This page has been left blank intentionally to allow for double-sided printing.

Chapter 3 Figures

This page has been left blank intentionally to allow for double-sided printing.

Figure 3-1: Conceptual Site Model – Superlon Plastics Site, Tacoma, Washington

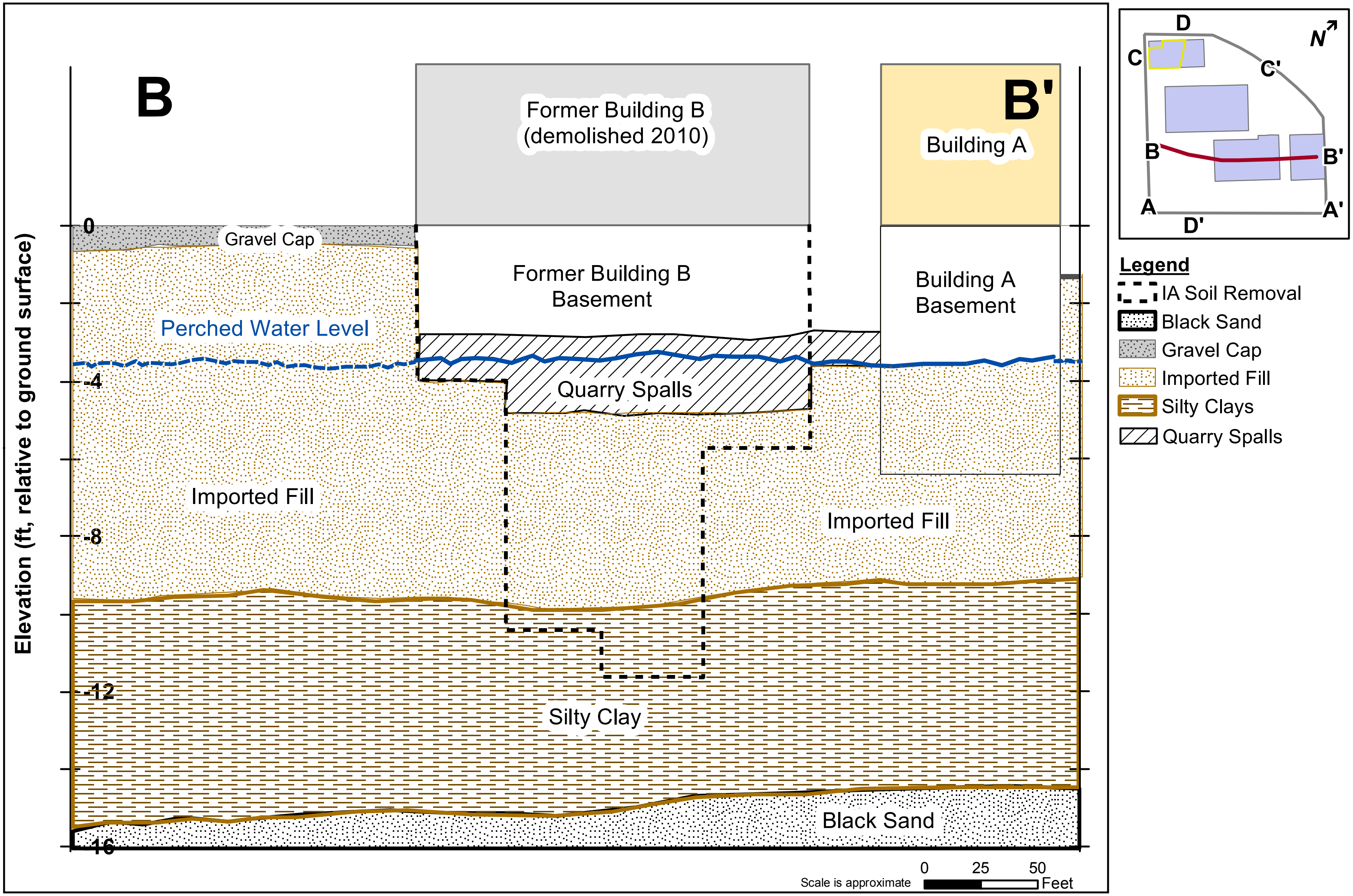




PIONEER TECHNOLOGIES CORPORATION

Site Ownership Timeline
Superlon Plastics Site, Tacoma, Washington

Figure 3-2



PIONEER TECHNOLOGIES CORPORATION

Cross-Section B-B'
Fill Soil Cross-Sections
Superlon Plastics Site, Tacoma, Washington

Figure 3-3

This page has been left blank intentionally to allow for double-sided printing.

Chapter 4. REMEDIAL ACTION OBJECTIVES AND ARARs

4.1. Introduction

The RAOs were identified in order to guide the development of remedial alternatives that will protect people and the environment from risks associated with COCs in on-Property soils and perched water. **The overarching RAO for the Property is to protect people and the environment from risks associated with COCs in on-Property soils and perched water.**

The CSM in Chapter 3 identified two potentially complete pathways for human exposure: contact with soils by future utility workers, and contact with groundwater (that has been impacted by perched water) by industrial workers during maintenance of a future process cooling water system. In light of these potential exposures, the following Property-specific objectives are also applicable:

- Soil
  - Achieve 10^{-5} residual cancer risk across entire Property
  - Protect on-Property perched water and groundwater
- Perched water
  - Prevent contact with affected on-Property perched water
  - Protect on-Property groundwater

These objectives will be met by:

- Achieving CLs and RELs that will be protective of human health and the environment;
- Complying with chemical-, location-, and action-specific applicable, relevant, and appropriate requirements (ARARs); and,
- Complying with Ecology policies.

MTCA (Chapter 173-340 WAC) requires that cleanup actions meet Cleanup Standards at least as stringent as those under the Superfund Amendments and Reauthorization Act of 1986 (SARA), and WAC 173-340-710 requires that all cleanup actions be in compliance with applicable state and federal laws. Section 121 (d) of the SARA requires cleanup actions at Superfund sites to attain the "applicable or relevant and appropriate" requirements of federal and state environmental laws and regulations. This FS-OSP used Property-specific exposure scenarios to develop RELs protective of human health and the environment (WAC 173-340-700 (3)(c)).

Section 4.2 discusses ARARs for the cleanup action(s) at the Property, as specified under MTCA and federal regulations. Section 4.3 presents chemical-specific requirements based on ARARs and risk-based CLs or RELs. Sections 4.4 and 4.5 discuss the location and action-specific ARARs for the Property cleanup action(s), respectively. Section 4.6 summarizes the various RAOs identified from the consideration of ARARs and CLs/RELs. These RAOs form the basis for remedial alternatives presented in subsequent sections of this FS-OSP report.

4.2. Potentially Applicable State and Federal Requirements

WAC 173-340-710 requires that cleanup actions conducted under MTCA comply with applicable state and federal laws. Applicable state and federal laws are defined in WAC 173-340-710(1) as those requirements that are legally applicable, and considered relevant and appropriate. "Legally applicable" and "relevant and appropriate" requirements are defined by WAC 173-340-710(3) and (4), respectively. These definitions are summarized below.

- **Legally applicable requirements** include those standards or other requirements, criteria, or limitations promulgated under Washington State law or federal law that specifically address a hazardous substance, cleanup action, location, or other circumstance at the site.
- **Relevant and appropriate requirements** include those cleanup standards, standards of control, and other environmental requirements, criteria, or limitations established under state or federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

Under MTCA, "applicable state and federal laws" are all legally applicable requirements and those requirements that Ecology determines are relevant and appropriate. Therefore the definition is similar to the federal Superfund concept of "applicable or relevant and appropriate requirements" or ARARs. The term ARARs is used throughout MTCA regulations, and is also used here.

The criteria used to make this determination are presented in WAC 173-340-710(4)(a)(i), which states:

"The following criteria shall be evaluated, where pertinent, to determine whether such requirements (ARARs) are relevant and appropriate for a particular hazardous substance, remedial action, or site:

- *Whether the purpose for which the statute or regulations under which the requirement was created is similar to the purpose of the cleanup action;*
- *Whether the media regulated or affected by the requirement is similar to the media contaminated or affected at the site;*
- *Whether the hazardous substance regulated by the requirement is similar to the hazardous substance found at the site;*
- *Whether the entities or interests affected or protected by the requirement are similar to the entities or interests affected by the site;*
- *Whether the actions or activities regulated by the requirement are similar to the cleanup action contemplated at the site;*
- *Whether any variance, waiver, or exemption to the requirements are available for the circumstances of the site;*
- *Whether the type of place regulated is similar to the site;*
- *Whether the type and size of structure or site regulated is similar to the type and size of structure or site affected by the release or contemplated by the cleanup action; and,*
- *Whether any consideration of use or potential use of affected resources in the requirement is similar to the use or potential use of the resources affected by the site or contemplated cleanup action."*

Remedial actions must comply with the substantive requirements of the ARARs, but are exempt from procedural requirements (e.g., obtaining permits and approvals) (WAC 173-340-710(9)). Specifically, this exemption applies to requirements under the Washington State Water Pollution Control Act, Solid Waste Management Act, Hazardous Waste Management Act, Clean Air Act, State Fisheries Code, and Shoreline Management Act. It also applies to local laws requiring permits or approvals.

4.3. Potential Cleanup Levels and Chemical-Specific ARARs

Chemical-specific ARARs include those requirements that regulate the acceptable amount or concentration of a constituent that may be found in or released to the environment.

The primary chemical-specific ARARs are:

- <u>The Model Toxics Control Act (Chapter 173-340 WAC):</u> MTCA establishes cleanup standards and regulations addressing implementation of cleanup actions.
- <u>Washington Pollution Control Act and the implementing regulations</u>: Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC).
- <u>Washington Hazardous Waste Management Act and the implementing regulations</u>: Dangerous Waste Regulations (Chapter 173-303 WAC) are applicable to the extent that any dangerous wastes are discovered or generated during the cleanup action.
- <u>Health and Safety:</u> Site cleanup-related construction activities need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926).

4.4. Potential Location-Specific Requirements

Location-specific ARARs are those requirements that restrict the concentration of hazardous substances or the performance of activities solely because they occur in specific locations. The location-specific ARARs that potentially apply to the Property are as follows:

- <u>Pierce County Development Regulations—Critical Areas (Title 18E):</u> This regulation protects critical areas by limiting any actions that are planned within 150 feet of a wetland or 35 feet of a stream, or near geologic hazard areas (steep slopes) or fish and wildlife habitat areas. Pierce County has mapped in an atlas, critical areas and wetlands in areas it has surveyed. This regulation establishes required buffer zones for actions adjacent to any of the above critical areas.
- <u>The Fish and Wildlife Coordination Act</u>: The Fish and Wildlife Coordination Act requires actions that will result in the control or structural modification of any natural body of water for any purpose, to protect the fish and wildlife resources that may be affected by the action. The United States Fish and Wildlife Service (USFWS) and appropriate state agencies must be consulted to ascertain the means and measures necessary to mitigate, prevent, and compensate for project-related losses and to enhance resources.
- <u>Endangered Species Act (16 USC 1531 et seq.; 50 CFR Parts 17, 225, and 402):</u> This act protects fish, wildlife, and plants species whose existence is threatened or endangered (T/E). The Coho salmon and the bald

eagle are candidate T/E species in the Puget Sound ecologically significant unit. The requirements of this regulatory program apply to cleanup actions that may affect a listed T/E species or designated critical habitat. Applicability will be determined via discussions with the USFWS and the National Marine Fisheries Service (NMFS), as appropriate. A biological assessment could be required by the agencies to evaluate whether the remedial action is likely to affect endangered species.

- Native American Graves Protection and Repatriation Act (25 USC 3001 Through 3013; 43 CFR Part 10) and Washington's Indian Graves and Records Law (Chapter 27.44 RCW): These statutes prohibit the destruction or removal of Native American cultural items (human remains and associated funerary objects, graves, cairns, pictographs, glyphics, or other painted records) and require written notification of their inadvertent discovery to the appropriate agencies and Native American tribe.
- Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR Part 7): This program sets forth requirements that are triggered when archaeological resources are discovered. It requires that excavation of these resources be conducted under a permit by professional archaeologists. These requirements apply only if archaeological items are discovered during implementation of the selected remedy.
- National Historic Preservation Act (NHPA) (16 USC 470 et seq.; 36 CFR Parts 60, 63, and 800): This regulatory program sets forth a national policy of historic preservation and provides a process that must be followed to ensure that impacts of actions on archaeological, historic, and other cultural resources are considered. NHPA requirements apply to federal sites but should be considered when evaluating location specific ARARs at the Property.

4.5. Potential Action-Specific Requirements

Action-specific ARARs are requirements that define acceptable management practices and are usually specific to certain kinds of activities that occur or technologies that are used during the implementation of cleanup actions.

- Washington Dangerous Waste Regulations (Chapter 173-303 WAC): These requirements potentially apply to the identification, generation, accumulation, and transport of hazardous/dangerous (hazardous) wastes at the Property. Under Ecology's AOC policy, if affected soil is managed within an AOC, it is not considered to be “generated” as a hazardous waste, even if constituent concentrations exceed regulatory levels. Ecology has designated the Property as an AOC and as a site-undergoing cleanup under a MTCA Consent Decree (Ecology 2011). Hazardous waste requirements would therefore not apply unless the wastes resulting from the Property cleanup action were moved outside the boundary of the AOC.
- Federal land disposal restrictions (LDRs) under 40 CFR Part 268: These restrictions require that hazardous wastes be treated prior to being disposed of in a land-based disposal unit. USEPA has developed special LDRs for contaminated soil and debris. The treatment standards for these substances are expressed as numerical limits and treatment methods, respectively. These standards would generally not apply to contaminated media disposed of within an AOC; however, they could be relevant and appropriate.
- Solid Waste Management Act (Chapter 70.95 RCW; Chapter 173-304 and 173-351 WAC): Potential Property cleanup actions include on-Property treatment and consolidation of solid wastes. MTCA specifically includes the solid waste landfill closure requirements as a potential ARAR. If wastes or contaminated soil

are to be disposed of on-site, the design requirements of the solid waste landfill regulations may be relevant and appropriate. These design standards include slope, cover, and other structural requirements.

- Water Quality Standards for Surface Waters of the State of Washington (Chapters 90.48 and 90.54 RCW; Chapter 173-201A WAC): This regulation is an action-specific ARAR because the remedial actions at the Property (e.g., soil movement and disposal) must not result in any exceedance of surface water quality standards (unless a short-term modification of water quality has been approved by Ecology ahead of the activity; see WAC 173-201A-110). Surface water quality standards such as turbidity, temperature, and metal limits could apply to the remedial actions. Ecology has designated Puget Sound as a Class A (excellent) water body. This regulation also governs the discharge of wastewater to surface water and groundwater, including discharges from municipal sewer systems to surface water or groundwater. Finally, it provides for use of best management practices for storm water management on construction sites. Specifically, Chapter 173-216 WAC requires that all known, available, and reasonable treatment (AKART) be used to remove contaminants from wastewater prior to discharge to meet state surface water and groundwater quality standards.

- Federal, State, and Local Air Quality Protection Programs: Regulations promulgated under the federal Clean Air Act (42 USC 7401) and the Washington State Clean Air Act (Chapter 70.94 RCW) governs the release of airborne contaminants from point and non-point sources. Local air pollution control authorities such as the Puget Sound Clean Air Agency (PSCAA) have also set forth regulations for implementing these air quality requirements. Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants, requires that point-source emissions for major sources of regulated air toxics be treated using best available control technologies for toxics (T-BACT) prior to discharge, and that emissions do not cause ambient air concentrations of these chemical constituents to exceed established ambient source impact levels (ASILs). Chapter 173-460 WAC establishes ASILs for several of the chemical constituents at the Property, including arsenic. Similar requirements and ambient concentration limits have been adopted by PSCAA under Regulation III, and it is these local requirements, which are at least as stringent as the state and federal requirements, that apply to the Property.

- Department of Transportation (DOT) Hazardous Materials Regulations (40 CFR Parts 171 Through 180): The US DOT has promulgated regulations that govern the transportation of hazardous materials, including packaging, labeling, placarding, and communications and emergency response requirements. The U.S. DOT and state regulations will apply to any hazardous materials transported off-Property as part of the remediation.

- Washington State Water Well Construction Act (Chapter 18.104 RCW; Chapter 173-160 WAC): This regulation governs the minimum standards for construction, maintenance, and abandonment of wells, including both water supply wells and resource protection wells (e.g., monitoring wells). These regulations will apply to any Property monitoring wells that are closed (abandoned) as part of the remedial action or new wells installed.

- City of Tacoma Regulations and Standards: The City of Tacoma has established regulations and standards which governs the minimum standards for construction, grading and setbacks from sensitive areas and wetlands. These substantive requirements of these regulations and standards, as they relate to the cleanup process, will be met and addressed as part of the remedial design process.

4.6. Screening of ARARs

A screening of ARARs was conducted to assess their applicability to the Property. Only those that were determined to be applicable were retained as RAOs. The following list identifies the ARARs that are potentially applicable to the Property.

4.6.1. Potential Cleanup Levels and Chemical-Specific ARARs

- The Model Toxics Control Act (Chapter 173-340 WAC).
- Dangerous Waste Regulations (Chapter 173-303 WAC).
- Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926).

4.6.2. Potential Location-Specific Requirements

- Pierce County Development Regulations—Critical Areas (Title 18E).
- Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR Part 7).
- Potential Action-Specific Requirements.

4.6.3. Washington Dangerous Waste Regulations

- Solid Waste Management Act (Chapter 70.95 RCW; Chapter 173-304 and 173-351 WAC).
- Water Quality Standards for Surface Waters of the State of Washington (Chapters 90.48 and 90.54 RCW; Chapter 173-201A WAC).
- Federal, State, and Local Air Quality Protection Programs.
- Department of Transportation Hazardous Materials Regulations (40 CFR Parts 171 Through 180).
- Washington State Water Well Construction Act (Chapter 18.104 RCW; Chapter 173-160 WAC).
- City of Tacoma Regulations and Standards.

4.7. Department of Ecology Policies

Washington State has an anti-degradation policy for groundwater (WAC 173-200-020). This policy provides that existing and future beneficial uses shall be maintained and protected, and degradation of groundwater quality that would interfere with or become injurious to beneficial uses, shall not be allowed.

4.8. References for Chapter 4

Ecology. 2011. Letter from Marv Coleman to Tim Bingman Regarding Area of Contamination Designation for the Superlon Property, March 7.

Chapter 5. DEVELOPMENT OF ON-PROPERTY PERCHED WATER AND SOIL CLEANUP LEVELS AND REMEDIATION LEVELS

5.1. Introduction

The RI was completed for on-Property surface water and soil in 2013 (PERC 2013). Perched water (perched water was called surface water in the RI-OSS) and soil constituent concentrations were compared to conservative (i.e., health protective) screening criteria and COPCs were determined. The RI screening criteria were reviewed for this evaluation and no new toxicity criteria were identified. Therefore, the RI COPCs were used with site-specific information to identify COCs, CLs, and RELs.

The COCs, CLs, and RELs presented apply only to on-Property perched water and soil. Three buildings associated with the facility are located on-Property (see Figure 1-2). Properties located outside of the Property boundary are considered to be off-Property. All of the COCs, CLs and RELs were determined in accordance with the MTCA regulations in WAC-173-340-357, -708, -720, -730, -740, -745, and -747. The remainder of this section summarizes the process used to identify the on-Property perched water and soil COCs, CLs, and RELs.

5.2. Overview

The information and processes that were used to identify COCs, CLs, and RELs include the following:

- **Chapter 3 – Conceptual Site Model**. This chapter introduces the Property and presents the CSM. The CSM identifies the current/future land use, sources of constituents, fate and transport pathways, potentially exposed populations, and exposure pathways.
- **Section 5.3 – Groundwater CLs.** This section presents the non-potable groundwater CLs. The non-potable groundwater CLs were identified in order to establish on-Property perched water and soil-to-perched water RELs, due to the potential of perched water to impact the underlying groundwater.
- **Section 5.4 – Perched Water COCs and RELs.** This section compares the perched water RELs to the perched water constituent concentrations to determine perched water COCs.
- **Section 5.5 – Soil-to-Perched Water COCs and RELs.** This section compares the perched water RELs to the shallow aquifer groundwater concentrations to determine soil-to-groundwater COCs. Soil leaching tests were performed for the soil-to-groundwater COCs to determine the amount of COCs that may leach from soil to perched water and subsequently migrate to groundwater. The concentrations of COCs in soil that corresponded to leachate concentrations at or below the perched water REL were then selected as the soil-to-perched water RELs.
- **Section 5.6 – Soil Direct Contact CLs and RELs.** This section identifies the soil direct contact COCs and the process that was used to determine the direct contact CLs and RELs. The reasonable maximum exposure scenario was determined to be a future utility worker who could be exposed to soil. Operations managers for organizations who may perform utility work at properties in the Tacoma Tide Flats were surveyed to determine the frequency and duration of work visits by utility workers to Tide Flats properties. This utility worker activity information was then used to determine the soil direct contact RELs.

5.3. Groundwater CLs

As noted in Chapter 3, all current and future on-Property perched water exposure pathways are incomplete (see Figure 3-1). However, due to the potential for the perched water to impact the underlying groundwater, non-potable groundwater CLs were first identified to determine on-Property perched water and soil-to-perched water RELs. According to MTCA WAC 173-340-720 (6)(c)(II), non-potable groundwater CLs can be developed for industrial properties by performing a site-specific risk assessment. Consistent with MTCA, a site-specific risk assessment was performed to identify the reasonable maximum exposure scenario for groundwater contact and to calculate non-potable groundwater CLs (and, by extension) perched water RELs.

5.3.1. Reasonable Maximum Exposure Scenario

Historically, Superlon used on-Property perched water in a closed-loop process water cooling system as part of the pipe manufacturing process. The cooling system was eliminated during the Building B demolition. However, a similar process water cooling system could be developed in the future with groundwater used as the process cooling water, and contact with this water by an industrial worker would be a potentially-complete exposure pathway. Since on-Property perched water appears to be a route of constituent migration to groundwater, non-potable groundwater CLs based on this exposure would also be applicable to perched water.

To determine non-potable groundwater CLs, the site-specific reasonable maximum exposure scenario for groundwater was evaluated. Consistent with MTCA (WAC 173-340-708(3)), groundwater CLs were determined by the reasonable maximum exposure expected to occur under current and future land use. Superlon representatives estimated that an industrial worker (i.e., Superlon worker) could spend two hours each week maintaining a process cooling system (PERC 2014). Based on this information, a non-potable groundwater exposure scenario assumed that Superlon workers could use groundwater for cooling water and could contact the water for two hours each week.

5.3.2. Site-Specific CLs for COCs Other Than Lead

Non-potable groundwater CLs for COCs (excluding lead) were calculated based on the site-specific exposure scenario, and MTCA and USEPA default exposure factors (see Table 5-1). The site-specific exposure scenario assumes that groundwater is used for future industrial purposes and that an industrial worker could incidentally ingest or contact process water on their head, arms, and hands. The USEPA toxicity and dermal exposure values used are presented in Table 5-2. Non-potable groundwater CLs were calculated by applying the exposure and toxicity information in Tables 5-1 and 5-3 and rearranging the equations in Table 5-1 to be consistent with the MTCA approach for determining CLs. Groundwater CLs were developed for both cancer and noncancer effects for each COC. The lower value was selected as the CL for each COC. The resulting non-potable groundwater CLs are presented in Table 5-3.

5.3.3. Site-Specific Lead CL

A noncancer reference dose (RfD) for lead is typically derived from a concentration below which adverse health effects are not expected (USEPA 2003). Blood-lead (PbB) concentration is regulated and can be associated with exposure. The USEPA and the Centers for Disease Control and Prevention (CDC) have determined that childhood PbB concentrations at or above 10 micrograms per deciliter (ug/dL) of blood present risk to child health. Therefore, the USEPA has established a contaminated site risk management goal of having no more than five percent chance of a child exceeding with PbB level of 10 ug/dL (USEPA 2003). To address potential risk to adults, the USEPA developed the Adult Lead Model (ALM), which estimates the fetal PbB concentration in women exposed to lead-contaminated soil.

The ALM does not consider adult ingestion of water. However, the California Department of Toxic Substances Control (DTSC) Lead Risk Assessment Spreadsheet (Leadspread) does evaluate this exposure pathway, and was used to determine the PbB level for the site-specific non-potable process water exposure scenario. The default Leadspread parameter values were used, with the exception of the skin area occupational parameter and the non-potable water ingestion rate, which were modified to be consistent with the site-specific exposure scenario. These values are presented in Table 5-1 and Figure 5-1. The Leadspread model assumes steady state exposure conditions; therefore, the exposure frequency was not decreased to the site-specific value of one day per week. In addition, the model assumes that the occupational worker was concurrently exposed to 1,000 milligrams per kilogram (mg/kg) of lead in soil, which is the MTCA Method C default value.

The Leadspread occupational PbB value is the predicted concentration for an adult who incidentally ingests and dermally contacts non-potable process cooling water. The occupational model does not account for exposure to a fetus in a pregnant adult. Therefore, the output of the Leadspread model (i.e., the 99th percentile estimate of the blood lead concentration) of 4.2 ug/dL (see Figure 5-1) was used as the input value for PbB level of an adult worker in the DTSC ALM, as shown in Figure 5-2.

5.3.4. Summary of Non-Potable Groundwater CLs

Non-potable groundwater CLs were identified to determine on-Property perched water RELs, because of the potential for the perched water to impact the underlying groundwater. The on-Property groundwater CLs are presented in Table 5-3.

5.4. Perched Water COCs and RELs

The purpose of this section is to identify perched water COCs. On-Property perched water is located beneath Building A and beneath quarry spalls in the former Building B at a depth that is generally about four feet bgs (see Figure 3-3).[4] Building A, quarry spalls in the former Building B footprint, parking lots, and other buildings prevent contact with the perched water. Buildings, paved areas, and graveled areas on the Property also limit

[4] Perched water has been visible above the quarry spalls occasionally in the winter.

the potential for exposure to perched water. No utilities are located in the footprints of Building A or former Building B. In the northwest portion of the Property, phone, gas, electric, cable, and water are located in the top three feet of soil and storm water and sewer lines are likely located between five and eight feet bgs (see Figure 3-3).

5.4.1. Perched Water COPCs

Non-potable water criteria were not available at the time of the RI to identify COPCs. Consequently, in order to not prematurely exclude constituents from consideration, perched water constituent concentrations were compared to drinking water criteria to identify COPCs at that time (see Table 2-1). Arsenic, cadmium, cis-1,2-dichloroethylene, lead, mercury, pentachlorophenol, TPH-HO, and trichlorethylene were identified as perched water COPCs in the RI based on drinking water criteria.

5.4.2. On-Property Perched Water COCs

Since the only potential route of exposure to perched water constituents would be indirectly through perched water-to-groundwater impacts, perched water COCs were determined by comparing the perched water concentrations to the non-potable groundwater CLs (see Table 5-4). Arsenic, cadmium, and lead were the only COPCs with perched water concentrations that exceeded the non-potable groundwater CLs, and hence were identified as on-Property perched water COCs.

5.4.3. Perched Water RELs

Non-potable groundwater CLs were identified as the perched water RELs[5] because of the potential for the perched water to impact the underlying groundwater. The perched water RELs are presented in Table 5-4.

5.5. Soil-to-Perched Water COPCs, COCs, and RELS

The purpose of this section is to identify soil-to-perched water COPCs, COCs, and RELs. Soil-to-perched water COPCs were identified in the RI–OSS. Constituents in soil may be transported to on-Property perched water through infiltration/percolation of water and subsequently to groundwater. To identify soil-to-perched water COCs, perched water RELs were compared to the shallow groundwater aquifer concentrations (see Table 5-5). Soil leaching tests were performed for the soil-to-perched water COCs to determine the amount of COCs that may leach from soil-to-perched water. The COC concentrations in leachate were then used to determine soil-to-perched water RELs.

[5] The perched water criteria are called MTCA RELs because they are based, in part, on the presence of an exposure barrier and future institutional controls to exclude perched water use and these cleanup action components will be required as part of a cleanup action at the Property.

5.5.1. Soil-to-Perched Water COPCs

On-Property groundwater is non-potable; however, non-potable water criteria were not available at the time of the RI–OSS to identify COPCs. In order to not prematurely exclude constituents from consideration, shallow groundwater aquifer constituent concentrations were compared to MTCA Method A drinking water criteria (WAC 173-340-720), even though these criteria are not representative of actual exposure conditions to this media. Arsenic, cadmium, lead, pentachlorophenol, and vinyl chloride were identified as soil-to-groundwater COPCs based on drinking water criteria in the RI–OSS.

5.5.2. Soil-to-Perched Water COCs

The groundwater COPC concentrations were compared to the non-potable groundwater CLs (see Table 5-3) to identify soil-to-perched water COCs. Soil-to-perched water COCs were identified and used to determine the soil-to-perched water RELs for the three OUs on the Property where the soils have demonstrated the potential to leach COCs to groundwater (i.e. OUs 1,2, and 3). Arsenic and lead were the only COPCs with concentrations that exceeded the perched water RELs, and hence were identified as soil-to-perched water COCs. Soil-to-perched water COCs were then evaluated to identify soil-to-perched water RELs.

5.5.3. Soil-to-Perched Water RELs

Soil samples were analyzed using the synthetic precipitation leaching procedure (SPLP) to estimate the soil concentration that would produce leachate that could impact groundwater above the non-potable groundwater CLs (WAC 173-340-747(7)(b)(i)). In instances where the soil pH is less than six, the Toxic Characteristic Leaching Procedure (TCLP) was used rather than the SPLP (WAC 173-340-747(7)(b)(ii)). Due to the variability in pH at the Property, soil samples collected from on-Property OUs were analyzed for arsenic and lead using both the SPLP and TCLP (see Figure 5-3). The results from the leaching tests are presented in the Table 5-6.

The arsenic and lead SPLP and TCLP results were compared to the perched water RELs to determine a corresponding soil concentration that would be protective of groundwater for each OU. The total soil concentration was compared to the SPLP or TCLP result and a leachate concentration equivalent to the perched water REL was calculated (see the following equation).

$$Soil\text{-}\ to\text{-}Perched\ Water\ \mathrm{REL}\ \left(\frac{\mathrm{mg}}{\mathrm{kg}}\right) = \frac{\left(\dfrac{Perched\ Water\ REL\ \frac{mg}{l}}{Dilution\ Factor}\right)}{SPLP\ or\ TCLP\ Result\ \frac{mg}{l}} \times Total\ Soil\ Concentration\ \frac{mg}{kg}$$

An assumed dilution factor of one between leachate and groundwater is recommended when using the three-phase groundwater model to predict leaching from soil when conditions are saturated (WAC 173-340-747(4)(e)). In reality, when infiltrating precipitation that contains leached COCs recharges perched water, leached COC precipitation mixes with perched water and reduces the leachate COC concentration available for transport to groundwater. Since dilution is not incorporated into the calculation of the soil-to-perched water REL, this conservative default assumption results in an over-prediction of the COC concentrations in groundwater.

For the two soil-to-perched water COCs, the lowest soil concentration that is predicted to result in a leachate concentration that is equal to the perched water REL was identified as the soil-to-perched water REL for each OU (see bold values in Table 5-6).

Constituents in soil may be transported to on-Property perched water through infiltration/percolation of water and subsequently to groundwater. The soil-to-perched water RELs are presented in Table 5-7.

5.6. Soil Direct Contact COPCs, COCs, CLs and RELs

The purpose of this section is to identify soil COPCs, COCs, and RELs associated with worker exposure to soil, i.e., direct contact with soil. Direct contact CLs were identified to determine direct contact COCs. In addition, to determine a direct contact soil REL for arsenic, a site-specific evaluation was conducted.

5.6.1. Soil Direct Contact COPCs

Arsenic, lead, TPH-D, TPH-G, and TPH-HO were identified as soil COPCs in the RI. The COPCs were identified by comparing the soil concentrations to the default industrial risk-based screening criteria (MTCA Method C).

5.6.2. Soil Direct Contact COCs

Maximum soil COPC concentrations were compared to MTCA Method C direct contact CLs to identify soil direct contact COCs (See Table 5-8). The criteria used to determine the MTCA Industrial Method C direct contact CLs are consistent with the values presented in the MTCA Cleanup Levels and Risk Calculation (CLARC) table (Ecology 2014) and are presented in Table 5-9.

Arsenic and lead were the only COPCs with concentrations greater than the default MTCA Method C soil direct contact CLs, and hence were identified as soil direct contact COCs.

5.6.3. Site-Specific Soil Direct Contact REL

In the MTCA regulation, Ecology acknowledges that site-specific RELs are necessary and useful in the site cleanup remedy selection process. The ability to consider site-specific conditions when evaluating site risks, and developing site-specific remedial alternatives and protective solutions has been proven successful. Site-specific risk assessments have incorporated site-specific RELs into many approved cleanup action plans for sites in Washington State.

Consistent with MTCA (WAC 173-340-708(3)), a site-specific reasonable maximum exposure scenario expected to occur under both current and potential future site use conditions was used to determine the REL for arsenic. The exposure scenario considered future soil contact on the Property by a utility worker when performing underground utility work. An REL was not specifically calculated for lead, since arsenic and lead are typically co-located, and remediation of arsenic soils will address lead to below the lead CL of 1,000 mg/kg.

5.6.4. Utility Worker Activity Survey

Organizations that may perform utility work at properties in the Tacoma Tide Flats were surveyed to determine the frequency and duration of work visits by utility workers to Tide Flats properties. The Tide Flat properties include approximately 563 properties (i.e. tax parcels) and are presented on Figure 5-4. The utility worker exposure scenario determination is presented in Appendix B - Estimated Exposure Frequency of Utility Workers to Soils in the Tacoma Tide Flats Area.

5.6.5. Utility Worker REL

The arsenic REL for a utility worker was based on future land use, the proposed engineered cover, institutional controls requiring future workers to wear the appropriate personal protective equipment, and the Tide Flats utility worker survey results. Soil direct contact RELs were determined using MTCA and USEPA criteria. The values and equations used to determine the direct contact REL are presented in Table 5-9. Noncancer and cancer RELs were determined using default MTCA assumptions and a site-specific exposure frequency, which was conservatively assumed to be 10 days per year. In addition, it was conservatively assumed that this exposure at a property would run continuously for two work weeks. This assumption results in a lower noncancer REL than if it had been assumed that the worker was at the Property discontinuously for 10 days each year. The lower of the noncancer and cancer RELs for arsenic, i.e., 588 mg/kg was identified as the soil direct contact REL for use in this FS.

MTCA 173-340-745(1) and (2) equations include the AB1 parameter which reflects the relative soil bioavailability of a constituent. This parameter is used to make adjustments to exposure estimates when the medium of exposure in the exposure assessment differs from the medium associated with the toxicity value. The current default assumption for arsenic in soil is that the bioavailability of arsenic in soil is the same as the bioavailability of arsenic in water (relative bioavailability [RBA] soil/water = 100%). Although bioavailability studies conducted in animal models show that bioavailability of arsenic in soil is typically less than 100%, a conservative 100% RBA soil/water was used in deriving the arsenic soil direct contact REL.

5.7. Points of Compliance

In accordance with WAC 173-340-700(3), it is necessary to specify the location where CLs and RELs must be met, that is, their points of compliance. The on-Property points of compliance for soil and perched water are presented below.

5.7.1. On-Property Soils

For any given OU, the soil point of compliance applies everywhere within the OU outside footprints of buildings that will remain after the cleanup action. The soil point of compliance depth will be from ground surface to 15 feet bgs in accordance with WAC 173-340-740(6)(d). Compliance with RELs will be evaluated using statistical tools in accordance with WAC 173-340-740(7)(d)–(f).

5.7.2. On-Property Perched Water

Perched water consists of discontinuous perched water in the fill zone that periodically daylights as perched water. The perched water point of compliance is the saturated zone located underneath Building A and the former Building B footprint within the fill unit (which extends from ground surface to approximately 15 feet bgs) since this is the primary area where perched water is present. Compliance with RELs will be evaluated using statistical tools in accordance with WAC 173-340-740(7)(d)–(f).

5.8. References for Chapter 5

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

PERC. 2014. Soil Excavation and Disposal Report – Building D Subsoil for the Superlon Plastics Site, Tacoma, Washington. January 2014.

USEPA. 2003. Assessing Intermittent or Variable Exposures at Lead Sites. November 2003.

Chapter 5 Tables

This page has been left blank intentionally to allow for double-sided printing.

Table 5-1: Non-Potable Groundwater Exposure Parameters

Information	Parameter	Parameter Definition	Units	Potable Water	Rationale	Reference
General Parameter		Receptor	--	Adult		WAC 173-340-745
	C_{gw}	Concentration in Groundwater	mg/L	Location-specific	Chemical-specific value	Chemical-specific value
	EF	Exposure Frequency	days/year	50	One day per week for 50 weeks per year	The USEPA standard default amount of time that an individual is assumed to be present at the work place is is 50 weeks per year. U.S. EPA 1991a. Human health evaluation manual, supplemental guidance: "Standard default exposure factors". OSWER Directive 9285.6-03.
	ED	Exposure Duration	years	20	MTCA default for an industrial scenario	WAC 173-340-745
	ET	Exposure time	hours/day	2	Site-Specific survey	PERC 2014
	BW	Body Weight	kg	70	MTCA default for an industrial scenario	WAC 173-340-745
	AT_c	Averaging Time-Cancer	days	27,375	MTCA default for an industrial scenario	WAC 173-340-745
	AT_n	Averaging Time-Non-Cancer	days	7,300	MTCA default for an industrial scenario	WAC 173-340-745
	CF	Converstion Factor	l/ml	0.0010	Conversion factor	Conversion Factor
	HQ	Hazard Quotient	unitless	1	MTCA default for an industrial scenario	WAC 173-340-745
	RISK	Cancer risk (1 in 100,000)	days	1.0E-05	MTCA default for an industrial scenario	WAC 173-340-745
Ingestion	IR	Incidental Water Ingestion Rate	mL/hour	3.7	USEPA Exposure Factors Handbook (Table 3-93) value for walking/wading/splashing in water.	USEPA. 2011. Exposure Factors Handbook. Table 3-93. http://www.epa.gov/ncea/efh/pdfs/efh-complete.pdf
Dermal Contact	DA_Event	Dermally absorbed dose per event	mg/cm^2-event	Chemical-specific	Chemical specific value for organics	Calculated using site-specific input for exposure time and USEPA spreadsheets http://www.epa.gov/swerrims/riskassessment/ragse/pdf/org04_01.xls and http://www.epa.gov/swerrims/riskassessment/ragse/pdf/inorg04_01.xls
	EV	Events per day	events/day	1	Site-Specific survey	PERC 2014
	SA	Skin Surface Area	cm^2	5,885	Average skin surface area for an adult male and female head, arms, and hands	USEPA. 2011. Exposure Factors Handbook. Table 7-2. http://www.epa.gov/ncea/efh/pdfs/efh-complete.pdf

Toxicity	RfD_o	Oral RfD	mg/kg-day	Chemical-specific	Chemical-specific value for inorganics	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
	RfD_d	Dermal RfD	mg/kg-day	Chemical-specific	Chemical-specific value for inorganics	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
	SF_o	Oral Cancer Slope Factor	$(mg/kg\text{-}day)^{-1}$	Chemical-specific	Chemical-specific value for inorganics	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
	SF_d	Dermal Cancer Slope Factor	$(mg/kg\text{-}day)^{-1}$	Chemical-specific	Chemical-specific value for inorganics	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
	GIABS	Gastrointestinal Absorption Value (used to adjust oral toxicity value to dermal)	%	Chemical-specific	Chemical-specific value for inorganics	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls

Notes:

The incidental water ingestion equation was obtained from USEPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Part A, EPA/540/1-89/002. December 1989 and rearranged to be consistent with MTCA. Dermal equation was obtained from USEPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005. OSWER 9285.7-02EP. July 2004 and rearranged to be consistent with MTCA.

Noncancer

Incidental Ingestion of Groundwater Concentration $[C_{gw}]$ (mg/L) = $\frac{HQ \times BW \times AT_n \times RfD_o}{IR \times EF \times ET \times ED \times CF}$

Dermal Contact with Groundwater Concentration $[C_{gw}]$ (mg/L) = $\frac{HQ \times BW \times AT_n \times RfD_d}{DA_{event} \times EV \times EF \times ED \times SA}$

Cleanup Level $[C_{gw}]$ (mg/L) = $\frac{1}{\frac{1}{\frac{HQ \times BW \times AT_n \times RfD_o}{IR \times EF \times ET \times ED \times CF}} + \frac{1}{\frac{HQ \times BW \times AT_n \times RfD_d}{DA_{event} \times EV \times EF \times ED \times SA}}}$

Cancer

Incidental Ingestion of Groundwater Concentration $[C_{gw}]$ (mg/L) = $\frac{RISK \times BW \times AT_c}{IR \times EF \times ET \times ED \times CF \times SF_o}$

Dermal Contact with Groundwater Concentration $[C_{gw}]$ (mg/L) = $\frac{RISK \times BW \times AT_c}{DA_{event} \times EV \times EF \times ED \times SA \times SF_d}$

Cleanup Level $[C_{gw}]$ (mg/L) = $\frac{1}{\frac{1}{\frac{RISK \times BW \times AT_c}{IR \times EF \times ET \times ED \times CF \times SF_o}} + \frac{1}{\frac{RISK \times BW \times AT_c}{DA_{event} \times EV \times EF \times ED \times SA \times SF_d}}}$

RfDd= $RfD_o \times GIABS\ (see\ Table\ 5-2)$

SF_d= $\frac{SF_o}{GIABS}$ (see Table 5-2)

Table 5-2: Toxicity Values and Physical Constants

Parameter	Parameter Definition	Units	Arsenic	Cadmium	cis-1,2-Dichloroethylene	Lead	Mercury	Pentachlorophenol	Trichloroethylene	Vinyl Chloride	Source
RfD_o	Oral RfD	mg/kg-day	0.00030	0.00050	0.0020	NA	0.00030	0.0050	0.00050	0.0030	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
RfD_d	Dermal RfD	mg/kg-day	0.00030	0.000025	0.0020	NA	0.000021	0.0050	0.00050	0.0030	Based on oral value and adusted for GIABS: (RfD_o x GIABS)
SF_o	Oral Cancer Slope Factor	$(mg/kg\text{-}day)^{-1}$	1.5	0.0	0.0	NA	0.0	0.40	0.046	0.72	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
SF_d	Dermal Cancer Slope Factor	$(mg/kg\text{-}day)^{-1}$	1.5	0.0	0.0	NA	0.0	0.40	0.046	0.72	Based on oral value and adusted for GIABS: (SF_o/GIABS)
GIABS	Gastrointestinal Absorption Value (used to adjust oral toxicity value to dermal)	%	1.0	0.050	1.0	NA	0.070	1.0	1.0	1.0	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
K_p	Permeability Coefficient	cm/hr	0.0010	0.0010	0.0077	NA	0.0010	0.39	0.012	0.0056	May 2014 USEPA RSL Table http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/docs/composite_sl_table_01run_MAY2014.xls
DA_{event}	Absorbed dose per event	mg/cm^2-event	0.0000020	0.0000020	0.000021	NA	0.0000020	0.0025	0.000036	0.000014	Calculated using site-specific input for exposure time and USEPA spreadsheets http://www.epa.gov/swerrims/riskassessment/ragse/pdf/org04_01.xls and http://www.epa.gov/swerrims/riskassessment/ragse/pdf/inorg04_01.xls

Notes:

NA: Not Applicable

Dermal contact values were obtained from the following USEPA website: http://www.epa.gov/oswer/riskassessment/ragse/index.htm

Oral values were obtained from the following EPA website: http://www.epa.gov/iris

TPH-HO: MTCA Method A Drinking Water criteria was used.

Table 5-3: Non-Potable Groundwater Cleanup Levels

COPC	Noncancer Site-Specific Non-Potable Groundwater CL (ug/L)	Cancer Site-Specific Non-Potable Groundwater CL (ug/L)	Site-Specific Non-Potable Groundwater CL[(2)] (ug/L)
Arsenic	7,997	666	666
Cadmium	1,050	Not Applicable	1,050
cis-1,2-dichloroethylene	7,802	Not Applicable	7,802
Lead	1,650	Not Applicable	1,650
Mercury	873	Not Applicable	873
Pentachlorophenol	1,701	32	32
TPH-HO	Not Applicable	Not Applicable	500[(1)]
Trichloroethylene	1,165	1,900	1,165
Vinyl Chloride	14,458	251	251

Notes:

[1] MTCA Method A drinking water criterion.

[2]The lower of the nonancer and cancer CL was selected as the site-specific CL.

Table 5-4: Perched Water COCs

COPC	Historical RI Data: Number of Samples	Historical RI Data: Number of Detected Samples	Historical RI Data: Detection Frequency (%)	Historical RI Data: Maximum Detection (ug/L)	March 2014 Sampling[2]: SW-BB-5-032014 Total (ug/L)	March 2014 Sampling[2]: SW-BB-5-032014 Dissolved (ug/L)	March 2014 Sampling[2]: SW-BB-6-032914 Total (ug/L)	March 2014 Sampling[2]: SW-BB-6-032914 Dissolved (ug/L)	Perched Water REL and Site-Specific Non-Potable Groundwater CL (ug/L)	Perched Water COC?[4]
Arsenic	5	5	100	181,000	3,400	3,400	3,000	3,000	666	Yes
Cadmium	5	5	100	5,100	0.4 U	0.4 U	0.4 U	0.4 U	1,050	Yes
cis-1,2-dichloroethylene	3	3	100	60	--	--	--	--	7,802	No
Lead	5	5	100	192,000	17	2.2	17	2.2	1,650	Yes
Mercury	3	2	67	53	0.20	0.20	0.20	0.20	873	No
Pentachlorophenol	3	1	33	1	--	--	--	--	32	No
Trichloroethylene	3	1	33	1	--	--	--	--	1,165	No
TPH-HO[1]	2	2	100	600	48 U	--	--	--	500[3]	No[4]

Notes:

--: Not analyzed in sample

U: Not Detected

(1) This sample was analyzed for Extractable Petroleum Hydrocarbons and none were detected. In addition, the highest historical concentration was only slightly above the MTCA Method A drinking water criteria.

(2) Soil removal interim actions in the Building B basement have improved the perched water conditions and lowered COPC concentrations. Two perched water samples were collected in March 2014 in support of treatability studies and to determine current COPC concentrations.

(3) MTCA Method A drinking water criteria

(4) Samples concentrations from a March 2013 sampling event were compared to the CL. If the concentration was greater than the CL it was identified as a COC. Lead and cadmium were retained as COCs because the historical sampling results were five to 1,000 times the non-potable perched water CL. However, TPH-HO was not retained as a COC because the concentrations from the March 2013 sampling event were not detected. Samples collected during the March 2013 sampling event are considered the most representative of current site conditions.

Table 5-5: Soil-to-Groundwater COCs

COPC	Number of Samples	Number of Detected Samples	Detection Frequency (%)	Maximum Detection (ug/L)	Location of Maximum Detection	Average (ug/L)	Site-Specific Non-Potable Groundwater CL (ug/L)	Soil-to-Groundwater COC?(1)
Arsenic	60	53	88	32,900	MW-8	2,968	666	Yes
Cadmium	60	16	27	170	MW-3	8.5	1,050	No
Lead	60	32	53	2,000	MW-3	98	1,650	Yes
Pentachlorophenol	59	1.0	2.0	3.0	MW-1	1.4	32	No
Vinyl Chloride	60	24	40	2.6	MW-8	0.51	251	No

Notes:

[1]The maximum detected concentration was compared to the CL and if the concentration was greater than the CL it was identified as a COC.

Table 5-6: Soil-to-Groundwater Cleanup Levels Based on SPLP and TCLP Results

			Arsenic						Lead						
Sample ID	Operable Unit	Final pH	Total Arsenic (mg/kg)	Arsenic SPLP (mg/L)	Qualifier	Arsenic TCLP[1] (mg/L)	Soil-to-Perched Water REL Based on SPLP (mg/kg)	Soil-to-Perched Water REL Based on TCLP (mg/kg)	Total Lead (mg/kg)	Lead SPLP (mg/L)	Qualifier	Lead TCLP[1] (mg/L)	Qualifier	Soil-to-Perched Water REL Based on SPLP (mg/kg)	Soil-to-Perched Water REL Based on TCLP (mg/kg)
SO-SLTS-17-110613-10-12	OU1	3.57	170	0.02	U	0.31	5,695	367	350	0.4		0.27		1,444	2,139
SO-SLTS-26-110613-12-14		10.23	83	0.23			**242**		3.5	0.0085				**679**	
SO-SLTS-8-112613-7-8	OU2	6.58	120	0.025		0.24	3,216	335	17	0.005	U			**5,610**	
SO-SLTS-7-112613-7-8		9.58	88	0.65			**91**		66	0.005	U			21,780	
SO-SLTS-35-110713-6-8	OU3	12.45	180	0.02	U		6,030		9.7	0.005	U			3,201	
SO-SLTS-51-110713-10-12		11.44	61	0.28			146		18	0.0056				5,304	
SO-SLTS-51-110713-10-12 (Duplicate)		11.65	61	0.36			**114**		18	0.014				**2,121**	
SO-SLTS-36-110713-1-2	OU4	8.95	66	0.02	U		2,211		1,400	0				16,500	
SO-SLTS-49-110713-6-8		8.37	250	0.037			4,527		2,600	0				66,000	
SO-SLTS-28-110713-2-4		9.23	90	0.044			1,370		1,350	0				67,500	
SO-SLTS-28-110713-2-4 (Duplicate)		9.39	90	0.05			1,206		1,350	0				61,875	
SO-SLTS-43-110613-1-2		9.63	420	0.37			**761**		610	0.42				**2,396**	
SO-SLTS-6-110613-10-12	OU5	4.08	910	0.02	U	0.071	30,485	**8,587**	890	0.062		0.03	U	**23,685**	48,950
SO-SLTS-42-110713-1-2	OU6	9.04	290	0.14			**1,388**		510	0.12				**7,013**	

Notes:

Bold value is the lowest soil concentration that is predicted to result in a leachate concentration in each OU that is equal to the perched water REL.

U: Not detected

[1]If the pH value was less than six, use the TCLP value (WAC 173-340-747(7)).

Soil-to-groundwater REL equation (per Section 5.5.3):

$$Soil\text{−}\ to\text{−}Perched\ Water\ \mathrm{REL}\ \left(\frac{\mathrm{mg}}{\mathrm{kg}}\right) = \frac{\left(\dfrac{Perched\ Water\ REL\ \frac{mg}{l}}{Dilution\ Factor}\right)}{SPLP\ or\ TCLP\ Result\ \frac{mg}{l}} \times Total\ Soil\ Concentration\ \frac{mg}{kg}$$

Perched water REL for total arsenic (mg/L)	0.67
Perched water REL for total lead (mg/L)	1.65
Dilution Factor	1

Table 5-7: Soil-to-Perched Water RELs[1]

Operable Unit	Arsenic (mg/kg)	Lead (mg/kg)
1	242	679
2	91	5,610
3	114	2,121
4	761	2,396
5	8,587	23,685
6	1,388	7,013

Notes:

[1]Summarized from Table 5-6. Represents the lowest soil concentration in a given OU that is expected to leach at levels that comply with the soil-to-perched water REL.

Table 5-8: Identification of Soil Direct Contact COCs

COPCs	Number of Samples	Number of Detected Samples	Detection Frequency (%)	Maximum Detection (mg/kg)	Location of Maximum Detection	Method C Industrial Soil CL (mg/kg)	Direct Contact COC?
Arsenic	393	379	96	23,700	SL_46, 6-8 ft bgs	90 [1]	Yes
Lead	393	391	99	31,400	SL_16, 3-4 ft bgs	1,000 [2]	Yes
TPH-D	156	66	66	8,440	SL_53, 1-2 ft bgs	39,000 [3]	No
TPH-G	150	48	48	1,700	SL_34, 8-10 ft bgs	150,000 [3,4]	No
TPH-HO	83	33	33	13,200	SL_53, 1-2 ft bgs	39,000 [3]	No

Notes:

[1] MTCA Method C CL

[2] MTCA Method A CL

[3] Direct contact soil CLs were obtained from the Soil Cleanup Levels for Industrial Land Use Table 745-1 memo (Ecology 2001). Values are from the Table 2, Dermal + Ingestion noncancer column.

[4] The TPH-G ocncentration includes gasoline range organics with benzene.

Table 5-9: Arsenic Soil Direct Contact CLs and RELs

Type	Parameter	Definition	Units	Default Method C CL	Utility Worker Noncancer REL	Utility Worker Cancer REL	Rationale for Site-Specific Value	Reference
Toxicity Criteria	RfD	Reference Dose	mg/kg-day	0.0003	0.0003	0.0003		USEPA Integrated Risk Information System (IRIS). September 2014. http://www.epa.gov/iris/subst/0278.htm
	CPF	Carcinogenic Potency Factor	kg-day/mg	1.5	1.5	1.5		USEPA Integrated Risk Information System (IRIS). September 2014. http://www.epa.gov/iris/subst/0278.htm
Exposure Parameters	ABW	Body Weight	kg	70	70	70	Average adult body weight	MTCA Equation 745-2
	UCF	Unit Conversion Factor	mg/kg	1.0E+06	1.0E+06	1.0E+06		MTCA Equation 745-2
	SIR	Soil Ingestion Rate	mg/day	50	50	50	MTCA default (173-340-745)	MTCA Equation 745-2
	AB1	Relative Soil Bioavailability	%	1	1	1	MTCA default (173-340-745)	
	EF	Exposure Frequency	days/year	146	10	10	Utility Worker Survey (see Appendix B)	MTCA Equation 745-2
	ED	Exposure Duration	years	20	1	20	MTCA default (173-340-745)	MTCA Equation 745-2
	AT-C	Averaging Time-Cancer	days	27,375	Not Applicable	27,375	75-year lifetime expressed in days for estimating cancer risk	MTCA Equation 745-2
	AT-N	Averaging Time-Noncancer	days	7,300	14	Not Applicable	Exposure is assumed to occur over a two week period	MTCA Equation 745-1 / Site Specific
Target Risks	HQ	Hazard Quotient	Unitless	1	1	1	MTCA default (173-340-745)	
	RISK	Cancer Risk	Unitless	1.0E-05	1.0E-05	1.0E-05	MTCA default (173-340-745)	
		Noncancer soil concentration (mg/kg)		1,050	588	--	Equation is MTCA Default (173-340-745-1)[1]	
		Cancer soil concentration (mg/kg)		88	--	1,278	Equation is MTCA Default (173-340-745-1)[2]	
		Lowest		**90[3]**	**588**			

Notes:

[1]Noncancer Soil Level (mg/kg) $= \frac{RfD \times ABW \times UCF \times HQ \times AT-N}{SIR \times AB1 \times EF \times ED}$

[2]Cancer Soil Level (mg/kg) $= \frac{RISK \times ABW \times AT-C \times UCF}{CPF \times SIR \times AB1 \times ED \times EF}$

[3]MTCA Method C Default value.

Chapter 5 Figures

This page has been left blank intentionally to allow for double-sided printing.

LEAD RISK ASSESSMENT SPREADSHEET
CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

USER'S GUIDE to version 7

INPUT

MEDIUM	LEVEL
Lead in Air (ug/m^3)	0.028
Lead in Soil/Dust (ug/g)	1000.0
Lead in Water (ug/l)	1650
% Home-grown Produce	7%
Respirable Dust (ug/m^3)	1.5

OUTPUT

	Percentile Estimate of Blood Pb (ug/dl)					PRG-99	PRG-95
	50th	90th	95th	98th	99th	(ug/g)	(ug/g)
BLOOD Pb, ADULT	~~3.1~~	~~5.7~~	~~6.7~~	~~8.1~~	~~9.3~~	~~1103~~	~~1638~~
BLOOD Pb, CHILD	~~112~~	~~204~~	~~241~~	~~293~~	~~334~~	~~-18535~~	~~-18304~~
BLOOD Pb, PICA CHILD	~~111.6~~	~~204.0~~	~~241.3~~	~~293.3~~	~~333.8~~	~~-18535~~	~~-18304~~
BLOOD Pb, OCCUPATIONAL	1.4	2.6	3.1	3.7	4.2	3934	5879

EXPOSURE PARAMETERS

	units	adults	~~children~~
Days per week	days/wk	0	
Days per week, occupational		5	
Geometric Standard Deviation		1.6	
Blood lead level of concern (ug/dl)		10	
Skin area, residential	cm^2	5700	~~2900~~
Skin area occupational	cm^2	5885	
Soil adherence	ug/cm^2	70	~~200~~
Dermal uptake constant	(ug/dl)/(ug/c	0.0001	
Soil ingestion	mg/day	50	~~100~~
Soil ingestion, pica	mg/day		~~200~~
Ingestion constant	(ug/dl)/(ug/c	0.04	~~0.16~~
Bioavailability	unitless	0.44	
Breathing rate	m^3/day	20	~~6.8~~
Inhalation constant	(ug/dl)/(ug/c	0.082	0.192
Water ingestion	l/day	0.007	~~0.4~~
Food ingestion	kg/day	1.9	~~1.1~~
Lead in market basket	ug/kg	3.1	
Lead in home-grown produce	ug/kg	450.0	

Click here for REFERENCES

PATHWAYS

ADULTS	Residential			Occupational		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	~~0.0E+0~~	~~0.00~~	~~0%~~	2.8E-5	0.03	2%
Soil Ingestion	~~0.0E+0~~	~~0.00~~	~~0%~~	6.3E-4	0.63	44%
Inhalation, bkgrnd		~~0.00~~	~~0%~~		0.03	2%
Inhalation	~~0.0E+0~~	~~0.00~~	~~0%~~	1.8E-6	0.00	0%
Water Ingestion		~~0.49~~	~~16%~~		0.49	1%
Food Ingestion, bkgrnd		~~0.22~~	~~7%~~		0.23	17%
Food Ingestion	~~2.4E-3~~	~~2.39~~	~~77%~~			0%

~~CHILDREN~~	~~typical~~			~~with pica~~		
	~~Pathway contribution~~			~~Pathway contribution~~		
~~Pathway~~	~~PEF~~	~~ug/dl~~	~~percent~~	~~PEF~~	~~ug/dl~~	~~percent~~
~~Soil Contact~~	~~0.0E+0~~	~~0.00~~	~~0%~~		~~0.00~~	~~0%~~
~~Soil Ingestion~~	~~0.0E+0~~	~~0.00~~	~~0%~~	~~0.0E+0~~	~~0.00~~	~~0%~~
~~Inhalation~~	~~0.0E+0~~	~~0.00~~	~~0%~~		~~0.00~~	~~0%~~
~~Inhalation, bkgrnd~~		~~0.00~~	~~0%~~		~~0.00~~	~~0%~~
~~Water Ingestion~~		~~105.60~~	~~95%~~		~~105.60~~	~~95%~~
~~Food Ingestion, bkgrnd~~		~~0.50~~	~~0%~~		~~0.50~~	~~0%~~
~~Food Ingestion~~	~~5.5E-3~~	~~5.54~~	~~5%~~		~~5.54~~	~~5%~~

PIONEER TECHNOLOGIES CORPORATION

DTSC Leadspread Model
Superlon Plastics Site
Tacoma, Washington

Figure 5-1

Calculations of Preliminary Remediation Goals (PRGs)

Figure C-5: Predicted Fetal Blood Lead Concentration

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

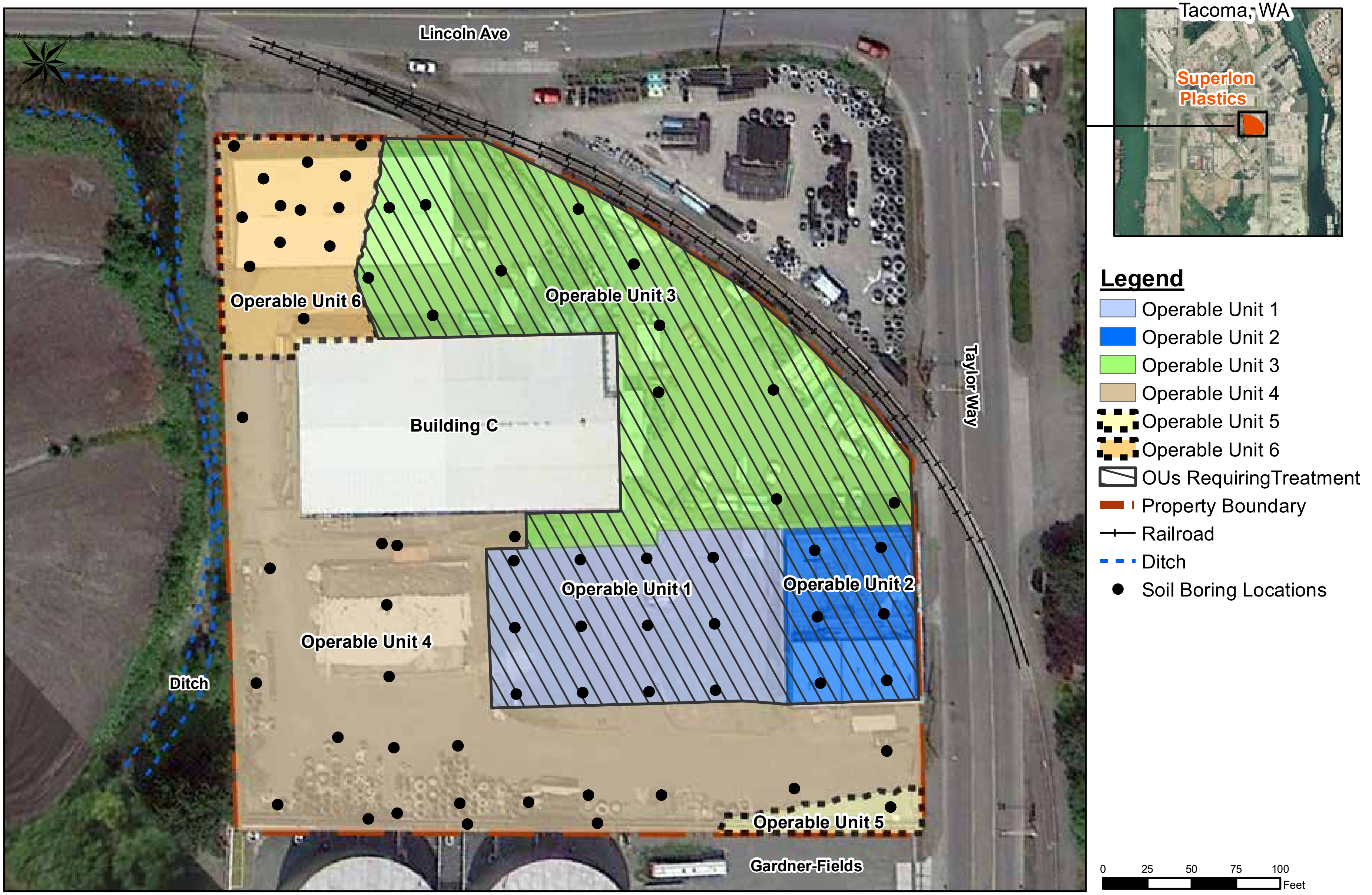
Version date 6/21/09 EDIT RED CELLS

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
~~PbS~~	~~Soil lead concentration~~	~~ug/g or ppm~~	~~2250~~
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
~~BKSF~~	~~Biokinetic Slope Factor~~	~~ug/dL per ug/day~~	~~0.4~~
GSD_i	Geometric standard deviation PbB	--	1.8
~~PbB0~~	~~Baseline PbB~~	~~ug/dL~~	~~1.0~~
~~IRS~~	~~Soil ingestion rate (including soil-derived indoor dust)~~	~~g/day~~	~~0.050~~
~~IRS+D~~	~~Total ingestion rate of outdoor soil and indoor dust~~	~~g/day~~	--
~~WS~~	~~Weighting factor; fraction of IRS+D ingested as outdoor soil~~	--	--
~~KSD~~	~~Mass fraction of soil in dust~~	--	--
~~AFS, D~~	~~Absorption fraction (same for soil and dust)~~	--	~~0.12~~
~~EFS, D~~	~~Exposure frequency (same for soil and dust)~~	~~days/yr~~	~~219~~
~~ATS, D~~	~~Averaging time (same for soil and dust)~~	~~days/yr~~	~~365~~
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**4.2**
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	10.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**5.0%**

PIONEER TECHNOLOGIES CORPORATION

Site-Specific Industrial Worker ALM Input Parameters
Superlon Plastics Site, Tacoma, Washington

Figure 5-2

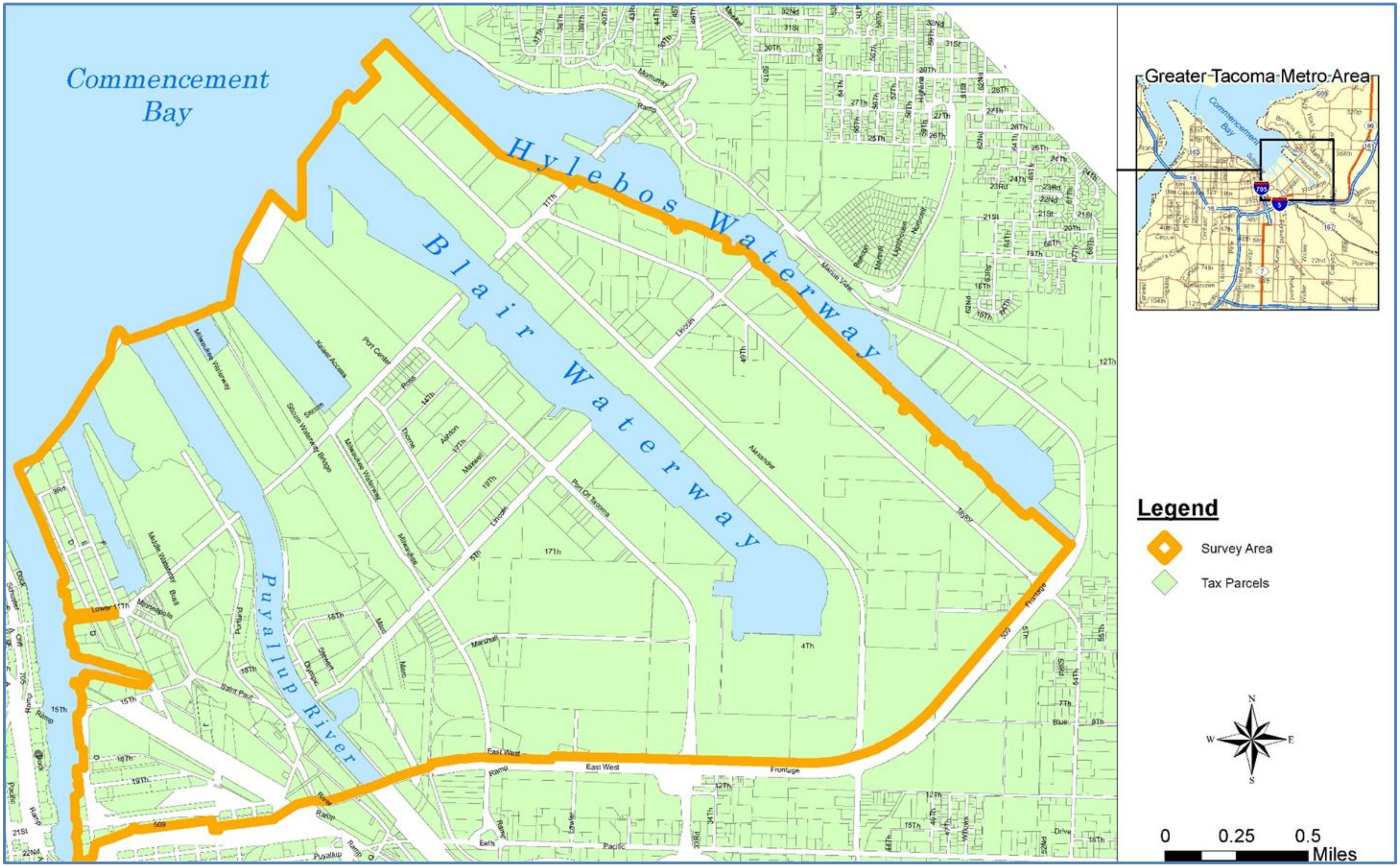


PIONEER TECHNOLOGIES CORPORATION

OUs Requiring Treatment to Protect Soil-to-Perched Water Pathway
Superlon Plastics Site, Tacoma, Washington

Figure 5-3

Document Path: G:\Projects\Superlon\Maps\2014\September\Figure 5-3_OUS_Requireing_Treatment_to_Protect_SOSW_Pathway.mxd; Author: SM; Date Saved: 9/30/2014



Tacoma Tide Flats Area
Superlon Plastics Site
Tacoma, Washington

Figure 5-4

PIONEER TECHNOLOGIES CORPORATION

Chapter 6. ESTIMATED VOLUMES OF SOIL AND PERCHED WATER REQUIRING REMEDIATION

6.1. Introduction

After the development of the appropriate CLs and RELs for the COCs in on-Property media, these levels were combined with on-Property characterization data from the RI–OSS to estimate the volumes of impacted media. This chapter presents the procedures that were used to estimate the impacted soil volumes and determine the volumes of in-place soils in each OU. In addition, the volume of perched water above the perched water RELs was also estimated.

6.2. Soil Volumes

Estimates of impacted soil volumes were based on interpretation of sample data collected during the RI–OSS and subsequent IAs or other characterization efforts. Estimated volumes reported below are pre-remedy estimates. The actual amount of soil to be excavated during the cleanup action will increase or decrease based on the actual volume of soil above the RELs, as verified by field sampling data (i.e., confirmation samples) obtained during the cleanup action. Only in-situ soils with COPC concentrations above the respective RELs are included in the estimated soil volumes for remediation.

6.2.1. Soil Volume Estimation Methods

Soil volumes were estimated using the RI-OSS analytical data and verification sample analytical data from the IAs and maps generated for the RI-OSS report. Excavated volumes were calculated by multiplying the in-place soil volumes by a "fluff" factor, which accounts for volume expansion that results during excavation. Based on laboratory and field measurements of on-Property soils, an excavation fluff factor of 1.1 was used. These volumes were converted to tons, a 1 CY = 1.5 tons. This volume-to-weight conversion factor was developed from actual Property data developed during the IAs. Generally, the excavation depth used to estimate excavated soil volume was based upon the findings of the RI-OSS. The square footage of the excavations was determined using a geographical information system (GIS) and the soil sampling locations to determine thiessen polygons. Thiessen polygons are created by drawing a polygon around each sample location that is half the distance to the next sample location in all directions.

SPLP information developed by MT2 indicates that virtually all of the soils in OUs 4, 5 and 6 are not expected to leach COCs in excess of their soil-to-perched water criteria. This information suggests that soils in these OUs are not expected to result in groundwater impacts. As such, the volume of soils to be remediated in these OUs is based on soils with COC concentrations greater than the direct contact REL (see Figure 5-3).

By contrast, soils in OUs 1,2, and 3 do leach COCs at concentrations above the perched water RELs (see Section 5.5). As such, the development of affected soil volumes in these OUs was based on the amount of material expected to leach COCs at concentrations above the perched water RELs.

6.2.2. In-Place Volumes of Impacted Soil

Table 6-1 presents the estimates of in-situ volume of impacted soils by OU. They represent impacted volumes prior to the selection of a remedy, but are predicated on use of the site-specific CLs and RELs for the on-Property soils (i.e. the preferred alternative). The selection of a remedy that uses more stringent criteria would increase these volumes.

These estimated soil volumes/weights were used as the basis for:

- Developing the scope for treatability studies (Appendices C and D);
- Identification and screening of remedial alternatives (Chapter 7); and,
- Detailed analysis of remedial alternatives (Chapter 8).

6.3. Perched Water Volume Estimate

Since the current perched water COC concentrations exceed the perched water REL, the entire volume of perched water on the Property is assumed to be impacted. Due to the discontinuous nature of the perched water body, developing an accurate perched water volume estimate is difficult. Table 6-2 presents the assumptions that were made to create an estimated range of the volumes of impacted perched water to be used during the screening of technologies and alternatives. Based on this evaluation, the volume of affected perched water requiring remediation is estimated to range between roughly 850,000 and 1.5 million (MM) gallons.

Chapter 6 Tables

This page has been left blank intentionally to allow for double-sided printing.

Table 6-1: Estimates of Impacted Soil Volumes and Weights for Each OU

Operable Unit	In-Situ Volume (CY)	Excavated Volume (CY)[1]	Excavated Weight Tons[2]
OU1 – Building B	1,516	1,668	2,501
OU2 – Building A	832	915	1,373
OU3 – Mixed Waste with White, Gypsum/Lime Material	5,000	5,500	8,250
OU4 – General Mixed Waste	6,796	7,476	11,213
OU5 – Black Shot Area 1	644	708	1,063
OU6 – Black Shot Area 2	947	1,042	1,563
Total Impacted Volume	15,735	17,309	25,963

Notes:

[1]Excavation fluff factor of 1.1 was used to account for the volume increasing once it is excavated.
[2]Conversion factor of 1.5 tons/cubic yard was used to determine the weight.

Table 6-2: Estimates of Perched Water Volumes

Gallons of Perched Water	Location	Sq. Ft.	Depth	FT^3	$Gallons/ft^3$	Gallons
Gallons of Perched Water - Low End Estimate	Building A Footprint	7,344	3	22,032	7.48	164,810
	Building B Footprint	15,454	3	46,362	7.48	346,812
	Remainder of the Property	92,621	0.5	46,311	7.48	346,427
Estimated Low End Total						858,049
Gallons of Perched Water - High End Estimate	Building A Footprint	7,344	5	36,720	7.48	274,684
	Building B Footprint	15,454	5	77,270	7.48	578,020
	Remainder of the Property	92,621	1	92,621	7.48	692,853
Estimated High End Total						1,545,557

Chapter 7. IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES

7.1. Introduction

This chapter summarizes the screening of technologies and associated process options. This process begins in Section 7.2 with the discussion of screening criteria used to screen the various technologies. Section 7.3 presents a list of databases reviewed in developing a list of potentially applicable technologies. Section 7.4 describes the technology screening process where Property-specific factors, potential effectiveness, implementability and the cost of the technologies were considered. Section 7.5 summarizes representative process options (at least one for each technology) that were selected following qualitative screening for compilation into remedial alternatives.

Screening was done to reduce the number of remedial technologies for detailed evaluation. A reasonable number and type of cleanup remedial technologies and process options were reviewed for both soil and perched water. During this initial screening, remedial options consisted of general remediation technologies identified for the purpose of potentially meeting the RAOs or to act as a component of an alternative that would meet RAOs for each medium and/or waste type. A review of effectiveness and implementability was made on the basis of professional judgment. Costs for each process were evaluated as to whether the general costs are high, medium, or low relative to other process options in the same technology category. For this phase of screening no vendor costs were obtained.

A list of these prospective technologies and processes were presented to Ecology on April 7, 2014. Ecology made the determination that the retained list was appropriate for further evaluation in the FS (Ecology 2014; see Appendix A).

7.2. Identification of Screening Criteria

7.2.1. MTCA Screening Criteria

MTCA requires that technologies and processes are screened to determine if the remedial alternatives selected for further evaluation represent those that were permanent to the maximum extent practicable (as defined by WAC 173-340-360 (3)(b)). For this FS-OSP the MTCA required criteria were grouped in the following manner:

Effectiveness:

Effectiveness includes those criteria that evaluate the state of development of the technology, the ability to protect human health and the environment, and identifies potential negative impacts associated with the technology. Effectiveness includes the following MTCA criteria:

- **Protectiveness**: This evaluation considers the degree of protection each technology provides to human health and the environment, the extent to which reductions in risk, toxicity, and/or mobility are expected to be achieved, the time required to reduce risk and obtain cleanup standards, the off-Property and on-Property risks resulting from the implementation of the alternative, and the degree of improvement of the overall environmental quality.

- **Permanence**: This evaluation considers the degree to which the alternative permanently reduces the toxicity, mobilization or volume of the contaminants. The evaluation considers the materials treated, quantity of material treated, degree of toxicity, mobility, and volume reduction, degree to which the treatment is irreversible, and the type and quantity of residual materials. Since metals are the COCs, one of the MTCA criteria, destruction, is not obtainable by any of the listed remedial alternatives and will not be evaluated.
- **Long-Term Effectiveness:** This evaluation considers the effectiveness of the process during the time when contaminant concentrations remain on-Property that are greater than CLs or RELs, the magnitude of risk with the alternative in place, and the adequacy and reliability of any Property controls.
- **Management of Short-Term Risks:** This evaluation considers the effectiveness of the process in dealing with the potential impacts to human health and the environment during the implementation phase.
- **Consideration of Public Concerns:** This evaluation considers any local community concerns over the alternative and how the alternative addresses those concerns.

Implementability:

Implementability involves the technical and administrative feasibility of constructing, operating, and maintaining a particular remediation technology. To assess technical implementability emphasis is placed on the institutional aspects of implementability, such as the ability to obtain the necessary permits, the availability of treatment, storage, and disposal services, and the availability of necessary equipment and skilled workers to implement the technology.

Cost:

The cost for remediation work includes such items as installation and operation of process equipment, excavation, and disposal fees.

7.3. Development of Candidate Technologies and Process Options

A list of potentially applicable technologies and process options was developed using the following resources:

- Vendor Information System for Innovative Treatment Technologies (VISITT) database, Version 2.0;
- USEPA Risk Reduction Engineering Laboratory (RREL) database;
- USEPA Superfund Innovative Technologies Evaluation (SITE) demonstrations;
- Remedial Technologies Screening Matrix and Reference Guide, USEPA and U.S. Air Force, July 1993;
- In-house DuPont Company experience;
- In-house consultant and contractor experience;
- Other consultant reports;
- Treatability studies for other sites; and,
- Literature survey.

Technologies or process options which could not be implemented or would not be effective (i.e., technically infeasible) were eliminated from further consideration using the following criteria:

- Technologies that have been demonstrated only in a laboratory;
- Technologies that cannot achieve the Cleanup Standards required at the Property; or,
- Technologies not applicable to the Property for practical reasons.

7.4. Technology Screening

MTCA requires that technologies and processes are screened to determine if the remedial alternatives selected for further evaluation represented those that were permanent to the maximum extent practicable (as defined by WAC 173-340-360 (3)(b)). Emphasis was placed on effectiveness (as protectiveness, permanence, long-term effectiveness, management of short-term risks, and consideration of public concerns), implementability, and cost when performing this screening evaluation. The institutional aspects of implementability were considered, such as the ability to obtain the necessary permits; the availability of treatment, storage, and disposal services; and the availability of necessary equipment and skilled workers to implement the technology. The cost analysis was made on the basis of professional judgment, and each process was evaluated as to whether the general costs would be high, medium, or low relative to other process options in the same technology category. For this phase of screening no vendor costs were obtained.

Table 7-1 presents a ranking of the relative effectiveness, implementability and cost of soil related technologies. Remedial technologies and process options for soil are grouped according to technology category (i.e., physical, chemical, biological, thermal, or administrative processes). These are the broad categories of remedial measures that may be implemented alone or in combination to meet the RAOs. The third column of the table includes a brief description of each process option. Technologies that do not meet the screening criteria and were not considered acceptable based on this initial screening are indicated by a "No" in the "Retained" column.

In Table 7-2 more general criteria (e.g., whether the technology could be applied to site COPCs, disposal based on known COPC concentrations, etc.) were used to screen the perched water remedial technologies. In Table 7-2, remedial technologies and process options for perched water are grouped according to the general response action (i.e., institutional actions, containment, disposal, and treatment). The fourth column of the table includes a brief description of each process option. Technologies that were not considered acceptable based on this initial qualitative screening are indicated by a "No" in the "Retained" column.

The remaining process options and technologies were retained for further development, assembly, and analysis as remedial alternatives.

7.5. Representative Processes Selected for the Development of Remedial alternatives

The technologies selected from the screening process include several process options. The "cap/cover" technology category, for example, could include many different subsets of process options (cover could mean soil cover, re-vegetation, synthetic membrane cap, clay cover, etc.). Many of these process options are similar since they reduce potential exposure. To include all combinations of process options in the development of remedial alternatives would result in the evaluation of hundreds of remedial alternatives with limited benefit. As such, the process options presented in Tables 7-3 and 7-4 were retained for further evaluation.

7.6. Summary of Selected Technologies

Table 7-5 presents a summary of the retained technologies and process options and identifies the ones that met RAOs and Ecology policies. Note that **none of the media-specific technologies and process options by themselves met RAOs for all impacted media.** Hence, the retained technologies needed to be combined into remedial alternatives for evaluation.

Besides No Action, which was kept for comparison purposes, the following technologies/process options were retained as components for development of alternatives that meet all Property RAOs. The technologies/process options retained to be used as components were:

7.6.1. Perched Water

- No Action;
- Institutional Controls - Deed Restrictions;
- Cover - Imported Soil/Gravel Cover;
- Cap/Cover - Multimedia (Imported Soil/Geotextile/Gravel Cover/Asphalt Cap);
- Off-Property Treatment and Disposal;
- Engineering Controls – Slurry/Grout Wall or other similar methods;
- Active on-Property perched water treatment; and,
- Active on-Property perched water treatment with Engineering controls and Cover.

7.6.2. Soils

- No Action;
- Institutional Controls - Deed Restrictions;
- Cover - Imported Soil/Gravel Cover;
- Cap/Cover - Multimedia (Imported Soil/Gravel Cover/Asphalt Cap);
- Engineering Controls - Dust Control & Water Spraying;
- Excavation - Conventional Equipment;
- Off-Property Disposal - Hazardous or Non-Hazardous Waste Landfill;
- On-Property Reuse - Reuse of Stabilized Soils;
- Debris Disposal - Construction Debris Landfill;
- Stabilization - Ex-situ Stabilization;
- Excavation, Ex-Situ Stabilization and On-Property Reuse; and,
- Excavation, Off-Property Disposal of Hazardous Waste, Ex-Situ Stabilization of Non-Hazardous Waste and On-Property Reuse.

- A list of these prospective technologies and processes were presented to Ecology on April 7, 2014. Ecology made the determination that the retained list was appropriate for further evaluation in the FS (Ecology 2014; see Appendix A).

7.7. Treatability Studies

Treatability studies were completed in 2013 and 2014 in order to further evaluate the technical and economic feasibility of applying select technologies to Property soils and perched water impacted by metals. The focus of these studies was to obtain data to:

- Confirm the suitability of these technologies for Property-specific soils and perched water;
- Identify potential problems associated with these technologies for application at the Property; and
- Identify additional treatability work that may need to be conducted prior to Remedial Design.

7.7.1. Soil Treatability Study

The soil treatability study is presented in Appendix C and was conducted by MT2. The goal of the soil treatability study was to determine if stabilization would be effective in reducing the leachability of metals in on-Property soils to perched water RELs, so that the soil could be re-used on-Property. The treatability study used bench-scale treatability testing to obtain data on the ability to successfully stabilize the soil and reduce concentrations of metals in leachate to perched water RELs. An overview of the program and the pertinent results are presented below.

Soil samples for the treatability study were collected at discreet areas of the Property which, based on RI-OSS data, represented arsenic and lead concentrations ranging from 90 mg/kg to 900 mg/kg and 250 mg/kg and 2000 mg/kg, respectively. These soils were collected using a GeoProbe. Splits of these samples were made and sent to TestAmerica Tacoma, the project's laboratory, and MT2.

Samples were analyzed by TestAmerica for total arsenic and lead by USEPA Method SW846-6010, and for TCLP by USEPA Method SW846-1311-6010. These tests provided baseline data to be used in determining which samples should be included in the treatability study.

After the results of the baseline data were received, MT2 blended impacted soils with their proprietary ECOBOND® As and ECOBOND® Pb soil additives and, following the SPLP method, collected leachate from the treated soils. The leachate was analyzed for lead and arsenic using USEPA Method SW846-1312-6010. The SPLP samples were processed and analyzed at an independent lab (i.e., ESC lab), and then filtered according to the prescribed procedures. In all cases the analytical results confirmed that leachate concentrations would meet the project performance goals. While this testing did not include samples of all waste materials on the Property, historic performance of the Ecobond® technology during the Phase III Interim Action has demonstrated its ability to perform well on a variety of waste materials.

7.7.2. Perched Water Treatability Studies

The goal of the perched water treatability study was to determine if commercial water treatment was available to treat perched water to a level equal to or below the perched water REL. The bench scale perched water treatability studies are presented in Appendix D and were conducted by Water Tectonics of Everett, Washington and Water and Waste Water Laboratories (WWL) of Cleveland, Ohio.

A 5-gallon sample of perched water was obtained from the footprint of former Building B. The sample was thoroughly mixed to ensure homogeneity before an aliquot was taken for treatment. The sample was treated using a laboratory-scale electrocoagulation (EC) cell. Electrocoagulation is the process of destabilizing suspended, emulsified, or dissolved COCs in an aqueous medium by introducing an electrical current. The electrical current provides the electromotive force to drive the chemical reactions. When reactions are driven or forced, the elements or compound will approach the most stable state. Generally, this stable state is a solid that is either, less colloidal, less emulsifiable, or less soluble than the element or compound at equilibrium values. As this occurs the COCs form hydrophobic entities such as precipitates or phase separations, which can easily be removed by a number of secondary separation techniques.

The EC treated sample was analyzed for total and dissolved arsenic, cadmium, and lead by USEPA Method 200.8. These analytical results provided baseline data to be used in determining if the performance goals could be met. After the results of the baseline data were received the perched water samples were processed using the EC process. Following EC, the sample was mixed to help the flocculant maturate. After settling, the supernatant was filtered through an 8-µm paper filter, simulating granular media filtration. The post-treatment water was also analyzed by USEPA Method 200.8, and analyzed for total and dissolved arsenic, cadmium, and lead. In all cases the analytical results confirmed that post-treatment water would meet the project performance goals (see Appendix D).

An additional 5-gallon sample of perched water was obtained from the footprint of former Building B. This water was delivered to WWL who conducted the bench scale treatability study described in Appendix D. WWL adjusted the pH of the water samples to approximately 6.5 with H_2SO_4 followed by running several bed volumes though the SMI® media at a rate of about 2 gpm/ft^2 for approximately 6 minutes of empty bed contact time to determine if the SMI® process would be feasible in reducing concentrations of COCs in perched water. SMI® is a patented, iron-based granular media that has been commercially developed for the removal of metals from water. No report was issued for this work, but pretreatment and post-treatment laboratory reports were issued and are included in Appendix D. This method showed some promise for reducing COC concentrations, but additional phases of research were not pursued as part of the pre-FS testing.

7.8. Development of Alternatives

Since none of the individual media-specific technologies met all Property RAOs, the following remedial alternatives were developed for further evaluation, and are described further in Chapter 8:

1. Alternative 1: No Action
2. Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > Direct Contact REL (DCREL), Cap and Cover Property, Apply Deed Restriction
3. Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > Soil-to-Perched water REL (SPWREL) in OUs 1,2, and 3, Cover Property, Apply Deed Restriction

4. Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4 and 6, Cover Property, Apply Deed Restriction
5. Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction

7.9. References for Chapter 7

Ecology. 2014. Verbal Communication from Marv Coleman to Tim Bingman Regarding Ecology Approval of the Initial Screening of Technologies. July 7, 2014.

This page has been left blank intentionally to allow for double-sided printing.

Chapter 7 Tables

This page has been left blank intentionally to allow for double-sided printing.

Table 7-1: Identification and Preliminary Screening of Remedial Technologies for Soil

Technology Category	Remedial Technology	Description	Relative Effectiveness[1]	Relative Implementability[2]	Relative Cost[3]	Retained?
Physical Process	Engineering Controls	Engineering controls, such as a fence, are put in place in order to reduce the potential for exposure.	**Medium** Direct contact exposure pathways would be mostly eliminated with the installation of engineering controls.	**Easy** Site is already enclosed by a fence, but additional measures may need to be considered.	**Capital: Low** **O&M: Low** Total cost is driven by cost to install and maintain appropriate engineering controls.	Yes
	Excavation	Contaminated soil and COPCs are physically removed via excavation.	High All contaminated soil above the cleanup/remediation level could be removed from the site.	**Medium** Most contaminated soil is located in areas of the site where it could be excavated. However, because the site is small and is actively used for manufacturing purposes and storage, there could be significant logistical challenges.	**Capital: Low** **O&M: None** Total cost would be driven by equipment rental and labor costs.	Yes
	On-Site Reuse	Remediated soil is reused on-site after COPC concentrations are reduced.	**High** Soil that is reused on-site would be free of COPC concentrations above the appropriate cleanup/remediation levels.	**Medium** Once contaminated soil is excavated and remediated, it would be relatively easy to reuse the soil on-site.	**Capital: Low** **O&M: None** Total cost would be driven by equipment rental and labor costs.	Yes
	Off-Site Disposal	Contaminated soil is disposed of off-site.	**High** All contaminated soil above the cleanup/remediation level could be removed from the site.	**Medium** Contaminated soil could be disposed of at the landfill in Arlington, OR.	**Capital: Medium to High** **O&M: None** Total capital cost is driven by waste disposal costs, which would vary depending on whether the contaminated soil is designated hazardous or non-hazardous.	Yes
	Cap/Cover	A barrier made of concrete, asphalt, or other similar material is placed above contaminated soil to minimize direct contact exposures and to prevent infiltration and subsequent leaching to groundwater.	**Medium** Contaminated soil would remain in place, but the potential for exposure would be minimized and on-site infiltration to groundwater would be eliminated.	**Easy** Most contaminated soil is located in areas of the site where it could be easily capped/covered.	**Capital: Low** **O&M: Low** Total cost is driven by long-term groundwater monitoring.	Yes
	Solidification/ Stabilization	Solidification involves encapsulating or coating the contaminated soil with low-permeability materials to restrict constituent migration due to leaching. Stabilization involves chemically converting constituents into a less soluble, mobile, or toxic form.	**Medium** Contaminated soil would remain in place, but could be in a less toxic or bioavailable form and leaching to groundwater would be reduced or eliminated.	**Medium** Contaminated soil may need to be excavated in order to allow mixing with stabilization or solidification amendments which may be difficult to accomplish at an active facility. Site is small and is actively used for manufacturing purposes and storage. This would result in significant logistical challenges.	**Capital: Medium** **O&M: None** Total cost is driven by the effort and equipment required to excavate all contaminated soil and mix it with the appropriate solidification/stabilization amendments.	Yes
	Soil Vapor Extraction	A vacuum is applied to the vadose zone soil to remove volatile and semivolatile constituents. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
	Soil Washing	Constituents sorbed onto fine-grained soil particles are separated from coarse grained soil particles using a water-based washing system that may include a leaching agent, surfactant, or chelating agent to help remove organics and metals.	**Low** Site soil is mostly heterogenesis and mixed with debris of differnet sizes and therefore could not be easily separated via washing.	**Difficult** This technology would require a large amount of space in order to excavate and wash all contaminated soil.	**Capital: Medium** **O&M: None** Total capital cost is driven by excavation and equipment rental costs.	No
	Aeration	Contaminated soil is excavated and spread out to increase surface area and the rate of constituent volatilization. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
Chemical Process	Zero-Valent Iron/Clay Mixing	Zero-valent iron and clay are mixed into soil in order to degrade constituents to less toxic byproducts or to decrease mobility.	**Low** This technology has not been proven to reduce site COPC concentrations in soil.	**Difficult** ZVI mixing with all contaminated soil on site would be difficult and would require lots of specialized equipment.	**Capital: High** **O&M: None** Total capital cost is driven by costs associated with equipment needed to thoroughly mix ZVI/clay with contaminated soil.	No
	In-Situ Chemical Oxidation	An oxidizing agent is injected into the contaminated soil to chemically oxidize volatile and semivolatile constituents to less toxic compounds. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
	In-Situ Chemical Reduction	A reducing agent is injected into the contaminated soil to chemically reduce volatile and semivolatile constituents to less toxic compounds. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
Chemical Process	Surfactant/Solvent Flushing	A solvent or surfactant is injected into the vadose zone to increase constituent solubility and migration to groundwater so that constituents can be more easily removed from groundwater.	**Medium** Site COPCs could be flushed from contaminated soil using acid, but extracted groundwater would require additional treatment.	**Medium** Injection and extraction wells could be used to inject acid into the contaminated soil and extract the heavily contaminated groundwater.	**Capital: High** **O&M: Low** Total cost is driven by surfactant/solvent costs and costs associated with installing injection and extraction wells.	No
	Hydrogen Flushing	Hydrogen gas is injected into the contaminated soil and serves as a substrate to encourage reductive dechlorination of constituents. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No

Table 7-1: Identification and Preliminary Screening of Remedial Technologies for Soil

Technology Category	Remedial Technology	Description	Relative Effectiveness[1]	Relative Implementability[2]	Relative Cost[3]	Retained?
Biological Process	Enhanced Bioremediation	Carbon sources, microbes, nutrients, and/or other amendments are added to the contaminated soil in order to encourage biodegradation of constituents to less toxic byproducts. This technology is not applicable to site COPCs at the concentrations present at the site.	n/a	n/a	n/a	No
	Phytoremediation	Trees, plants, or grasses remove constituents from contaminated soil through their roots. Constituents are either internally degraded or stabilized by the plant or are respired to the air. This technology is not applicable to site COCs at the concentrations present at the site.	n/a	n/a	n/a	No
Thermal Process	Electrical Resistivity Heating	Electrical current is delivered to the contaminated soil and vadose zone to increase the soil temperature so that the constituents are vaporized and then captured by an SVE system. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
	Electrokinetic Remediation	Electrical current is applied to the contaminated soil using an anode and a cathode in order to encourage migration of constituents to a central location for removal.	**High** An adequately designed electrokinetic system would reduce concentrations of site COPCs to acceptable levels.	**Difficult** Installing and operating anodes and cathodes throughout a site actively used for manufacturing and storage purposes may not be feasible.	**Capital: High** **O&M: Medium** Total cost is driven by the number of anodes and cathodes that must be installed and the amount of electrical current that must be applied to the system to completely remove all site COPCs.	No
	In-Situ Steam Heating	Steam is delivered to the contaminated soil and vadose zone to increase the soil temperature and mass transfer rate so that the constituents are vaporized and then captured by an SVE system. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
	Ex-Situ Thermal Desorption	Contaminated soil is excavated and heated to increase the soil temperature so that the constituents are vaporized and then captured. This technology is not applicable to site COPCs.	n/a	n/a	n/a	No
	In-Situ Vitrification	Extremely high temperatures are used to melt contaminated soil into an obsidian-like glass that fully encapsulates all constituents.	**Medium** Contaminated soil would remain in place, but leaching to groundwater would be eliminated.	**Difficult** This technology requires very high temperatures and is not suitable for an active manufacturing facility.	**Capital: High** **O&M: None** Total cost is driven by amount of energy needed to completely vitrify all contaminated soil.	No
Administrative Process	Institutional Controls	Administrative and legal controls, such as a deed restriction, are put in place to limit the future use of the site in order to reduce the potential for exposure.	**Medium** Direct contact exposure pathways would be mostly eliminated with the addition of institutional controls.	**Easy** It would be relatively easy to implement institutional controls for the site to limit future use because the site is in an industrial (rather than residential) area.	**Capital: Low** **O&M: Low** Total cost would be minimal.	Yes

Notes:

n/a: not applicable

Primary site COPCs are arsenic and lead.

[1] Relative effectiveness is qualitatively rated as low, medium, or high relative to other alternatives presented in this table.

[2] Relative implementability is qualitatively ranked as easy, medium, or difficult relative to other alternatives presented in this table. Implementability includes considerations for technical feasibility and administrative feasibility but does not include regulatory feasibility.

[3] Relative cost is broken out into capital and O&M costs and is ranked as none, low, medium, or high relative to other alternatives presented in this table.

Table 7-2: Identification and Preliminary Screening of Remedial Technologies for Perched Water

General Response Action	Technology Sub-Category	Remedial Technology	Description	Retained?
Soil Remedial Technology			Soil remedial technologies (e.g., excavation and off-site disposal, stabilization/solidification, and cap/cover) are also technologies that would be suitable for on-site perched water because they would minimize direct contact with perched water and/or reduce COPC concentrations for perched water in contact with soil.	Yes
Institutional Actions		Monitored Natural Attenuation	If the source removal action is protective of groundwater, groundwater concentrations of site COPCs will reduce over time.	Yes
		Institutional Controls	Administrative and legal controls, such as a deed restriction, are put in place to limit the future use of the site in order to reduce the potential for exposure.	Yes
		Engineering Controls	Engineering controls, such as a fence, are put in place in order to reduce the potential for direct contact exposure.	Yes
Containment		Cap/Cover	A barrier made of concrete, asphalt, or other similar material is placed above contaminated soil to minimize direct contact exposures and to prevent infiltration and subsequent leaching to groundwater.	Yes
		Slurry Wall	A non-structural underground wall is constructed by placing a cement-based mixture of water, aggregate, and slag into an excavated trench. When the cement-based slurry hardens, a permanent underground wall controls the movement of groundwater. A slurry wall would eliminate the pathway between contaminated on-site perched water and off-site surface water.	Yes
		Grout Curtain	A grout curtain is a thin, vertical wall that is installed by pressure-injecting grout into the ground at closely spaced intervals. Grout materials typically include hydraulic cement, clay, bentonite, and silicates. A grout curtain would eliminate the pathway between contaminated on-site perched water and off-site surface water.	Yes
		Sheet Piling	Thin interlocking sheets of steel are driven into the ground in order to create a continuous barrier. The sheet pile barrier would eliminate the pathway between contaminated on-site perched water and off-site surface water.	No
		Hydraulic Control	A groundwater gradient is established, typically through pumping, that will result in capture of all flow paths that would otherwise result in contaminated perched water leaving the site.	No
Disposal		Off-Site Disposal Without Treatment	Contaminated perched water is pumped from the site into a truck and disposed of off-site.	No
Treatment	Ex-Situ Physical Processes	Membrane Filtration	Contaminants are separated from water by passing contaminated water through a semi-permeable barrier or membrane. Membrane processes include microfiltration, ultrafiltration, nanofiltration, and reverse osmosis.	Yes
	In-Situ Physical Processes	Permeable Reactive Barrier	A permeable wall is installed in the subsurface near the downgradient site boundary. Dissolved phase contaminants can be removed from the groundwater that flows through the PRB using a variety of materials or amendments (e.g., ZVI, ion exchange, etc.).	No
		Air Stripping/ Aeration	Air is injected throughout contaminated perched water in order to increase the rate of contaminant volatilization. This technology is not applicable to site COPCs.	No

Table 7-2: Identification and Preliminary Screening of Remedial Technologies for Perched Water

General Response Action	Technology Sub-Category	Remedial Technology	Description	Retained?
Treatment	In-Situ or Ex-Situ Chemical Processes	Precipitation/ Coprecipitation	Chemicals are added to contaminated perched water in order to transform dissolved contaminants into an insoluble solid. In coprecipitation, dissolved contaminants are adsorbed onto another solid particle that is precipitated. The insoluble particles are then removed through a process such as coagulation, flocculation, or filtration.	No
		Adsorption	Contaminated water is passed through adsorption media that is typically packed into a column. Contaminants tend to concentrate at the surface of the sorbent material (e.g., granular activated carbon) which must be regenerated or replaced over time.	Yes
		Ion Exchange	Contaminated water is passed through an ion exchange resin in which cations or anions are exchanged between the contaminants and the exchange medium.	Yes
		Chemical Oxidation	An oxidizing agent is injected into the contaminated perched water to encourage reduction/oxidation reactions that chemically convert volatile and semivolatile constituents to less toxic compounds. This technology is not applicable to site COPCs.	No
	In-Situ Biological Processes	Enhanced Bioremediation	Carbon sources, microbes, nutrients, and/or other amendments are added to the contaminated groundwater in order to encourage biodegradation of constituents to less toxic byproducts. This technology is not applicable to site COPCs.	No
		Phytoremediation	Trees, plants, or grasses remove constituents from contaminated perched water through their roots. Constituents are either internally degraded or stabilized by the plant or are respired to the air.	No
	In-Situ or Ex-Situ Thermal Processes	Electrokinetic Remediation	Electrical current is applied to the contaminated perched water using an anode and a cathode in order to encourage migration of constituents to a central location for removal.	No
		Electrical Resistivity Heating	Electrical current is delivered to the contaminated perched water to increase the temperature so that the constituents are vaporized and then captured by an SVE system. This technology is not applicable to site COPCs.	No
		Thermal Desorption	Contaminated perched water is heated to increase the temperature so that the constituents are vaporized and then captured. This technology is not applicable to site COPCs.	No
		Vitrification	Extremely high temperatures are used to melt contaminated soil and perched water into an obsidian-like glass that fully encapsulates all constituents.	No
		Steam Heating	Steam is delivered to the contaminated perched water to increase the perched water temperature and mass transfer rate so that the constituents are vaporized and then captured by an SVE system. This technology is not applicable to site COPCs.	No

Notes:

Primary site COPCs are arsenic and lead.

Table 7-3: Retained Soil Process Options

Technology Type	Selection Process Options
Institutional Controls	Deed Restrictions
Cover	Imported Soil/Gravel Cover
Cap	Asphalt Cap
Cap/Cover · Multimedia	Imported Soil/Gravel Cover/Asphalt Cap
Engineering Controls	Dust Control · Water Spraying
Excavation	Conventional Equipment
Off-Property Disposal	Hazardous or Non-Hazardous Waste Landfill
On-Site Reuse	Reuse of Stabilized Soils
Debris Disposal	Construction Debris Landfill
Recycling	Registered Recycling Facility
Solidification/Stabilization	Ex-situ Stabilization, Solidification not retained

Table 7-4: Retained Perched Water Process Options

Technology Type	Selection Process Options
Institutional Controls	Deed Restrictions
Natural Attenuation/Restoration	Natural Restoration with Active Monitoring
Cover	Imported Soil/Gravel Cover
Cap	Asphalt Cap
Cap/Cover · Multimedia	Imported Soil/Gravel Cover/Asphalt Cap
Off-Property Treatment and Disposal	Off-site treatment vendor and disposal
Engineering Controls	Slurry Wall, other similar methods
Active Water Treatment	In-Situ or Ex-Situ Chemical or Ex-Situ Physical Processes

Table 7-5: Technologies Versus RAOS

Media	Primary Media =>	Soil		Perched Water		
	Exposure Media =>	HH Direct Contact	Soil-to-PW	PW (on-property)	SW (off-property)	PW-to-GW
Soil	No Action	No	No	No	NA	NA
	Institutional Control	No	No	No	NA	NA
	Cover (imported soil or gravel, geotextile, etc.)	No	No	Yes	NA	No
	Cap (asphalt)	Yes	No	Yes	NA	Yes
	Cap & Cover	Yes	No	Yes	NA	Yes
	Excavation and Off-Property disposal of soil > DCCL (default)	Yes	Yes	Yes	NA	Yes
	Excavation and Off-Property disposal of soil > DCREL	Yes	No	No	NA	NA
	Ex-Situ Stabilization of soils < DCREL and > SGCL	Yes	Yes	Yes	NA	NA
PW	Institutional Controls	NA	No	No	NA	NA
	Natural Attenuation/Restoration	NA	No	No	No	No
	Off-Property Treatment and Disposal	NA	NA	Yes	Yes	Yes
	Active Water Treatment (In-Situ or Ex-Situ Processes)	NA	NA	Yes	Yes	Yes
	Engineering Controls (slurry/grout wall)	NA	NA	Yes	Yes	Yes

Notes:
Shaded cells – Technologies retained for consideration that meet **both** RAOs and Ecology policy requirements

This page has been left blank intentionally to allow for double-sided printing.

Chapter 8. DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

8.1. Introduction

This chapter presents a comparative analysis of the remedial alternatives identified in Chapter 7. Section 8.2 identifies the potential alternatives. Section 8.3 compares the potential alternatives to the MTCA threshold criteria. Section 8.4 identifies and discusses the retained alternatives. Section 8.5 presents the evaluation criteria, a detailed comparative analysis of the remedial alternatives, and rates each alternative. Section 8.6 identifies the preferred alternative. Figure 8-1 presents the overall process that was used to evaluate technologies and alternatives.

8.2. Potential Alternatives

In addition to the No Action alternative, which is retained as a baseline, the alternatives identified in Chapter 7 and evaluated in this chapter contain the following major components:

- *Alternative 1: No action*
- *Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL, Cap and Cover Property, Apply Deed Restriction:*
  - Installation of a slurry/grout wall;
  - On-Property treatment of perched water;
  - Excavation and off-Property disposal at a landfill of soils > DCREL;
  - Cover with a geotextile and gravel and cap with asphalt; and,
  - Apply deed restriction to restrict Property to industrial land use.
- *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction:*
  - Installation of a slurry/grout wall;
  - On-Property treatment of perched water;
  - Excavation and off-Property disposal at a landfill of soils > DCREL in OUs 4 and 6;
  - Excavation, stabilization, and reuse of soils > SPWREL in OUs 1,2, and 3;
  - Cover with a geotextile and gravel; and,
  - Apply deed restriction to restrict Property to industrial land use.
- *Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction:*
  - Installation of a slurry/grout wall;
  - On-Property treatment of perched water;
  - Excavation and off-Property disposal at a landfill of soils > SPWREL in OUs 1,2, and 3;
  - Excavation and off-Property disposal at a landfill of soils > DCREL in OUs 4, and 6;
  - Cover with a geotextile and gravel; and,
  - Apply deed restriction to restrict Property to industrial land use.
- *Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate Soil > MTCA Defaults, Cover Property, Apply Deed Restriction:*

- Installation of a slurry/grout wall;
- On-Property treatment of perched water;
- Excavation and off-Property disposal at a landfill of soils > MTCA Defaults;
- Cover for storm water controls; and
- Apply deed restriction to restrict Property to industrial land use.

8.3. MTCA Threshold Criteria

The five cleanup action alternatives defined in Chapter 7 were first evaluated using the MTCA threshold criteria in WAC 173-340-360(2). The four threshold criteria specified in MTCA are:

- "Protect human health and the environment"
- "Comply with cleanup standards"
- "Comply with applicable state and federal laws"
- "Provide for compliance monitoring"

The five potential alternatives were evaluated to determine if they meet the threshold criteria.

8.3.1. Alternative 1: No Action

Alternative 1: No Action does not remediate the soil or perched water or improve the current environmental condition of the Property and thus, does not satisfy the threshold criteria or achieve the RAOs. This alternative was initially retained for the purpose of comparing the current Property condition to the conditions present after implementing any of the other remedial alternatives. No Action does not meet cleanup standards, and will not be used for either media.

No Action can have some applicability to land use areas that are ecologically sensitive, or which have isolated occurrences of chemicals. These situations are not present on the Property. For No Action to be an appropriate alternative the following conditions must be met:

- The contaminant must not have been detected in groundwater;
- Their concentrations are low (near the cleanup level);
- The average/mean concentration is below the cleanup level;
- The number of exceedances (less than 5%) of the cleanup level are low in comparison to the number of detections and/or samples collected; and,
- No known sources for these contaminants are associated with activities at the Property.

Given that these conditions do not exist at the Property, the No Action alternative is not appropriate, and hence is not carried forward in subsequent stages of the alternative evaluation.

8.3.2. Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > Direct Contact REL (DCREL), Cap and Cover Property, Apply Deed Restriction

Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL, Cap and Cover Property, Apply Deed Restriction does not address the soil-to-perched water pathway and thus, does not meet the threshold criteria or achieve the RAOs. Therefore, it was eliminated from further detailed evaluation.

The remaining three alternatives *do* meet the threshold criteria and are analyzed in the following sections.

8.4. Description of the Remedial Alternatives Retained for Detailed Analysis

The following descriptions of remedial alternatives are presented as they would be implemented. These descriptions also define how the alternative achieves the RAOs.

8.4.1. Common Activities for the Retained Alternatives

Certain activities are common to all of the retained remedial alternatives, except No Action. The common activities/steps are:

1. **Property preparation:** Preparation of the Property will be started once approval to proceed is received from Ecology. During this task, all stored materials (pipe, and physical debris) will be removed from the areas to be excavated. Manufacturing material will also be staged for disposal or recycle. The work area will be prepared to create a safe working environment and the stockpile areas will be built.
2. **Installation of a slurry/grout wall:** Construct a Slurry/Grout wall of highly durable, impermeable, engineered materials along the Property boundary to minimize or eliminate lateral migration of perched water on-Property or off-Property. The slurry/grout wall will either be installed using standard excavation techniques or through direct injection. If excavation is involved, the overburden will be excavated and stockpiled prior to the start of the excavation of affected soils. Where necessary, the overburden will be field-screened using an X-ray fluorescence instrument (XRF) to determine if it is to be used as backfill. This is particularly important at sections of the Property were a geotextile barrier has not been placed at the overburden/impacted soil interface during an IA.
3. **Treatment of the perched water:** Treat the resident perched water using an EC treatment system to be designed during remedial design phase and installed as part of the cleanup action. The treated water will be returned to the perched water body, recycled and re-treated until the concentration of arsenic in water extracted for treatment is equal to or lower than the perched water REL.
4. **Excavation, stockpiling and analysis of overburden:** Overburden will be excavated and stockpiled prior to the start of the excavation of affected soils. Where necessary, the overburden will be field-screened using an XRF to determine if it is to be used as backfill. This is particularly important at sections of the Property were a geotextile barrier has not been placed at the overburden/impacted soil interface during an IA.
5. **Excavation of soil above the DCREL**: Soil with COC concentrations above the DCREL will be excavated to the depth delineated by the RI-OSS or by additional sample data. This soil/fill mixture will be stockpiled in the stockpile area for dewatering prior to disposal.
6. **Screening of the stockpiled soil/fill mixture to reduce volume:** Screen the excavated soil to remove any recoverable debris. The recovered soil and debris will be stockpiled separately.

7. **Verification sampling and analysis of the stockpiled soil and debris:** Analyze both the stockpiled soils and recovered debris to determine their regulatory status and stockpile for stabilization and/or disposal.
8. **Verification sampling and analysis of the excavation:** Post-excavation verification soil samples will be collected from the excavated area and analyzed by an XRF and, if needed, by an analytical laboratory. Analytical results will be evaluated to determine compliance with CLs and RELs. If soil remaining in the excavation does not meet Property RELs, additional excavation and verification sampling and analysis will be performed.
9. **Haul/stockpile:** Excavated soil will be transported directly to a central area and stockpiled in preparation for treatment or disposal.
10. **Disposal**: Dewater excavated soils with COC concentrations greater than the DCREL and load and transport to either the ChemWaste or Waste Management landfill in Arlington, Oregon (based upon stockpile sampling results) for disposal.
11. **Construction of a cover**: In general, this action will involve the construction of a minimum of four inches of gravel over a geotextile liner. The thickness of this cover will depend on the requirements of the Property's storm water permit. This cover system would act as the human health exposure barrier.

8.4.2. Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction

General Process: In addition to the tasks/steps listed in Section 8.4.1 above, this alternative would involve the following:

- Excavate and stockpile soil/fill with COC concentrations greater than the SPWREL but less than the DCREL in OUs 1,2, and 3;
- Process this soil/fill by screening (step 6 above), dewatering and stabilizing the soil/fill fraction to meet performance goals, and reuse the stabilized soil as backfill in the excavation. This would require the design and installation of an on-Property soil processing plant; and,
- Apply a deed restriction on the Property restricting it to industrial use.

The volume of impacted soil associated with all the OUs is presented on Table 6-1. Additional excavation would be required if analytical testing showed that the average residual concentrations of COCs were greater than RELs.

8.4.3. Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil in OUs 1,2, and 3, > Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction

General Process: In addition to the tasks/steps listed in Section 8.4.1 above, this alternative would involve the following:

- Excavate and stockpile soil with COC concentrations greater than the SPWREL but less than the DCREL in OUs 1,2, and 3;
- Dewater soils, based upon stockpile sampling results, transport, along with the soils with COC concentrations greater than DCREL, to either the ChemWaste or Waste Management landfill in Arlington, Oregon for disposal; and,
- Apply a deed restriction on the Property restricting it to industrial use.

8.4.4. Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction

General Process: In addition to the tasks/steps listed in Section 8.4.1 above, this alternative would involve the following:

- Excavate soil with COC concentrations greater than the MTCA direct contact industrial CL;
- Excavate soil/fill with COC concentrations greater than the MTCA soil-to-perched water CL in OUs 1,2, and 3;
- Load and transport, once dewatered, these excavated soils to either the ChemWaste or Waste Management landfill in Arlington, Oregon (based upon stockpile sampling results) for disposal; and,
- Apply a deed restriction on the Property restricting it to industrial use.

A cover would not be required with this alternative, but would be necessary to comply with the Property's storm water permit. The volume of impacted soil associated with all the OUs is presented on Table 6-1.

8.5. Comparative Analysis

The five cleanup action alternatives defined in Chapter 7 were evaluated against the four MTCA threshold criteria, and Alternatives 1 and 2 were eliminated in Section 8.3. The following comparative analysis of the three retained remedial alternatives was conducted in order to identify the preferred alternative. The advantages and disadvantages of each retained alternative are identified and compared against the other remedial alternatives to determine their relative performance with respect to each criterion. Figure 8-1 presents the overall process that was used to evaluate technologies and alternatives.

The criteria used for the comparative detailed analysis of remedial alternatives include the MTCA balancing criteria, the MTCA disproportionate cost/benefit evaluation criteria (WAC 173-340-360(3)(e)), as well as a consideration of health and safety and the environmental sustainability of each alternative. Thus, the criteria used to evaluate the retained alternatives include the following[6]:

- Protectiveness;
- Permanence;
- Effectiveness Over the Long Term;
- Management of Short-term Risks;
- Technical and Administrative Implementability;
- Restoration Time Frame;
- Consideration of Public Concerns;
- Sustainability;
- Safety; and,
- Cost;

The comparative analysis that follows describes the evaluation criteria, presents the most favorable alternative first, and includes the remaining remedial alternatives in decreasing order of ability to satisfy these criteria.

8.5.1. Protectiveness

This evaluation criterion addresses Ecology's preference for selecting remedial alternatives that are protective. This evaluation focuses on the degree of protection each technology provides to human health and the environment. All three of the retained remedial alternatives meet the MTCA threshold criterion of protecting human health and the environment by addressing the concentrations of constituents in the soil and perched water above the associated CLs or RELs. As such, all three of the retained alternatives will meet the RAOs, improve environmental quality, and be protective.

8.5.2. Permanence

This evaluation criterion addresses Ecology's preference for selecting remedial alternatives that use treatment technologies that permanently and significantly reduce toxicity, mobility, and volume of the constituents in Property soils. This evaluation also focuses on the ability of remedial alternatives to reduce the total volume of impacted soils, and irreversibly reduce mobility and toxicity of the constituents.

[6] The MTCA criterion to "Use permanent solutions to the maximum extent practicable" includes Protectiveness, Permanence, Effectiveness over Long-term, Management of Short-term Risks, Technical and Administrative Implementability, and Cost criteria.

Toxicity Reduction

This evaluation is based on the ability of the alternative to destroy or convert the Property COCs to a less toxic form. Lead and arsenic in Property soils are elements, and thus, they cannot be destroyed, per se. However, they can exist in the environment as various organic and inorganic complexes, which can have reduced bioavailabilty in living systems. In risk terms, a reduction in bioavailability is comparable to a reduction in toxicity, since the delivered dose of the constituent is reduced proportional to a reduction in its bioavailability.

Analysis

None of the retained remedial alternatives are intended to reduce the toxicity of lead or arsenic in soil. However, *Alternative 3* includes soil stabilization, which will likely result in decreased bioavailability of lead and possibly arsenic in soil (Ecobond, 2014). MT2 performed a study with lead-based paint treated with Ecobond® (the same material that was used in the Superlon soil treatability study) using an USEPA in-vitro bioaccessibility test, and found that there was a 50% to 75% reduction in relative lead bioavailability. Thus, in at least a qualitative sense, a reduction in lead bioavailability in soils treated with this same reagent can be expected.

Mobility Reduction

The reduction of mobility is based on the alternative's ability to permanently prevent constituents from being transported in the environment. The potential exposure pathways considered in this FS are direct contact and impacts to groundwater. All three remedial alternatives involve excavation and disposal of soil above the DCRELs and would permanently reduce the potential for direct contact exposure in the excavation area by removing the source of COCs. The following discusses the relative magnitude of the reduction in mobility achieved by each alternative.

Analysis

All alternatives would include an element of off-Property disposal at a controlled landfill, where the mobility of the COCs will be controlled with liner and cap containment for the long term.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction disposes of the greatest volume of soil, and thus would have the greatest reduction in mobility resulting from off-site disposal.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction results in the disposal of the second greatest volume of soil being relocated to an off-Property landfill.

While *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction* disposes of a relatively smaller volume of soil at an off-Property landfill, it does directly reduce the mobility of the COCs as part of the stabilization process, which makes it equivalent to *Alternative 4* in reducing mobility.

Total Volume Reduction:

Reduction of the volume of impacted soils is compared in this evaluation. Because metals are present in Property soils, destruction/reduction is not an option; thus, only soil volume reduction is considered. The following discusses the volume of soil that will be removed from the Property by each alternative.

Analysis

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction would result in the greatest amount of soil being removed from the Property and placed in an engineered landfill.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SGREL in OUs 1,2, and 3, Excavate and Dispose of Soils > GWCL in OUs 4, and 6, Cover Property, Apply Deed Restriction would result in the second greatest amount of soil being removed from the Property and placed in an engineered landfill.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction will increase the volume of stabilized soils that are to be reused on-Property by the amount of treatment material added during the stabilization process in OUs 1,2, and 3, but will reduce the overall volume due to the separation and removal of debris. Also, under *Alternative 3* soils above the DCREL will be excavated and transported from the Property and placed in an engineered landfill.

8.5.3. Effectiveness over the Long Term

Long-term effectiveness measures the effectiveness of the cleanup action after the cleanup action has been completed. The primary focus of this comparison is to weigh the controls that may be necessary to manage the treatment residuals or untreated soil. This is done in two ways: by assessing the magnitude of the residual risk; and by assessing the adequacy of the individual controls to manage the treatment residuals or untreated soil. This long-term effectiveness comparison does not consider the residual risk or controls that may be associated with the off-Property landfill remedial alternatives. The evaluation of "certainty of success" was omitted from this evaluation since each of the cleanup remedial alternatives being evaluated will need to attain cleanup goals before demobilization can occur. The cleanup of the Property will be performed over a period of time during which "success" can be measured with a high degree of certainty for each process. The following section discusses the relative magnitude of each alternative related to long-term management risk.

Magnitude of Residual Risk on Property

Each remedial alternative will have low residual risk since each will leave only acceptable concentrations of constituents (below either CLs or RELs) on Property. Some remedial alternatives have less residual risk than others. Excavation of soil above the REL means that the Property meets the RELs, which are based on acceptable levels of risk. The following discusses the relative magnitude of each alternative related to residual risk.

Analysis

All the analyzed alternatives are considered permanent solutions. Environmental audits of appropriate off-Property landfill facilities have determined that current controls implemented at those facilities are acceptable. In *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2,and 3, Cover Property, Apply Deed Restriction* soils with COC concentrations above the SPWREL would be stabilized to reduce their leachability to below the SPWREL, thereby eliminating the soil-to-perched water pathway. Placement of a cover would reduce the potential for human and ecological exposure to the stabilized soils.

Adequacy and Reliability of Controls

The adequacy and reliability of controls relate to future land uses at the Property. The Property is zoned for industrial use and that designation is unlikely to change. The development of RELs took this fact into account. Non-potable groundwater standards were used to develop RELs which were protective of groundwater for both soil and perched water.

Analysis

Of the three alternatives retained for analysis, *Alternatives 3 and 4* will rely on the Property remaining industrial. Since the Property is currently zoned industrial, and since a deed restriction specifying ongoing industrial land use will be a component of these remedies, the future land use controls are adequate.

8.5.4. Management of Short-Term Risks

This evaluation criterion addresses the effects of the alternative during the construction and implementation phases of the cleanup action. Each alternative is evaluated with respect to the potential impact on human health in the surrounding community, Property workers, and the environment.

Potential Community Exposure during Implementation

This aspect of short-term effectiveness addresses any exposures that may result from implementation of the proposed alternative, such as dust generation during materials handling and transportation, or air emissions resulting from equipment operation. Dust generation may require monitoring so that the level of dust generated during soil handling does not exceed allowable levels in downwind areas. Dust control methods (e.g. applying water to work areas prior to and during excavation) could be required. The air quality impacts may be monitored to protect both Property and surrounding property workers' health and safety. Soil excavation and handling done along the southern boundary of the Property would require perimeter dust monitoring and dust prevention measures.

The high moisture content of the excavated soils and fill is one of the most significant factors mitigating significant dust generation. While transportation (by truck or rail) of soils off-Property has a low potential to result in exposure, such exposures due to releases of soil or wastes during transport is known to occur. As a result, the quantity of material being transported to an off-Property landfill forms the basis for this evaluation.

The following discusses the relative magnitude of each alternative to result in risks associated with community exposure during implementation.

Analysis

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2,and 3, Cover Property, Apply Deed Restriction will create the least potential for community exposure during implementation. This alternative requires the smallest volume of soil transport, since soils/wastes from OUs 1,2, and 3 are intended to be stabilized and reused on-Property. It will require excavation of soils for stabilization and/or disposal, but it is unlikely due to high moisture content that this activity will increase community exposure during implementation.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction will require the second highest volume of soil disposal of the three alternatives, and will require greater controls to minimize risk associated with off-Property dust generation. Truck traffic would also be greater than *Alternative 3,* due to a relatively larger volume of material being shipped off site, and a relatively larger volume of backfill being brought on site.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction presents the highest potential for community exposure during implementation. This alternative requires the greatest amount of soil excavation and disposal and will require the most controls to minimize risk associated with dust generation. Truck traffic will also be greater than the other alternatives.

Potential Worker Exposure during Implementation

This factor assesses potential risks that may be posed to the workers, and the effectiveness and reliability of protective measures that would be taken during implementation of the cleanup action. Personal protective equipment (PPE) appropriate for the type of potential exposure would be worn to reduce worker exposure. Workers would be trained in the health and safety procedures appropriate for their respective tasks, and operation of equipment (trucks, backhoes, and other heavy equipment) and would comply with the appropriate safety regulations.

Each of the remedial alternatives would generate dust and/or require transportation to a landfill during implementation. Dust generation will be managed by wetting the soil during handling, paving the centralized treatment area, and/or covering stockpiles when not adding or removing material. Transportation of soil to the landfill will be managed by conforming to applicable DOT regulations. Each of the remedial alternatives will also involve excavation during installation of the Slurry/Grout wall. This would potentially increase safety risks to workers on the Property.

The following discusses the relative magnitude of each alternative to the reduce risks associated with worker exposure during implementation. The total volume of material handled and the use of water or extraction solutions are the primary criteria for this evaluation. Exposure to pre-treated or treated water will be the same under each alternative. As such, the total volume of soil and fill material handled is the primary criteria for this evaluation.

Analysis

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction requires the least excavation of soils, and thus represents least potential for worker exposure during implementation. Management of dust generated during the excavation and disposal of soils greater than the DCREL, during the excavation, stabilization and disposal of soils/waste greater than the SPWREL, and during construction of the slurry/grout wall and cover will be necessary.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction requires the same amount of soil excavation as *Alternative 4*. It does, however, have the additional stabilization step that could generate local dust, if the soils are dry. This added step could increase the potential for worker exposure during implementation. Management of dust generated during the excavation and disposal of soils greater than the DCREL, stabilization and disposal of soils/wastes greater than the SPWREL, and the construction of the slurry/grout wall and cover will be necessary.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction requires the greatest amount of soil excavation, and thus represents greatest potential for worker exposure during implementation. Management of dust generated during the excavation and disposal of soils greater than the MTCA direct contact CL in OUs 4 and 6, excavation and disposal of soils/wastes above the SPWREL in OUs 1,2 and 3, and the construction of the slurry/grout wall and cover will be necessary.

Potential Environmental Impacts

This factor addresses the potential adverse environmental impacts that may result from the implementation of the alternative, and evaluates the mitigation measures that could be implemented to prevent or reduce these impacts. Potential environmental impacts include, but are not limited to, dispersion of constituents; treatment water releases; spills; and wildlife exposure. All remedial alternatives have the same impacts during the initial excavation of soils and during the construction of the slurry/grout wall. Those remedial alternatives that include stabilization have the potential for additional impacts. The following discusses the relative magnitude of each alternative with regard to its potential environmental impacts during implementation.

Analysis

All of the alternatives have a low potential for environmental impacts. If spills occur from the loading of trucks or the stabilization plant, the effected soils will be promptly excavated and treated appropriately. The underlying soils will be sampled to ensure the completeness of any additional cleanup.

8.5.5. Technical and Administrative Implementability

The implementability criterion addresses the technical feasibility of implementing the alternative, and the availability of materials and services. This evaluation focuses on the:

- Ability and reliability of the technology to operate as would be required by the design and implementation schedule;
- Ease of undertaking additional cleanup actions; and,
- Availability of services and materials.

Additional criteria, such as availability of equipment, availability of commercially demonstrated technologies, administrative and regulatory requirements, scheduling, availability of appropriately sized equipment, construction access, and monitoring access, are considered to have minor impacts on the retained remedial alternatives being evaluated in this section.

Ability and Reliability of Technology

This evaluation relates to the technical difficulties and unknowns associated with the alternative. Technical problems associated with the implementation of the alternative may prevent attainment of the CLs or RELs or result in delays in the cleanup schedule. The following section discusses the magnitude of technical difficulties and unknowns associated with the retained alternatives.

Analysis

All three of the retained alternatives would be readily implementable. No delays in the excavation and stabilization process are anticipated. Application of these technologies as part of the interim action for Building B has demonstrated their viability. Trained professionals are readily available to conduct the remedial activities, including the construction of the slurry/grout wall.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction could be readily implemented. Since this alternative requires the least volume of soil to be transported for off-Property disposal, limitations associated with the availability of waste transport vehicles and landfill capacity would be less than the other alternatives. Stabilization technologies have been proven on large scales at several sites and have been successfully during IAs at the Property. Only minor delays associated with the startup of a process containing a number of mechanical operations are anticipated.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction could be limited by the availability of transportation and landfill capacity. While excavation and the capacity of the landfill is not a limiting factor in the past, transportation has been a limiting factor. The availability of qualified trucks can be problematic during the summer months when the majority of the disposal would be completed. The excavation and dewatering process would need to anticipate the availability of haul trucks. Without strong management, delays could be significant. As this alternative requires a lesser volume of soil disposal than *Alternative 5* this is the second most attractive alternative with respect to this criterion.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction could be limited by the availability of transportation and landfill capacity. While excavation and the capacity of the landfill has not been a limiting factor in the past, the volumes of material to be disposed under this alternative would dwarf the volumes handled historically. Transportation has been a limiting factor in the past. The availability of qualified trucks can be problematic during the summer months when the majority of the disposal would be completed. The excavation and dewatering process would need to anticipate the availability of haul trucks. Without strong management, delays could be significant. As *Alternative 5* requires the greatest volume of soil disposal this is the least attractive alternative with respect to this criterion.

Ease of Undertaking Additional Actions

This evaluation discusses what, if any, future cleanup actions may be necessary, and how difficult it would be to implement such additional actions after implementing one or more of the remedial alternatives.

Analysis

All the analyzed alternatives are considered to be permanent solutions. They will all meet RAOs. Further cleanup actions would not be anticipated following the implementation of these permanent treatment and/or disposal remedial alternatives.

Availability of Services and Materials

This evaluation criterion considers the availability of the materials and equipment necessary to implement the alternative, as well as the availability of contractors to provide competitive bids for the work. Cleanup actions directed toward soil impacted with lead and arsenic have been and are currently being implemented throughout the Northwest, North America, and Europe. Many vendors were questioned regarding the efficacy and availability of technology they use, and the information they provided was used in the screening of remedial alternatives. These same vendors continue to provide updates on their activities and new developments in the technologies in the form of soil treatment field demonstrations. The screening of remedial alternatives also identified remedial technologies that are not complex to operate and use common construction processes and equipment.

Analysis

Based on the above considerations, the availability of services and the necessary materials to achieve the RAOs are not anticipated to be a limiting factor, and are unlikely to impact schedule for any of the remedial alternatives.

8.5.6. Restoration Time Frame

This factor estimates the time required to complete the remedy and achieve the RAOs for the Property. RAOs will be achieved by each of the three retained alternatives.

All the alternatives could be implemented in a timeframe that is principally limited by the time to complete excavation, verification sampling and analysis and the time required to dewater the soils prior to loading and the loading and transport the contaminated soil off Property. The primary limiting factors are the small work area available at the Property, and the slow rate of dewatering (up to six months) to allow for stabilization and disposal. This space limitation will require that soil be excavated, dewatered and processed in not greater than 3,000 ton increments.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction will require time for the stabilization of impacted soils. The current concept for implementing *Alternative 3* includes the use of a processing plant to both dry and stabilize the soils, thereby reducing the time necessary to complete the remedy. Use of a processing plant would not be cost effective for *Alternatives 4 and 5*.

Analysis

The timeframe for each of the three retained remedial alternatives is principally limited by the time it takes to dewater material for treatment and/or disposed. Table 8-1 lists the timeframes (in days, and working years) of each retained alternative.

By using a processing plant to both dry and stabilize the soils *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2 and 3, Cover Property, Apply Deed Restriction* would be the quickest to achieve RAOs at 2.4 years to complete.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction requires a greater amount of soil excavation than *Alternative 3*. However, it would involve dewatering and disposal of less material than the remaining *Alternative 5*, and thus would be the second quickest alternative, with a duration of 3.8 years.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction requires the greatest amount of soil excavation, dewatering and disposal, and would require a significantly longer time to achieve the RAOs, with a timeframe of approximately 6.4 years.

8.5.7. Consideration of Public Concerns

MTCA calls for the evaluation of any local community concerns over the alternative and how the alternative addresses those concerns. Concerns over long-term and short-term public health have been addressed above. Concerns related to any additional short-term impacts, not covered above, are focused on concerns over truck traffic. A ranking of concerns related to this additional short-term impact is presented below.

Analysis

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction represents the least potential for public concern, since it is the alternative with the least volume of soil leaving the

Property (approximately 1,300 trucks) and, with the installation of the Cover, will minimize the potential for exposure.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction would require approximately 1,860 truckloads and, thus, has the second highest potential for public concern.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction would require approximately 4,600 truckloads and, thus, has the highest potential for public concern.

8.5.8. Sustainability

Sustainability is an appropriate screening criterion because the Companies are committed to incorporating sustainability into the decision making processes. The "sustainability" of each alternative is measured and compared against all other remedial alternatives by evaluating a standardized set of environmental stressors. The following environmental stressors were determined to be the appropriate factors in evaluating sustainability:

- Greenhouse gas emissions
- Airborne particulates/toxic vapors
- Solid waste production
- Soil structure disruption
- Noise/odor/vibration/aesthetics
- Traffic
- Land Stagnation
- Petroleum use
- Construction materials
- Land & space

While sustainability is not specifically required under MTCA as a separate screening criterion, it is recognized as very important in today's environment, and was included in this analysis. Of the environmental stressors listed above, the greatest impact from implementing the listed alternatives will be the emission of greenhouse gases and consumption of petroleum resulting from waste transport by truck. Thus, a surrogate for the evaluation of both of these impacts can be the number of truck miles required to complete the alternative.

Analysis

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction would create the least greenhouse gases of the alternatives. Approximately 1,300 trucks would be required to complete the remediation of the Property using this alternative. Approximately 880 of these trucks would be used for hauling backfill and cover soils, an approximately 12 mile roundtrip. Approximately 420 of these trucks would travel approximately 550 miles to dispose of waste at the landfill. This would result in a total of 241,560 truck miles associated with *Alternative 3*, which is the lowest of the three alternatives.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction will create marginally more greenhouse gases than *Alternative 3,* due to the transport of additional backfill and waste material. Approximately 1,860 trucks would be required to complete the remediation of the Property using this alternative. Approximately 1,280 of these trucks would be used for hauling backfill and cover soils an approximately 12 mile roundtrip. Approximately 580 of these trucks would travel approximately 550 miles to dispose of waste at the landfill. This would result in a total of 334,360 truck miles associated with *Alternative 4*, which is approximately 40% more than *Alternative 3*.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction creates the most greenhouse gases of the alternatives. Approximately 4,600 trucks would be required to complete the remediation of the Property using this alternative. Approximately 2,680 of these trucks would be used for hauling backfill and cover soils the approximately 12 mile roundtrip (32,160 miles). Approximately 1,920 of these trucks would travel approximately 550 miles to dispose of waste at the landfill. This results in a total of 1,088,160 truck miles for *Alternative 5*, which is four times more than *Alternative 3* and three times more than *Alternative 4*. Thus, *Alternative 5* is the least sustainable alternative with respect to greenhouse gas emissions and petroleum consumption.

8.5.9. Safety

This criteria was included because the Companies believe that worker safety is always a primary consideration when performing any work, and because safety is an ARAR under the Washington Industrial Safety and Health Act (RCW 49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926).

Each of the alternatives would represent a significant safety risk without proper training and Health and Safety procedures. Written procedures would need to be established and an exclusion zone created to minimize this potential. All remediation workers would require appropriate training.

Analysis

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction represents the least potential for work place safety risks because it involves the least amount of material handling. It does require a greater time, and hence greater occupational exposure hours, to meet RAOs than *Alternative 3*. This could potentially increase safety risks on the Property not only to those implementing the action, but to other workers on the Property.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction represents the second least potential for worker safety risks. This alternative will involve the excavation and processing of all impacted soil above the SPWREL in OUs 1,2, and 3. It will also involve the potential exposure to these same soils SPWREL during stabilization. This could potentially increase safety risks on the Property not only to those implementing the action, but to other workers on the Property.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction represents the highest potential for work place safety risks as it requires the greatest volume of soil excavation, dewatering and disposal and requires the greatest time to meet RAOs. This would potentially increase safety risks on the Property not only to those implementing the action, but to other workers on the Property.

8.5.10. Cost

This evaluation includes an assessment of costs that may be incurred to implement the cleanup action. The evaluation considers three cost categories: direct costs; indirect costs; and long-term operation and maintenance (O&M) costs, and presents the total cost for each alternative.

Direct Capital Costs

Direct capital costs are considered to be those costs associated with the implementation of each alternative. These costs are associated with construction, equipment, Property preparation, operation/maintenance, and disposal. Direct costs were obtained from several sources, including vendor solicitations, previous experience, and actual costs for disposal of soil generated during IAs at the Property.

Analysis

From Table 8-1, the direct capital costs for *Alternatives 3 and 4* are \$4.3 MM and \$4.8MM, respectively, while the direct capital cost for *Alternative 5* is \$9.8MM. This makes *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction* the most attractive with respect to direct capital costs.

Indirect Capital Costs

Indirect capital costs are those costs associated with administration, community relations, engineering design, construction oversight, and contingency for the alternative. These costs were estimated based on previous experience during interim actions.

Analysis

From Table 8-1, the indirect capital costs for *Alternatives 3 and 4* are \$0.6MM and \$0.8MM, respectively, while the indirect capital cost for *Alternative 5* is \$1.5MM. This makes *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction* the most attractive with respect to indirect capital costs.

Long-Term Operation and Maintenance Costs

Long-term O&M costs associated with site remediation activities typically include items such as long-term monitoring, cap and cover maintenance, site security maintenance, etc. They are most often associated with a site where there is an active on-going operation after completion of the remedy that is necessary to maintain the protectiveness of the site.

Analysis

All the analyzed alternatives are considered to be permanent solutions. They will all meet RAOs. Further cleanup actions and ongoing long-term maintenance would not be anticipated following the implementation of these alternatives. Any minor maintenance of the cover would likely be conducted as part of the normal operations of the business interest occupying the site, and would be similar for each of the alternatives.

Summary Cost Analysis

The following and Table 8-1 presents an estimate of the total anticipated costs associated with each alternative.

Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction represents the lowest cost estimate, ranging between $4.1MM and $5.6MM.

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4 and 6, Cover Property, Apply Deed Restriction represents the second highest cost estimate ranging between $4.8MM and $6.5MM. The midpoint of this range is approximately 1.2 times higher than the midpoint cost for *Alternative 3.*

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction represents the high cost alternative, with a cost estimate ranging between $9.5MM and $13.0MM. The midpoint of this range is approximately 2.3 times higher than the midpoint cost for *Alternative 3* and approximately 2.0 times higher than the midpoint cost for *Alternative 4*.

8.5.10.1. Disproportionate Cost Analysis

According to MTCA (WAC 173-340-360(3)(e)), costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative. Using this definition the costs of *Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction* are clearly disproportionate to benefits over the other analyzed alternatives. The protectiveness, permanence, effectiveness over the long-term (especially as it applies to risk), management of short-term risks, consideration of public concerns, and technical and administrative implementability of *Alternative 5* is no greater than the other analyzed alternatives and its cost is disproportionately higher.

8.5.10.2. Accuracy of Estimate

The estimates presented on Table 8-1 present the range of estimated total costs. These estimates of remedial action cost are assumed to be accurate to within +/-15 percent. In effect, the "Best Estimate" remedial action cost would be the midpoint between the high and low estimate. Thus, cost estimates that overlap once the +/-15 percent factor is applied should be considered equal for the purpose of this evaluation.

8.5.11. Summary of the Detailed Analysis

A comparative detailed analysis of the three remaining remedial alternatives was conducted based on their performance against the MTCA criteria of protectiveness, permanence, effectiveness over the long-term, management of short-term risks, technical and administrative implementability, restoration time frame, consideration of public concerns, and cost. The remaining alternatives were also ranked with respect to their environmental sustainability and their implementation safety.

The results of the comparative detailed analysis were quantified by assigning a numeric score between 1 and 5 to each alternative for each of the evaluation criteria. A score of 1 was assigned to the best alternative, while a larger numeric score (up to 5) was assigned to the worst performing alternative. Generally, an alternative was only assigned a score of 4 or 5 if it significantly underperformed relative to the other alternatives for a given criteria. In cases where it was not possible to distinguish performance between remedial alternatives, those remedial alternatives were discussed together and given equal scores. Table 8-2 presents the scoring for the alternatives. The scores for each evaluation criteria category (e.g. long-term effectiveness, implementability, etc.) and the overall score for the sum of all criteria are presented in the bottom row of each table. Note that the lowest score indicates the best performance. The results obtained using this method are based on an equal weighting of each sub-criteria. This approach is consistent with MTCA guidance, which emphasizes the permanence of the selected remedial alternatives.

Analysis

Based on the numeric ranking described above, *Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Soils > SPWREL in OUs 1,2, and 3, Cover Property, Apply Deed Restriction* scores the most favorably, with an overall score of 20. *Alternatives 4 and 5* have higher scores (less desirable) of 23 and 41, respectively.

Of the three alternatives, *Alternative 3* can be implemented in 2.4 years at an estimated cost of $4.8MM, has the lowest potential for public concerns, and is the most sustainable alternative. *Alternative 4* can be implemented in 3.8 years at an estimated cost of $5.6MM, has similar potential for public concerns with *Alternative 3*, and is similar to *Alternative 3* in terms of sustainability. *Alternative 5* can be implemented in 6.4 years (over twice as long as the other alternatives), at an estimated cost of $11.2MM, has the highest potential for public concerns, and is by far, the least sustainable alternative.

Based on this analysis*, Alternative 3* is the preferred on-Property alternative for the Property.

8.6. Preferred Alternative

***Alternative 3: Installation of a Slurry/Grout Wall, Treatment of Perched Water, Excavation and Off-Property Disposal of Soils > DCREL in OUs 4 and 6, Ex-Situ Stabilization of Soils > SPWREL in OU 1, OU2 and OU3, and Cover* is the preferred alternative based the detailed analyses of remedial alternatives as reflected in the scoring presented in Table 8-2.**

Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1,2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4 and 6, Cover Property, Apply Deed Restriction is the secondary alternative.

Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > MTCA Defaults, Cover Property, Apply Deed Restriction received the highest score making it the least attractive alternative, and its cost is considered to be disproportionate to its benefits, relative to the other alternatives. It also requires significantly more time to reach RAOs.

Since neither *Alternative 1: No action*, nor *Alternative 2: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL, Cap and Cover Property, Apply Deed Restrictio*n do not meet the threshold criteria in MTCA, they were not ranked.

As the preferred alternative, the conceptual design for *Alternative 3* is described in Chapter 9.

Chapter 8 Tables

This page has been left blank intentionally to allow for double-sided printing.

Table 8-1: Estimated Cost of Implementation – Retained Alternatives

	Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in Ous 4 and 6, Excavate and Stabilize Additional Soils > SPWREL in OUs 1, 2 and 3, Cover Property, Apply Deed Restriction	Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1, 2, and 3, Excavate and Dispose of Soils > GWCL in OUs 4, and 6, Cover Property, Apply Deed Restriction	Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate Soil > MTCA Defaults and cover, Deed Restriction
Direct Costs			
Perched Water Treatment	**494,949**	**494,949**	**494,949**
Construction of Slurry Wall	289,000	289,000	289,000
Analytical Testing (Slurry Wall Waste)	7,856	7,856	7,856
Cost of Treatment Plant	150,000	150,000	150,000
Analytical Testing (Treated Water)	48,093	48,093	48,093
Soil Treatment	**3,772,487**	**854,134**	**1,601,330**
Cost of Overburden removal/Stockpiling	358,494	358,494	358,494
Analytical Testing (Overburden)	10,711	10,711	10,711
Cost of Excavation - Impacted Soil	471,001	471,001	1,197,020
Verification Sampling and Analysis	13,928	13,928	35,105
Cost of Debris Screening	Part of Processing Cost	88,313	Not Cost Effective
Analytical Testing (Debris)	Part of Processing Cost	4,586	Not Cost Effective
Dewatering of Impacted soil	Part of Processing Cost	52,000	78,000
Stabilization of Impacted Soil (HAZ)	848,490	848,490	848,490
Process Soil (Stabilization/Drying)	450,000	Not Cost Effective	Not Cost Effective
Disposal of Waste ALL Soil	828,736	1,449,922	4,904,971
Disposal of Debris	255,921	266,647	Not Cost Effective
Backfilling of Excavation	478,731	700,188	1,780,839
Cover Construction	56,475	56,475	56,475
Total Direct Cost	**4,267,436**	**4,815,703**	**9,765,054**
Indirect Costs			
Project Management & Legal	213,372	240,785	488,253
Construction Oversight	391,235	608,585	1,028,585
Contingency NOT INCLUDED PER MTCA	N/A	N/A	N/A
Total Indirect Cost	**604,607**	**849,370**	**1,516,838**
TOTAL COST OF ALTERNATIVE	**4,872,042**	**5,665,073**	**11,281,891**
15% LOW	4,141,236	4,815,312	9,589,608
15% HIGH	5,602,849	6,514,834	12,974,175
TIME REQUIRED (DAYS)	373	580	980
WORK YEARS	2.4	3.8	6.4

Table 8-2: Scoring of the Alternatives

Criteria	Alternative 3: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > DCREL in OUs 4 and 6, Excavate and Stabilize Additional Soils > SPWREL in OUs 1, 2 and 3, Cover Property, Apply Deed Restriction	Alternative 4: Install a Slurry or Grout Wall/Treat PW, Excavate and Dispose of Soil > SPWREL in OUs 1, 2, and 3, Excavate and Dispose of Soils > DCREL in OUs 4, and 6, Cover Property, Apply Deed Restriction	Alternative 5: Install a Slurry or Grout Wall/Treat PW, Excavate Soil > MTCA Defaults and Cover, Deed Restriction
Protectiveness	1	1	1
Permanance			
Toxicity Reduction	1	1	1
Mobility Reduction	1	1	1
Total Volume Reduction	2	1	1
Effectiveness Over the Long Term			
Magnitude of Residual Risk on Property	1	1	1
Adequacy and Reliability of Controls	1	1	1
Management of Short-term Risks			
Potential Community Exposure during Implementation	1	2	5
Potential Worker Exposure during Implementation	2	1	3
Potential Environmental Impacts	2	2	2
Technical and Administrative Implementability			
Ability and Reliability of Technology	1	1	1
Ease of Undertaking Additional Actions	1	1	1
Availability of Services and Materials	1	1	1
Restoration Time Frame			
Time to Achieve RAOs	1	2	5
Consideration of Public Concerns			
Consideration of Public Concerns	1	2	5
Sustainability	1	2	5
Safety	1	1	2
Cost	1	2	5
TOTAL	***20***	***23***	***41***

Note:

The scores for each evaluation criteria category (e.g. long-term effectiveness, implementability, etc.) and the total score for the sum of all criteria are presented in the bottom row of each table. Note that the lowest score indicates the best performance. The results obtained using this method are based on an equal weighting of each sub-criteria. This approach is consistent with MTCA guidance, which emphasizes the permanence of the selected remedial alternatives.

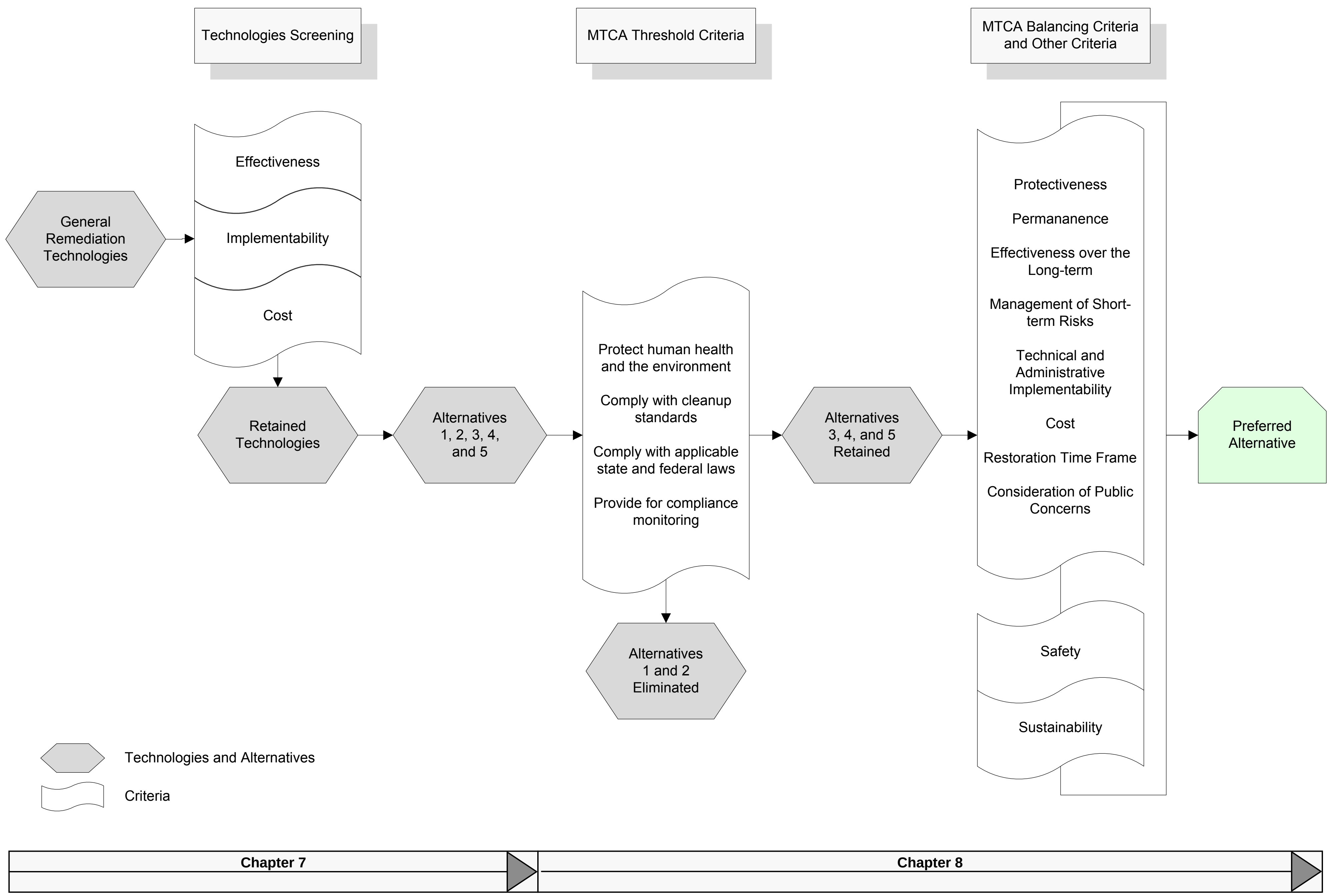
Ratings were assigned to each criterion using the following scale:

1 = Excellent
2 = Very Good
3 = Good
4 = Fair
5 = Poor

Chapter 8 Figures

This page has been left blank intentionally to allow for double-sided printing.

Figure 8-1: Technologies and Alternative Evaluation Process



This page has been left blank intentionally to allow for double-sided printing.

Chapter 9. CONCEPTUAL DESIGN OF THE PREFERRED REMEDIAL ALTERNATIVE

9.1. Introduction

This chapter describes how the Property cleanup can be achieved using the preferred remedial alternative. Section 9.2 describes how the preferred alternative will be implemented to achieve RAOs. Section 9.3 presents an estimate of the total remediation cost for remediation of on-Property soils and perched water, and an estimate of the time necessary to implement the preferred alternative.

9.2. Conceptual Design of the Preferred Alternative by OU

A provision of the preferred alternative that applies to all OUs will be the placement of a deed restriction on the Property that specifies its on-going industrial land use. The remainder of this section describes the preferred remedial alternative and how it will be applied to each OU. The alternative includes the following four sub-units:

OU1 - Building B; OU2 - Building A; OU3 – Mixed Waste with Gypsum/lime:

Overburden materials in these OUs will be removed and stockpiled. Using data from the RI-OSS, wastes and soils in these areas will be excavated to a depth and areal extent predicted to remove sufficient material to meet compliance with the SPWRELs (Table 5-7). In the event that the initial excavation fails to remove sufficient material to produce compliance with the SPWRELs (based on post-excavation testing), additional material will be removed laterally and/or vertically until confirmation sampling of the excavation bottom and/or sidewalls demonstrates compliance with the RELs. Compliance with RELs will be evaluated using statistical tools in accordance with WAC 173-340-740(7)(d) – (f). All soil excavation will be completed in a manner that avoids undermining structures that will remain after the completion of the cleanup action.

The targeted soils/fill will be screened to separate the soil/fill from debris. The soil/fill and debris will be stockpiled separately and sampled to determine their regulatory status (i.e., hazardous or non-hazardous). If the debris is non-hazardous, it will be transported to a non-hazardous waste landfill. After dewatering, the screened soil/fill will undergo treatment to stabilize it to meet project performance (leachability) criteria. Following treatment, the soil/fill will be re-stockpiled and sampled to ensure that the SPWRELs are met. If the material does not meet the SPWREL, it will go through a second stabilization step and be re-sampled. This process will continue until project performance (leachability) criteria are met. The soil/fill will then be returned to the excavation and covered with a geotextile material and a minimum of four inches of compacted gravel.

In order to safely remediate the soils underlying Building A in OU2, this structure may need to be demolished. In this event, all appropriate actions to safely demolish Building A and dispose of the ensuing debris will be taken.

OU4 – General Mixed Waste; OU6 – Shot Area 2:

Overburden materials in these OUs will be removed and stockpiled. Using data from the RI-OSS, wastes and soils in these areas will be excavated to a depth and areal extent predicted to remove sufficient material to meet compliance with the DC RELs. In the event that the initial excavation fails to remove sufficient material to produce compliance with the DC RELs (based on post-excavation testing), additional material will be removed laterally and/or vertically until confirmation sampling of the excavation bottom and/or sidewalls demonstrates compliance with the DC RELs. Compliance with DC RELs will be evaluated using statistical tools in accordance with WAC 173-340-740(7)(d) – (f). All soil excavation will be completed in a manner that avoids undermining structures that will remain after the completion of the cleanup action.

OU7 – Perched Water:

This OU is located Property wide, but predominately in OU1 and OU2. The volume of water is unknown largely due to its discontinuous nature, but at a minimum is estimated to range between roughly 850,000 and 1.5 million US gallons.

The following will be completed to address the impacted perched water**:**

- A Slurry/Grout wall will be installed along the Property boundary. This wall will be completed from 6 inches bgs down to the first clay layer, which ranges in depth from 10 to 13 feet bgs. A GeoProbe will be used to determine the depth of the wall prior to start of installation. Any overburden will be excavated and stockpiled prior to the start of the excavation. Where necessary, the overburden will be field-screened using an XRF to determine if it is able to be used as backfill. This is particularly important at sections of the Property where a geotextile barrier has not been installed previously at the overburden/impacted soil interface during an IA. Installation of this wall will effectively bound the on-Property perched water, and will minimize or eliminate the lateral migration of perched water to/from off-Property. Once the wall is installed, treatment of on-Property perched water will begin.
- The perched water will be treated using an active treatment system designed during Remedial Design and installed on-Property. The treated water will be returned to the perched water body and re-recycled until the water extracted for treatment is equal to or lower than the perched water RELs described in Section 5.4.

OU5 – Shot Area 2:

Waste in this area came to be present in its current location as a result of filling on the adjacent Property, and will not be addressed further in this FS-OSP. Ecology will determine the need for other parties to Investigate (and possibly remediate) wastes in this OU.

9.3. Cost and Timing of the Preferred Alternative

The anticipated cost[7] of the preferred alternative ranges from \$4.1MM and \$5.6MM (see Table 8-1). The actual estimate of costs will be presented to Ecology following Remedial Design. The completion of this

[7] Cost for the implementation of the remedy and costs directly associated with the remedy. It does not include costs for other items since as reporting.

alternative is estimated to require 2.4 years, assuming that a design that will provide expedited soil/fill dewatering can be developed[8].

[8] Timeframe for the implementation of the remedy and time directly associated with the remedy. It does not include time for other items since as reporting.

This page has been left blank intentionally to allow for double-sided printing.

FS-OSP Appendix A Letters and Other Documentation of Property-Specific Determinations

10/10/2014

This page has been left blank intentionally to allow for double-sided printing.

Appendix A
Superlon Plastics Property,
Tacoma, Washington

Contents

Appendix A contains the following correspondence:

Attachment 1: Ecology. 2011. Letter from Marv Coleman to Tim Bingman Regarding Area of Contamination Designation for the Superlon Property, March 7.

Attachment 2: Ecology. 2013. Electronic mail from Marv Coleman to Tim Bingman Regarding Ecology Approval to Separate On-Property Soils into a Separate Remedial Investigation and Feasibility Study Track. January 13, 2013.

Attachment 3: Ecology. 2014. Electronic mail from Marv Coleman to Tim Bingman Regarding Ecology Approval of the Initial Screening of Technologies. September 2014.

This page has been left blank intentionally to allow for double-sided printing.

Attachment 1

DEPARTMENT OF ECOLOGY

MARCH 7, 2011 LETTER

This page has been left blank intentionally to allow for double-sided printing.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

March 7, 2011

Timothy S. Bingman, D.A.B.T.
DuPont Corporate Remediation Group
1108 Ohio River Boulevard, Suite 801
Sewickley, PA 15143

Dear Tim:

This letter is in response to your request to designate an Area of Contamination (AOC) at the Superlon Plastics site in Tacoma. The request is made to help expedite the investigation and remediation of soil and groundwater at the site. It is my opinion that the request is reasonable and logical to aid in management of waste materials that will be generated during site activities. Some steps that will need to be performed in furtherance of this include:

- Based on preliminary data, it appears that most of the site has been impacted to some degree or another, from the historical manufacturing of lead-arsenate pesticides. Data has not yet been developed for areas outside the property as defined by property lines. For the time being the AOC should consist of the Superlon property, proper; if future data indicates that off-property contamination exists, the AOC can be adjusted appropriately at that time.

- Ecology will develop a list of ARARs that will substantively apply to handling waste materials within the AOC. It is expected that these ARARs will be particularly derived from Chapter 173-340 WAC and Chapter 173-303 WAC. Any wastes that designate as DW or EHW and that are handled outside the AOC would be subject to both the substantive and administrative requirements of the regulations.

Per your letter requesting an AOC, it is Ecology's understanding that expected tasks that would be subject to the AOC designation include:

- The stockpiling of excavated soils that will require testing to determine its final designation;

- The stockpiling of soils that require secondary treatment;
- The consolidation of soils that require treatment before disposal or reuse; or,
- The dewatering of soil containing impacted water.
- Additionally, the management of drummed or tanked wastes would be subject to the AOC provisions.

Please let me know if you have any questions.

Sincerely,

MColeman

Marv Coleman, Site Manager/Inspector
Southwest Regional Office
Toxics Cleanup Program
Phone: 360 407 6259
Fax: 360 407 6305
Pager: 360 709 4139
Email: mcol461@ecy.wa.gov

MK/ksc:AOC Approval

By CERTIFIED MAIL: (7009 2820 0001 7155 6689)

cc: Jeff King, L.G., Pacific Environmental & Redevelopment Corp.
James DeMay, Ecology

Attachment 2

DEPARTMENT OF ECOLOGY

JANUARY 13, 2011 EMAIL CORRESPONDENCE

This page has been left blank intentionally to allow for double-sided printing.

Attachment 2

Ecology. 2013. Electronic Mail from Marv Coleman to Tim Bingman Regarding Ecology Approval to Separate On-Property Soils into a Separate Remedial Investigation and Feasibility Study Track. January 13, 2013.

From: Coleman, Marv (ECY)
Sent: Friday, January 31, 2013 7:39 PM
To: Timothy S Bingman [mailto:Timothy.S.Bingman-2@USA.dupont.com]
Cc: Jeff King
Subject: Fw: Follow-Up Note from Meeting with DuPont and Pacific

Hi Tim,

Looks like I managed to bury your memo in December. I am in agreement with the approach and Jeff and I met recently to discuss some details of that. Proceed accordingly…

Marv Coleman, Site Manager, Inspector
Southwest Regional Office
Toxics Cleanup Program
Phone: 360.407.6259
Fax: 360.407.6305
Email: mcol461@ecy.wa.gov

From: Timothy S Bingman [mailto:Timothy.S.Bingman-2@USA.dupont.com]
Sent: Friday, January 25, 2013 8:20 AM
To: Coleman, Marv (ECY)
Cc: Jeff King
Subject: Fw: Follow-Up Note from Meeting with DuPont and Pacific

Hi Marv:

I understand in talking with Jeff that you may not have gotten this note originally back in December. I hope that you can give us your feedback, as a lot of the planning that we're doing for the project hinges on this approach.

Thanks for your consideration.

Best regards,

Tim.

-- Forwarded by Timothy S Bingman/AE/DuPont on 01/25/2013 11:13 AM -----

From: Timothy S Bingman/AE/DuPont
To: "Coleman, Marv (ECY)" <MCOL461@ECY.WA.GOV>
Cc: "Jeff King" <JKING@PACIFIC-ENVIRONMENTAL.COM>
Date: 12/03/2012 04:47 PM
Subject: Follow-Up Note from Meeting with DuPont and Pacific

Greetings Marv:

Thanks for meeting with Jeff King and me during your meeting in Olympia a while back. As a part of that conversation, I agreed to write you a note that captured our proposed plan for moving forward with the Superlon Plastics on-property soils RI/FS and Clean-Up Action Plan.

The basic idea that we discussed is that we would “decouple” the on-property soils RI/FS and Clean-Up Action Plan (CAP) process from the groundwater investigation and off-property issues (e.g. soils on Gardner-Fields’ property and the ditch on the Port's property). Our rationale for wanting to pursue this approach is that it will enable us to continue to make progress with the remediation of the on-property soils, in effect not "holding up" the remedy for this media while we continue to study the off-property issues.

Specifically, we will continue to work to complete the interim action for the former Building B soils, while drafting the RI/FS for the on-property soils only. Based on the outcome of the FS, Ecology could then develop a draft CAP for the on-property soils only. At that point, we would be able to implement the final remedy for the on-property soils. In parallel, we will continue to improve our understanding of the on- and off-property groundwater situation, the extent of Site-related soils contamination on the Gardner-Fields property, etc. To the extent that the off-property issues involve other parties, we may ask to have them joined in the process as PLPs at some point.

My understanding from our conversation is that you are amenable to this approach. Please let me know if you agree, and we will proceed accordingly.

We really appreciate your insights and counsel as we continue to investigate and remediate the Superlon Plastics Site. As always, please give me a call if there’s anything that you would like to see us doing differently.

Best regards,

Tim

Attachment 3

DEPARTMENT OF ECOLOGY

OCTOBER 27, 2014

ELECTRONIC MAIL APPROVAL

This page has been left blank intentionally to allow for double-sided printing.

From: Coleman, Marv (ECY) [mailto:MCOL461@ECY.WA.GOV]
Sent: Monday, October 27, 2014 10:05 AM
To: Jeffrey King; Timothy.S.Bingman-2@dupont.com
Subject: Initial screening of RA technologies

Jeff, Tim –

The initial screening of Remedial Action Technologies that was provided April 7, 2014 is acceptable to me. Go ahead and proceed as we discussed. I am still reviewing the Draft FS dated October 10, 2014, but my initial scan of it indicates that it is consistent with what we discussed in April. Let me know if any questions.

Marv Coleman, Cleanup Project Manager, Inspector
Southwest Regional Office
Toxics Cleanup Program
Phone: 360.407.6259
Cell: 253.227.7780
Fax: 360.407.6305
Email: mcol461@ecy.wa.gov

This page has been left blank intentionally to allow for double-sided printing.

Appendix B

Estimated Exposure Frequency of Utility Workers to Soils in the Tacoma Tide Flats Area

This page has been left blank intentionally to allow for double-sided printing.

Estimated Exposure Frequency of Utility Workers to Soils in the Tacoma Tide Flats Area

PREPARED BY:

PIONEER TECHNOLOGIES CORPORATION

5205 Corporate Center Ct. SE, Suite A
Olympia, WA 98503
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

OCTOBER 2014

This page has been left blank intentionally to allow for double-sided printing.

TABLE OF CONTENTS

TABLES

FIGURES

This page has been left blank intentionally to allow for double-sided printing.

SECTION 1 – INTRODUCTION

Environmental investigations are being conducted at properties located in the Tide Flats area of Tacoma (Tide Flats properties) in Washington State (see Figure 1). A survey and evaluation of the frequency and duration of visits to the Tide Flats properties by utility workers was conducted to determine annual frequency that a utility worker may contact soil in the course of performing their work. The frequency that utility workers may be exposed to soil can then be used in environmental investigations to determine protective constituent concentrations in soil. This report summarizes the survey and evaluation, and presents the results.

A Tide Flats properties utility worker was defined as a worker who may access the Tide Flats properties while performing typical work-related activities. Workers who were included in this evaluation include utility company employees and civil service employees (i.e., water department employees, Puget Sound Energy employees, Tacoma Rail employees, firefighters, and police). Survey data regarding property visits were collected and used to estimate the minimum and maximum number of days per year a utility worker may come into contact with soil at Tide Flats properties. The 95th percentile of the distribution of these data was calculated to determine an upper bound minimum and maximum number of days a utility worker could contact soil at the properties[(1)]. The inherent uncertainty associated with this type of data collection and analysis effort was also taken into consideration when determining a conservative, upper-bound estimate of the number of days per year a utility worker may come into contact with soil at a given Tide Flats property. Based on this analysis, an upper-bound estimate of utility worker exposure frequency to Tide Flat soils was determined to be 10 days/year.

The remainder of this document is organized as follows:

- Section 2: Survey Results
- Section 3: Data Evaluation
- Section 4: Conclusions

(1)U.S. EPA. Guidelines for Exposure Assessment. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, EPA/600/Z-92/001, 1992.

This page has been left blank intentionally to allow for double-sided printing.

SECTION 2 – UTILITY AND CIVIL SERVICE ORGANIZATIONS SURVEY RESULTS

Five of the utility companies and civil service organizations who service the Tacoma Tide Flats properties (Tacoma Fire Department, Tacoma Police Department, Tacoma Water Department, Puget Sound Energy, and Tacoma Rail) were surveyed to determine the extent to which these utility workers could be exposed to soils in the Tide Flats area. Each organization identified the types of utility workers and the types of work performed during Tide Flats property visits, and most were able to provide an indication of the frequency and duration of such visits. Each utility company and civil service organization's data are explained in detail and presented in Tables 1 - 8. This section provides the results from each organization's survey.

2.1 Tacoma Fire Department

The Tacoma Fire Department conducts various fire, aid, entrapment, spill, and responder activities during visits to the Tacoma Tide Flats area. The Tacoma Fire Department identified the number of calls that require a department worker to visit the Tacoma Tide Flats area (see Table 1). A summary of the calls from 2009 through 2013 is presented in Table 2 (Tacoma Fire Department 2014). These data indicate that Tacoma Fire Department personnel visited properties in the Tide Flats area approximately 1,100 times each year, and the visits generally lasted between one and six hours in duration.

2.2 Tacoma Police Department

The Tacoma Police Department rarely conducts traffic control or assists the Port of Tacoma Police in the Tacoma Tide Flats properties (Tacoma Police Department 2014). The majority of aid response calls are handled by the Tacoma Fire Department. Data presented in Table 3 reveals that the Tacoma Police Department visited Tide Flats properties infrequently, usually less than one day each year.

2.3 Tacoma Water Department

The Tacoma Water Department conducts work at the Tide Flats properties, and the type of activities that involve direct contact with soil include water leak inspections, meter inspections, and water pressure reading activities. The Tacoma Water Department did not complete an actual survey, but instead provided documentation that identified the number of calls and the duration of the work a utility worker who visited the Tacoma Tide Flats properties (Tacoma Water Department 2014). A summary of the calls from 2004 through 2013 is presented in Table 4. These data indicate that the Tacoma Water Department visited properties in the Tide Flats area approximately 40 times each year, and the visits were generally between one and eight hours in duration. The minimum, maximum, and average hours spent at each property which varied according to the type of service call are summarized in Table 4. Detailed documentation of the number and duration of service calls to the Tide Flats properties are provided in Tables 5 and 6, respectively.

2.4 Puget Sound Energy

Puget Sound Energy conducts work at the Tide Flats properties. Only one Puget Sound Energy worker conducts work in the Tide Flats area, and the type of activities that involve direct contact with soil include gas line locates, trench work, and on-site safety supervision (Puget Sound Energy 2014). Minimum and maximum estimates were used to determine the amount and length of time the worker is at the property (see Table 7). The Puget Sound Energy utility worker visited properties in the Tide Flats area roughly six to twelve times a month, and the visits were generally between four and six hours in duration.

2.5 Tacoma Rail

A minimum of five and a maximum of ten Tacoma Rail workers conduct work on properties in the Tide Flats area each year, and the types of activities that involve direct contact with soil include rail operations, rail ties replacement, and railroad bed work (Tacoma Rail 2014). The Tacoma Rail utility worker visited properties in the Tide Flats area a maximum of 15 times a month, and the visits were generally between one and eight hour(s) in duration (see Table 8).

SECTION 3 – DATA EVALUATION

The survey data for the Tacoma Fire Department, Tacoma Police Department, Tacoma Water Department, Puget Sound Energy, and Tacoma Rail utility workers who visit and could directly contact soil while working on the Tacoma Tide Flats properties each year were evaluated to develop an estimate of how many days per year utility workers could contact soil. The amount of detailed survey data information provided by the utility and civil service companies varied substantially among the organizations surveyed. Puget Sound Energy and Tacoma Rail surveys provided high and low estimates for the number of workers, days per month and site visits per year. The fire, police, and water departments provided the number of workers that may contact soil and the days per month at the properties were determined to calculate the number of site visits per month.

The number of site visits per month, and the number of properties in the Tide Flats area (563) were then integrated to estimate the number of days per month a utility worker may spend at any given Tide Flats property (see Table 9 and equations presented below). Note that although not all visits to a Tide Flats property result in a utility worker contacting soil, this was conservatively assumed to be the case for the purpose of this analysis.

$$Days\ per\ Month\ at\ a\ Property = \frac{Number\ of\ People\ x\ Days\ per\ Month\ at\ Properties}{Total\ Number\ of\ Properties\ (563)}$$

$$Days\ per\ Year\ at\ a\ Property = Days\ per\ Month\ at\ a\ Property\ x\ 12\,\frac{months}{year}$$

3.1 Tacoma Fire Department

Based on the information provided in the surveys, the fire department visited properties in the Tide Flats area approximately 1,100 times each year, and the visits lasted between one and six hours in duration. Based on this information, an employee of the Tacoma Fire Department could be at a property between 0.22 and 1.6 days per year (see Table 2).

3.2 Tacoma Police Department

Based on the information provided in the surveys, the police department rarely visited properties in the Tide Flats area, and the department provided an estimate of zero days per year for the expected visits to the properties. Therefore, an exposure frequency assumption of zero days per year would be appropriate for police department workers (see Table 3).

3.3 Tacoma Water Department

Based on the information provided in the surveys, personnel from the water department could be expected to visit properties in the Tide Flats area approximately 40 times each year, and the visits averaged between one and two hours in duration. Therefore, an employee of the Tacoma Water Department could be at a property between 0.01 to 0.082 days per year (see Table 4).

3.4 Puget Sound Energy

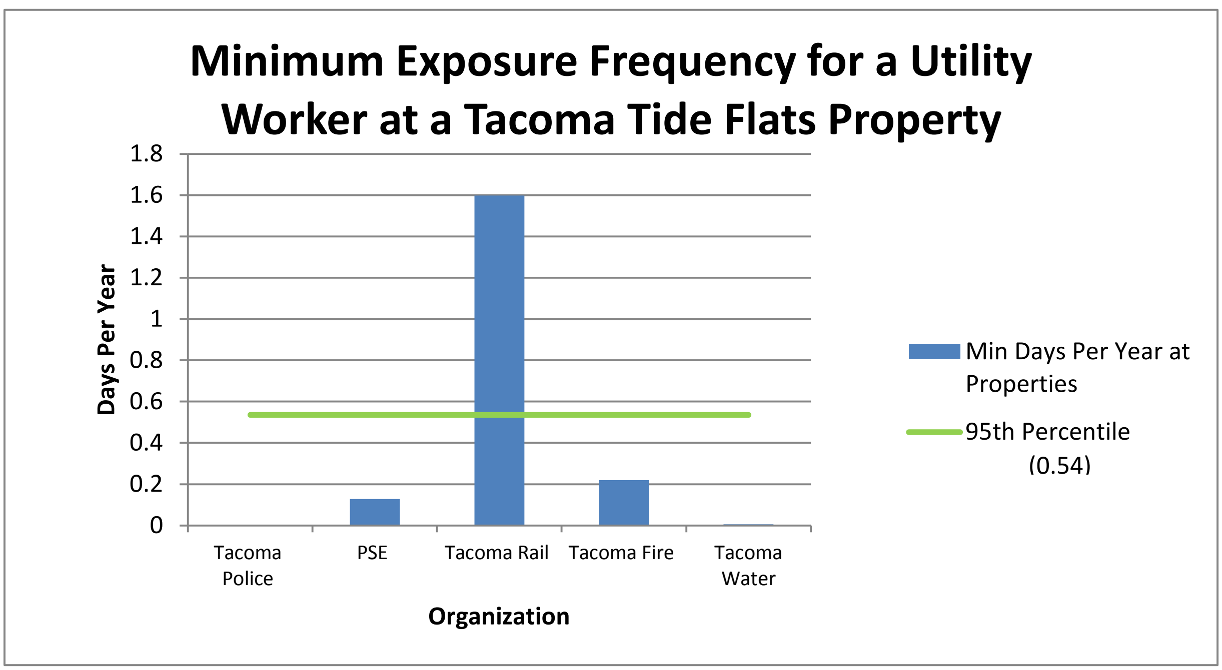
Based on the information provided in the surveys, Puget Sound Energy estimated that one worker conducted all of the work at properties in the Tide Flats area, and that worker visited the Tide Flats-area properties approximately 72 to 144 times per year, with visits lasting 4 to 15 hours per visit (see Table 7). Based on this information, Puget Sound Energy personnel could be at a property between 0.13 to 0.26 days per year (see Table 9).

3.5 Tacoma Rail

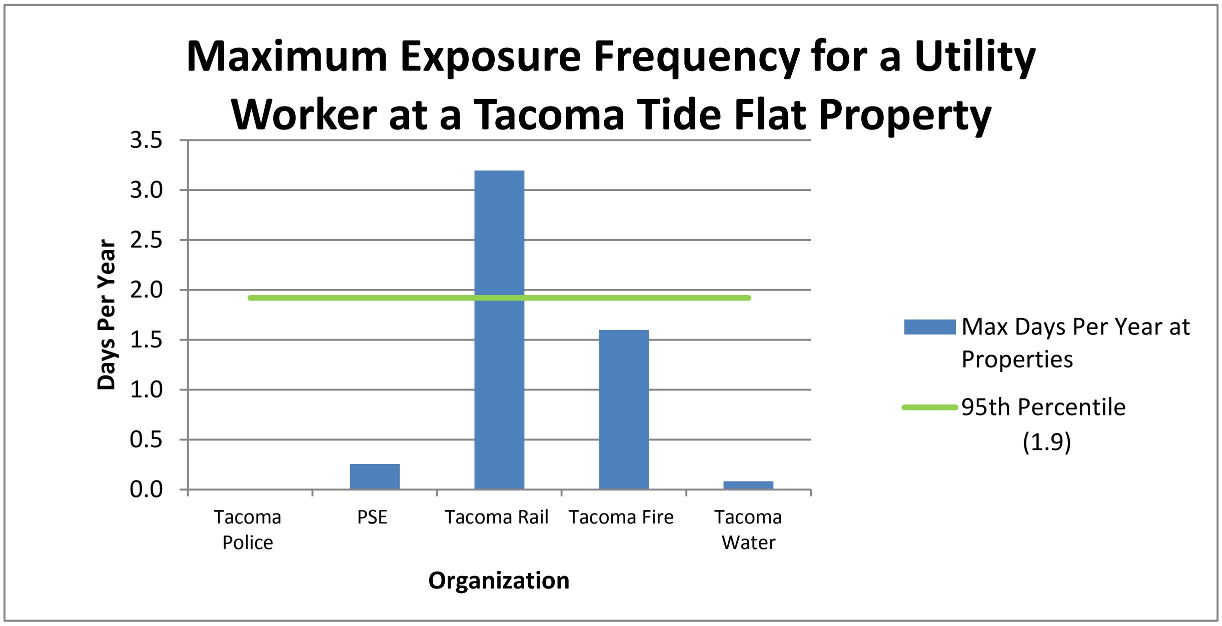
Based on the information provided in the surveys, personnel from Tacoma Rail could be expected to visit properties in the Tide Flats area a maximum of 180 per year, with visits lasting between 1 and 8 hours per visit. Based on this information, personnel from Tacoma Rail could be at a property between 1.6 and 3.2 days per year (see Table 9).

3.6 Summary

The survey data for all utility workers were considered collectively to determine a reasonable range for the number of days per year that a utility worker could be expected to conduct work at any given Tide Flats property. A standard eight hour work day was used in this evaluation. The following graph presents the minimum number of days per year that a utility worker could be expected to conduct work at a given Tide Flats property. The 95th percentile of these data, 0.54 represents the upper bound estimate of the minimum number of days per year that a worker could contact soil.



The following graph presents the maximum number of days per year that a utility worker could conduct work at a given Tide Flats property. The 95th percentile of these data, 1.9 days/year, represents an upper bound estimate of the maximum number of days per year that a worker could contact soil.



This page has been left blank intentionally to allow for double-sided printing.

SECTION 4 – CONCLUSION

Data provided by the Tacoma Fire Department, Tacoma Police Department, Tacoma Water Department, Puget Sound Energy and Tacoma Rail are summarized in Table 9. The information obtained from the surveys was used to determine the number of days each year that a utility worker may contact soil at Tacoma Tide Flats properties. These results indicate that utility workers are typically at Tide Flats properties infrequently, and for a short period of time (typically a few hours or less).

Based on the results of the utility worker activity survey, the number of days each year that a utility worker could have the potential to contact soils at the properties was determined. The 95th percentile of the minimum and maximum number of days per year that exposure could occur was calculated to be 0.54 days/year and 1.9 days/year, respectively, with a mid-point result of 1.22 days/year. Given the variability in this range of results, and considering the inherent uncertainty in any survey data collection effort, an uncertainty factor of 10-fold was applied to the mid-point result. This results in a reasonable maximum value of 10 days per year that a utility worker could be expected to contact soil at an individual Tide Flats property.

This upper-bound estimate for soil exposure frequency can be used in risk assessments where Tide Flat utility workers are a potential receptor population, or to calculate residual levels of contaminants in soils that will be protective of these workers.

This page has been left blank intentionally to allow for double-sided printing.

SECTION 5 – REFERENCES

Puget Sound Energy. 2014. Ralph Yerbury in interview with Steve Duggan, April 18.

Tacoma Fire Department. 2014. Sue Bozar, Deputy Fire Marshal, in interview with Steve Duggan, June 3.

Tacoma Police Department. 2014. Joseph Kirby in interview with Steve Duggan, May 30.

Tacoma Rail. 2014. Tim Flood in interview with Steve Duggan, May 28.

Tacoma Water Department. 2014. City of Tacoma Water Department data.

This page has been left blank intentionally to allow for double-sided printing.

Tables

This page has been left blank intentionally to allow for double-sided printing.

Table 1: Tacoma Tide Flats Survey – Tacoma Fire Department

The purpose of this survey is to determine how often people may come into contact with soil at properties in the Tacoma Tide Flats. This information will be used to make sure that a site cleanup at a property in the Tide Flats is protective of future workers who come to the property.

Question	Answer
1. Date	5/28/14
2. Name	Sue Bozar
1. Company	Tacoma Fire Dept.
2. Type of Activity	Various Fire, Aid, Entrapment, Spills, Responder
3. How many people in your organization work in the tide flat area of Tacoma as bounded by the Thea Foss waterway, the Hylebos waterway, Commencement Bay and Highway 509 (see Figure)?	• Varies by type of call; Simple call would be an Engine (3 people) and Ambulance (2 people). • More complex call could include 2 Engines, Battalion Chief, Aid etc (13 people)
4. How many days a month might you be out on the tide flat area? If there is more than one person then add all of the days for all people together.	Varies greatly. More detailed information is presented in Table 2.
5. How many hours would you typically spend at one property per visit?	Depends on type of call. Simple aid could be 10 minutes… Fire or entrapment could be 5 to 6 hours. More detailed information is presented in Table 2.
6. Do you ever have to be in contact with soil?	Yes. There may be an underground leak of something, entrapment etc that may require contact with soil.

This page has been left blank intentionally to allow for double-sided printing.

Table 2: Summary of the Tacoma Fire Department Visits to the Tide Flats Area

Year	Number of Tide Flats Properties Visited	Hours at Property (Minimum)	Hours at Property (Maximum)	Days/Year at a Tide Flats Property (Minimum Estimate) [(1)]	Days/Year at a Tide Flats Property (Maximum Estimate) [(1)]
2009	1,116	1	6	0.25	1.5
2010	1,211	1	6	0.27	1.6
2011	1,027	1	6	0.23	1.4
2012	995	1	6	0.22	1.3
2013	1,187	1	6	0.26	1.6

Notes:

[(1)] Determined by: $$\frac{\text{Number of Hours at Property}}{\text{8 Hours per work day}} \times \frac{\text{Number of Tide Tlat Properties Visited}}{\text{Total Number of Tide Flat Properties (563)}}$$

Table information provided by: Sue Bozar, Deputy Fire Marshall, City of Tacoma Fire Department, June 3, 2014.

This page has been left blank intentionally to allow for double-sided printing.

Table 3: Tacoma Tide Flats Survey – Tacoma Police Department

The purpose of this survey is to determine how often people may come into contact with soil at properties in the Tacoma Tide Flats. This information will be used to make sure that a site cleanup at a property in the Tide Flats is protective of future workers who come to the property.

Question	Answer
1. Date	5/30/14
2. Name	Joseph Kirby
1. Company	Tacoma Police Dept.
2. Type of Activity	Traffic Control, Rare assistance to Port of Tacoma Police
3. How many people in your organization work in the tide flat area of Tacoma as bounded by the Thea Foss waterway, the Hylebos waterway, Commencement Bay and Highway 509 (see Figure)?	Rarely called. Fire Dept takes care of aid and Hazardous calls. They may rarely get a call for an investigation of a body found but that's about it.
4. How many days a month might you be out on the tide flat area? If there is more than one person then add all of the days for all people together.	No real information due to the above.
5. How many hours would you typically spend at one property per visit?	No real information due to the above.
6. Do you ever have to be in contact with soil?	Almost never. Tends to be more of a Fire Dept. function. Maybe if a buried body was found or something along those lines. Otherwise, no need to contact the soil.

This page has been left blank intentionally to allow for double-sided printing.

Table 4: Summary of the Tacoma Water Department Visits to the Tacoma Tide Flats Area

Year	Number of Tide Flat Properties Visited	Hours at Property		Days/Year at a Tide Flat Property (Minimum Estimate)[1]	Days/Year at a Tide Flat Property (Maximum Estimate)[1]
		Minimum	Maximum		
2004	45	1	7	0.010	0.070
2005	32	1	4	0.0071	0.028
2006	31	1	4	0.0069	0.028
2007	47	1	7	0.010	0.073
2008	40	1	8	0.0089	0.071
2009	47	1	8	0.010	0.083
2010	28	1	8	0.0062	0.050
2011	37	1	8	0.0082	0.066
2012	46	1	8	0.010	0.082
2013	29	1	8	0.0064	0.052

Notes:

[1] Determined by: $$\frac{Number\ of\ Hours\ at\ \ Property}{8\ Hours\ per\ Work\ Day} \times \frac{Number\ of\ Tide\ Flat\ Properties\ Visited}{Total\ Number\ of\ Tide\ Flat\ Properties\ (563)}$$

According to City of Tacoma 2014 tax records, there are 563 properties in the Tacoma Tide Flats.

Data provided by City of Tacoma, Water Department, 2014.

This page has been left blank intentionally to allow for double-sided printing.

Table 5: Tacoma Water Department Summary of Phone Calls and Service Visits to the Tacoma Tide Flats Area

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
Phone Calls							
20000000859	TW-DIST-SERVPT-111713	LEAK/CITY SIDE	1851 E ALEXANDER AVE	07/14/1997	09/19/2003	1997	Investigate Possible Leak
20000001338	TW-DIST-SERVPT-165736	LEAK/CITY SIDE	440 E 19TH ST	07/22/1997	09/19/2003	1997	Investigate Possible Leak
20000001643	TW-DIST-SERVPT-166559	PROP/SIDE PROB	2101 TAYLOR WAY E	07/25/1997	09/19/2003	1997	Investigate Property Side
20000001642	TW-DIST-SERVPT-167183	PROP/SIDE PROB	1901 TAYLOR WAY E	07/25/1997	09/19/2003	1997	Investigate Property Side
20000001890	TW-DIST-SERVPT-166659	LEAK/CITY SIDE	1500 ST PAUL AVE	07/30/1997	09/19/2003	1997	Investigate Possible Leak
20000003328	TW-DIST-SERVPT-167689	METER FAULT	1002 E F ST	08/20/1997	09/19/2003	1997	Check Meter
20000003759	TW-DIST-SERVPT-166003	WATER QUALITY	1202 TAYLOR WAY E	08/26/1997	09/19/2003	1997	Invest Other, WQ
20000004098	TW-DIST-SERVPT-167905	LEAK/CITY SIDE	1144 THORNE RD	08/29/1997	09/19/2003	1997	Investigate Possible Leak
20000005896	TW-DIST-SERVPT-210118	LEAK/CITY SIDE	1656 E J ST	09/24/1997	09/19/2003	1997	Investigate Possible Leak
20000008127	TW-DIST-SERVPT-165152	TURN ON/OFF	1123 TAYLOR WAY E	11/13/1997	09/19/2003	1997	Engineering Plan Review-INSIDE
20000008570	TW-DIST-SERVPT-164658	LEAK/CITY SIDE	2244 PORT OF TACOMA RD E	11/21/1997	09/19/2003	1997	Investigate Possible Leak
20000010750	TW-DIST-SERVPT-098463	TURN ON/OFF	512 E 15TH ST	01/21/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000010906	TW-DIST-SERVPT-166338	PROP/SIDE PROB	501 E 19TH ST	01/26/1998	09/19/2003	1998	Investigate Property Side
20000011842	TW-DIST-SERVPT-156955	LOW PRESSURE	2338 E 11TH ST	02/09/1998	09/19/2003	1998	DO NOT USE on W1 Notif-Invest. Low Press
20000001209	TW-DIST-SERVPT-165761	CHECK METER	1616 ST PAUL AVE	02/23/1998	09/19/2003	1998	Check Meter
20000012675	TW-DIST-SERVPT-164759	LEAK/CITY SIDE	1476 THORNE RD	02/26/1998	09/19/2003	1998	Investigate Possible Leak
20000013045	TW-DIST-SERVPT-105560	TURN ON/OFF	949 E F ST	03/02/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000012979	TW-DIST-SERVPT-164559	LEAK/CITY SIDE	1735 PORT OF TACOMA RD E	03/02/1998	09/19/2003	1998	Investigate Possible Leak
20000001424	TW-DIST-SERVPT-167201	CHECK METER	1240 E ALEXANDER AVE	03/11/1998	09/19/2003	1998	Check Meter
20000014002	TW-DIST-SERVPT-172532	TURN ON/OFF	602 E 11TH ST	03/13/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000000161	TW-DIST-SERVPT-164809	CHECK METER	1621 LINCOLN AVE	04/02/1998	09/19/2003	1998	Check Meter
20000001875	TW-DIST-SERVPT-167624	CHECK METER	250 E D ST	04/08/1998	09/19/2003	1998	Check Meter
20000016688	TW-DIST-SERVPT-164404	TURN ON/OFF	401 E 15TH ST	04/15/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000016897	TW-DIST-SERVPT-165803	TURN ON/OFF	1754 THORNE RD	04/17/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000018034	TW-DIST-SERVPT-164628	LEAK/CITY SIDE	1123 PORT OF TACOMA RD E	04/28/1998	09/19/2003	1998	Investigate Possible Leak
20000018109	TW-DIST-SERVPT-167894	LEAK/CITY SIDE	2124 E MARSHALL AVE	04/29/1998	09/19/2003	1998	Investigate Possible Leak
20000001026	TW-DIST-SERVPT-165404	CHECK METER	2116 TAYLOR WAY E	04/30/1998	09/19/2003	1998	Check Meter
20000018244	TW-DIST-SERVPT-167894	LEAK/CITY SIDE	2124 E MARSHALL AVE	04/30/1998	09/19/2003	1998	Investigate Possible Leak
20000018382	TW-DIST-SERVPT-164442	TURN ON/OFF	1118 E D ST, #C	05/01/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000002128	TW-DIST-SERVPT-167675	CHECK METER	475 E 19TH ST	05/01/1998	09/19/2003	1998	Check Meter
20000002175	TW-DIST-SERVPT-167683	CHECK METER	902 E E ST	05/01/1998	09/19/2003	1998	Check Meter
20000019844	TW-DIST-SERVPT-164499	DAMAGE	1510 TAYLOR WAY E	05/18/1998	09/19/2003	1998	Investigate Damage
20000000430	TW-DIST-SERVPT-165104	CHECK METER	3501 TAYLOR WAY E	05/29/1998	09/19/2003	1998	Check Meter
20000000025	TW-DIST-SERVPT-156936	LEAK/CITY SIDE	325 E 11TH ST	06/10/1998	09/19/2003	1998	Investigate Possible Leak
20000000246	TW-DIST-SERVPT-167183	PROP/SIDE PROB	1901 TAYLOR WAY E	06/12/1998	09/19/2003	1998	Investigate Property Side
20000000504	TW-DIST-SERVPT-167797	METER FAULT	1718 THORNE RD	06/15/1998	09/19/2003	1998	Check Meter
20000001301	TW-DIST-SERVPT-164628	LOW PRESSURE	1123 PORT OF TACOMA RD E	06/19/1998	09/19/2003	1998	DO NOT USE on W1 Notif-Invest. Low Press
20000001016	TW-DIST-SERVPT-165402	CHECK METER	1930 E D ST	06/19/1998	09/19/2003	1998	Check Meter
20000002203	TW-DIST-SERVPT-167688	CHECK METER	2367 LINCOLN AVE	07/01/1998	09/19/2003	1998	Check Meter
20000000546	TW-DIST-SERVPT-165164	CHECK METER	2347 LINCOLN AVE	07/07/1998	09/19/2003	1998	Check Meter
20000000514	TW-DIST-SERVPT-165152	CHECK METER	1123 TAYLOR WAY E	07/08/1998	09/19/2003	1998	Check Meter
20000004068	TW-DIST-SERVPT-167183	DAMAGE	1901 TAYLOR WAY E	07/10/1998	09/19/2003	1998	Investigate Damage
20000001770	TW-DIST-SERVPT-167560	CHECK METER	1601 TAYLOR WAY E	07/10/1998	09/19/2003	1998	Check Meter
20000007795	TW-DIST-SERVPT-164927	LEAK/CITY SIDE	711 E 11TH ST	08/04/1998	09/19/2003	1998	Investigate Possible Leak
20000009144	TW-DIST-SERVPT-180954	LEAK/CITY SIDE	1815 PORT OF TACOMA RD E	08/10/1998	09/19/2003	1998	Investigate Possible Leak
20000012680	TW-DIST-SERVPT-181246	LEAK/CITY SIDE	2006 E PORTLAND AVE	08/31/1998	09/19/2003	1998	Investigate Possible Leak

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000012809	TW-DIST-SERVPT-084866	LEAK/CITY SIDE	1132 THORNE RD	09/01/1998	09/19/2003	1998	Investigate Possible Leak
20000013443	TW-DIST-SERVPT-167209	PROP/SIDE PROB	2340 E ALEXANDER AVE	09/03/1998	09/19/2003	1998	Investigate Property Side
20000018018	TW-DIST-SERVPT-143346	LEAK/CITY SIDE	1801 E D ST	10/05/1998	09/19/2003	1998	Investigate Possible Leak
20000018732	TW-DIST-SERVPT-165777	TURN ON/OFF	1918 MILWAUKEE WAY	10/08/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000000864	TW-DIST-SERVPT-165343	CHECK METER	2302 ROSS WAY	10/19/1998	09/19/2003	1998	Check Meter
20000000892	TW-DIST-SERVPT-165349	CHECK METER	1754 THORNE RD	10/19/1998	09/19/2003	1998	Check Meter
20000020712	TW-DIST-SERVPT-165668	MISCELLANEOUS	733 E 11TH ST	10/22/1998	09/19/2003	1998	MISCELLANEOUS
20000020705	TW-DIST-SERVPT-165668	MISCELLANEOUS	733 E 11TH ST	10/22/1998	09/19/2003	1998	MISCELLANEOUS
20000002345	TW-DIST-SERVPT-181565	CHECK METER	1747 PORT OF TACOMA RD E	10/26/1998	09/19/2003	1998	Check Meter
20000000067	TW-DIST-SERVPT-164559	CHECK METER	1735 PORT OF TACOMA RD E	10/28/1998	09/19/2003	1998	Check Meter
20000000937	TW-DIST-SERVPT-165378	CHECK METER	1221 E ALEXANDER AVE	10/28/1998	09/19/2003	1998	Check Meter
20000022741	TW-DIST-SERVPT-166743	NO WATER	624 E 15TH ST	11/06/1998	09/19/2003	1998	DO NOT USE Investigate No Water
20000022732	TW-DIST-SERVPT-166743	TURN ON/OFF	624 E 15TH ST	11/06/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000023585	TW-DIST-SERVPT-180913	TURN ON/OFF	1815 PORT OF TACOMA RD E	11/13/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000023669	TW-DIST-SERVPT-098463	TURN ON/OFF	512 E 15TH ST	11/16/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000023963	TW-DIST-SERVPT-164499	NO WATER	1510 TAYLOR WAY E	11/18/1998	09/19/2003	1998	DO NOT USE Investigate No Water
20000025307	TW-DIST-SERVPT-144416	TURN ON/OFF	2144 PORT OF TACOMA RD E	12/02/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000026721	TW-DIST-SERVPT-166659	LEAK/CITY SIDE	1500 ST PAUL AVE	12/14/1998	09/19/2003	1998	Investigate Possible Leak
20000026669	TW-DIST-SERVPT-167183	PROP/SIDE PROB	1901 TAYLOR WAY E	12/14/1998	09/19/2003	1998	Investigate Property Side
20000027020	TW-DIST-SERVPT-166828	METER FAULT	2021 MARC AVE	12/17/1998	09/19/2003	1998	Check Meter
20000028830	TW-DIST-SERVPT-165152	TURN ON/OFF	1123 TAYLOR WAY E	12/23/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000029603	TW-DIST-SERVPT-167065	TURN ON/OFF	1120 MILWAUKEE WAY	12/24/1998	09/19/2003	1998	Engineering Plan Review-INSIDE
20000032593	TW-DIST-SERVPT-167183	LEAK/CITY SIDE	1901 TAYLOR WAY E	01/07/1999	09/19/2003	1999	Investigate Possible Leak
20000033643	TW-DIST-SERVPT-167065	TURN ON/OFF	1120 MILWAUKEE WAY	01/14/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000034043	TW-DIST-SERVPT-166110	PROP/SIDE PROB	1801 E D ST	01/19/1999	09/19/2003	1999	Investigate Property Side
20000033999	TW-DIST-SERVPT-167078	LEAK/CITY SIDE	1035 PORT OF TACOMA RD E	01/19/1999	09/19/2003	1999	Investigate Possible Leak
20000002642	TW-DIST-SERVPT-105123	METER FAULT	2253 LINCOLN AVE	02/09/1999	09/19/2003	1999	Check Meter
20000002656	TW-DIST-SERVPT-165986	WATER QUALITY	1902 E D ST	02/09/1999	09/19/2003	1999	Invest Other, WQ
20000004622	TW-DIST-SERVPT-156941	WATER QUALITY	660 E 11TH ST	02/23/1999	09/19/2003	1999	Invest Other, WQ
20000002420	TW-DIST-SERVPT-167178	CHECK METER	2124 E MARSHALL AVE	03/17/1999	09/19/2003	1999	Check Meter
20000011366	TW-DIST-SERVPT-167134	NO WATER	2000 TAYLOR WAY E	04/12/1999	09/19/2003	1999	DO NOT USE Investigate No Water
20000015676	TW-DIST-SERVPT-151653	MISCELLANEOUS	1616 ST PAUL AVE	05/10/1999	09/19/2003	1999	MISCELLANEOUS
20000015684	TW-DIST-SERVPT-166210	MISCELLANEOUS	1501 ST PAUL AVE	05/10/1999	09/19/2003	1999	MISCELLANEOUS
20000019798	TW-DIST-SERVPT-166963	TURN ON/OFF	1114 TAYLOR WAY E	06/04/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000020599	TW-DIST-SERVPT-166386	TURN ON/OFF	3003 TAYLOR WAY E	06/09/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000023706	TW-DIST-SERVPT-166037	TURN ON/OFF	1735 PORT OF TACOMA RD E	06/30/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000025644	TW-DIST-SERVPT-167028	HYDRANT FAULT	2124 E MARSHALL AVE	07/16/1999	09/19/2003	1999	Check Hydrant (DO NOT USE on W1 Notifs)
20000026415	TW-DIST-SERVPT-166386	METER IN/OUT	3003 TAYLOR WAY E	07/23/1999	09/19/2003	1999	Install Meter
20000027382	TW-DIST-SERVPT-105130	LEAK/CITY SIDE	3401 LINCOLN AVE	07/29/1999	09/19/2003	1999	Investigate Possible Leak
20000028416	TW-DIST-SERVPT-166386	TURN ON/OFF	3003 TAYLOR WAY E	08/06/1999	09/19/2003	1999	Engineering Plan Review-INSIDE

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000029711	TW-DIST-SERVPT-098463	TURN ON/OFF	512 E 15TH ST	08/18/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000030192	TW-DIST-SERVPT-202545	MISCELLANEOUS	401 E 11TH ST	08/21/1999	09/19/2003	1999	MISCELLANEOUS
20000031221	TW-DIST-SERVPT-166614	MISCELLANEOUS	404 E ALEXANDER AVE, BLDG 331	08/27/1999	09/19/2003	1999	MISCELLANEOUS
20000031703	TW-DIST-SERVPT-180954	LEAK/CITY SIDE	1815 PORT OF TACOMA RD E	09/01/1999	09/19/2003	1999	Investigate Possible Leak
20000031751	TW-DIST-SERVPT-164927	LEAK/CITY SIDE	711 E 11TH ST	09/02/1999	09/19/2003	1999	Investigate Possible Leak
20000033767	TW-DIST-SERVPT-105124	METER FAULT	2301 LINCOLN AVE	09/17/1999	09/19/2003	1999	Check Meter
20000026227	TW-DIST-SERVPT-165632	HYDRANT FAULT	2001 THORNE RD	10/05/1999	09/19/2003	1999	Check Hydrant (DO NOT USE on W1 Notifs)
20000003071	TW-DIST-SERVPT-167124	CHECK METER	1035 PORT OF TACOMA RD E	10/07/1999	09/19/2003	1999	Check Meter
20000026598	TW-DIST-SERVPT-164966	HYDRANT FAULT	1701 E ALEXANDER AVE	10/08/1999	09/19/2003	1999	Check Hydrant (DO NOT USE on W1 Notifs)
20000030131	TW-DIST-SERVPT-165615	MISCELLANEOUS	1017 E D ST	10/29/1999	09/19/2003	1999	MISCELLANEOUS
20000030477	TW-DIST-SERVPT-111713	TURN ON/OFF	1851 E ALEXANDER AVE	11/02/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000030510	TW-DIST-SERVPT-165155	TURN ON/OFF	1451 THORNE RD	11/02/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000033780	TW-DIST-SERVPT-165986	NO WATER	1902 E D ST	12/01/1999	09/19/2003	1999	DO NOT USE Investigate No Water
20000034952	TW-DIST-SERVPT-084866	TURN ON/OFF	1132 THORNE RD	12/10/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000035277	TW-DIST-SERVPT-166622	DAMAGE	2120 MILWAUKEE WAY	12/14/1999	09/19/2003	1999	Investigate Damage
20000035485	TW-DIST-SERVPT-164628	METER FAULT	1123 PORT OF TACOMA RD E	12/15/1999	09/19/2003	1999	Check Meter
20000035641	TW-DIST-SERVPT-165541	TURN ON/OFF	725 E 11TH ST	12/16/1999	09/19/2003	1999	Engineering Plan Review-INSIDE
20000036309	TW-DIST-SERVPT-144430	TURN ON/OFF	2608 PORT OF TACOMA RD E	12/21/1999	09/20/2003	1999	Engineering Plan Review-INSIDE
20000036770	TW-DIST-SERVPT-130092	LEAK/CITY SIDE	424 E 19TH ST	12/27/1999	09/20/2003	1999	Investigate Possible Leak
20000039175	TW-DIST-SERVPT-166652	MISCELLANEOUS	3329 E 11TH ST, #331	01/12/2000	09/20/2003	2000	MISCELLANEOUS
20000005702	TW-DIST-SERVPT-164489	CHECK METER CHECK MTR. SUB-MTR IS REGIS	520 E D ST	01/28/2000	09/19/2003	2000	Check Meter
20000005716	TW-DIST-SERVPT-166222	CHECK METER CHECK MTR. SUB-MTR IS REGIS	516 E D ST	01/28/2000	09/19/2003	2000	Check Meter
20000006238	TW-DIST-SERVPT-165220	EXCHANGE METER EXCHANGE METER.	1157 THORNE RD	02/02/2000	09/19/2003	2000	Other Meter
20000006254	TW-DIST-SERVPT-167212	CHECK METER CHECK B & C OPERATION ON 8"	1600 E 11TH ST	02/02/2000	09/19/2003	2000	Check Meter
20000008183	TW-DIST-SERVPT-167194	CHECK METER CHECK LEAK IN 445 - VAULT.	901 E ALEXANDER AVE	02/07/2000	09/19/2003	2000	Check Meter
20000042790	TW-DIST-SERVPT-167194	LEAK/CITY SIDE	901 E ALEXANDER AVE	02/07/2000	09/20/2003	2000	Investigate Possible Leak
20000016710	TW-DIST-SERVPT-166598	REPAIR METER CLEAN AND REPAIR REGS. ON O	1206 E D ST	02/11/2000	09/19/2003	2000	Repair Meter
20000016764	TW-DIST-SERVPT-167193	EXCHANGE METER CHECK MTR FOR EXCHG.	1206 E D ST	02/15/2000	09/19/2003	2000	Other Meter
20000016795	TW-DIST-SERVPT-167193	EXCHANGE METER FEB. 29TH (TUES) EXCHG 8	1206 E D ST	02/16/2000	09/19/2003	2000	Other Meter
20000044787	TW-DIST-SERVPT-164798	TURN ON/OFF	2340 TAYLOR WAY E	02/22/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000045334	TW-DIST-SERVPT-166386	TURN ON/OFF	3003 TAYLOR WAY E	02/24/2000	09/20/2003	2000	Engineering Plan Review-INSIDE

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000045433	TW-DIST-SERVPT-167116	TURN ON/OFF	2340 TAYLOR WAY E	02/24/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000047037	TW-DIST-SERVPT-144421	MISCELLANEOUS	2232 PORT OF TACOMA RD E	03/09/2000	09/20/2003	2000	MISCELLANEOUS
20000047111	TW-DIST-SERVPT-167211	MISCELLANEOUS	3122 E ALEXANDER AVE	03/10/2000	09/20/2003	2000	MISCELLANEOUS
20000049986	TW-DIST-SERVPT-166760	PROP/SIDE PROB	1240 E ALEXANDER AVE	04/11/2000	09/20/2003	2000	Investigate Property Side
20000050077	TW-DIST-SERVPT-151653	LEAK/CITY SIDE	1616 ST PAUL AVE	04/12/2000	09/20/2003	2000	Investigate Possible Leak
20000050156	TW-DIST-SERVPT-165149	LEAK/CITY SIDE	711 E 11TH ST	04/12/2000	09/20/2003	2000	Investigate Possible Leak
20000050152	TW-DIST-SERVPT-167133	HYDRANT FAULT	1801 TAYLOR WAY E	04/12/2000	09/20/2003	2000	Check Hydrant (DO NOT USE on W1 Notifs)
20000050341	TW-DIST-SERVPT-165986	WATER QUALITY	1902 E D ST	04/14/2000	09/20/2003	2000	Invest Other, WQ
20000051482	TW-DIST-SERVPT-167193	MISCELLANEOUS	1206 E D ST	05/04/2000	09/20/2003	2000	MISCELLANEOUS
20000052076	TW-DIST-SERVPT-165541	METER IN/OUT	725 E 11TH ST	05/16/2000	09/20/2003	2000	Install Meter
20000052241	TW-DIST-SERVPT-156943	LEAK/CITY SIDE	680 E 11TH ST	05/17/2000	09/20/2003	2000	Investigate Possible Leak
20000025521	TW-DIST-SERVPT-153403	LEAK/CITY SIDE	1928 MILWAUKEE WAY	05/25/2000	09/19/2003	2000	Investigate Possible Leak
20000027060	TW-DIST-SERVPT-144437	METER IN/OUT	1919 E PORTLAND AVE	06/05/2000	09/19/2003	2000	Install Meter
20000005386	TW-DIST-SERVPT-156939	RENEW SERVICE	609 E 11TH ST	06/05/2000	09/19/2003	2000	Renew Service
20000005427	TW-DIST-SERVPT-084845	TRANSFER SERVICE	1100 ST PAUL AVE	06/06/2000	09/19/2003	2000	Transfer Service
20000005435	TW-DIST-SERVPT-084846	TRANSFER SERVICE	1106 ST PAUL AVE	06/06/2000	09/19/2003	2000	Transfer Service
20000005442	TW-DIST-SERVPT-084847	TRANSFER SERVICE	1113 ST PAUL AVE	06/06/2000	09/19/2003	2000	Transfer Service
20000005451	TW-DIST-SERVPT-084848	TRANSFER SERVICE	1114 ST PAUL AVE	06/06/2000	09/19/2003	2000	Transfer Service
20000005469	TW-DIST-SERVPT-084850	TRANSFER SERVICE	1129 ST PAUL AVE	06/06/2000	09/19/2003	2000	Transfer Service
20000005398	TW-DIST-SERVPT-156941	TRANSFER SERVICE	660 E 11TH ST	06/06/2000	09/19/2003	2000	Transfer Service
20000005404	TW-DIST-SERVPT-156942	TRANSFER SERVICE	672 E 11TH ST	06/06/2000	09/19/2003	2000	Transfer Service
20000005409	TW-DIST-SERVPT-165541	TRANSFER SERVICE	725 E 11TH ST	06/06/2000	09/19/2003	2000	Transfer Service
20000005528	TW-DIST-SERVPT-144437	TRANSFER SERVICE	1919 E PORTLAND AVE	06/07/2000	09/19/2003	2000	Transfer Service
20000005479	TW-DIST-SERVPT-151649	TRANSFER SERVICE	1448 ST PAUL AVE	06/07/2000	09/19/2003	2000	Transfer Service
20000005513	TW-DIST-SERVPT-164927	TRANSFER SERVICE	711 E 11TH ST	06/07/2000	09/19/2003	2000	Transfer Service
20000005495	TW-DIST-SERVPT-165149	TRANSFER SERVICE	711 E 11TH ST	06/07/2000	09/19/2003	2000	Transfer Service
20000005521	TW-DIST-SERVPT-165668	TRANSFER SERVICE	733 E 11TH ST	06/07/2000	09/19/2003	2000	Transfer Service
20000005487	TW-DIST-SERVPT-166210	TRANSFER SERVICE	1501 ST PAUL AVE	06/07/2000	09/19/2003	2000	Transfer Service
20000005473	TW-DIST-SERVPT-202560	TRANSFER SERVICE	1134 ST PAUL AVE	06/07/2000	09/19/2003	2000	Transfer Service
20000027404	TW-DIST-SERVPT-166415	LEAK/CITY SIDE	2240 TAYLOR WAY E	06/08/2000	09/19/2003	2000	Investigate Possible Leak
20000006646	TW-DIST-SERVPT-151651	TRANSFER SERVICE	1519 ST PAUL AVE	06/16/2000	09/19/2003	2000	Transfer Service
20000006660	TW-DIST-SERVPT-151653	TRANSFER SERVICE	1616 ST PAUL AVE	06/16/2000	09/19/2003	2000	Transfer Service
20000006666	TW-DIST-SERVPT-151654	TRANSFER SERVICE	1616 ST PAUL AVE	06/16/2000	09/19/2003	2000	Transfer Service
20000006625	TW-DIST-SERVPT-156943	TRANSFER SERVICE	680 E 11TH ST	06/16/2000	09/19/2003	2000	Transfer Service
20000006674	TW-DIST-SERVPT-156944	TRANSFER SERVICE	902 E 11TH ST	06/16/2000	09/19/2003	2000	Transfer Service
20000006632	TW-DIST-SERVPT-164412	TRANSFER SERVICE	922 E 11TH ST	06/16/2000	09/19/2003	2000	Transfer Service
20000006638	TW-DIST-SERVPT-167836	TRANSFER SERVICE	922 E 11TH ST	06/16/2000	09/19/2003	2000	Transfer Service
20000006652	TW-DIST-SERVPT-167837	TRANSFER SERVICE	1519 ST PAUL AVE	06/16/2000	09/19/2003	2000	Transfer Service
20000006681	TW-DIST-SERVPT-181246	TRANSFER SERVICE	2006 E PORTLAND AVE	06/16/2000	09/19/2003	2000	Transfer Service
20000030186	TW-DIST-SERVPT-153028	LEAK/CITY SIDE	1916 MARC AVE	06/27/2000	09/19/2003	2000	Investigate Possible Leak
20000030496	TW-DIST-SERVPT-105124	METER FAULT	2301 LINCOLN AVE	06/28/2000	09/19/2003	2000	Check Meter
20000009523	TW-DIST-SERVPT-165736	CHECK METER MAINT CHECK	440 E 19TH ST	07/12/2000	09/19/2003	2000	Check Meter
20000009530	TW-DIST-SERVPT-167681	CHECK METER MAINT CHECK	2120 PORT OF TACOMA RD E	07/12/2000	09/19/2003	2000	Check Meter
20000009605	TW-DIST-SERVPT-167760	CHECK METER MAINT CHECK	1970 MILWAUKEE WAY	07/12/2000	09/19/2003	2000	Check Meter
20000009598	TW-DIST-SERVPT-167760	CHECK METER MAINT CHECK	1970 MILWAUKEE WAY	07/12/2000	09/19/2003	2000	Check Meter
20000009547	TW-DIST-SERVPT-167807	CHECK METER MAINT CHECK	1940 E 11TH ST	07/12/2000	09/19/2003	2000	Check Meter
20000009768	TW-DIST-SERVPT-164453	CHECK METER MAINT CHECK	2810 E MARSHALL AVE	07/13/2000	09/19/2003	2000	Check Meter
20000009726	TW-DIST-SERVPT-165430	CHECK METER MAINT CHECK	2102 MILWAUKEE WAY	07/13/2000	09/19/2003	2000	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000009731	TW-DIST-SERVPT-165430	CHECK METER MAINT CHECK	2102 MILWAUKEE WAY	07/13/2000	09/19/2003	2000	Check Meter
20000009850	TW-DIST-SERVPT-165471	CHECK METER MAINT CHECK	2240 TAYLOR WAY E	07/13/2000	09/19/2003	2000	Check Meter
20000009745	TW-DIST-SERVPT-165707	CHECK METER MAINT CHECK	2144 MILWAUKEE WAY	07/13/2000	09/19/2003	2000	Check Meter
20000009738	TW-DIST-SERVPT-165707	CHECK METER MAINT CHECK	2144 MILWAUKEE WAY	07/13/2000	09/19/2003	2000	Check Meter
20000009831	TW-DIST-SERVPT-166652	CHECK METER MAINT CHECK	3329 E 11TH ST, #331	07/13/2000	09/19/2003	2000	Check Meter
20000009906	TW-DIST-SERVPT-167051	CHECK METER MAINT CHECK	2901 PORT OF TACOMA RD E	07/13/2000	09/19/2003	2000	Check Meter
20000009912	TW-DIST-SERVPT-167052	CHECK METER MAINT CHECK	230 E F ST	07/13/2000	09/19/2003	2000	Check Meter
20000009712	TW-DIST-SERVPT-167120	CHECK METER MAINT CHECK	2421 PORT OF TACOMA RD E	07/13/2000	09/19/2003	2000	Check Meter
20000009717	TW-DIST-SERVPT-167124	CHECK METER MAINT CHECK	1035 PORT OF TACOMA RD E	07/13/2000	09/19/2003	2000	Check Meter
20000009817	TW-DIST-SERVPT-167134	CHECK METER MAINT CHECK	2000 TAYLOR WAY E	07/13/2000	09/19/2003	2000	Check Meter
20000009824	TW-DIST-SERVPT-167183	CHECK METER MAINT CHECK	1901 TAYLOR WAY E	07/13/2000	09/19/2003	2000	Check Meter
20000009802	TW-DIST-SERVPT-167201	CHECK METER MAINT CHECK	1240 E ALEXANDER AVE	07/13/2000	09/19/2003	2000	Check Meter
20000033984	TW-DIST-SERVPT-181246	LEAK/CITY SIDE	2006 E PORTLAND AVE	07/19/2000	09/19/2003	2000	Investigate Possible Leak
20000034230	TW-DIST-SERVPT-166018	MISCELLANEOUS	1202 E 11TH ST	07/20/2000	09/19/2003	2000	MISCELLANEOUS
20000013662	TW-DIST-SERVPT-166650	CHECK METER CHECK MTR FOR EXCHG & TAKE E	1220 E ALEXANDER AVE	08/02/2000	09/19/2003	2000	Check Meter
20000036678	TW-DIST-SERVPT-091894	LEAK/CITY SIDE	2902 TAYLOR WAY E	08/08/2000	09/20/2003	2000	Investigate Possible Leak
20000014622	TW-DIST-SERVPT-091894	UPDATE SERVICE	2902 TAYLOR WAY E	08/09/2000	09/19/2003	2000	DO NOT USE - Update Service
20000014707	TW-DIST-SERVPT-180954	OTHER METER FIELD TEST 4"COMP - DEDUCT M	1815 PORT OF TACOMA RD E	08/10/2000	09/19/2003	2000	Other Meter
20000038229	TW-DIST-SERVPT-144420	LEAK/CITY SIDE	2222 PORT OF TACOMA RD E	08/16/2000	09/20/2003	2000	Investigate Possible Leak
20000038295	TW-DIST-SERVPT-180612	NO WATER	225 E F ST	08/16/2000	09/20/2003	2000	DO NOT USE Investigate No Water
20000038520	TW-DIST-SERVPT-167110	LEAK/CITY SIDE	2301 TAYLOR WAY E	08/17/2000	09/20/2003	2000	Investigate Possible Leak
20000039361	TW-DIST-SERVPT-144418	LEAK/CITY SIDE	2202 PORT OF TACOMA RD E	08/23/2000	09/20/2003	2000	Investigate Possible Leak
20000040004	TW-DIST-SERVPT-166507	LEAK/CITY SIDE	3120 E ALEXANDER AVE	08/28/2000	09/20/2003	2000	Investigate Possible Leak
20000040186	TW-DIST-SERVPT-091897	MISCELLANEOUS	3002 TAYLOR WAY E	08/29/2000	09/20/2003	2000	MISCELLANEOUS
20000040233	TW-DIST-SERVPT-153108	METER FAULT	2102 E MARSHALL AVE	08/29/2000	09/20/2003	2000	Check Meter
20000041574	TW-DIST-SERVPT-210118	MISCELLANEOUS	1656 E J ST	09/08/2000	09/20/2003	2000	MISCELLANEOUS
20000041779	TW-DIST-SERVPT-167052	PROP/SIDE PROB	230 E F ST	09/11/2000	09/20/2003	2000	Investigate Property Side
20000042588	TW-DIST-SERVPT-165632	LEAK/CITY SIDE	2001 THORNE RD	09/15/2000	09/20/2003	2000	Investigate Possible Leak
20000019395	TW-DIST-SERVPT-084800	TRANSFER SERVICE	1118 E D ST	09/22/2000	09/19/2003	2000	Transfer Service
20000043965	TW-DIST-SERVPT-164412	DAMAGE	922 E 11TH ST	09/25/2000	09/20/2003	2000	Investigate Damage
20000045610	TW-DIST-SERVPT-165935	LEAK/CITY SIDE	1460 THORNE RD	10/05/2000	09/20/2003	2000	Investigate Possible Leak
20000046416	TW-DIST-SERVPT-144423	NO WATER	2150 PORT OF TACOMA RD E	10/12/2000	09/20/2003	2000	DO NOT USE Investigate No Water
20000046492	TW-DIST-SERVPT-167051	LEAK/CITY SIDE	2901 PORT OF TACOMA RD E	10/12/2000	09/20/2003	2000	Investigate Possible Leak
20000046576	TW-DIST-SERVPT-166725	TURN ON/OFF	1751 THORNE RD	10/13/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000046734	TW-DIST-SERVPT-165838	TURN ON/OFF	3401 TAYLOR WAY E	10/16/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000046871	TW-DIST-SERVPT-164412	MISCELLANEOUS	922 E 11TH ST	10/17/2000	09/20/2003	2000	MISCELLANEOUS
20000047100	TW-DIST-SERVPT-156940	SHUTDOWN	652 E 11TH ST	10/19/2000	09/20/2003	2000	Shutdown Main

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000047167	TW-DIST-SERVPT-156940	SHUTDOWN	652 E 11TH ST	10/20/2000	09/20/2003	2000	Shutdown Main
20000047279	TW-DIST-SERVPT-181565	TURN ON/OFF	1747 PORT OF TACOMA RD E	10/23/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000048643	TW-DIST-SERVPT-151651	PROP/SIDE PROB	1519 ST PAUL AVE	11/07/2000	09/20/2003	2000	Investigate Property Side
20000049529	TW-DIST-SERVPT-167028	HYDRANT FAULT	2124 E MARSHALL AVE	11/18/2000	09/20/2003	2000	Check Hydrant (DO NOT USE on W1 Notifs)
20000049878	TW-DIST-SERVPT-164809	TURN ON/OFF	1621 LINCOLN AVE	11/25/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000049976	TW-DIST-SERVPT-164885	LEAK/CITY SIDE	1202 E D ST	11/27/2000	09/20/2003	2000	Investigate Possible Leak
20000050067	TW-DIST-SERVPT-164927	LEAK/CITY SIDE	711 E 11TH ST	11/28/2000	09/20/2003	2000	Investigate Possible Leak
20000003798	TW-DIST-SERVPT-164885	RENEW SERVICE	1202 E D ST	12/07/2000	09/19/2003	2000	Renew Service
20000004045	TW-DIST-SERVPT-130073	UPDATE SERVICE	448 E 18TH ST	12/11/2000	09/19/2003	2000	DO NOT USE - Update Service
20000052015	TW-DIST-SERVPT-144416	DAMAGE	2144 PORT OF TACOMA RD E	12/26/2000	09/20/2003	2000	Investigate Damage
20000052038	TW-DIST-SERVPT-144416	TURN ON/OFF	2144 PORT OF TACOMA RD E	12/27/2000	09/20/2003	2000	Engineering Plan Review-INSIDE
20000026053	TW-DIST-SERVPT-166762	MISCELLANEOUS	401 E ALEXANDER AVE	01/16/2001	09/19/2003	2001	MISCELLANEOUS
20000011286	TW-DIST-SERVPT-166141	RENEW SERVICE	1616 E D ST	02/16/2001	09/19/2003	2001	Renew Service
20000030600	TW-DIST-SERVPT-098461	METER FAULT	459 E 15TH ST	02/20/2001	09/19/2003	2001	Check Meter
20000030764	TW-DIST-SERVPT-111717	DAMAGE	2431 E ALEXANDER AVE	02/21/2001	09/19/2003	2001	Investigate Damage
20000031459	TW-DIST-SERVPT-111717	TURN ON/OFF	2431 E ALEXANDER AVE	02/26/2001	09/19/2003	2001	Engineering Plan Review-INSIDE
20000033826	TW-DIST-SERVPT-151712	PROP/SIDE PROB	2007 STEWART AVE E	03/14/2001	09/19/2003	2001	Investigate Property Side
20000035069	TW-DIST-SERVPT-206169	TURN ON/OFF	733 E 11TH ST, #E	03/26/2001	09/19/2003	2001	Engineering Plan Review-INSIDE
20000035596	TW-DIST-SERVPT-165611	TURN ON/OFF	1525 E D ST	03/30/2001	09/19/2003	2001	Engineering Plan Review-INSIDE
20000035673	TW-DIST-SERVPT-167512	TURN ON/OFF	1525 E D ST	03/30/2001	09/19/2003	2001	Engineering Plan Review-INSIDE
20000036663	TW-DIST-SERVPT-165384	PROP/SIDE PROB	2301 TAYLOR WAY E	04/09/2001	09/20/2003	2001	Investigate Property Side
20000045176	TW-DIST-SERVPT-165384	METER FAULT	2301 TAYLOR WAY E	04/09/2001	09/20/2003	2001	Check Meter
20000045175	TW-DIST-SERVPT-167110	METER FAULT	2301 TAYLOR WAY E	04/09/2001	09/20/2003	2001	Check Meter
20000036660	TW-DIST-SERVPT-167110	PROP/SIDE PROB	2301 TAYLOR WAY E	04/09/2001	09/20/2003	2001	Investigate Property Side
20000036767	TW-DIST-SERVPT-166725	MISCELLANEOUS	1751 THORNE RD	04/10/2001	09/20/2003	2001	MISCELLANEOUS
20000037084	TW-DIST-SERVPT-166652	METER FAULT	3329 E 11TH ST, #331	04/12/2001	09/20/2003	2001	Check Meter
20000038448	TW-DIST-SERVPT-167065	LEAK/CITY SIDE	1120 MILWAUKEE WAY	04/21/2001	09/20/2003	2001	Investigate Possible Leak
20000039001	TW-DIST-SERVPT-111712	LEAK/CITY SIDE	1825 E ALEXANDER AVE, #B	04/25/2001	09/20/2003	2001	Investigate Possible Leak
20000039885	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	05/01/2001	09/20/2003	2001	Engineering Plan Review-INSIDE
20000040534	TW-DIST-SERVPT-166630	LEAK/CITY SIDE	1600 E D ST	05/07/2001	09/20/2003	2001	Investigate Possible Leak
20000045999	TW-DIST-SERVPT-167689	PROP/SIDE PROB	1002 E F ST	06/13/2001	09/20/2003	2001	Investigate Property Side
20000046245	TW-DIST-SERVPT-165384	LEAK/CITY SIDE	2301 TAYLOR WAY E	06/14/2001	09/20/2003	2001	Investigate Possible Leak
20000047801	TW-DIST-SERVPT-167213	LEAK/CITY SIDE	2201 E 11TH ST	07/02/2001	09/20/2003	2001	Investigate Possible Leak
20000048265	TW-DIST-SERVPT-166760	TURN ON/OFF	1240 E ALEXANDER AVE	07/09/2001	09/20/2003	2001	Engineering Plan Review-INSIDE
20000049486	TW-DIST-SERVPT-165838	PROP/SIDE PROB	3401 TAYLOR WAY E	07/25/2001	09/20/2003	2001	Investigate Property Side
20000049535	TW-DIST-SERVPT-167213	TURN ON/OFF	2201 E 11TH ST	07/25/2001	09/20/2003	2001	Engineering Plan Review-INSIDE
20000050826	TW-DIST-SERVPT-166732	LEAK/CITY SIDE	1616 E D ST, #B	08/09/2001	09/20/2003	2001	Investigate Possible Leak
20000031501	TW-DIST-SERVPT-217302	INSTALL SERVICE	1123 ST PAUL AVE	08/27/2001	09/19/2003	2001	Install Service
20000027407	TW-DIST-SERVPT-165670	HYDRANT FAULT	2144 MILWAUKEE WAY	09/16/2001	09/19/2003	2001	Check Hydrant (DO NOT USE on W1 Notifs)
20000028085	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	09/21/2001	09/19/2003	2001	Engineering Plan Review-INSIDE
20000030030	TW-DIST-SERVPT-165159	LEAK/CITY SIDE	1015 E F ST	10/04/2001	09/19/2003	2001	Investigate Possible Leak
20000030731	TW-DIST-SERVPT-166652	MISCELLANEOUS	3329 E 11TH ST, #331	10/09/2001	09/19/2003	2001	MISCELLANEOUS
20000031070	TW-DIST-SERVPT-166507	MISCELLANEOUS	3120 E ALEXANDER AVE	10/11/2001	09/19/2003	2001	MISCELLANEOUS
20000031769	TW-DIST-SERVPT-165456	METER FAULT	1476 THORNE RD	10/18/2001	09/19/2003	2001	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000032742	TW-DIST-SERVPT-166652	PROP/SIDE PROB	3329 E 11TH ST, #331	10/26/2001	09/19/2003	2001	Investigate Property Side
20000034906	TW-DIST-SERVPT-165670	LEAK/CITY SIDE	2144 MILWAUKEE WAY	11/15/2001	09/19/2003	2001	Investigate Possible Leak
20000038495	TW-DIST-SERVPT-166760	LEAK/CITY SIDE	1240 E ALEXANDER AVE	12/15/2001	09/20/2003	2001	Investigate Possible Leak
20000038564	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	12/17/2001	09/20/2003	2001	Engineering Plan Review-INSIDE
20000039706	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	12/26/2001	09/20/2003	2001	Engineering Plan Review-INSIDE
20000041218	TW-DIST-SERVPT-165201	MISCELLANEOUS	1825 E ALEXANDER AVE, #B	01/08/2002	09/20/2003	2002	MISCELLANEOUS
20000041547	TW-DIST-SERVPT-167219	HYDRANT FAULT	605 E ALEXANDER AVE	01/10/2002	09/20/2003	2002	Check Hydrant (DO NOT USE on W1 Notifs)
20000046622	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	02/22/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000047102	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	02/27/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000047317	TW-DIST-SERVPT-165220	MISCELLANEOUS	1157 THORNE RD	03/01/2002	09/20/2003	2002	MISCELLANEOUS
20000040558	TW-DIST-SERVPT-165220	RENEW SERVICE	1157 THORNE RD	03/07/2002	09/20/2003	2002	Renew Service
20000048064	TW-DIST-SERVPT-167217	TURN ON/OFF	635 E ALEXANDER AVE	03/08/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000048824	TW-DIST-SERVPT-165220	TURN ON/OFF	1157 THORNE RD	03/19/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000049023	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	03/21/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000048965	TW-DIST-SERVPT-165761	MISCELLANEOUS	1616 ST PAUL AVE	03/21/2002	09/20/2003	2002	MISCELLANEOUS
20000049835	TW-DIST-SERVPT-164499	TURN ON/OFF	1510 TAYLOR WAY E	04/01/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000052090	TW-DIST-SERVPT-105120	LEAK/CITY SIDE	1931 LINCOLN AVE	04/25/2002	09/20/2003	2002	Investigate Possible Leak
20000025848	TW-DIST-SERVPT-105120	UPDATE SERVICE	1931 LINCOLN AVE	05/03/2002	09/19/2003	2002	DO NOT USE - Update Service
20000039138	TW-DIST-SERVPT-167213	METER IN/OUT	2201 E 11TH ST	05/24/2002	09/20/2003	2002	Install Meter
20000041693	TW-DIST-SERVPT-130073	LEAK/CITY SIDE	448 E 18TH ST	06/10/2002	09/20/2003	2002	Investigate Possible Leak
20000042359	TW-DIST-SERVPT-167271	METER FAULT	1940 E 11TH ST	06/12/2002	09/20/2003	2002	Check Meter
20000048798	TW-DIST-SERVPT-166386	TURN ON/OFF	3003 TAYLOR WAY E	07/25/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000049078	TW-DIST-SERVPT-144427	HYDRANT FAULT	2420 PORT OF TACOMA RD E	07/29/2002	09/20/2003	2002	Check Hydrant (DO NOT USE on W1 Notifs)
20000049105	TW-DIST-SERVPT-167031	MISCELLANEOUS	3113 E 11TH ST	07/29/2002	09/20/2003	2002	MISCELLANEOUS
20000049108	TW-DIST-SERVPT-167031	MISCELLANEOUS	3113 E 11TH ST	07/29/2002	09/20/2003	2002	MISCELLANEOUS
20000049618	TW-DIST-SERVPT-165444	TURN ON/OFF	2407 PORT OF TACOMA RD E	08/02/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000050141	TW-DIST-SERVPT-164453	HYDRANT FAULT	2810 E MARSHALL AVE	08/09/2002	09/20/2003	2002	Check Hydrant (DO NOT USE on W1 Notifs)
20000052197	TW-DIST-SERVPT-153403	MISCELLANEOUS	1928 MILWAUKEE WAY	08/27/2002	09/20/2003	2002	MISCELLANEOUS
20000052832	TW-DIST-SERVPT-166210	TURN ON/OFF	1501 ST PAUL AVE	09/05/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000052899	TW-DIST-SERVPT-165073	LEAK/CITY SIDE	1123 PORT OF TACOMA RD E	09/09/2002	09/20/2003	2002	Investigate Possible Leak
20000039105	TW-DIST-SERVPT-167217	UPDATE SERVICE	635 E ALEXANDER AVE	09/16/2002	09/20/2003	2002	DO NOT USE - Update Service
20000039109	TW-DIST-SERVPT-167219	UPDATE SERVICE	605 E ALEXANDER AVE	09/16/2002	09/20/2003	2002	DO NOT USE - Update Service
20000053159	TW-DIST-SERVPT-091909	WATER QUALITY	1144 THORNE RD	09/17/2002	09/20/2003	2002	Invest Other, WQ
20000040090	TW-DIST-SERVPT-164744	UPDATE SERVICE	1410 THORNE RD	10/01/2002	09/20/2003	2002	DO NOT USE - Update Service
20000053684	TW-DIST-SERVPT-167217	TURN ON/OFF	635 E ALEXANDER AVE	10/02/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000053900	TW-DIST-SERVPT-166386	TURN ON/OFF	3003 TAYLOR WAY E	10/10/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000054167	TW-DIST-SERVPT-164489	MISCELLANEOUS	520 E D ST	10/21/2002	09/20/2003	2002	MISCELLANEOUS
20000054628	TW-DIST-SERVPT-165736	LEAK/CITY SIDE	440 E 19TH ST	11/04/2002	09/20/2003	2002	Investigate Possible Leak
20000036586	TW-DIST-SERVPT-130092	DAMAGE	424 E 19TH ST	11/27/2002	09/20/2003	2002	Investigate Damage
20000036526	TW-DIST-SERVPT-165541	LEAK/CITY SIDE	725 E 11TH ST	11/27/2002	09/20/2003	2002	Investigate Possible Leak
20000036873	TW-DIST-SERVPT-166338	METER FAULT	501 E 19TH ST	12/02/2002	09/20/2003	2002	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000039174	TW-DIST-SERVPT-167110	TURN ON/OFF	2301 TAYLOR WAY E	12/16/2002	09/20/2003	2002	Engineering Plan Review-INSIDE
20000041220	TW-DIST-SERVPT-180954	HYDRANT FAULT	1815 PORT OF TACOMA RD E	01/02/2003	09/20/2003	2003	Check Hydrant (DO NOT USE on W1 Notifs)
20000041359	TW-DIST-SERVPT-153403	NO WATER	1928 MILWAUKEE WAY	01/03/2003	09/20/2003	2003	DO NOT USE Investigate No Water
20000043455	TW-DIST-SERVPT-098461	HYDRANT FAULT	459 E 15TH ST	01/16/2003	09/20/2003	2003	Check Hydrant (DO NOT USE on W1 Notifs)
20000043437	TW-DIST-SERVPT-098462	METER FAULT	465 E 15TH ST	01/16/2003	09/20/2003	2003	Check Meter
20000043451	TW-DIST-SERVPT-167518	METER FAULT	465 E 15TH ST	01/16/2003	09/20/2003	2003	Check Meter
20000045836	TW-DIST-SERVPT-105123	MISCELLANEOUS	2253 LINCOLN AVE	02/03/2003	09/20/2003	2003	MISCELLANEOUS
20000047813	TW-DIST-SERVPT-166596	RENEW SERVICE & RELOCATE SERVICE	3115 E 11TH ST	02/03/2003	09/20/2003	2003	Renew Service
20000047015	TW-DIST-SERVPT-164658	TURN ON/OFF	2244 PORT OF TACOMA RD E	02/14/2003	09/20/2003	2003	Engineering Plan Review-INSIDE
20000047012	TW-DIST-SERVPT-166963	MISCELLANEOUS	1114 TAYLOR WAY E	02/14/2003	09/20/2003	2003	MISCELLANEOUS
20000049257	TW-DIST-SERVPT-156966	LEAK/CITY SIDE	3510 E 11TH ST	03/14/2003	09/20/2003	2003	Investigate Possible Leak
20000049631	TW-DIST-SERVPT-167689	MISCELLANEOUS	1002 E F ST	03/19/2003	09/20/2003	2003	MISCELLANEOUS
20000053102	TW-DIST-SERVPT-167133	PROP/SIDE PROB	1801 TAYLOR WAY E	05/11/2003	09/20/2003	2003	Investigate Property Side
20000053738	TW-DIST-SERVPT-240894	MISCELLANEOUS	2810 E MARSHALL AVE, #B	06/04/2003	09/20/2003	2003	MISCELLANEOUS
20000054014	TW-DIST-SERVPT-165444	TURN ON/OFF	2407 PORT OF TACOMA RD E	06/13/2003	09/20/2003	2003	Engineering Plan Review-INSIDE
20000054054	TW-DIST-SERVPT-167178	HYDRANT FAULT	2124 E MARSHALL AVE	06/14/2003	09/20/2003	2003	Check Hydrant (DO NOT USE on W1 Notifs)
20000054090	TW-DIST-SERVPT-167178	PROP/SIDE PROB	2124 E MARSHALL AVE	06/16/2003	09/20/2003	2003	Investigate Property Side
20000037069	TW-DIST-SERVPT-166134	UPDATE SERVICE	2601 SR 509 N FRONTAGE RD	06/19/2003	09/20/2003	2003	DO NOT USE - Update Service
20000039966	TW-DIST-SERVPT-130099	LOW PRESSURE	495 E 19TH ST	07/31/2003	09/20/2003	2003	DO NOT USE on W1 Notif-Invest. Low Press
20000040170	TW-DIST-SERVPT-167297	MISCELLANEOUS	1623 E J ST	08/01/2003	09/20/2003	2003	MISCELLANEOUS
20000040804	TW-DIST-SERVPT-144426	MISCELLANEOUS	2406 PORT OF TACOMA RD E	08/05/2003	09/20/2003	2003	MISCELLANEOUS
20000042927	TW-DIST-SERVPT-130099	HIGH PRESSURE	495 E 19TH ST	08/18/2003	09/20/2003	2003	DO NOT USE on W1 Notif-Invest. Hi Press
20000042997	TW-DIST-SERVPT-167297	LEAK/CITY SIDE	1623 E J ST	08/19/2003	09/20/2003	2003	Investigate Possible Leak
20000043490	TW-DIST-SERVPT-167781	LOW PRESSURE	1616 E D ST	08/21/2003	09/20/2003	2003	DO NOT USE on W1 Notif-Invest. Low Press
20000045563	TW-DIST-SERVPT-166507	PROP/SIDE PROB	3120 E ALEXANDER AVE	09/04/2003	09/20/2003	2003	Investigate Property Side
20000045489	TW-DIST-SERVPT-166630	TURN ON/OFF	1600 E D ST	09/04/2003	09/20/2003	2003	Engineering Plan Review-INSIDE
20000055221	TW-DIST-SERVPT-167694	Detector Check 5 YR Maintenance	1630 E 18TH ST	11/17/2003	02/24/2004	2003	Check Meter
20000055185	TW-DIST-SERVPT-165349	Detector Check 5 YR Maintenance	1754 THORNE RD	11/17/2003	02/25/2004	2003	Check Meter
20000055188	TW-DIST-SERVPT-165378	Detector Check 5 YR Maintenance	1221 E ALEXANDER AVE	11/17/2003	02/25/2004	2003	Check Meter
20000055205	TW-DIST-SERVPT-166110	Detector Check 5 YR Maintenance	1801 E D ST	11/17/2003	03/02/2004	2003	Check Meter
20000055247	TW-DIST-SERVPT-167809	Detector Check 5 YR Maintenance	1002 E F ST	11/17/2003	03/03/2004	2003	Check Meter
20000055237	TW-DIST-SERVPT-165343	Detector Check 5 YR Maintenance	2302 ROSS WAY	11/17/2003	03/08/2004	2003	Check Meter
20000055245	TW-DIST-SERVPT-167664	Detector Check 5 YR Maintenance	480 E 19TH ST	11/17/2003	03/17/2004	2003	Check Meter
20000067840	TW-DIST-SERVPT-165378	Detector Check 5 YR Maintenance	1221 E ALEXANDER AVE	11/17/2003	10/04/2005	2003	Repair Meter
20000055353	TW-DIST-SERVPT-084827	Missing meter lid - 1123 Port of Tacoma	1123 PORT OF TACOMA RD E	11/26/2003	02/09/2004	2003	Other Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000056112	TW-DIST-SERVPT-166141	Turn off service - 1616 E D St	1616 E D ST	01/07/2004	02/11/2004	2004	Engineering Plan Review-INSIDE
20000056167	TW-DIST-SERVPT-210118	Emergency Turn Off - 1656 E. J St	1656 E J ST	01/09/2004	01/09/2004	2004	Turn Off Valve
20000055638	TW-DIST-SERVPT-167781	Detector Check 5 YR Maintenance	1616 E D ST	01/12/2004	03/02/2004	2004	Check Meter
20000056394	TW-DIST-SERVPT-111711	Turn off water-1801 Alexander Ave	1801 E ALEXANDER AVE	01/21/2004	03/17/2004	2004	Engineering Plan Review-INSIDE
20000056486	TW-DIST-SERVPT-167713	Detector Check 5 YR Maintenance	1112 E ALEXANDER AVE	01/26/2004	03/11/2004	2004	Check Meter
20000056550	TW-DIST-SERVPT-164453	CHECK STRUCTURES 2810 MARSHAL	2810 E MARSHALL AVE	01/28/2004	02/12/2004	2004	Investigate Damage
20000056597	TW-DIST-SERVPT-111717	Turn Off - 2500 Blk E. Alexander Ave	2431 E ALEXANDER AVE	01/30/2004	01/30/2004	2004	Engineering Plan Review-INSIDE
20000057312	TW-DIST-SERVPT-167688	Detector Check 5 YR Maintenance	2367 LINCOLN AVE	02/26/2004	02/26/2004	2004	Check Meter
20000057290	TW-DIST-SERVPT-181245	Detector Check 5 YR Maintenance	2006 E PORTLAND AVE	02/26/2004	02/26/2004	2004	Check Meter
20000057597	TW-DIST-SERVPT-084827	Hydrant down-1123 Port of Tacoma Rd	1123 PORT OF TACOMA RD E	03/09/2004	03/16/2004	2004	Investigate Vehicle v/s Hyd/Guard Post
20000057574	TW-DIST-SERVPT-105121	Broken Pipe	1955 LINCOLN AVE	03/09/2004	03/16/2004	2004	Engineering Plan Review-INSIDE
20000057613	TW-DIST-SERVPT-164608	Turn Off - 1223 E. 11th St	1223 E 11TH ST	03/10/2004	03/16/2004	2004	Engineering Plan Review-INSIDE
20000058171	TW-DIST-SERVPT-167194	901 Alexander Ave - Street leak	1101 E ALEXANDER AVE	04/02/2004	04/03/2004	2004	Investigate Possible Leak
20000058239	TW-DIST-SERVPT-167860	Detector Check 5 YR Maintenance	2000 E ALEXANDER AVE	04/06/2004	04/08/2004	2004	Check Meter
20000058251	TW-DIST-SERVPT-165451	Detector Check 5 YR Maintenance	1671 LINCOLN AVE	04/06/2004	12/15/2004	2004	Check Meter
20000058380	TW-DIST-SERVPT-167703	Detector Check 5 YR Maintenance	1509 TAYLOR WAY	04/12/2004	04/19/2004	2004	Check Meter
20000058383	TW-DIST-SERVPT-184145	Detector Check 5 YR Maintenance	3126 E 11TH ST	04/12/2004	04/19/2004	2004	Check Meter
20000058722	TW-DIST-SERVPT-166743	624 E 15TH ST- TURN OFF SERVICE	624 E 15TH ST	04/28/2004	04/28/2004	2004	Engineering Plan Review-INSIDE
20000059224	TW-DIST-SERVPT-153404	1938 milwaukee way missing meter box lid	1938 MILWAUKEE WAY	05/19/2004	05/19/2004	2004	Replace Mtr Box Lid
20000059235	TW-DIST-SERVPT-165308	1112 E. Alexander Ave. Turn on	1112 E ALEXANDER AVE	05/19/2004	07/23/2007	2004	Engineering Plan Review-INSIDE
20000059929	TW-DIST-SERVPT-144416	2148 Port of Tacoma Rd - Possible leak	2144 PORT OF TACOMA RD E	06/21/2004	06/21/2004	2004	Investigate Possible Leak
20000060028	TW-DIST-SERVPT-164453	2810 Marshall Ave - Turn Off	2810 E MARSHALL AVE	06/23/2004	06/23/2004	2004	Engineering Plan Review-INSIDE
20000060148	TW-DIST-SERVPT-165308	1112 E ALEXANDER AVE	1112 E ALEXANDER AVE	06/29/2004	06/30/2004	2004	NO CONTRACT-After Hrs Turn On
20000060224	TW-DIST-SERVPT-167713	1112 E ALEXANDER AVE	1112 E ALEXANDER AVE	07/01/2004	07/02/2004	2004	NO CONTRACT-After Hrs Turn On
20000060454	TW-DIST-SERVPT-165371	2148 Port of Tacoma Rd- Emerg. Shut off	2150 PORT OF TACOMA RD E	07/12/2004	07/14/2004	2004	Engineering Plan Review-INSIDE
20000060529	TW-DIST-SERVPT-167620	Detector Check 5 YR Maintenance	624 E 15TH ST	07/19/2004	07/20/2004	2004	Check Meter
20000060628	TW-DIST-SERVPT-165541	725 E. 11th St - Turn Off	725 E 11TH ST	07/28/2004	07/29/2004	2004	Engineering Plan Review-INSIDE
20000060951	TW-DIST-SERVPT-156935	301 E 11th St - leak	301 E 11TH ST	08/09/2004	08/09/2004	2004	Investigate Possible Leak
20000061450	TW-DIST-SERVPT-084866	1140 THORNE RD - BROKEN SERVICE	1132 THORNE RD	09/02/2004	09/02/2004	2004	Investigate Damage

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000061732	TW-DIST-SERVPT-167797	1718 Thorne Rd - Turn off	1718 THORNE RD	09/17/2004	09/20/2004	2004	Engineering Plan Review-INSIDE
20000061736	TW-DIST-SERVPT-165585	1718 Thorne Rd.	1718 THORNE RD	09/18/2004	09/20/2004	2004	Turn On Valve
20000061752	TW-DIST-SERVPT-166762	401 E. ALEXANDER	401 E ALEXANDER AVE	09/19/2004	09/20/2004	2004	Check Hydrant (DO NOT USE on W1 Notifs)
20000061978	TW-DIST-SERVPT-166762	401 Alexander Ave - turn off	401 E ALEXANDER AVE	10/08/2004	10/11/2004	2004	Engineering Plan Review-INSIDE
20000062093	TW-DIST-SERVPT-167753	Detector Check 5 YR Maintenance	1616 ST PAUL AVE	10/11/2004	10/13/2004	2004	Check Meter
20000062107	TW-DIST-SERVPT-166762	401 Alexander Ave - Repair leaking meter	401 E ALEXANDER AVE	10/13/2004	10/13/2004	2004	Repair Meter
20000062690	TW-DIST-SERVPT-167749	Detector Check 5 YR Maintenance	2202 PORT OF TACOMA RD E	11/08/2004	11/16/2004	2004	Check Meter
20000062682	TW-DIST-SERVPT-165611	Detector Check 5 YR Maintenance	1525 E D ST	11/08/2004	11/24/2004	2004	Check Meter
20000062700	TW-DIST-SERVPT-164798	Detector Check 5 YR Maintenance	2340 TAYLOR WAY	11/08/2004	11/24/2004	2004	Check Meter
20000062741	TW-DIST-SERVPT-167749	Detector Check 5 YR Maintenance	2202 PORT OF TACOMA RD E	11/08/2004	11/24/2004	2004	Check Meter
20000062762	TW-DIST-SERVPT-164628	1123 PORT OF TACOMA RD-INVEST SINKHOLE	1123 PORT OF TACOMA RD E	11/12/2004	11/12/2004	2004	Investigate Sink Hole
20000062916	TW-DIST-SERVPT-165360	Detector Check 5 YR Maintenance	635 E 15TH ST	11/22/2004	12/01/2004	2004	Check Meter
20000062957	TW-DIST-SERVPT-165615	Detector Check 5 YR Maintenance	1017 E D ST	11/22/2004	12/01/2004	2004	Check Meter
20000063191	TW-DIST-SERVPT-156935	302 E. 11th St - Possible Hydrant leak	301 E 11TH ST	12/08/2004	12/08/2004	2004	Investigate Possible Leak
20000008025	TW-DIST-SERVPT-164442	1118 D St E-Renew Svc - 600		12/20/2004	12/20/2004	2004	Renew Service
20000063438	TW-DIST-SERVPT-164442	1118 D St E-Renew Svc - 600	1118 E D ST, #C	12/20/2004	08/02/2005	2004	Renew Service
20000063800	TW-DIST-SERVPT-180920	Detector Check 5 YR Maintenance	1815 PORT OF TACOMA RD E	01/10/2005	01/12/2005	2005	Check Meter
20000063987	TW-DIST-SERVPT-167028	2124 Marshall Ave-repair leaking hyd.	2124 E MARSHALL AVE	01/21/2005	01/25/2005	2005	Repair Hydrant
20000064213	TW-DIST-SERVPT-130098	490 E 19th ST - Vault full of water	490 E 19TH ST	02/15/2005	02/16/2005	2005	Check Vault
20000064318	TW-DIST-SERVPT-167217	E. 11th & 4th on Alexander -Expose Gates	635 E ALEXANDER AVE	02/17/2005	01/11/2007	2005	Locate And Raise Valve Box
20000064578	TW-DIST-SERVPT-181245	2006 Portland Ave - Hit Service	2006 E PORTLAND AVE	03/07/2005	03/16/2005	2005	Investigate Damage
20000064733	TW-DIST-SERVPT-167130	2101 taylor way /prop side week	1901 TAYLOR WAY E	03/23/2005	03/24/2005	2005	Investigate Possible Leak
20000064756	TW-DIST-SERVPT-165736	Detector Check 5 YR Maintenance	440 E 19TH ST	03/28/2005	07/07/2005	2005	Check Meter
20000064757	TW-DIST-SERVPT-167681	Detector Check 5 YR Maintenance	2120 PORT OF TACOMA RD E	03/28/2005	07/07/2005	2005	Check Meter
20000064820	TW-DIST-SERVPT-167807	Detector Check 5 YR Maintenance	1940 E 11TH ST	03/28/2005	07/07/2005	2005	Check Meter
20000070099	TW-DIST-SERVPT-167681	Detector Check 5 YR Maintenance	2120 PORT OF TACOMA RD E	03/28/2005	03/07/2006	2005	Check Meter
20000064797	TW-DIST-SERVPT-130073	448 E. 18th St - Street Leak	448 E 18TH ST	03/31/2005	03/31/2005	2005	Investigate Possible Leak
20000064922	TW-DIST-SERVPT-167760	Detector Check 5 YR Maintenance	1970 MILWAUKEE WAY	04/04/2005	08/29/2005	2005	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000065286	TW-DIST-SERVPT-166134	2601 N Frontage Rd - check for leak	2601 SR 509 N FRONTAGE RD	04/27/2005	04/27/2005	2005	Investigate Possible Leak
20000065497	TW-DIST-SERVPT-167028	2124 Marshall Ave S hyd broken	2124 E MARSHALL AVE	05/19/2005	05/24/2005	2005	Repair Hydrant
20000065573	TW-DIST-SERVPT-130098	490 E. 19th St - Vault Sunken	490 E 19TH ST	05/25/2005	05/09/2006	2005	Adjust Vault height
20000067608	TW-DIST-SERVPT-166104	Detector Check 5 YR Maintenance	2556 E 11TH ST	05/30/2005	09/21/2005	2005	Check Meter
20000065519	TW-DIST-SERVPT-166104	Detector Check 5 YR Maintenance	2556 E 11TH ST	05/30/2005	04/24/2006	2005	Check Meter
20000065583	TW-DIST-SERVPT-167146	Detector Check 5 YR Maintenance	2434 E 11TH ST	06/20/2005	08/08/2005	2005	Check Meter
20000066730	TW-DIST-SERVPT-143347	1815 E.D check for leak	1815 E D ST	06/29/2005	06/29/2005	2005	Investigate Possible Leak
20000066524	TW-DIST-SERVPT-167207	WQ - 3701 Taylor Way - Filters clogging	3701 TAYLOR WAY	06/29/2005	06/29/2005	2005	Invest Brown/Sand In Water, WQ
20000066517	TW-DIST-SERVPT-130092	424 E. 19th street repair service	424 E 19TH ST	06/29/2005	04/26/2006	2005	Repair Service
20000066740	TW-DIST-SERVPT-206184	733 E.11th St.-Fire Svc.Lking	733 E 11TH ST, #C	06/30/2005	06/30/2005	2005	Check Meter
20000066757	TW-DIST-SERVPT-130092	424 Ea. 19th St.-Update Svc. - 600	424 E 19TH ST	06/30/2005	05/10/2006	2005	DO NOT USE - Update Service
20000066653	TW-DIST-SERVPT-130093	440 E 19th possible leak	440 E 19TH ST	07/02/2005	07/02/2005	2005	Investigate Possible Leak
20000066840	TW-DIST-SERVPT-167565	REPLACED BAD 3/4" CHECK VALVE	1900 E D ST	07/08/2005	07/08/2005	2005	Repair Meter
20000066973	TW-DIST-SERVPT-156939	609 E 11th St locate service	609 E 11TH ST	07/24/2005	05/05/2006	2005	Investigate Possible Water Structure
20000067142	TW-DIST-SERVPT-167822	Detector Check 5 YR Maintenance	1501 E PORTLAND AVE	08/01/2005	08/29/2005	2005	Check Meter
20000067256	TW-DIST-SERVPT-163493	1652 Lincoln Ave S hyd hit & damaged	1651 LINCOLN AVE	08/14/2005	08/15/2005	2005	Check Hydrant (DO NOT USE on W1 Notifs)
20000067379	TW-DIST-SERVPT-167489	Detector Check 5 YR Maintenance	3319 LINCOLN AVE	09/05/2005	09/07/2005	2005	Check Meter
20000068254	TW-DIST-SERVPT-180920	1815 PORT OF TACOMA RD E- MTR MASTER	1815 PORT OF TACOMA RD E	10/19/2005	10/19/2005	2005	Other Meter
20000068833	TW-DIST-SERVPT-084800	1118 E.'D'St.-Update Svc. - 600	1118 E D ST	11/08/2005	12/13/2005	2005	DO NOT USE - Update Service
20000068886	TW-DIST-SERVPT-167837	Detector Check 5 YR Maintenance	1519 ST PAUL AVE	11/14/2005	12/06/2005	2005	Check Meter
20000069484	TW-DIST-SERVPT-163493	1651 Lincoln Ave.-Inst. # 4 Box	1651 LINCOLN AVE	01/13/2006	01/19/2006	2006	Replace Mtr Box
20000069556	TW-DIST-SERVPT-167688	Detector Check 5 YR Maintenance	2367 LINCOLN AVE	01/26/2006	02/02/2006	2006	Check Meter
20000069753	TW-DIST-SERVPT-165367	Detector Check 5 YR Maintenance	516 E D ST	01/30/2006	02/02/2006	2006	Check Meter
20000069754	TW-DIST-SERVPT-165746	Detector Check 5 YR Maintenance	1401 THORNE RD	01/30/2006	02/02/2006	2006	Check Meter
20000070142	TW-DIST-SERVPT-167203	3111 E MARSHALL AVE- REPLACE VAULT LID	2602 PORT OF TACOMA RD	03/01/2006	03/15/2006	2006	Replace Vault Lid
20000070394	TW-DIST-SERVPT-167841	Detector Check 5 YR Maintenance	1901 E D ST	03/20/2006	03/21/2006	2006	Check Meter
20000070798	TW-DIST-SERVPT-165651	3320 Lincoln Ave	3320 LINCOLN AVE	03/30/2006	03/31/2006	2006	Investigate Property Side
20000070799	TW-DIST-SERVPT-165651	3320 Lincoln Ave	3320 LINCOLN AVE	03/31/2006	03/31/2006	2006	Investigate Property Side

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000070950	TW-DIST-SERVPT-167846	Detector Check 5 YR Maintenance	1662 LINCOLN AVE	04/10/2006	04/17/2006	2006	Check Meter
20000071754	TW-DIST-SERVPT-217302	Detector Check 5 YR Maintenance	1123 ST PAUL AVE	05/15/2006	05/16/2006	2006	Check Meter
20000071853	TW-DIST-SERVPT-165541	725 E 11TH ST-CHECK METER GUTS	725 E 11TH ST	05/24/2006	05/24/2006	2006	Other Meter
20000072054	TW-DIST-SERVPT-166386	3003 TAYLOR WY-INVEST. POSS. LEAK	3003 TAYLOR WAY	06/06/2006	06/06/2006	2006	Investigate Possible Leak
20000072924	TW-DIST-SERVPT-156963	1100 Blk of E. Alexander Ave-Street Leak	3302 E 11TH ST	07/03/2006	07/03/2006	2006	Investigate Possible Leak
20000072920	TW-DIST-SERVPT-219889	Detector Check 5 YR Maintenance	802 E 11TH ST	07/03/2006	07/26/2006	2006	Check Meter
20000073194	TW-DIST-SERVPT-167905	Detector Check 5 YR Maintenance	1144 THORNE RD	07/24/2006	07/28/2006	2006	Check Meter
20000073195	TW-DIST-SERVPT-167842	Detector Check 5 YR Maintenance	2216 E 11TH ST	07/24/2006	07/28/2006	2006	Check Meter
20000073912	TW-DIST-SERVPT-166760	1240 E Alexander-dig up & replace gt box	1240 E ALEXANDER AVE	08/08/2006	08/25/2006	2006	Repair Valve
20000073949	TW-DIST-SERVPT-166134	2601 SR509 N FRONTAGE RD-WTR QU-DIRTY	2601 SR 509 N FRONTAGE RD	08/10/2006	08/10/2006	2006	Invest Brown/Sand In Water, WQ
20000073973	TW-DIST-SERVPT-166134	2601 SR509 N FRONTAGE RD- POSS ST LEAK	2601 SR 509 N FRONTAGE RD	08/14/2006	08/14/2006	2006	Investigate Possible Leak
20000074331	TW-DIST-SERVPT-165615	1017 E D St - No water	1017 E D ST	09/05/2006	10/24/2006	2006	Check Service
20000074381	TW-DIST-SERVPT-105121	wq-1955 lincoln ave-illness	1955 LINCOLN AVE	09/06/2006	09/06/2006	2006	Invest Other, WQ
20000074783	TW-DIST-SERVPT-084866	1132 Thorne Rd.- Podd. Water Meter	1132 THORNE RD	09/18/2006	09/26/2007	2006	Investigate Possible Water Structure
20000074814	TW-DIST-SERVPT-167028	2124 Marshall - Hydrant broke	2124 E MARSHALL AVE	09/22/2006	09/22/2006	2006	Investigate Damage
20000074815	TW-DIST-SERVPT-167178	2124 Marshall - Hydrant broke	2124 E MARSHALL AVE	09/22/2006	09/26/2006	2006	Check Hydrant (DO NOT USE on W1 Notifs)
20000075532	TW-DIST-SERVPT-130099	WQ 495 E 19th St	495 E 19TH ST	09/28/2006	09/28/2006	2006	Invest Brown/Sand In Water, WQ
20000075533	TW-DIST-SERVPT-130099	495 E 19th St	495 E 19TH ST	09/28/2006	09/28/2006	2006	Flush Main
20000075936	TW-DIST-SERVPT-181565	1747 PORT OF TACOMA RD - RAISE GATE	1747 PORT OF TACOMA RD E	11/03/2006	02/13/2008	2006	Locate And Raise Valve Box
20000076066	TW-DIST-SERVPT-144427	2420 PORT OF TACOMA ROAD-INVES POSS LEAK	2420 PORT OF TACOMA RD E	11/22/2006	11/22/2006	2006	Investigate Possible Leak
20000076117	TW-DIST-SERVPT-166111	Detector Check 5 YR Maintenance	1157 THORNE RD	11/27/2006	12/04/2006	2006	Check Meter
20000076118	TW-DIST-SERVPT-166117	Detector Check 5 YR Maintenance	1460 THORNE RD	11/27/2006	12/04/2006	2006	Check Meter
20000076221	TW-DIST-SERVPT-167836	Detector Check 5 YR Maintenance	922 E 11TH ST	11/27/2006	12/06/2006	2006	Check Meter
20000076929	TW-DIST-SERVPT-166100	Detector Check 5 YR Maintenance	1910 MILWAUKEE WAY	01/01/2007	01/10/2007	2007	Check Meter
20000076953	TW-DIST-SERVPT-167463	Detector Check 5 YR Maintenance	2330 PORT OF TACOMA RD E	01/01/2007	01/10/2007	2007	Check Meter
20000076927	TW-DIST-SERVPT-166085	Detector Check 5 YR Maintenance	1420 PORT OF TACOMA RD E	01/01/2007	01/18/2007	2007	Check Meter
20000076923	TW-DIST-SERVPT-166075	Detector Check 5 YR Maintenance	2021 MARC AVE	01/01/2007	03/16/2007	2007	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
40000872011		Disconnect Large mtr-Water	1206 E D ST	01/05/2007	01/05/2007	2007	Disconnect Large mtr-Water
40000875961		Reconnect-Water no charge	1157 THORNE RD	01/17/2007	01/17/2007	2007	Reconnect-Water no charge
40000896067		Disconnect Large mtr-Water	3400 TAYLOR WAY	02/12/2007	02/12/2007	2007	Disconnect Large mtr-Water
20000018233	TW-DIST-SERVPT-167560	5214 S. Bell St.-Renew Service - 400		02/16/2007	02/06/2007	2007	Renew Service
40000917705		WTR-After hours reconnect -day charge	1206 E D ST	03/13/2007	03/13/2007	2007	WTR-After hours reconnect
20000078626	TW-DIST-SERVPT-144435	1701 E PORTLAND AVE	1701 E PORTLAND AVE	03/30/2007	03/30/2007	2007	Investigate Possible Water Structure
40000928706		Disconnect mtr-Water	501 E 11TH ST	03/30/2007	03/30/2007	2007	Disconnect mtr-Water
20000078696	TW-DIST-SERVPT-130092	424 E 19th St-Invest Poss Leak	424 E 19TH ST	04/09/2007	04/09/2007	2007	Investigate Possible Leak
20000078764	TW-DIST-SERVPT-165371	Detector Check 5 YR Maintenance	2150 PORT OF TACOMA RD E	04/09/2007	04/11/2007	2007	Check Meter
20000079573	TW-DIST-SERVPT-167219	605 E.Alexander Ave.-Invest.Lk.	605 E ALEXANDER AVE	05/09/2007	05/09/2007	2007	Investigate Possible Leak
40000962186		Over 1" sprinkler Reconnect	1747 PORT OF TACOMA RD	05/15/2007	05/15/2007	2007	Over 1" sprinkler Reconnect
20000079792	TW-DIST-SERVPT-166415	2301 Taylor Way broken manhole cover	2240 TAYLOR WAY	05/22/2007	05/22/2007	2007	Replace Vault Lid
20000079976	TW-DIST-SERVPT-167518	Detector Check 5 YR Maintenance	465 E 15TH ST	06/04/2007	06/05/2007	2007	Check Meter
20000079960	TW-DIST-SERVPT-167499	Detector Check 5 YR Maintenance	2221 ROSS WAY	06/04/2007	06/20/2007	2007	Check Meter
20000079968	TW-DIST-SERVPT-167540	Detector Check 5 YR Maintenance	701 E D ST	06/04/2007	06/20/2007	2007	Check Meter
20000079967	TW-DIST-SERVPT-167539	Detector Check 5 YR Maintenance	1118 E D ST	06/04/2007	06/21/2007	2007	Check Meter
20000079959	TW-DIST-SERVPT-167496	Detector Check 5 YR Maintenance	2141 MILWAUKEE WAY	06/04/2007	12/13/2007	2007	Check Meter
20000080741	TW-DIST-SERVPT-167297	1623 E J St-Invest Dirty Water	1623 E J ST	07/20/2007	07/20/2007	2007	Invest Brown/Sand In Water, WQ
20000081326	TW-DIST-SERVPT-130099	495 E 19th St - Invest Poss Leak	495 E 19TH ST	08/02/2007	08/02/2007	2007	Investigate Possible Leak
20000081378	TW-DIST-SERVPT-144410	1440 Port of Tacoma - FLUSH	1440 PORT OF TACOMA RD E	08/03/2007	08/03/2007	2007	Flush Main
20000081377	TW-DIST-SERVPT-144410	1440 Port of Tacoma-WATER QUALITY-Dirty	1440 PORT OF TACOMA RD E	08/03/2007	08/03/2007	2007	Invest Brown/Sand In Water, WQ
20000081419	TW-DIST-SERVPT-144410	1440 Port of Tacoma Rd-Dirty Water	1440 PORT OF TACOMA RD E	08/03/2007	08/06/2007	2007	Invest Brown/Sand In Water, WQ
20000081416		1002 E "F" St- Replace Mbox/ Lid	1002 E F ST	08/06/2007	08/06/2007	2007	Replace Mbox/ Lid
20000081652	TW-DIST-SERVPT-144431	Portland Av btwn 11th & 15th-missing lid	1501 E PORTLAND AVE	08/17/2007	09/19/2007	2007	Investigate Possible Water Structure
20000082162	TW-DIST-SERVPT-167807	Install Touch Rd on 445 Cover	1940 E 11TH ST	08/28/2007	08/29/2007	2007	Install Touch Rd on Meter
20000081843	TW-DIST-SERVPT-165384	wq-2301 taylor way e-brown	2301 TAYLOR WAY	08/29/2007	08/29/2007	2007	Invest Brown/Sand In Water, WQ
20000082228	TW-DIST-SERVPT-167545	Detector Check 5 YR Maintenance	702 E D ST	09/10/2007	09/12/2007	2007	Check Meter
20000082527	TW-DIST-SERVPT-144426	2406 Port of Tacoma Rd-Invest Poss Leak	2406 PORT OF TACOMA RD E	09/20/2007	09/20/2007	2007	Investigate Possible Leak
40001066295		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	10/12/2007	10/12/2007	2007	Disconnect Large mtr-Water

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000082739	TW-DIST-SERVPT-167797	Detector Check 5 YR Maintenance	1718 THORNE RD	10/15/2007	10/25/2007	2007	Check Meter
20000082736	TW-DIST-SERVPT-167582	Detector Check 5 YR Maintenance	1802 STEWART St	10/15/2007	10/29/2007	2007	Check Meter
20000082763	TW-DIST-SERVPT-206184	Detector Check 5 YR Maintenance	733 E 11TH ST, #C	10/15/2007	10/29/2007	2007	Check Meter
20000083207	TW-DIST-SERVPT-167512	Detector Check 5 YR Maintenance	1525 E D ST	10/22/2007	10/29/2007	2007	Check Meter
20000083272	TW-DIST-SERVPT-091902	3601 Taylor Way-WATER QUALITY-Dirty	3601 TAYLOR WAY	10/24/2007	10/24/2007	2007	Invest Brown/Sand In Water, WQ
20000083302	TW-DIST-SERVPT-167797	Detector Check 5 YR Maintenance	1718 THORNE RD	10/25/2007	10/29/2007	2007	Check Meter
40001077018		Disconnect mtr-Water	1171 TAYLOR WAY	11/05/2007	11/05/2007	2007	Disconnect mtr-Water
20000083488	TW-DIST-SERVPT-167689	Detector Check 5 YR Maintenance	1002 E F ST	11/05/2007	11/06/2007	2007	Check Meter
20000083446	TW-DIST-SERVPT-167689	1002 E F ST-REPLACE VAULT LID	1002 E F ST	11/07/2007	11/07/2007	2007	Replace Vault Lid
20000083445	TW-DIST-SERVPT-167809	Detector Check 5 YR Maintenance	1002 E F ST	11/07/2007	11/08/2007	2007	Check Meter
20000083918	TW-DIST-SERVPT-167565	Detector Check 5 YR Maintenance	1900 E D ST	11/19/2007	11/29/2007	2007	Check Meter
20000083926	TW-DIST-SERVPT-167894	Detector Check 5 YR Maintenance	2124 E MARSHALL AVE	11/19/2007	11/30/2007	2007	Check Meter
20000083933	TW-DIST-SERVPT-167529	Detector Check 5 YR Maintenance	520 E D ST	11/19/2007	12/03/2007	2007	Check Meter
20000084628	TW-DIST-SERVPT-167736	Detector Check 5 YR Maintenance	2345 ROSS WAY	12/24/2007	01/17/2008	2007	Check Meter
20000084773	TW-DIST-SERVPT-165444	2407 PORT OF TACOMA RD E-DAMAGED LID	2407 PORT OF TACOMA RD E	01/02/2008	01/07/2008	2008	Replace Vault Lid
20000084723	TW-DIST-SERVPT-165430	2102 MILWAUKEE WAY-CLEAN PS METER SPOOL	2102 MILWAUKEE WAY	01/03/2008	01/11/2008	2008	Other Meter
20000084813	TW-DIST-SERVPT-165456	Detector Check 5 YR Maintenance	1476 THORNE RD	01/14/2008	01/30/2008	2008	Check Meter
20000084921	TW-DIST-SERVPT-165761	Detector Check 5 YR Maintenance	1510 ST PAUL AVE	01/21/2008	01/30/2008	2008	Check Meter
20000085000	TW-DIST-SERVPT-206168	Detector Check 5 YR Maintenance	733 E 11TH ST, #D	01/28/2008	02/04/2008	2008	Check Meter
20000085026	TW-DIST-SERVPT-144423	2150 Port of Tacoma Rd.-Invest.Leak	2150 PORT OF TACOMA RD E	02/01/2008	02/01/2008	2008	Investigate Possible Leak
20000085077	TW-DIST-SERVPT-206168	733 E 11TH ST-REPLACE VAULT LID	733 E 11TH ST, #D	02/04/2008	02/04/2008	2008	Replace Vault Lid
20000085044	TW-DIST-SERVPT-164809	Detector Check 5 YR Maintenance	1621 LINCOLN AVE	02/04/2008	02/11/2008	2008	Check Meter
20000085048	TW-DIST-SERVPT-167624	Detector Check 5 YR Maintenance	250 E D ST	02/04/2008	02/11/2008	2008	Check Meter
20000018234	TW-DIST-SERVPT-091882	1621 Taylor way - Relocate Service - 400		02/06/2008	02/06/2007	2008	Relocate Service
20000018235	TW-DIST-SERVPT-167560	1601 Taylor Way - Relocate 6" Fire Servi		02/06/2008	02/06/2007	2008	Relocate Service
20000085122	TW-DIST-SERVPT-153406	1952 Milwaukee Way-Contr.Hit Srvc.	1952 MILWAUKEE WAY	02/06/2008	02/25/2008	2008	Investigate Damage
20000085152	TW-DIST-SERVPT-165404	Detector Check 5 YR Maintenance	2116 TAYLOR WAY	02/11/2008	02/13/2008	2008	Check Meter
20000085154	TW-DIST-SERVPT-240894	Detector Check 5 YR Maintenance	2810 E MARSHALL AVE, #B	02/11/2008	02/13/2008	2008	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000085225	TW-DIST-SERVPT-167512	1525 E. Dst - invest poss leak	1525 E D ST	02/12/2008	02/12/2008	2008	Investigate Possible Leak
20000085163	TW-DIST-SERVPT-240894	2810 E Marshall - Broken/Buried Serv Gate	2810 E MARSHALL AVE, #B	02/13/2008	02/26/2008	2008	Repair Valve
20000085261	TW-DIST-SERVPT-180800	Detector Check 5 YR Maintenance	303 E D ST	02/18/2008	03/27/2008	2008	Check Meter
20000085166	TW-DIST-SERVPT-164453	2810 Marshall Ave - Repair hydrant	2810 E MARSHALL AVE	02/27/2008	02/27/2008	2008	Repair Hydrant
20000085436	TW-DIST-SERVPT-167683	Detector Check 5 YR Maintenance	902 E E ST	03/03/2008	05/07/2008	2008	Check Meter
20000085435	TW-DIST-SERVPT-167675	Detector Check 5 YR Maintenance	475 E 19TH ST	03/03/2008	05/12/2008	2008	Check Meter
20000022867	TW-DIST-SERVPT-167198	8" Fireline Meter Exchange - 721 Alexand		03/05/2008	03/05/2008	2008	8" Fireline Meter Exchange
20000022868	TW-DIST-SERVPT-167203	10" Fireline Exchange 3111 Marshall Ave		03/05/2008	03/05/2008	2008	10" Fireline meter exchange
20000085424	TW-DIST-SERVPT-165761	Detector Check 5 YR Maintenance	1510 ST PAUL AVE	03/07/2008	03/19/2008	2008	Check Meter
20000085409	TW-DIST-SERVPT-167688	Detector Check 5 YR Maintenance	2367 LINCOLN AVE	03/17/2008	04/28/2008	2008	Check Meter
20000023053	TW-DIST-SERVPT-166069	Replace FM Meter - 3701 Taylor Way		03/19/2008	03/19/2008	2008	Replace FM Meter
20000085359	TW-DIST-SERVPT-151653	1616 St Paul Ave E- replace mtr gasket	1510 ST PAUL AVE	03/19/2008	03/24/2008	2008	Check Meter
20000020466	TW-DIST-SERVPT-167212	10" Fireline Meter Exchange at 1600 E 11		04/01/2008	07/12/2007	2008	10" Fireline meter exchange
40001179948		Over 1" sprinkler Reconnect	1747 PORT OF TACOMA RD	04/02/2008	04/02/2008	2008	Over 1" sprinkler Reconnect
20000086186	TW-DIST-SERVPT-181245	Detector Check 5 YR Maintenance	2006 E PORTLAND AVE	04/07/2008	05/12/2008	2008	Check Meter
20000086216	TW-DIST-SERVPT-181565	1747 Port of Tacoma Rd- Raise gate box	1747 PORT OF TACOMA RD E	04/10/2008	08/04/2008	2008	Locate And Raise Valve Box
20000086342	TW-DIST-SERVPT-165402	Detector Check 5 YR Maintenance	1930 E D ST	04/14/2008	05/23/2008	2008	Check Meter
40001194180		Disconnect Large mtr-Water	605 E ALEXANDER AVE	04/22/2008	04/22/2008	2008	Disconnect Large mtr-Water
20000086921		wq-313 f st e-brown	313 E F ST	05/06/2008	05/06/2008	2008	WQ
20000087202	TW-DIST-SERVPT-165692	1906 MARC AVE-REPAIR VAULT LID	1906 MARC AVE	06/04/2008	06/04/2008	2008	Other Vault
20000020662	TW-DIST-SERVPT-164608	10" Fireline meter exchange - 1223 E 11t		07/25/2008	07/25/2007	2008	10" Fireline meter exchange
40001264585		Disconnect Large mtr-Water	4215 SR 509 N FRONTAGE RD	07/25/2008	07/25/2008	2008	Disconnect Large mtr-Water
20000088064	TW-DIST-SERVPT-167194	901 Alexander Investigate leak	1101 E ALEXANDER AVE	09/01/2008	09/01/2008	2008	Investigate Possible Leak
20000088203	TW-DIST-SERVPT-084827	1123 Port of Tacoma Rd.- Inc. Hyd.#4395	1123 PORT OF TACOMA RD E	09/16/2008	09/17/2008	2008	Investigate Vehicle v/s Hyd/Guard Post
40001321397		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	10/10/2008	10/10/2008	2008	Disconnect Large mtr-Water
20000025902	TW-DIST-SERVPT-164559	Replace FM Meter - 1735 Port of Tacoma R		11/13/2008	08/27/2008	2008	Replace FM Meter
20000089829	TW-DIST-SERVPT-153401	1902 Milwaukee Way E - invest poss leak	1910 MILWAUKEE WAY	01/05/2009	01/05/2009	2009	Investigate Possible Leak
20000090368	TW-DIST-SERVPT-163493	1651 Lincoln Ave- Invest Sink Hole	1651 LINCOLN AVE	01/07/2009	01/07/2009	2009	Investigate Sink Hole

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000090474	TW-DIST-SERVPT-105120	1905 Lincoln Ave E - Raise mtr box to gr	1905 LINCOLN AVE	01/13/2009	01/14/2009	2009	Adjust Mtr Box Height
20000090799	TW-DIST-SERVPT-165349	Detector Check 5 YR Maintenance	1754 THORNE RD	01/26/2009	03/10/2009	2009	Check Meter
20000090856	TW-DIST-SERVPT-167694	Detector Check 5 YR Maintenance	1630 E 18TH ST	01/26/2009	03/30/2009	2009	Check Meter
20000090995	TW-DIST-SERVPT-166743	624 E 15TH ST - exchg 445 vlt lid w/3x3	624 E 15TH ST	01/30/2009	02/02/2009	2009	Replace Vault
20000090996	TW-DIST-SERVPT-166743	624 E 15TH ST - exchg 445 vlt lid w/3x3	624 E 15TH ST	01/30/2009	02/02/2009	2009	Replace Vault Lid
20000091018	TW-DIST-SERVPT-166110	Detector Check 5 YR Maintenance	1801 E D ST	02/02/2009	07/01/2009	2009	Check Meter
20000091022	TW-DIST-SERVPT-167781	Detector Check 5 YR Maintenance	1616 E D ST	02/02/2009	07/01/2009	2009	Check Meter
20000091212	TW-DIST-SERVPT-166743	8702 S HOSMER ST - Excg 445 w/3x3 vlt lid	624 E 15TH ST	02/06/2009	02/06/2009	2009	Replace Vault Lid
20000091478	TW-DIST-SERVPT-165343	Detector Check 5 YR Maintenance	2302 ROSS WAY	02/09/2009	10/07/2009	2009	Check Meter
20000091481	TW-DIST-SERVPT-167713	Detector Check 5 YR Maintenance	1112 E ALEXANDER AVE	02/09/2009	10/07/2009	2009	Check Meter
20000091149	TW-DIST-SERVPT-167664	Detector Check 5 YR Maintenance	480 E 19TH ST	02/16/2009	10/05/2009	2009	Check Meter
40001400574		Disconnect mtr-Water	4215 SR 509 N FRONTAGE RD	02/17/2009	02/17/2009	2009	Disconnect mtr-Water
20000092684	TW-DIST-SERVPT-167860	Detector Check 5 YR Maintenance	2000 E ALEXANDER AVE	03/09/2009	11/03/2009	2009	Check Meter
20000093096	TW-DIST-SERVPT-167703	Detector Check 5 YR Maintenance	1509 TAYLOR WAY	03/23/2009	11/19/2009	2009	Check Meter
20000093097	TW-DIST-SERVPT-184145	Detector Check 5 YR Maintenance	3126 E 11TH ST	03/23/2009	03/01/2010	2009	Check Meter
20000093260	TW-DIST-SERVPT-111709	1701 Alexander Ave - Adj mtr box height	1701 E ALEXANDER AVE	04/03/2009	04/23/2009	2009	Adjust Mtr Box Height
40001445572		Over 1" sprinkler Reconnect	1747 PORT OF TACOMA RD	04/09/2009	04/09/2009	2009	Over 1" sprinkler Reconnect
20000094027	TW-DIST-SERVPT-166650	1220 E ALEXANDER AVE - multi dial error	1220 E ALEXANDER AVE	04/20/2009	04/20/2009	2009	Check Meter
20000094024	TW-DIST-SERVPT-167183	1901 TAYLOR WAY - multi dial error rpt	1851 TAYLOR WAY	04/20/2009	04/22/2009	2009	Check Meter
20000023518	TW-DIST-SERVPT-104856	1656 E. "J" St. - Update Service - 300 P		04/21/2009	04/21/2008	2009	Update Service - 300 P
20000094562	TW-DIST-SERVPT-167183	1901 TAYLOR WAY - Replace vlt lid	1851 TAYLOR WAY	05/07/2009	05/15/2009	2009	Replace Vault Lid
20000095562		WQ-313 F STREET E-BROWN	313 E F ST	06/19/2009	06/19/2009	2009	WQ
20000095590		313 F St E	313 E F ST	06/19/2009	06/19/2009	2009	313 F St E
20000095563	TW-DIST-SERVPT-167620	Detector Check 5 YR Maintenance	624 E 15TH ST	06/21/2009	09/01/2009	2009	Check Meter
20000097010	TW-DIST-SERVPT-091912	1401 Thorne Rd - locate/raise valve box	1425 THORNE RD	08/14/2009	08/18/2009	2009	Locate And Raise Valve Box
20000097011	TW-DIST-SERVPT-164453	2810 Marshall Ave - locate/raise gate box	2810 E MARSHALL AVE	08/14/2009	09/10/2009	2009	Locate And Raise Valve Box
20000097302	TW-DIST-SERVPT-144411	1440 Port of Tacoma Rd-locate/raise gate	1440 PORT OF TACOMA RD E	08/19/2009	09/16/2009	2009	Locate And Raise Valve Box
20000097417	TW-DIST-SERVPT-165430	2102 Milwaukee Way E	2102 MILWAUKEE WAY	08/23/2009	08/23/2009	2009	Investigate Possible Leak
20000097441	TW-DIST-SERVPT-166725	1751 Thorne Rd-EL Gate/Repack	1751 THORNE RD	08/24/2009	10/07/2009	2009	Repair Valve
20000025901	TW-DIST-SERVPT-164404	Replace FM Meter - 401 E 15th St Pg 129		08/27/2009	08/27/2008	2009	Replace FM Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000025906	TW-DIST-SERVPT-165149	Replace FM Meter - 711 E 11th St		08/27/2009	08/27/2008	2009	Replace FM Meter
20000097585	TW-DIST-SERVPT-167297	1623 E. J St - Street Leak	1623 E J ST	09/09/2009	09/09/2009	2009	Investigate Possible Leak
20000097981	TW-DIST-SERVPT-167753	Detector Check 5 YR Maintenance	1616 ST PAUL AVE	09/14/2009	12/16/2009	2009	Check Meter
20000099198	TW-DIST-SERVPT-153400	Milwaukee Way & 11th St - poss leak	1101 MILWAUKEE WAY, #A	10/06/2009	10/06/2009	2009	Investigate Possible Leak
40001581170		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	10/07/2009	10/07/2009	2009	Disconnect Large mtr-Water
20000030148	TW-DIST-SERVPT-164658	2244 Port of Tacoma Rd. - Renew Service		10/08/2009	09/16/2009	2009	Renew Service
20000099622	TW-DIST-SERVPT-165611	Detector Check 5 YR Maintenance	1525 E D ST	10/26/2009	01/15/2010	2009	Check Meter
20000099627	TW-DIST-SERVPT-167749	Detector Check 5 YR Maintenance	2202 PORT OF TACOMA RD E	10/26/2009	01/20/2010	2009	Check Meter
20000099640	TW-DIST-SERVPT-164798	Detector Check 5 YR Maintenance	2340 TAYLOR WAY	10/26/2009	01/20/2010	2009	Check Meter
20000099674	TW-DIST-SERVPT-165360	Detector Check 5 YR Maintenance	635 E 15TH ST	11/02/2009	02/03/2010	2009	Check Meter
20000099694	TW-DIST-SERVPT-165615	Detector Check 5 YR Maintenance	1017 E D ST	11/02/2009	03/10/2010	2009	Check Meter
20000100106	TW-DIST-SERVPT-165451	Detector Check 5 YR Maintenance	1671 LINCOLN AVE	11/16/2009	04/16/2010	2009	Check Meter
40001612852		Disconnect mtr-Water	1401 THORNE RD	11/30/2009	11/30/2009	2009	Disconnect mtr-Water
20000100863	TW-DIST-SERVPT-166596	E 11th & Alexander - Invest poss leak	3115 E 11TH ST	12/13/2009	12/13/2009	2009	Investigate Possible Leak
20000100900	TW-DIST-SERVPT-180920	Detector Check 5 YR Maintenance	1815 PORT OF TACOMA RD E	12/14/2009	07/20/2010	2009	Check Meter
20000100958	TW-DIST-SERVPT-167219	605 Alexander Ave	605 E ALEXANDER AVE	12/20/2009	12/21/2009	2009	Check Service
20000102276	TW-DIST-SERVPT-165615	1017 E "D" St- Leaking Srvc Gate	1017 E D ST	03/19/2010	03/19/2010	2010	Investigate Possible Leak
20000102642	TW-DIST-SERVPT-167297	wq-1623 j st e-brown	1623 E J ST	04/01/2010	04/01/2010	2010	Invest Brown/Sand In Water, WQ
40001701523		Over 1" sprinkler Reconnect	1747 PORT OF TACOMA RD	04/01/2010	04/01/2010	2010	Over 1" sprinkler Reconnect
20000102306	TW-DIST-SERVPT-166075	2021 MARC AV instl vlt riser and new lid	2021 MARC AVE	04/02/2010	04/14/2010	2010	Replace Vault Lid
20000102682	TW-DIST-SERVPT-166828	2021 MARC AVE - replace #6 box	2021 MARC AVE	04/09/2010	04/14/2010	2010	Replace Mtr Box
20000103936	TW-DIST-SERVPT-180913	1815 PORT OF TACOMA RD-DAMAGED HYDRNT	1815 PORT OF TACOMA RD E	05/27/2010	05/27/2010	2010	Inspect Hydrant
20000104045	TW-DIST-SERVPT-167807	1940 E 11TH ST - repair vault lid	1940 E 11TH ST	06/03/2010	06/07/2010	2010	Repair Vault
20000104013	TW-DIST-SERVPT-165736	Detector Check 5 YR Maintenance	440 E 19TH ST	06/07/2010	08/23/2010	2010	Check Meter
20000104016	TW-DIST-SERVPT-167807	Detector Check 5 YR Maintenance	1940 E 11TH ST	06/07/2010	08/30/2010	2010	Check Meter
20000104204	TW-DIST-SERVPT-156940	652 E. 11th Street - replace yoke stop	652 E 11TH ST	06/21/2010	06/22/2010	2010	Replace Yoke Stop
20000104545	TW-DIST-SERVPT-167297	1623 E J St - Possible leak in street	1623 E J ST	07/01/2010	07/01/2010	2010	Investigate Possible Leak
40001766509		Reconnect-Water	1851 TAYLOR WAY	07/02/2010	07/02/2010	2010	Reconnect-Water
20000104772	TW-DIST-SERVPT-167146	Detector Check 5 YR Maintenance	2434 E 11TH ST	07/12/2010	11/09/2010	2010	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000104969	TW-DIST-SERVPT-084382	810 East F St. /Check sink hole	1002 E F ST	08/02/2010	08/02/2010	2010	Investigate Sink Hole
20000105030	TW-DIST-SERVPT-167760	Detector Check 5 YR Maintenance	1970 MILWAUKEE WAY	08/02/2010	10/27/2010	2010	Check Meter
20000105033	TW-DIST-SERVPT-167822	Detector Check 5 YR Maintenance	1501 E PORTLAND AVE	08/02/2010	10/27/2010	2010	Check Meter
40001790950		Reconnect-Water	420 E 18TH ST	08/06/2010	08/06/2010	2010	Reconnect-Water
20000105090	TW-DIST-SERVPT-167489	Detector Check 5 YR Maintenance	3319 LINCOLN AVE	08/09/2010	02/22/2011	2010	Check Meter
20000105323	TW-DIST-SERVPT-165378	Detector Check 5 YR Maintenance	1221 E ALEXANDER AVE	09/06/2010	02/22/2011	2010	Check Meter
20000105366	TW-DIST-SERVPT-153402	1918 Milwauke Way - Replace yoke stop	1918 MILWAUKEE WAY	09/14/2010	09/14/2010	2010	Replace Yoke Stop
20000105494	TW-DIST-SERVPT-151709	1802 Stewart St - replace mtr box & lid	1802 STEWART St	09/30/2010	10/04/2010	2010	Replace Mtr Box
40001838578		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	10/20/2010	10/20/2010	2010	Disconnect Large mtr-Water
20000105762	TW-DIST-SERVPT-180612	225 E F St - WATER QUALITY- DIRTY	225 E F ST	10/21/2010	03/09/2011	2010	Invest Brown/Sand In Water, WQ
20000105869	TW-DIST-SERVPT-167837	Detector Check 5 YR Maintenance	1519 ST PAUL AVE	11/08/2010	08/01/2011	2010	Check Meter
40001859825		Disconnect mtr-Water	1940 E 11TH ST	11/23/2010	11/23/2010	2010	Disconnect mtr-Water
20000106383	TW-DIST-SERVPT-167201	1240 E ALEXANDER AVE - Repair vlt lid	1240 E ALEXANDER AVE	12/06/2010	12/06/2010	2010	Repair Vault
40001866925		Reconnect-Water no charge	1851 TAYLOR WAY	12/06/2010	12/06/2010	2010	Reconnect-Water no charge
40001877097		Disconnect mtr-Water	1910 MILWAUKEE WAY	12/21/2010	12/21/2010	2010	Disconnect mtr-Water
20000106529	TW-DIST-SERVPT-165367	Detector Check 5 YR Maintenance	516 E D ST	01/03/2011	01/03/2011	2011	Check Meter
20000106540	TW-DIST-SERVPT-165746	Detector Check 5 YR Maintenance	1401 THORNE RD	01/03/2011	09/28/2011	2011	Check Meter
20000107474	TW-DIST-SERVPT-104856	1656 E "J" St- Check vault	1656 E J ST	02/07/2011	02/07/2011	2011	Check Vault
20000107347	TW-DIST-SERVPT-167681	Detector Check 5 YR Maintenance	2120 PORT OF TACOMA RD E	02/07/2011	12/06/2011	2011	Check Meter
20000107469	TW-DIST-SERVPT-166596	3115 E 11TH ST - repair vault lid	3115 E 11TH ST	02/09/2011	03/16/2012	2011	Repair Vault
20000107490	TW-DIST-SERVPT-167031	3113 E 11TH ST - repair vault lid	3113 E 11TH ST	02/09/2011	03/16/2012	2011	Repair Vault
20000107327	TW-DIST-SERVPT-167841	Detector Check 5 YR Maintenance	1901 E D ST	02/21/2011	12/02/2011	2011	Check Meter
20000107851	TW-DIST-SERVPT-167846	Detector Check 5 YR Maintenance	1662 LINCOLN AVE	03/21/2011	12/06/2011	2011	Check Meter
20000108064	TW-DIST-SERVPT-166104	Detector Check 5 YR Maintenance	2556 E 11TH ST	03/28/2011	02/22/2012	2011	Check Meter
40001943459		Over 1" sprinkler Reconnect	1747 PORT OF TACOMA RD	04/04/2011	04/04/2011	2011	Over 1" sprinkler Reconnect
20000108158	TW-DIST-SERVPT-217302	Detector Check 5 YR Maintenance	1123 ST PAUL AVE	04/18/2011	12/05/2011	2011	Check Meter
20000109591	TW-DIST-SERVPT-167905	Detector Check 5 YR Maintenance	1144 THORNE RD	06/27/2011	02/01/2012	2011	Check Meter
20000109592	TW-DIST-SERVPT-167842	Detector Check 5 YR Maintenance	2216 E 11TH ST	06/27/2011	02/01/2012	2011	Check Meter
20000109595	TW-DIST-SERVPT-219889	Detector Check 5 YR Maintenance	802 E 11TH ST	06/27/2011	02/01/2012	2011	Check Meter
20000109962	TW-DIST-SERVPT-167115	3401 Lincoln Ave - Invest Damaged hydrnt	3401 LINCOLN AVE	08/03/2011	08/04/2011	2011	Investigate Damage

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000109948	TW-DIST-SERVPT-166281	1002 E D ST replace vlt lid complete	1002 E D ST	08/11/2011	08/16/2011	2011	Replace Vault Lid
20000109949	TW-DIST-SERVPT-206168	733 E 11TH ST replace vlt lid complete	733 E 11TH ST, #D	08/11/2011	08/18/2011	2011	Replace Vault Lid
20000110059	TW-DIST-SERVPT-166281	1002 E D ST install tr on vlt lid	1002 E D ST	08/15/2011	08/17/2011	2011	Install Touch Rd on Meter
20000110329	TW-DIST-SERVPT-164404	Inv possible leak 401 E 15th St	401 E 15TH ST	09/13/2011	09/14/2011	2011	Investigate Possible Leak
20000110396	TW-DIST-SERVPT-167212	1600 E 11th - Verify domestic demand	1600 E 11TH ST	09/15/2011	09/20/2011	2011	Investigate Property Side
20000119223	TW-DIST-SERVPT-167212	1600 E 11th - Verify domestic demand	1600 E 11TH ST	09/15/2011	01/27/2012	2011	Investigate Property Side
40002062646		Reconnect-Water	420 E 18TH ST	09/16/2011	09/16/2011	2011	Reconnect-Water
40002064795		Reconnect-Water no charge	1113 ST PAUL AVE	09/20/2011	09/20/2011	2011	Reconnect-Water no charge
20000111030	TW-DIST-SERVPT-143341	700 E "D" St - WATER QUALITY	702 E D ST	09/29/2011	09/29/2011	2011	Invest Brown/Sand In Water, WQ
20000111471	TW-DIST-SERVPT-167146	2434 E 11TH ST needs new slipnot vlt lid	2434 E 11TH ST	10/03/2011	04/11/2013	2011	Install Non Skid Lid on Vault
40002080186		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	10/13/2011	10/13/2011	2011	Disconnect Large mtr-Water
20000118110	TW-DIST-SERVPT-166743	check meter 624 E 15th St	624 E 15TH ST	11/01/2011	11/01/2011	2011	Check Meter
20000118130	TW-DIST-SERVPT-166111	Detector Check 5 YR Maintenance	1157 THORNE RD	11/07/2011	03/02/2012	2011	Check Meter
20000118131	TW-DIST-SERVPT-166117	Detector Check 5 YR Maintenance	1460 THORNE RD	11/07/2011	03/02/2012	2011	Check Meter
20000118134	TW-DIST-SERVPT-167836	Detector Check 5 YR Maintenance	922 E 11TH ST	11/07/2011	05/09/2012	2011	Check Meter
20000118126	TW-DIST-SERVPT-167781	1616 E D ST install slipnot vlt lid	1616 E D ST	11/10/2011	11/16/2011	2011	Install Non Skid Lid on Vault
20000118614	TW-DIST-SERVPT-166110	1801 E D St - Missing water lid	1801 E D ST	12/05/2011	12/05/2011	2011	Replace Valve Box Lid
40002111554		Reconnect-Water	420 E 18TH ST	12/05/2011	12/05/2011	2011	Reconnect-Water
20000118715	TW-DIST-SERVPT-166100	Detector Check 5 YR Maintenance	1910 MILWAUKEE WAY	12/12/2011	05/02/2012	2011	Check Meter
20000118719	TW-DIST-SERVPT-167463	Detector Check 5 YR Maintenance	2330 PORT OF TACOMA RD E	12/12/2011	05/02/2012	2011	Check Meter
20000118783	TW-DIST-SERVPT-167198	721 E Alexander-Locate/Uncover Valve	721 E ALEXANDER AVE	12/15/2011	12/20/2011	2011	Locate And Raise Valve Box
20000118858	TW-DIST-SERVPT-166085	Detector Check 5 YR Maintenance	1420 PORT OF TACOMA RD E	12/19/2011	05/21/2012	2011	Check Meter
20000118946	TW-DIST-SERVPT-091911	Inv possible leak 1160 Thorne Rd	1160 THORNE RD	01/13/2012	01/13/2012	2012	Investigate Possible Leak
40002142795		Disconnect Large mtr-Water	4215 SR 509 N FRONTAGE RD	01/23/2012	01/23/2012	2012	Disconnect Large mtr-Water
20000119589	TW-DIST-SERVPT-165152	Inv poss. wtr strct 1123 Taylor Way	1123 TAYLOR WAY	02/09/2012	05/09/2012	2012	Investigate Possible Water Structure
20000119409	TW-DIST-SERVPT-166075	Detector Check 5 YR Maintenance	2021 MARC AVE	02/13/2012	07/03/2012	2012	Check Meter
20000122652	TW-DIST-SERVPT-165451	1720 E 67TH ST exchg mtr and instl trpl	1671 LINCOLN AVE	03/05/2012	03/13/2012	2012	Install Touch Rd on Meter
20000122653	TW-DIST-SERVPT-165451	1671 LINCOLN AVE repair vlt lid	1671 LINCOLN AVE	03/05/2012	05/29/2013	2012	Repair Vault
20000122638	TW-DIST-SERVPT-166743	624 E 15TH ST - backward flow on DC mtr	624 E 15TH ST	03/07/2012	03/07/2012	2012	Invest Other, WQ

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000122639	TW-DIST-SERVPT-166743	624 E 15TH ST - backward flow on DC mtr	624 E 15TH ST	03/07/2012	03/08/2012	2012	Invest Other, WQ
20000122830	TW-DIST-SERVPT-165371	Detector Check 5 YR Maintenance	2150 PORT OF TACOMA RD E	03/12/2012	06/28/2012	2012	Check Meter
20000122891	TW-DIST-SERVPT-165761	1510 ST PAUL AVE repair vault lid	1510 ST PAUL AVE	03/13/2012	03/13/2012	2012	Repair Vault
20000122858	TW-DIST-SERVPT-166762	401 E ALEXANDER AVE - INSPECTION	401 E ALEXANDER AVE	03/15/2012	03/20/2012	2012	WQ Inspection
20000123682	TW-DIST-SERVPT-167518	Detector Check 5 YR Maintenance	465 E 15TH ST	05/07/2012	11/06/2012	2012	Check Meter
20000123929	TW-DIST-SERVPT-165803	1754 THORNE RD E - INSPECTION	1754 THORNE RD	05/10/2012	05/15/2012	2012	WQ Inspection
20000123717	TW-DIST-SERVPT-091894	Invest Leak	2902 TAYLOR WAY	05/18/2012	05/18/2012	2012	Investigate Sink Hole
20000124050	TW-DIST-SERVPT-167499	Detector Check 5 YR Maintenance	2221 ROSS WAY	05/21/2012	10/24/2012	2012	Check Meter
20000124052	TW-DIST-SERVPT-167540	Detector Check 5 YR Maintenance	701 E D ST	05/21/2012	10/25/2012	2012	Check Meter
20000124051	TW-DIST-SERVPT-167539	Detector Check 5 YR Maintenance	1118 E D ST	05/21/2012	03/04/2013	2012	Check Meter
40002233415		Disconnect mtr-Water	400 E 11TH ST	05/29/2012	05/29/2012	2012	Disconnect mtr-Water
40002256846		Disconnect mtr-Electric	810 E F ST	07/05/2012	07/05/2012	2012	Disconnect mtr-Electric
20000124575	TW-DIST-SERVPT-181397	1701 Port of Tacoma Rd - Invest/Leak	1701 PORT OF TACOMA RD E	07/17/2012	07/17/2012	2012	Investigate Possible Leak
20000124870	TW-DIST-SERVPT-158017	2221 Ross Way - Install Yoke Resestter	2221 ROSS WAY	08/01/2012	08/14/2012	2012	Install Yoke Resetter
20000041391	TW-DIST-SERVPT-167620	624 E 15th St - Renew Meter/Vault - 400		08/06/2012	08/06/2012	2012	Renew Meter/Vault - 400
20000124878	TW-DIST-SERVPT-167545	Detector Check 5 YR Maintenance	702 E D ST	08/13/2012	03/04/2013	2012	Check Meter
20000125112	TW-DIST-SERVPT-167110	wq-2301 taylor way-brown	2301 TAYLOR WAY	08/21/2012	08/21/2012	2012	Invest Brown/Sand In Water, WQ
20000125098	TW-DIST-SERVPT-167134	2000 TAYLOR WAY fire mtr maint ck	2000 TAYLOR WAY	08/22/2012	08/30/2012	2012	Check Meter
20000125167	TW-DIST-SERVPT-167115	3401 LINCOLN AVE fire mtr maint ck	3401 LINCOLN AVE	08/22/2012	10/24/2012	2012	Check Meter
20000125160	TW-DIST-SERVPT-167193	1206 E D ST fire mtr maint ck	1206 E D ST	08/22/2012	10/25/2012	2012	Check Meter
20000125161	TW-DIST-SERVPT-164404	401 E 15TH ST fire mtr maint ck	401 E 15TH ST	08/22/2012	12/18/2012	2012	Check Meter
20000125135	TW-DIST-SERVPT-166100	1910 MILWAUKEE WAY replace vlt lid	1910 MILWAUKEE WAY	08/30/2012	10/26/2012	2012	Replace Vault Lid
20000125372		wq-2810 marshall ave-brown	2810 MARSHALL AVE	09/11/2012	09/11/2012	2012	WQ
20000125401	TW-DIST-SERVPT-166622	2120 Milwaukee Way - WQ -Dirty Wtr	2120 MILWAUKEE WAY	09/13/2012	09/13/2012	2012	Invest Brown/Sand In Water, WQ
20000125614	TW-DIST-SERVPT-167736	2345 Ross Way- Verify FS is off	2345 ROSS WAY	09/20/2012	10/02/2012	2012	Investigate Possible Water Structure
20000125547	TW-DIST-SERVPT-167797	Detector Check 5 YR Maintenance	1718 THORNE RD	09/24/2012	03/04/2013	2012	Check Meter
20000125626	TW-DIST-SERVPT-206184	Detector Check 5 YR Maintenance	733 E 11TH ST, #C	10/01/2012	10/01/2012	2012	Check Meter
20000125764	TW-DIST-SERVPT-167512	Detector Check 5 YR Maintenance	1525 E D ST	10/01/2012	05/20/2013	2012	Check Meter
20000125768	TW-DIST-SERVPT-167582	Detector Check 5 YR Maintenance	1802 STEWART St	10/01/2012	05/24/2013	2012	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000125794	TW-DIST-SERVPT-167809	Detector Check 5 YR Maintenance	1002 E F ST	10/08/2012	05/20/2013	2012	Check Meter
20000125793	TW-DIST-SERVPT-167689	Detector Check 5 YR Maintenance	1002 E F ST	10/08/2012	06/05/2013	2012	Check Meter
40001404313		Disconnect Large mtr-Water	2000 E ALEXANDER AVE	10/19/2012	10/19/2012	2012	Disconnect Large mtr-Water
20000125929	TW-DIST-SERVPT-167565	Detector Check 5 YR Maintenance	1900 E D ST	10/29/2012	05/02/2013	2012	Check Meter
20000125952	TW-DIST-SERVPT-167894	Detector Check 5 YR Maintenance	2124 E MARSHALL AVE	10/29/2012	06/20/2013	2012	Check Meter
20000126072	TW-DIST-SERVPT-167529	Detector Check 5 YR Maintenance	520 E D ST	11/05/2012	07/31/2013	2012	Check Meter
20000126136	TW-DIST-SERVPT-167496	Detector Check 5 YR Maintenance	2141 MILWAUKEE WAY	11/12/2012	10/07/2013	2012	Check Meter
20000126554	TW-DIST-SERVPT-167736	Detector Check 5 YR Maintenance	2345 ROSS WAY	12/17/2012	10/24/2013	2012	Check Meter
20000126695	TW-DIST-SERVPT-165456	Detector Check 5 YR Maintenance	1476 THORNE RD	12/31/2012	11/07/2013	2012	Check Meter
20000126693	TW-DIST-SERVPT-165761	Detector Check 5 YR Maintenance	1510 ST PAUL AVE	12/31/2012	11/18/2013	2012	Check Meter
20000126769	TW-DIST-SERVPT-206168	Detector Check 5 YR Maintenance	733 E 11TH ST, #D	01/07/2013	12/06/2013	2013	Check Meter
20000126880	TW-DIST-SERVPT-164809	Detector Check 5 YR Maintenance	1621 LINCOLN AVE	01/14/2013	11/21/2013	2013	Check Meter
20000126881	TW-DIST-SERVPT-240894	Detector Check 5 YR Maintenance	2810 E MARSHALL AVE, #B	01/14/2013	11/22/2013	2013	Check Meter
20000126882	TW-DIST-SERVPT-167624	Detector Check 5 YR Maintenance	250 E D ST	01/14/2013	12/03/2013	2013	Check Meter
20000126885	TW-DIST-SERVPT-165404	Detector Check 5 YR Maintenance	2116 TAYLOR WAY	01/14/2013	12/06/2013	2013	Check Meter
20000127146	TW-DIST-SERVPT-165471	2240 TAYLOR WAY E - INSPECTION	2240 TAYLOR WAY	01/28/2013	02/06/2013	2013	WQ Inspection
20000126919	TW-DIST-SERVPT-180913	1815 port of tacoma road	1815 PORT OF TACOMA RD E	01/29/2013	01/29/2013	2013	Investigate Possible Leak
20000127206	TW-DIST-SERVPT-091896	2958 TAYLOR WAY	2958 TAYLOR WAY	02/12/2013	02/14/2013	2013	Investigate Possible Leak
20000127856	TW-DIST-SERVPT-180800	Detector Check 5 YR Maintenance	303 E D ST	02/25/2013	02/13/2014	2013	Check Meter
40002431605		Disconnect Large mtr-Water	420 E 18TH ST	03/13/2013	03/13/2013	2013	Disconnect Large mtr-Water
20000129758	TW-DIST-SERVPT-164453	2810 MARSHALL AVE Fire mtr maint check	2810 E MARSHALL AVE	03/13/2013	03/29/2013	2013	Other Meter
20000129757	TW-DIST-SERVPT-167214	1640 MARC AVE Fire meter maint check	1640 MARC AVE	03/13/2013	03/29/2013	2013	Other Meter
40002431894		Reconnect-Water no charge	1747 PORT OF TACOMA RD	03/14/2013	03/14/2013	2013	Reconnect-Water no charge
20000129826	TW-DIST-SERVPT-206168	733 E 11TH ST investigate tr problem	733 E 11TH ST, #D	03/14/2013	03/15/2013	2013	Other Meter
20000130129	TW-DIST-SERVPT-167688	Detector Check 5 YR Maintenance	2367 LINCOLN AVE	04/01/2013	03/12/2014	2013	Check Meter
20000130906	TW-DIST-SERVPT-167683	Detector Check 5 YR Maintenance	902 E E ST	04/08/2013	03/10/2014	2013	Check Meter
20000131107	TW-DIST-SERVPT-166386	3003 Taylor Way - LEAK	3003 TAYLOR WAY	04/12/2013	04/12/2013	2013	Investigate Possible Leak
20000131131	TW-DIST-SERVPT-181245	Detector Check 5 YR Maintenance	2006 E PORTLAND AVE	04/15/2013	02/26/2014	2013	Check Meter
20000131136	TW-DIST-SERVPT-167675	Detector Check 5 YR Maintenance	475 E 19TH ST	04/15/2013	03/14/2014	2013	Check Meter

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000131394	TW-DIST-SERVPT-165402	1930 E D ST	1930 E D ST	04/22/2013	03/14/2014	2013	Check Meter
20000131714	TW-DIST-SERVPT-165220	1157 THORNE RD	1157 THORNE RD	04/26/2013	05/01/2013	2013	WQ Inspection
20000131948	TW-DIST-SERVPT-167512	1525 E D ST repair 3x3 vlt lid	1525 E D ST	05/20/2013	06/12/2013	2013	Repair Vault
20000132442	TW-DIST-SERVPT-167689	1002 E F ST repair vault lid	1002 E F ST	06/06/2013	06/10/2013	2013	Repair Vault
20000132748	TW-DIST-SERVPT-165743	Detector Check 5 YR Maintenance	1202 PORT OF TACOMA RD E	07/08/2013	07/29/2013	2013	Check Meter
20000132961	TW-DIST-SERVPT-181379	Detector Check 5 YR Maintenance	1701 PORT OF TACOMA RD E	07/08/2013	07/29/2013	2013	Check Meter
20000132809	TW-DIST-SERVPT-165149	711 E 11TH ST fix 3x3 dbl vault lid	711 E 11TH ST	07/19/2013	08/01/2013	2013	Repair Vault
20000134453	TW-DIST-SERVPT-167134	2000 Taylor Way - WQ - Brown Water	2000 TAYLOR WAY	09/30/2013	09/30/2013	2013	Invest Brown/Sand In Water, WQ
20000134456	TW-DIST-SERVPT-164885	Inv poss. damage 1204 E D St	1204 E D ST	10/01/2013	10/02/2013	2013	Investigate Damage
20000045831	TW-DIST-SERVPT-164412	922 11TH ST E - RENEW METER, YOKE <(>&<)		11/26/2013	11/26/2013	2013	RENEW METER, YOKE
40002650266		Disconnect mtr-Water	1202 TAYLOR WAY	01/09/2014	01/09/2014	2014	Disconnect mtr-Water
20000137001	TW-DIST-SERVPT-166650	1220 E Alexander Ave - Leak	1220 E ALEXANDER AVE	01/14/2014	01/14/2014	2014	Investigate Possible Leak
20000046662	TW-DIST-SERVPT-165761	DO NOT USE - CHARGES TO BE MOVED TO 2000		01/23/2014	01/23/2014	2014	DO NOT USE - CHARGES TO BE MOVED TO 2000
40002665303		Disconnect mtr-Water	2316 E 11TH ST	02/03/2014	02/03/2014	2014	Disconnect mtr-Water
40002670452		Reconnect-Water no charge	501 E 11TH ST	02/07/2014	02/07/2014	2014	Reconnect-Water no charge
20000137299	TW-DIST-SERVPT-165349	Detector Check 5 YR Maintenance	1754 THORNE RD	02/10/2014	02/10/2014	2014	Check Service
20000137603	TW-DIST-SERVPT-167031	3113 E 11TH ST raise gate box to grade - Locate And Raise Valve Box	3113 E 11TH ST	02/13/2014	02/13/2014	2014	Locate And Raise Valve Box
40002675104		Disconnect Large mtr-Water	1747 PORT OF TACOMA RD	02/19/2014	02/19/2014	2014	Disconnect Large mtr-Water
20000138105	TW-DIST-SERVPT-167694	Detector Check 5 YR Maintenance	1630 E 18TH ST	03/03/2014	03/03/2014	2014	Check Service
20000138303	TW-DIST-SERVPT-166003	1202 TAYLOR WAY replace vault lid	1202 TAYLOR WAY	03/14/2014	04/18/2014	2014	Replace Vault Lid
20000138530	TW-DIST-SERVPT-167753	MR- Corrosion Inspection of fire service	1616 ST PAUL AVE	03/19/2014	03/19/2014	2014	Structural Deficiency
20000047252	TW-DIST-SERVPT-166743	624 E 15th St - Renew Meter/Yoke/Box Onl		03/21/2014	03/21/2014	2014	RENEW METER, YOKE
20000138552	TW-DIST-SERVPT-166743	Backflow incident during shutdown	624 E 15TH ST	03/21/2014	03/26/2014	2014	WQ Inspection
20000138089	TW-DIST-SERVPT-167624	250 E D ST fix vault lid	250 E D ST	03/24/2014	03/24/2014	2014	Repair Vault
20000138646	TW-DIST-SERVPT-166743	624 E 15th St. Backflow Incident	624 E 15TH ST	03/26/2014	04/09/2014	2014	Invest Other, WQ
20000138307		1206 E D St - is 10-inch svc active	1206 E D ST	03/28/2014	03/28/2014	2014	10-inch svc active
20000047186	TW-DIST-SERVPT-166659	1500 St Paul Ave - Renew/Transfer Servic		04/02/2014	04/02/2014	2014	Renew Service
20000047442	TW-DIST-SERVPT-167837	1519 St Paul Ave - Update Service -400		04/08/2014	04/08/2014	2014	Update Service - 400

Notification	Functional loc.	Description	Street	Notif.date	Comp Date	Comp_Year	Coding code txt
20000138656	TW-DIST-SERVPT-166743	624 E 15th St.-Backflow incident	624 E 15TH ST	04/09/2014	04/09/2014	2014	Invest Other, WQ
20000047487	TW-DIST-SERVPT-165761	1510 St Paul Ave - Renew Service - 400		04/22/2014	04/22/2014	2014	Renew Service
20000047377	TW-DIST-SERVPT-167837	1519 St Paul Ave - Renew Service - 400		04/30/2014	04/30/2014	2014	Renew Service
40002734395		Disconnect Large mtr-Water	401 E 15TH ST	05/09/2014	05/09/2014	2014	Disconnect Large mtr-Water
40002734396		Disconnect Large mtr-Water	401 E 15TH ST	05/09/2014	05/09/2014	2014	Disconnect Large mtr-Water
40002738783		Reconnect-Water no charge	401 E 15TH ST	05/15/2014	05/15/2014	2014	Reconnect-Water no charge
40002738784		Reconnect-Water no charge	401 E 15TH ST	05/15/2014	05/15/2014	2014	Reconnect-Water no charge

This page has been left blank intentionally to allow for double-sided printing.

Table 6: Tacoma Water Department Service Visits to the Tacoma Tide Flats Area

Service	Hours at Property
10" Fireline Exchange	2
10" Fireline meter exchange	2
10-inch svc active	2
8" Fireline Meter Exchange	2
Adjust Mtr Box Height	2
Adjust Vault height	4
CHARGES TO BE MOVED TO 2000	This order was cancelled
Check Hydrant (DO NOT USE on W1 Notifs)	1
Check Meter	1
Check Service	1
Check Vault	1
Disconnect Large mtr-Water	1
Disconnect mtr-Electric	Not a water order
Disconnect mtr-Water	1
DO NOT USE - Update Service	2
DO NOT USE Investigate No Water	1
DO NOT USE on W1 Notif-Invest. Hi Press	2
DO NOT USE on W1 Notif-Invest. Low Press	2
Engineering Plan Review-INSIDE	varies
Flush Main	varies
Inspect Hydrant	2
Install Meter	1.5
Install Non Skid Lid on Vault	4
Install Service	5
Install Touch Rd on Meter	2
Install Yoke Resetter	1
Invest Brown/Sand In Water, WQ	1
Invest Other, WQ	1
Investigate Damage	2
Investigate Possible Leak	1
Investigate Possible Water Structure	1
Investigate Property Side	1
Investigate Sink Hole	2
Investigate Vehicle v/s Hyd/Guard Post	1
Locate And Raise Valve Box	4
NO CONTRACT-After Hrs Turn On	2
Other Meter	1
Other Vault	2
Over 1" sprinkler Reconnect	1
Reconnect-Water	1
Reconnect-Water no charge	1

Table 6: Tacoma Water Department Service Visits to the Tacoma Tide Flats Area

Relocate 6" Fire Service	8
Relocate Service	7
RENEW METER, YOKE	2
Renew Meter/Vault - 400	6
Renew Meter/Yoke/Box Onl	2
Renew Service	7
Renew Service - 400	7
Renew Svc - 600	7
Renew/Transfer Servic	7
Repair Hydrant	2
Repair Meter	4 (includes testing)
Repair Service	4
Repair Valve	4
Repair Vault	8
Replace FM Meter	8
Replace Mbox/ Lid	1
Replace Mtr Box	2
Replace Mtr Box Lid	1
Replace Valve Box Lid	1
Replace Vault	8
Replace Vault Lid	2
Replace Yoke Stop	3
Shutdown Main	Varies
Structural Deficiency	2
Transfer Service	5
Turn Off Valve	1
Turn On Valve	1
Update Service - 300 P	2
Update Service - 400	2
WQ	1
WQ Inspection	1
WTR-After hours reconnect	2
MISCELLANEOUS	8

Table 7: Tacoma Tide Flats Survey – Puget Sound Energy

The purpose of this survey is to determine how often people may come into contact with soil at properties in the Tacoma Tide Flats. This information will be used to make sure that a site cleanup at a property in the Tide Flats is protective of future workers who come to the property.

Question	Answer
1. Date	4/18/2014
2. Name	Ralph Yerbury
3. Company	Puget Sound Energy
4. Type of Activity	Locate gas lines whenever anyone is performing intrusive work. Be present at sites where intrusive work is being performed.
5. How many people in your organization work in the tide flat area of Tacoma as bounded by the Thea Foss waterway, the Hylebos waterway, Commencement Bay and Highway 509 (see Figure)?	One
6. How many days a month might you be out on the tide flat area? If there is more than one person then add all of the days for all people together.	It varies due to projects underway but an average would be 6 times a month.
7. How many hours would you typically spend at one property per visit?	Again it varies. Some projects are quick and only require a locate to verify safe distances and others require being on site while work is being completed to ensure safety. These jobs could last 15 or more hours. However, an average would be 4 to 6 hours per visit. Average = 6 property visits/month at 4 to 6 hours/visit High Estimate = 12 visits/month (6 property visits/month with each visit lasting 2 days i.e, 15 hours.
8. Do you ever have to be in contact with soil?	On occasion. Again it is unique to the job. Sometimes he has to get into a trench to brush off a pipe to inspect it for instance.

This page has been left blank intentionally to allow for double-sided printing.

Table 8: Tacoma Tide Flats Survey – Tacoma Rail

The purpose of this survey is to determine how often people may come into contact with soil at properties in the Tacoma Tide Flats. This information will be used to make sure that a site cleanup at a property in the Tide Flats is protective of future workers who come to the property.

Question	Answer
1. Date	5/28/14
2. Name	Tim Flood
1. Company	Tacoma Rail
2. Type of Activity	Rail operations
3. How many people in your organization work in the tide flat area of Tacoma as bounded by the Thea Foss waterway, the Hylebos waterway, Commencement Bay and Highway 509 (see Figure)?	Less than 10
4. How many days a month might you be out on the tide flat area? If there is more than one person then add all of the days for all people together.	• Max = 15 days. 10 people x 15 days/month = 150 man days on tide flat property. • 5 people might actually have potential of coming into contact with soil and the hours would vary a lot… 1 to 8 per property however, if you took total time those 5 folks would be potentially working in all the tide flat area you would take 5 people times 15 days per month time 8 hours or 5 x 15 x 8= 600 hours a month.
5. How many hours would you typically spend at one property per visit?	1 to 8 hours per property
6. Do you ever have to be in contact with soil?	Yes. Replacing ties, working on the road bed etc.

This page has been left blank intentionally to allow for double-sided printing.

Table 9: Summary of the Tacoma Tide Flats Utility Worker Surveys

Agency	Estimate	Number of People who May Contact Soil	Days per Month at Tide Flat Properties	Property Visits per Month	Number of Tide Flat Properties	Days per Month at Tide Flat Properties	Days per Year at Tide Flat Properties (Min)	Days per Year at Tide Flat Properties (Max)
Tacoma Police	--	0	0	0	0	0	0	0
Puget Sound Energy	Low	1	6	6	563	0.011	0.13	--
Puget Sound Energy	High	1	12	12	563	0.021	--	0.26
Tacoma Rail	Low	5	15	75	563	0.13	1.6	--
Tacoma Rail	High	10	15	150	563	0.27	--	3.2
Tacoma Fire Department	2009	--	--	--	--	--	0.25	1.5
Tacoma Fire Department	2010	--	--	--	--	--	0.27	1.6
Tacoma Fire Department	2011	--	--	--	--	--	0.23	1.4
Tacoma Fire Department	2012	--	--	--	--	--	0.22	1.3
Tacoma Fire Department	2013	--	--	--	--	--	0.26	1.6
Tacoma Water Department	2004	--	--	--	--	--	0.01	0.07
Tacoma Water Department	2005	--	--	--	--	--	0.0071	0.028
Tacoma Water Department	2006	--	--	--	--	--	0.0069	0.028
Tacoma Water Department	2007	--	--	--	--	--	0.01	0.073
Tacoma Water Department	2008	--	--	--	--	--	0.0089	0.071
Tacoma Water Department	2009	--	--	--	--	--	0.01	0.083
Tacoma Water Department	2010	--	--	--	--	--	0.0062	0.05
Tacoma Water Department	2011	--	--	--	--	--	0.0082	0.066
Tacoma Water Department	2012	--	--	--	--	--	0.01	0.082

Notes:

-- = Not applicable

See Surveys for more information.

The following formulas were used in the evaluation:

$$Property\ Visits\ per\ Month = Number\ of\ People\ x\ Days\ per\ Month\ at\ Properties$$

$$Days\ per\ Month\ at\ Property = \frac{Number\ of\ People\ x\ Days\ per\ Month\ at\ Properties}{Total\ Number\ of\ Properties\ (563)}$$

$$Days\ per\ Year\ at\ Property = Days\ per\ Month\ at\ Property\ x\ 12\frac{months}{year}$$

This page has been left blank intentionally to allow for double-sided printing.

Figures

PIONEER
TECHNOLOGIES CORPORATION

Tacoma Tideflats Area
Tacoma, Washington

Figure 1

This page has been left blank intentionally to allow for double-sided printing.

Appendix C

Arsenic and Lead Soil Stabilization Treatability Study

10/10/2014

This page has been left blank intentionally to allow for double-sided printing.

Contents

Figures

Tables

Attachments

This page has been left blank intentionally to allow for double-sided printing.

SOIL STABILIZATION TREATABILITY STUDY

C-1.1. Introduction

This appendix describes the treatability study that was conducted and additional information that was collected to further evaluate the technical and economic feasibility of applying a selected technology to reduce the leachability of metals from on-Property soils. Section C-1.2 presents the objectives of the treatability study. Section C-1.3 describes the treatability study designs, communications with treatability experts on the feasibility of treatment, and the pertinent study results. Section C-1.4 provides the conclusion and recommendation of the soil stabilization treatability study.

C-1.2. Treatability Study Objectives

The goal of the soil treatability study was to determine if stabilization would be an effective means to reduce the leachability of metals in on-Property soils to achieve surface water performance goals (i.e., surface water remediation levels [RELs]) thereby enabling the re-use of soil on-Property. The soil treatability study was conducted by MT2, LLC Arvada, Colorado (MT2, LLC 2014). The focus of this study was to:

- Confirm the suitability of the selected technologies for Property-specific soils;
- Identify potential problems associated with the selected technologies for application at the Property; and,
- Identify additional treatability work that may need to be conducted prior to Remedial Design.

C-1.2.1. Soil Characterization

Soil samples for the treatability study were collected from various OUs, as defined by the RI-OSS sampling, and contained targeted constituent of concern (COC) concentrations. Six soil OUs were defined to describe the residual contamination and to determine volumes of soil requiring remediation. OUs were defined as Property locations with like waste types. These OUs are shown on Figure C-1. The targeted soil samples that were collected for treatability testing based on RI-OSS data, generally representing arsenic and lead concentrations ranging from 90 mg/kg to 900 mg/kg and 250 mg/kg to 2000 mg/kg, respectively. These soils were collected using a GeoProbe and the locations are shown in Figure C-1. Splits of these samples were made and sent to Test America Tacoma and MT2. The samples were analyzed at Test America for total arsenic and lead by EPA Method SW846-6010/SW846-7470 and for TCLP by EPA Method SW846-1311-6010/SW846-1311-7470. These tests provided baseline data to identify suitable samples for the treatability study. The analytical data, location, depth, and concentrations of the soils sent for treatability testing are presented in Table C-1. The analytical laboratory reports are presented in Attachment 1.

C-1.2.2. Soil Stabilization

After the baseline data were received and reviewed, a subset of the samples were selected for analysis in the treatability study. The treatability study candidate samples are identified, and the rationale for selecting the different samples for evaluation are summarized and presented in Table C-2. A sample from OU5 was included in the treatability study but, all of the sample material was used during SPLP testing.

The soil treatability study methodology and results are presented in the MT2 report which is included in Attachment 2. MT2 blended impacted soils with their proprietary ECOBOND® Pb and ECOBOND® As soil additives and, following SPLP methodology, collected leachate from the treated soils. The leachate was analyzed for lead and arsenic by using EPA's SW-846 Method No. 1312/6010B. The SPLP samples were processed and analyzed at ESC laboratory (which is independent of MT2) and then filtered according to the prescribed procedures. The ESC laboratory reports are presented in Attachment 3.

C-1.3. Results

The results of the treatability study are presented in Table C-3. In OU3 and OU6, the SPLP results indicated that the samples met the surface water performance goals and no ECOBOND® was added. ECOBOND® was added to representative samples from OU1, OU2, and OU4 and in all cases the analytical results confirmed that the addition of ECOBOND® resulted in SPLP leachate concentrations that were less than the surface water performance goals.

C-1.4. Conclusion

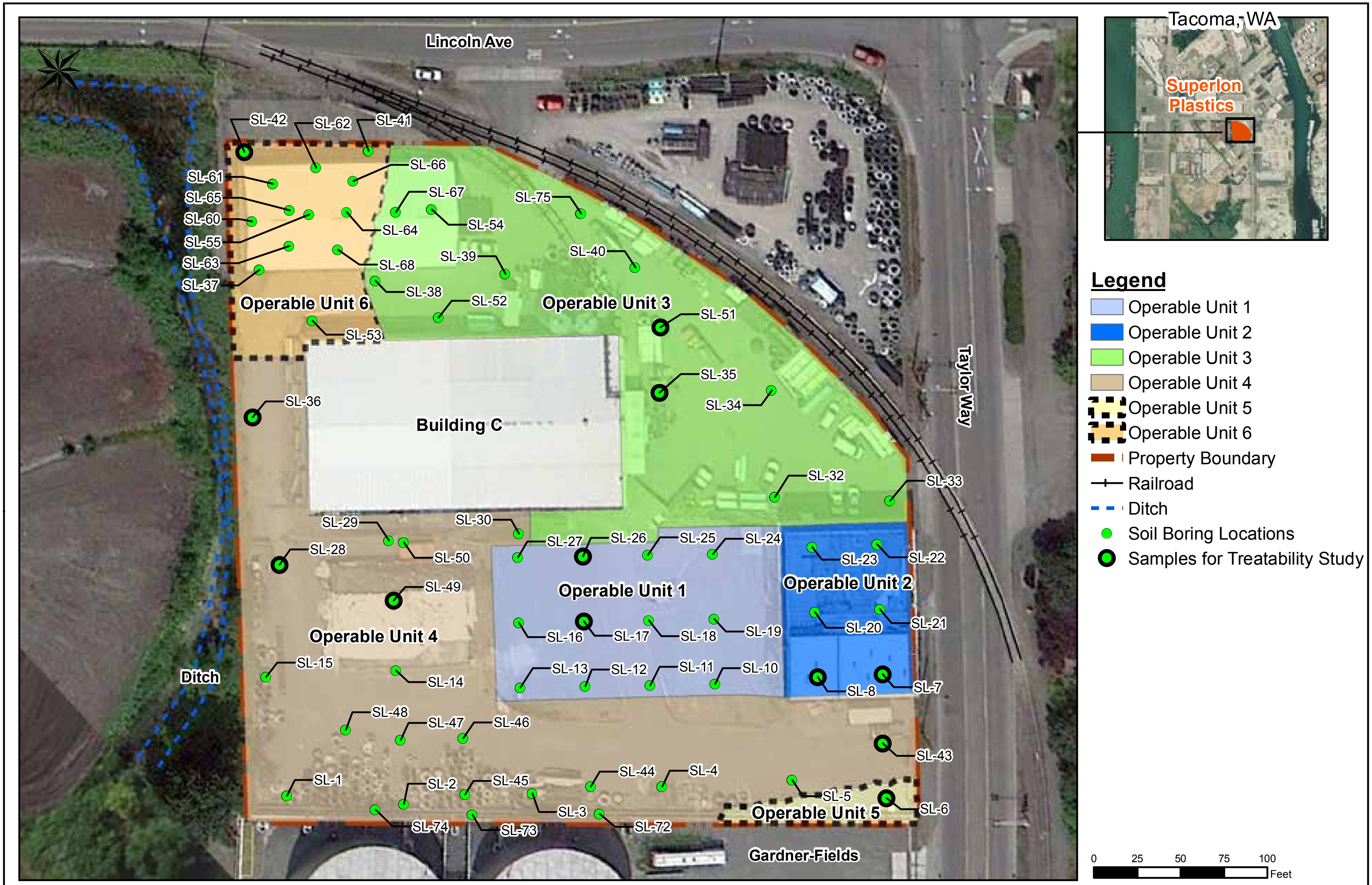
The treatability study used bench-scale testing to determine the feasibility of successfully stabilizing soils, so as to reduce concentrations of metals in the leachate to surface water performance goals. This soil stabilization treatability study demonstrated that ECOBOND® As and ECOBOND® Pb were effective in treating all of the on-Property soils tested in this study to a level that will achieve the surface water performance goals. While this testing did not include samples of all waste materials on the Property, historic performance of the Ecobond® technology during the Phase III Interim Action has demonstrated its ability to perform well on a variety of waste materials. Furthermore, MT2 has successfully treated soils on the Property as part of interim actions, and are confident that these stabilization technologies will be successful in treating all on-Property soils in this FS that have the potential to leach arsenic and lead above their OU-specific surface water RELs.

C-1.5. References for Appendix C

MT2, LLC. October 2014. Treatability Report. Prepared for the Superlon Site, WA.

Figures

This page has been left blank intentionally to allow for double-sided printing.



PIONEER TECHNOLOGIES CORPORATION

Operable Units and Samples for Soil Stabilization Treatability Study
Superlon Plastics Site, Tacoma, Washington

Figure C-1

Document Path: G:\Projects\Superlon\Maps\2014\September\Figure C-1_Operable_Units_and_MT2Samples.mxd; Author: SM; Date Saved: 10/2/2014

This page has been left blank intentionally to allow for double-sided printing.

Tables

Table C-1: Soil Treatability Study Baseline Sample Results

Sample	SLTS-17	SLTS-26	SLTS-7	SLTS-8	SLTS-35	SLTS-51	SLTS-28	SLTS-36	SLTS-43	SLTS-49	SLTS-6	SLTS-42
Operable Unit	Operable Unit 1		Operable Unit 2		Operable Unit 3		Operable Unit 4				Operable Unit 5	Operable Unit 6
Boring #	17	26	7	8	35	51	28	36	43	49	6	42
Depth (feet bgs)	10-12	12-14	7-8	7-8	6-8	10-12	2-4	1-2	1-2	6-8	10-12	1-2
Date Collected	11/6/2013	11/6/2013	11/26/2013	11/26/2013	11/7/2013	11/7/2013	11/7/2013	11/7/2013	11/6/2013	11/7/2013	11/6/2013	11/7/2013
Analyte	**Result**											
Arsenic (mg/kg)	170	83	88	120	180	61	90	66	420	250	910	290
Arsenic TCLP (mg/L)	0.31	1.4	0.41	0.24	0.060 U	0.49	0.060 U	0.060 U	0.27	0.10	0.071	0.17
Lead (mg/kg)	350	3.5	66	17	9.7	18	1,350	1,400	610	2,600	890	510
Lead TCLP (mg/L)	0.27	0.030 U	0.11	0.030 U	0.030 U	0.030 U	0.34	0.79	1.0	0.27	0.030 U	2.2
pH	7.9	7.9	9.8	7.2	12	12	8.5	8.1	9.1	8.5	6.8	8.3
Total Organic Carbon (mg/kg)	6,500	2,000 U	5,300	42,000	72,000	27,000	99,500	110,000	24,000	86,000	23,000	77,000

Notes:

bgs: below ground surface

TCLP: Toxicity characteristic leachate procedure

U: Analyte was not detected; reporting limit is shown.

This page has been left blank intentionally to allow for double-sided printing.

Table C-2: Soil Treatability Study Samples

Sample	Operable Unit	Priority	Boring #	Depth (ft bgs)	Date Collected	Total Arsenic (mg/kg)	Arsenic TCLP (mg/L)	Total Lead (mg/kg)	Lead TCLP (mg/L)	pH	Total Organic Carbon (mg/kg)	Rationale for Selection or Exclsusion from Treatabilty Study
SLTS-17	OU1	2	17	10-12	11/6/2013	170	0.31	350	0.27	7.9	6,500	Moderate Pb/Moderate As, lowest pH
SLTS-26		1	26	12-14	11/6/2013	83	1.4	3.5	0.030 U	7.9	2,000 U	Meets Criteria per TCLP Pb
SLTS-7	OU2	1	7	7-8	11/26/2013	88	0.41	66	0.11	9.8	5,300	Moderate Pb/Moderate As, Intermediate pH
SLTS-8		2	8	7-8	11/26/2013	120	0.24	17	0.030 U	7.2	42,000	Meets Criteria per TCLP Pb
SLTS-35	OU3	1	35	6-8	11/7/2013	180	0.060 U	9.7	0.030 U	12	72,000	Meets Criteria per TCLP Pb and TCLP As
SLTS-51		1	51	10-12	11/7/2013	61	0.49	18	0.030 U	12	27,000	Low Pb/High Leachable As, Highest pH
SLTS-28	OU4	2	28	2-4	11/7/2013	90	0.060 U	1,350	0.34	8.5	99,500	High Pb/Low As, Intermediate pH
SLTS-36		2	36	1-2	11/7/2013	66	0.060 U	1,400	0.79	8.1	110,000	Meets Criteria per TCLP As
SLTS-43		1	43	1-2	11/6/2013	420	0.27	610	1	9.1	24,000	High Pb/High As, Intermediate pH
SLTS-49		2	49	6-8	11/7/2013	250	0.1	2,600	0.27	8.5	86,000	High Pb/Moderate As, Intermediate pH, low priority
SLTS-6	OU5	1	6	10-12	11/6/2013	910	0.071	890	0.030 U	6.8	23,000	Meets Criteria per TCLP Pb and TCLP As
SLTS-42	OU6	1	42	1-2	11/7/2013	290	0.17	510	2.2	8.3	77,000	High Pb/High As, Intermediate/low pH

Notes:

Highlighted samples were included in the Treatability Study.

U: Analyte was not detected; reporting limit is shown.

This page has been left blank intentionally to allow for double-sided printing.

Table C-3: Soil Stabilization Results

MT2 Test #	OU #	Total Lead (mg/kg)	Total Arsenic (mg/kg)	Natural pH	SPLP Lead (mg/L)	SPLP Arsenic (mg/L)
Base Analysis						
SLTS-17	1	350	170	7.9	0.4	<0.020
SLTS-7	2	66	88	9.8	0.65	<0.005
SLTS-51	3	18	61	12	0.0056	0.28
SLTS-28	4	1350	90	8.5	0.033	0.044
SLTS-43	4	610	420	9.1	0.42	0.37
SLTS-42	6	510	290	8.3	0.12	0.14
Best Mix of ECOBOND Post-Treatment Analysis						
SLTS-17-D	1	--	--	--	0.15	0.034
SLTS-7	2	--	--	--	0.005	<0.02
SLTS-51	3	Sample was consumed during SPLP testing.				
SLTS-28	4	Not tested - Meets SW REL[1]				
SLTS-43	4	--	--	--	0.096	2.9
SLTS-42	6	Not tested - Meets SW REL[1]				

Notes:

-- = Not Tested

[1] SPLP concentration was less than the preliminary treatability study goals of 0.07 mg/L for arsenic and 0.10 mg/L For lead.

This page has been left blank intentionally to allow for double-sided printing.

Attachment C-1: Pre-Treatment Baseline Analytical Data

This page has been left blank intentionally to allow for double-sided printing.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-41203-1
Client Project/Site: Superlon Tacoma, WA

For:
Pacific Environmental and Redevelopment
8424 East Meadow Lake Drive
Snohomish, Washington 98290

Attn: Jeff King

Authorized for release by:
12/9/2013 1:40:53 PM

Melissa Armstrong, Project Manager I
(253)922-2310 x135
melissa.armstrong@testamericainc.com

Designee for

Pam Johnson, Project Manager I
(253)922-2310 x112
pamr.johnson@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

This page has been left blank intentionally to allow for double-sided printing.

Table of Contents

Job ID: 580-41203-1

Laboratory: TestAmerica Seattle

Narrative

CASE NARRATIVE

Client: Pacific Environmental and Redevelopment
Project: Superlon Tacoma, WA
Report Number: 580-41203-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

It should be noted that samples with elevated Reporting Limits (RLs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the RLs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 11/7/2013 1:35 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.7º C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

TCLP METALS
Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3), SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for TCLP metals in accordance with EPA SW-846 Methods 1311/ 6010B. The samples were leached on 11/18/2013 and 12/03/2013, prepared on 11/19/2013 and 12/04/2013 and analyzed on 11/20/2013 and 12/05/2013.

EPA Method 1311 requires the temperature of the room to be maintained at 21 to 25 degrees Celsius. For batch 580-149487, a temperature excursion of 25.2 was noted for a maximum time of 18 hours.

No other difficulties were encountered during the TCLP metals analysis.

All other quality control parameters were within the acceptance limits.

TOTAL METALS (ICP)
Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3), SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 11/15/2013 and analyzed on 11/18/2013.

Job ID: 580-41203-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

Samples SO-SLTS-49-110713-6-8 (580-41203-6)[10X], SO-SLTS-28-110713-2-4 (580-41203-7)[10X], SO-SLTS-44-110713-6-8 (580-41203-9)[100X] and SO-SLTS-44-110713-8-10 (580-41203-10)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

Arsenic and/ or Lead failed the recovery criteria high for the matrix spike/ matrix spike duplicate (MS/ MSD) of sample SO-SLTS-43-110613-1-2 (580-41203-1) in analysis batch 580-149481. The presence of the '4' qualifier in the data indicates analytes where the concentration in the unspiked sample exceeded four times the spiking amount. Affected data has been “F” or “4” qualified and reported.

No other difficulties were encountered during the metals analysis.

All other quality control parameters were within the acceptance limits.

TOTAL SOLIDS

Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3), SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for total solids in accordance with EPA Method 160.3. The samples were analyzed on 11/12/2013.

No difficulties were encountered during the TS analysis.

All quality control parameters were within the acceptance limits.

CORROSIVITY (PH)

Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3), SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for corrosivity (pH) in accordance with EPA SW-846 Method 9045C. The samples were analyzed on 11/18/2013.

No difficulties were encountered during the pH analysis.

All quality control parameters were within the acceptance limits.

TOTAL ORGANIC CARBON

Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3), SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for total organic carbon in accordance with EPA SW-846 Method 9060. The samples were analyzed on 11/15/2013.

No difficulties were encountered during the TOC analysis.

All quality control parameters were within the acceptance limits.

PERCENT SOLIDS

Samples SO-SLTS-43-110613-1-2 (580-41203-1), SO-SLTS-6-110613-10-12 (580-41203-2), SO-SLTS-6-110613-14-16 (580-41203-3),

Job ID: 580-41203-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

SO-SLTS-26-110613-12-14 (580-41203-4), SO-SLTS-17-110613-10-12 (580-41203-5), SO-SLTS-49-110713-6-8 (580-41203-6), SO-SLTS-28-110713-2-4 (580-41203-7), SO-SLTS-28-110713-2-4-(01) (580-41203-8), SO-SLTS-44-110713-6-8 (580-41203-9), SO-SLTS-44-110713-8-10 (580-41203-10), SO-SLTS-36-110713-1-2 (580-41203-11), SO-SLTS-35-110713-6-8 (580-41203-12), SO-SLTS-51-110713-8-10 (580-41203-13), SO-SLTS-51-110713-10-12 (580-41203-14), SO-SLTS-75-110713-8-10 (580-41203-15) and SO-SLTS-42-110713-1-2 (580-41203-16) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 11/12/2013.

No difficulties were encountered during the % solids analysis.

All quality control parameters were within the acceptance limits.

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon Tacoma, WA

TestAmerica Job ID: 580-41203-1

Qualifiers

Metals

Qualifier	Qualifier Description
F	MS/MSD Recovery and/or RPD exceeds the control limits
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: SO-SLTS-43-110613-1-2

Lab Sample ID: 580-41203-1

Date Collected: 11/06/13 11:15
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 93.5

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	420		3.0		mg/Kg	☼	11/15/13 15:27	11/18/13 12:51	1
Lead	610		1.5		mg/Kg	☼	11/15/13 15:27	11/18/13 12:51	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.27		0.060		mg/L		11/19/13 14:41	11/20/13 16:09	1
Lead	1.0		0.030		mg/L		11/19/13 14:41	11/20/13 16:09	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.09				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	24000		2000		mg/Kg			11/15/13 16:12	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	94		0.0099		%			11/12/13 17:46	1
Residue, Total	94		0.0099		%			11/12/13 17:46	1
Percent Moisture	5.8		0.0099		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-6-110613-10-12
Lab Sample ID: 580-41203-2

Date Collected: 11/06/13 11:45
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 58.1

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	910		3.6		mg/Kg	☼	11/15/13 15:27	11/18/13 13:16	1
Lead	890		1.8		mg/Kg	☼	11/15/13 15:27	11/18/13 13:16	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.071		0.060		mg/L		11/19/13 14:41	11/20/13 16:13	1
Lead	ND		0.030		mg/L		11/19/13 14:41	11/20/13 16:13	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	6.77				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	23000		2000		mg/Kg			11/15/13 16:17	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	60		0.0088		%			11/12/13 17:46	1
Residue, Total	60		0.0088		%			11/12/13 17:46	1
Percent Moisture	40		0.0088		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-6-110613-14-16

Date Collected: 11/06/13 12:15
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-3

Matrix: Solid
Percent Solids: 82.5

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**510**		2.5		mg/Kg	☼	11/15/13 15:27	11/18/13 13:19	1
Lead	**510**		1.2		mg/Kg	☼	11/15/13 15:27	11/18/13 13:19	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		11/19/13 14:41	11/20/13 16:16	1
Lead	ND		0.030		mg/L		11/19/13 14:41	11/20/13 16:16	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**6.98**				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	ND		2000		mg/Kg			11/15/13 16:21	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**83**		0.0076		%			11/12/13 17:46	1
Residue, Total	**83**		0.0076		%			11/12/13 17:46	1
Percent Moisture	**17**		0.0076		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-26-110613-12-14

Lab Sample ID: 580-41203-4

Date Collected: 11/06/13 13:30
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 81.0

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	83		3.3		mg/Kg	☼	11/15/13 15:27	11/18/13 13:23	1
Lead	3.5		1.6		mg/Kg	☼	11/15/13 15:27	11/18/13 13:23	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.4		0.060		mg/L		11/19/13 14:41	11/20/13 16:19	1
Lead	ND		0.030		mg/L		11/19/13 14:41	11/20/13 16:19	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.92				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	ND		2000		mg/Kg			11/15/13 16:35	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.0083		%			11/12/13 17:46	1
Residue, Total	84		0.0083		%			11/12/13 17:46	1
Percent Moisture	16		0.0083		%			11/12/13 17:46	1

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon Tacoma, WA

TestAmerica Job ID: 580-41203-1

Client Sample ID: SO-SLTS-17-110613-10-12
Date Collected: 11/06/13 13:50
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-5
Matrix: Solid
Percent Solids: 75.2

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	170		2.6		mg/Kg	☼	11/15/13 15:27	11/18/13 13:26	1
Lead	350		1.3		mg/Kg	☼	11/15/13 15:27	11/18/13 13:26	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.31		0.060		mg/L		11/19/13 14:42	11/20/13 16:22	1
Lead	0.27		0.030		mg/L		11/19/13 14:42	11/20/13 16:22	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.89				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	6500		2000		mg/Kg			11/15/13 16:39	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.0090		%			11/12/13 17:46	1
Residue, Total	75		0.0090		%			11/12/13 17:46	1
Percent Moisture	25		0.0090		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-49-110713-6-8
Lab Sample ID: 580-41203-6

Date Collected: 11/07/13 09:15
Matrix: Solid

Date Received: 11/07/13 13:35
Percent Solids: 58.9

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	250		4.5		mg/Kg	☼	11/15/13 15:27	11/18/13 13:30	1
Lead	2600		22		mg/Kg	☼	11/15/13 15:27	11/18/13 16:02	10

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.10		0.060		mg/L		11/19/13 14:42	11/20/13 16:25	1
Lead	0.27		0.030		mg/L		11/19/13 14:42	11/20/13 16:25	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.53				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	86000		2000		mg/Kg			11/15/13 16:43	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	58		0.0099		%			11/12/13 17:46	1
Residue, Total	58		0.0099		%			11/12/13 17:46	1
Percent Moisture	42		0.0099		%			11/12/13 17:46	1

1
2
3
4
5
6
7
8
9
10
11

Client Sample ID: SO-SLTS-28-110713-2-4

Date Collected: 11/07/13 09:45
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-7

Matrix: Solid
Percent Solids: 74.4

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**94**		3.3		mg/Kg	☼	11/15/13 15:27	11/18/13 13:33	1
Lead	**1500**		16		mg/Kg	☼	11/15/13 15:27	11/18/13 16:06	10

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		11/19/13 14:42	11/20/13 16:29	1
Lead	**0.27**		0.030		mg/L		11/19/13 14:42	11/20/13 16:29	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**8.67**				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	**100000**		2000		mg/Kg			11/15/13 16:47	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**77**		0.0087		%			11/12/13 17:46	1
Residue, Total	**77**		0.0087		%			11/12/13 17:46	1
Percent Moisture	**23**		0.0087		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-28-110713-2-4-(01)

Lab Sample ID: 580-41203-8

Date Collected: 11/07/13 09:45

Matrix: Solid

Date Received: 11/07/13 13:35

Percent Solids: 75.3

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**86**		3.7		mg/Kg	☼	11/15/13 15:27	11/18/13 13:37	1
Lead	**1200**		1.9		mg/Kg	☼	11/15/13 15:27	11/18/13 13:37	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		11/19/13 14:42	11/20/13 16:33	1
Lead	**0.41**		0.030		mg/L		11/19/13 14:42	11/20/13 16:33	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**8.30**				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	**99000**		2000		mg/Kg			11/15/13 16:52	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**72**		0.0099		%			11/12/13 17:46	1
Residue, Total	**72**		0.0099		%			11/12/13 17:46	1
Percent Moisture	**28**		0.0099		%			11/12/13 17:46	1

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon Tacoma, WA

TestAmerica Job ID: 580-41203-1

Client Sample ID: SO-SLTS-44-110713-6-8
Date Collected: 11/07/13 10:00
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-9
Matrix: Solid
Percent Solids: 62.4

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6800		350		mg/Kg	☼	11/15/13 15:27	11/18/13 16:09	100
Lead	2400		170		mg/Kg	☼	11/15/13 15:27	11/18/13 16:09	100

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.5		0.060		mg/L		12/04/13 12:48	12/05/13 10:39	1
Lead	16		0.030		mg/L		12/04/13 12:48	12/05/13 10:39	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.68				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	37000		2000		mg/Kg			11/15/13 16:56	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	60		0.0098		%			11/12/13 17:46	1
Residue, Total	60		0.0098		%			11/12/13 17:46	1
Percent Moisture	40		0.0098		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-44-110713-8-10
Date Collected: 11/07/13 10:05
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-10
Matrix: Solid
Percent Solids: 63.1

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1600		45		mg/Kg	☼	11/15/13 15:27	11/18/13 16:12	10
Lead	22		2.3		mg/Kg	☼	11/15/13 15:27	11/18/13 13:50	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	8.7		0.060		mg/L		12/04/13 12:48	12/05/13 10:43	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 10:43	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.86				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	20000		2000		mg/Kg			11/15/13 17:00	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	62		0.0077		%			11/12/13 17:46	1
Residue, Total	62		0.0077		%			11/12/13 17:46	1
Percent Moisture	38		0.0077		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-36-110713-1-2
Date Collected: 11/07/13 10:15
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-11
Matrix: Solid
Percent Solids: 66.3

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	66		4.1		mg/Kg	☼	11/15/13 15:27	11/18/13 13:53	1
Lead	1400		2.1		mg/Kg	☼	11/15/13 15:27	11/18/13 13:53	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/04/13 12:48	12/05/13 10:46	1
Lead	0.79		0.030		mg/L		12/04/13 12:48	12/05/13 10:46	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.08				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	110000		2000		mg/Kg			11/15/13 17:09	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	63		0.0099		%			11/12/13 17:46	1
Residue, Total	63		0.0099		%			11/12/13 17:46	1
Percent Moisture	37		0.0099		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-35-110713-6-8
Date Collected: 11/07/13 11:20
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-12
Matrix: Solid
Percent Solids: 55.6

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**180**		4.9		mg/Kg	☼	11/15/13 15:27	11/18/13 13:57	1
Lead	**9.7**		2.5		mg/Kg	☼	11/15/13 15:27	11/18/13 13:57	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/04/13 12:48	12/05/13 10:50	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 10:50	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	**12.4**				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	**72000**		2000		mg/Kg			11/15/13 17:14	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**58**		0.0094		%			11/12/13 17:46	1
Residue, Total	**58**		0.0094		%			11/12/13 17:46	1
Percent Moisture	**42**		0.0094		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-51-110713-8-10
Lab Sample ID: 580-41203-13
Date Collected: 11/07/13 11:45
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 67.7

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	100		3.9		mg/Kg	☼	11/15/13 15:27	11/18/13 14:00	1
Lead	8.5		1.9		mg/Kg	☼	11/15/13 15:27	11/18/13 14:00	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/04/13 12:48	12/05/13 10:53	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 10:53	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	12.3				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	88000		2000		mg/Kg			11/15/13 17:19	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	65		0.0083		%			11/12/13 17:46	1
Residue, Total	65		0.0083		%			11/12/13 17:46	1
Percent Moisture	35		0.0083		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-51-110713-10-12
Date Collected: 11/07/13 11:50
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-14
Matrix: Solid
Percent Solids: 64.3

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	61		3.3		mg/Kg	☼	11/15/13 15:27	11/18/13 14:04	1
Lead	18		1.7		mg/Kg	☼	11/15/13 15:27	11/18/13 14:04	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.49		0.060		mg/L		12/04/13 12:48	12/05/13 10:56	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 10:56	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	12.4				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	27000		2000		mg/Kg			11/15/13 17:24	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	64		0.0090		%			11/12/13 17:46	1
Residue, Total	64		0.0090		%			11/12/13 17:46	1
Percent Moisture	36		0.0090		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-75-110713-8-10

Lab Sample ID: 580-41203-15

Date Collected: 11/07/13 12:30
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 59.1

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	130		4.4		mg/Kg	☼	11/15/13 15:27	11/18/13 14:08	1
Lead	31		2.2		mg/Kg	☼	11/15/13 15:27	11/18/13 14:08	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/04/13 12:48	12/05/13 11:01	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 11:01	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	12.4				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	88000		2000		mg/Kg			11/15/13 17:29	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	61		0.0099		%			11/12/13 17:46	1
Residue, Total	61		0.0099		%			11/12/13 17:46	1
Percent Moisture	39		0.0099		%			11/12/13 17:46	1

Client Sample ID: SO-SLTS-42-110713-1-2

Date Collected: 11/07/13 12:50
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-16
Matrix: Solid
Percent Solids: 66.4

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	290		3.6		mg/Kg	☼	11/15/13 15:27	11/18/13 14:11	1
Lead	510		1.8		mg/Kg	☼	11/15/13 15:27	11/18/13 14:11	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.17		0.060		mg/L		12/04/13 12:48	12/05/13 11:04	1
Lead	2.2		0.030		mg/L		12/04/13 12:48	12/05/13 11:04	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.33				SU			11/18/13 12:45	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	77000		2000		mg/Kg			11/15/13 17:34	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	66		0.0099		%			11/12/13 17:46	1
Residue, Total	66		0.0099		%			11/12/13 17:46	1
Percent Moisture	34		0.0099		%			11/12/13 17:46	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 580-149395/21-A
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 149395

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		3.0		mg/Kg		11/15/13 15:27	11/18/13 12:35	1
Lead	ND		1.5		mg/Kg		11/15/13 15:27	11/18/13 12:35	1

Lab Sample ID: LCS 580-149395/22-A
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	196		mg/Kg		98	80 - 120
Lead	50.0	49.2		mg/Kg		98	80 - 120

Lab Sample ID: LCSD 580-149395/23-A
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	197		mg/Kg		98	80 - 120	0	20
Lead	50.0	49.4		mg/Kg		99	80 - 120	0	20

Lab Sample ID: LCSSRM 580-149395/24-A
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	237	234		mg/Kg		98.7	71.3 - 129.1
Lead	103	97.0		mg/Kg		94.2	70.9 - 128.2

Lab Sample ID: 580-41203-1 MS
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: SO-SLTS-43-110613-1-2
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	420		167	691	F	mg/Kg	☼	163	80 - 120
Lead	610		41.7	770	4	mg/Kg	☼	373	80 - 120

Lab Sample ID: 580-41203-1 MSD
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: SO-SLTS-43-110613-1-2
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	420		188	641		mg/Kg	☼	118	80 - 120	8	20
Lead	610		46.9	748	4	mg/Kg	☼	285	80 - 120	3	20

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 580-41203-1 DU
Matrix: Solid
Analysis Batch: 149481

Client Sample ID: SO-SLTS-43-110613-1-2
Prep Type: Total/NA
Prep Batch: 149395

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	420		476		mg/Kg	☼	13	20
Lead	610		660		mg/Kg	☼	7	20

Lab Sample ID: MB 580-149487/1-B
Matrix: Solid
Analysis Batch: 149661

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 149548

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		11/19/13 14:42	11/20/13 15:22	1
Lead	ND		0.030		mg/L		11/19/13 14:42	11/20/13 15:22	1

Lab Sample ID: LCS 580-149487/2-B
Matrix: Solid
Analysis Batch: 149661

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 149548

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.11		mg/L		103	80 - 120
Lead	1.00	1.01		mg/L		101	80 - 120

Lab Sample ID: LCSD 580-149487/3-B
Matrix: Solid
Analysis Batch: 149661

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 149548

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	4.25		mg/L		106	80 - 120	3	20
Lead	1.00	1.04		mg/L		104	80 - 120	3	20

Lab Sample ID: LCSSRM 580-149487/15-B
Matrix: Solid
Analysis Batch: 149661

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 149548

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.28		mg/L		107	80 - 120
Lead	1.00	1.04		mg/L		104	80 - 120

Lab Sample ID: MB 580-150214/15-B
Matrix: Solid
Analysis Batch: 150345

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 150271

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/04/13 12:48	12/05/13 09:57	1
Lead	ND		0.030		mg/L		12/04/13 12:48	12/05/13 09:57	1

Lab Sample ID: LCS 580-150214/2-B
Matrix: Solid
Analysis Batch: 150345

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 150271

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	3.99		mg/L		100	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 580-150214/2-B
Matrix: Solid
Analysis Batch: 150345

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 150271

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	1.00	0.974		mg/L		97	80 - 120

Lab Sample ID: LCSD 580-150214/3-B
Matrix: Solid
Analysis Batch: 150345

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 150271

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	4.04		mg/L		101	80 - 120	1	20
Lead	1.00	0.985		mg/L		98	80 - 120	1	20

Lab Sample ID: LCSSRM 580-150214/4-B
Matrix: Solid
Analysis Batch: 150345

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 150271

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	3.96		mg/L		99	80 - 120
Lead	1.00	0.964		mg/L		96	80 - 120

Method: 160.3 - Solids, Total (TS)

Lab Sample ID: 580-41203-1 DU
Matrix: Solid
Analysis Batch: 149168

Client Sample ID: SO-SLTS-43-110613-1-2
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	94		94.3		%		0.05	20
Residue, Total	94		94.3		%		0.05	20
Percent Moisture	5.8		5.74		%		0.9	20

Lab Sample ID: 580-41203-2 DU
Matrix: Solid
Analysis Batch: 149168

Client Sample ID: SO-SLTS-6-110613-10-12
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	60		60.2		%		0.7	20
Residue, Total	60		60.2		%		0.7	20
Percent Moisture	40		39.8		%		1	20

Method: 9045C - pH

Lab Sample ID: 580-41203-1 DU
Matrix: Solid
Analysis Batch: 149457

Client Sample ID: SO-SLTS-43-110613-1-2
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	9.09		9.060		SU		0.3	1

1 2 3 4 5 6 7 8 9 10 11

Method: 9060 - Organic Carbon, Total (TOC)

Lab Sample ID: MB 580-149444/3
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	ND		2000		mg/Kg			11/15/13 16:05	1

Lab Sample ID: LCS 580-149444/4
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon	2850	3760		mg/Kg		132	27.8 - 170

Lab Sample ID: LCSD 580-149444/5
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon	2850	3280		mg/Kg		115	27.8 - 170	14	35

Lab Sample ID: 580-41203-3 MS
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: SO-SLTS-6-110613-14-16
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon	ND		108000	120000		mg/Kg		111	50 - 140

Lab Sample ID: 580-41203-3 MSD
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: SO-SLTS-6-110613-14-16
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon	ND		98900	110000		mg/Kg		111	50 - 140	9	35

Lab Sample ID: 580-41203-3 DU
Matrix: Solid
Analysis Batch: 149444

Client Sample ID: SO-SLTS-6-110613-14-16
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Organic Carbon	ND		ND		mg/Kg		NC	50

Client Sample ID: SO-SLTS-43-110613-1-2

Lab Sample ID: 580-41203-1

Date Collected: 11/06/13 11:15
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 93.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 12:51	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:41	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:09	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:12	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-6-110613-10-12

Lab Sample ID: 580-41203-2

Date Collected: 11/06/13 11:45
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 58.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:16	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:41	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:13	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:17	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-6-110613-14-16

Lab Sample ID: 580-41203-3

Date Collected: 11/06/13 12:15
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 82.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:19	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:41	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:16	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:21	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-26-110613-12-14

Lab Sample ID: 580-41203-4

Date Collected: 11/06/13 13:30
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 81.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:23	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:41	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:19	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:35	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-17-110613-10-12

Lab Sample ID: 580-41203-5

Date Collected: 11/06/13 13:50
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 75.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:26	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:42	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:22	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:39	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-49-110713-6-8

Lab Sample ID: 580-41203-6

Date Collected: 11/07/13 09:15
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 58.9

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:30	HJM	TAL SEA
Total/NA	Analysis	6010B		10	149501	11/18/13 16:02	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:42	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:25	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:43	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-28-110713-2-4

Lab Sample ID: 580-41203-7

Date Collected: 11/07/13 09:45
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 74.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6010B		1	149481	11/18/13 13:33	HJM	TAL SEA
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		10	149501	11/18/13 16:06	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:42	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:29	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:47	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-28-110713-2-4-(01)

Lab Sample ID: 580-41203-8

Date Collected: 11/07/13 09:45
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 75.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:37	HJM	TAL SEA
TCLP	Leach	1311			149487	11/18/13 16:25	ALC	TAL SEA
TCLP	Prep	3010A			149548	11/19/13 14:42	PAB	TAL SEA
TCLP	Analysis	6010B		1	149661	11/20/13 16:33	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:52	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-44-110713-6-8

Lab Sample ID: 580-41203-9

Date Collected: 11/07/13 10:00
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 62.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		100	149501	11/18/13 16:09	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:39	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 16:56	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-44-110713-8-10

Lab Sample ID: 580-41203-10
Date Collected: 11/07/13 10:05
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 63.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	6010B		1	149481	11/18/13 13:50	HJM	TAL SEA
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		10	149501	11/18/13 16:12	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:43	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:00	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-36-110713-1-2

Lab Sample ID: 580-41203-11
Date Collected: 11/07/13 10:15
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 66.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:53	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:46	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:09	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-35-110713-6-8

Lab Sample ID: 580-41203-12
Date Collected: 11/07/13 11:20
Matrix: Solid
Date Received: 11/07/13 13:35
Percent Solids: 55.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 13:57	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:50	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:14	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-51-110713-8-10

Lab Sample ID: 580-41203-13

Date Collected: 11/07/13 11:45
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 67.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 14:00	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:53	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:19	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-51-110713-10-12

Lab Sample ID: 580-41203-14

Date Collected: 11/07/13 11:50
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 64.3

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 14:04	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 10:56	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:24	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client Sample ID: SO-SLTS-75-110713-8-10

Lab Sample ID: 580-41203-15

Date Collected: 11/07/13 12:30
Date Received: 11/07/13 13:35

Matrix: Solid
Percent Solids: 59.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 14:08	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 11:01	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:29	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon Tacoma, WA

TestAmerica Job ID: 580-41203-1

Client Sample ID: SO-SLTS-42-110713-1-2
Date Collected: 11/07/13 12:50
Date Received: 11/07/13 13:35

Lab Sample ID: 580-41203-16
Matrix: Solid
Percent Solids: 66.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			149395	11/15/13 15:27	PAB	TAL SEA
Total/NA	Analysis	6010B		1	149481	11/18/13 14:11	HJM	TAL SEA
TCLP	Leach	1311			150214	12/03/13 16:04	ALC	TAL SEA
TCLP	Prep	3010A			150271	12/04/13 12:48	PAB	TAL SEA
TCLP	Analysis	6010B		1	150345	12/05/13 11:04	HJM	TAL SEA
Total/NA	Analysis	160.3		1	149168	11/12/13 17:46	IWH	TAL SEA
Total/NA	Analysis	9060		1	149444	11/15/13 17:34	RSB	TAL SEA
Total/NA	Analysis	9045C		1	149457	11/18/13 12:45	IWH	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Laboratory: TestAmerica Seattle

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-04-14
California	NELAP	9	01115CA	01-31-14
L-A-B	DoD ELAP		L2236	01-19-16
L-A-B	ISO/IEC 17025		L2236	01-19-16
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-06-14
USDA	Federal		P330-11-00222	05-20-14
Washington	State Program	10	C553	02-17-14

Sample Summary

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon Tacoma, WA

TestAmerica Job ID: 580-41203-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-41203-1	SO-SLTS-43-110613-1-2	Solid	11/06/13 11:15	11/07/13 13:35
580-41203-2	SO-SLTS-6-110613-10-12	Solid	11/06/13 11:45	11/07/13 13:35
580-41203-3	SO-SLTS-6-110613-14-16	Solid	11/06/13 12:15	11/07/13 13:35
580-41203-4	SO-SLTS-26-110613-12-14	Solid	11/06/13 13:30	11/07/13 13:35
580-41203-5	SO-SLTS-17-110613-10-12	Solid	11/06/13 13:50	11/07/13 13:35
580-41203-6	SO-SLTS-49-110713-6-8	Solid	11/07/13 09:15	11/07/13 13:35
580-41203-7	SO-SLTS-28-110713-2-4	Solid	11/07/13 09:45	11/07/13 13:35
580-41203-8	SO-SLTS-28-110713-2-4-(01)	Solid	11/07/13 09:45	11/07/13 13:35
580-41203-9	SO-SLTS-44-110713-6-8	Solid	11/07/13 10:00	11/07/13 13:35
580-41203-10	SO-SLTS-44-110713-8-10	Solid	11/07/13 10:05	11/07/13 13:35
580-41203-11	SO-SLTS-36-110713-1-2	Solid	11/07/13 10:15	11/07/13 13:35
580-41203-12	SO-SLTS-35-110713-6-8	Solid	11/07/13 11:20	11/07/13 13:35
580-41203-13	SO-SLTS-51-110713-8-10	Solid	11/07/13 11:45	11/07/13 13:35
580-41203-14	SO-SLTS-51-110713-10-12	Solid	11/07/13 11:50	11/07/13 13:35
580-41203-15	SO-SLTS-75-110713-8-10	Solid	11/07/13 12:30	11/07/13 13:35
580-41203-16	SO-SLTS-42-110713-1-2	Solid	11/07/13 12:50	11/07/13 13:35

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: PERC
Address: 4424 E. Meadow Lake Drive
City: Snohomish State: NA Zip Code: 98290
Project Name and Location (State): Superlon Tacoma, WA
Contract/Purchase Order/Quote No.:

Client Contact: JEFF King
Telephone Number (Area Code)/Fax Number: 425 238 2142
Sampler: Katie Kulha
Lab Contact:
Billing Contact:

Date: 11/7/13
Lab Number: 41203
Chain of Custody Number: 13358
Page 1 of 2

Analysis (Attach list if more space is needed)

	Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Matrix: Aqueous	Matrix: Sed.	Matrix: Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6020 Ars.+Lead	9045C-pH	160.3-Moisture	9060-Tot.Org.Ca.	TCLP-Ars+Lead	Special Instructions/ Conditions of Receipt
1-	SO-SLTS-43-110613-1-2	11/6/13	11:15				X	2						X	X	X	X	X	
2-	SO-SLTS-6-110613-10-12	11/6/13	11:45				X	2						X	X	X	X	X	
3-	SO-SLTS-6-110613-14-16	11/6/13	12:15				X	2						X	X	X	X	X	
4-	SO-SLTS-26-110613-12-14	11/6/13	1:30				X	3						X	X	X	X	X	1-8oz for archive
5-	SO-SLTS-17-110613-10-12	11/6/13	1:50				X	2						X	X	X	X	X	
6-	SO-SLTS-49-110713-6-8	11/7/13	9:15				X	2						X	X	X	X	X	
7-	SO-SLTS-28-110713-2-4	11/7/13	9:45				X	2						X	X	X	X	X	
8-	SO-SLTS-28-110713-2-4-(01)	11/7/13	9:45				X	2						X	X	X	X	X	
9-	SO-SLTS-44-110713-6-8	11/7/13	10:00				X	2						X	X	X	X	X	
10-	SO-SLTS-44-110713-8-10	11/7/13	10:05				X	2						X	X	X	X	X	
11-	SO-SLTS-36-110713-1-2	11/7/13	10:15				X	2						X	X	X	X	X	
12-	SO-SLTS-35-110713-6-8	11/7/13	11:20				X	2						X	X	X	X	X	

580-41203 Chain of Custody

Cooler: ☑ Yes ☐ No Cooler Temp: ______

Possible Hazard Identification: ☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☑ 10 Days ☐ 15 Days ☐ Other ______

QC Requirements (Specify)

Relinquished By (Sign/Print)	Date	Time	Received By (Sign/Print)	Date	Time
1. Katie Kulha	11/7/13	1:35	1. Tami Blankinship	11/7/13	1335
2.			2.		
3.			3.		

Comments:

DISTRIBUTION: WHITE - Stays with the Samples; CANARY - Returned to Client with Report; PINK - Field Copy

TAL-8274-580 (0210)

1 2 3 4 5 6 7 8 9 10 11

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: PERC
Client Contact: Jeff King
Date: 11/7/13
Chain of Custody Number: 19359

Address: 8424 E. Meadow Lake Dr.
Telephone Number (Area Code)/Fax Number: 425 238 2212
Lab Number: 41203
Page 2 of 2

City: Snohomish
State: WA
Zip Code: 98290
Sampler: Katie Kulha
Lab Contact:

Project Name and Location (State): Superlon Tacoma, WA
Billing Contact:
Contract/Purchase Order/Quote No.

Analysis (Attach list if more space is needed)

	Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6020-Ars.+Lead	9045C- pH	160.3 - Moisture	9060-Tot. Org. C	TCLP-Ars+Lead	Special Instructions/ Conditions of Receipt
13-	SO-SLTS-5E-110713-8-10	11/7/13	11:45				X	2						X	X	X	X	X	
14-	SO-SLTS-51-110713-10-12	11/7/13	11:50				X	2						X	X	X	X	X	
15-	SO-SLTS-75-110713-8-10	11/7/13	12:30				X	2						X	X	X	X	X	
16-	SO-SLTS-42-110713-1-2	11/7/13	12:50				X	2						X	X	X	X	X	

Client: 30
La Blu/wki
321/6ubb
AITB = 3.7/3.9 w/o

Cooler: ☑ Yes ☐ No Cooler Temp: ____

Possible Hazard Identification: ☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☑ 10 Days ☐ 15 Days ☐ Other ____

QC Requirements (Specify)

1. Relinquished By Sign/Print: [signature] Katie Kulha | Date: 11/7/13 | Time: 1:35
1. Received By Sign/Print: [signature] | Date: 11/7/13 | Time: 1335

2. Relinquished By Sign/Print: | Date: | Time:
2. Received By Sign/Print: | Date: | Time:

3. Relinquished By Sign/Print: | Date: | Time:
3. Received By Sign/Print: | Date: | Time:

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

Login Sample Receipt Checklist

Client: Pacific Environmental and Redevelopment

Job Number: 580-41203-1

Login Number: 41203
List Number: 1
Creator: Balles, Racheal M

List Source: TestAmerica Seattle

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-41446-1
Client Project/Site: Superlon

For:
Pacific Environmental and Redevelopment
8424 East Meadow Lake Drive
Snohomish, Washington 98290

Attn: Jeff King

Pamela R. Johnson

Authorized for release by:
12/26/2013 10:45:47 AM

Pam Johnson, Project Manager I
(253)922-2310 x112
pamr.johnson@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This page has been left blank intentionally to allow for double-sided printing.

Table of Contents

Job ID: 580-41446-1

Laboratory: TestAmerica Seattle

Narrative

CASE NARRATIVE

Client: Pacific Environmental and Redevelopment
Project: Superlon
Report Number: 580-41446-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

It should be noted that samples with elevated Reporting Limits (RLs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the RLs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT
The samples were received on 11/26/2013; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 2.3 C.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

TCLP METALS
Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for TCLP metals in accordance with EPA SW-846 Methods 1311/ 6010B. The samples were leached on 12/18/2013, and prepared and analyzed on 12/19/2013.

No difficulties were encountered during the TCLP metals analysis.

All quality control parameters were within the acceptance limits.

TOTAL METALS (ICP)
Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 12/10/2013 and analyzed on 12/11/2013.

No difficulties were encountered during the metals analysis.

All quality control parameters were within the acceptance limits.

TOTAL SOLIDS
Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for total solids in accordance with EPA Method 160.3. The samples were analyzed on 12/02/2013.

No difficulties were encountered during the TS analysis.

Job ID: 580-41446-1 (Continued)

Laboratory: TestAmerica Seattle (Continued)

All quality control parameters were within the acceptance limits.

CORROSIVITY (PH)

Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for corrosivity (pH) in accordance with EPA SW-846 Method 9045C. The samples were analyzed on 12/04/2013.

No difficulties were encountered during the pH analysis.

All quality control parameters were within the acceptance limits.

TOTAL ORGANIC CARBON

Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for total organic carbon in accordance with EPA SW-846 Method 9060. The samples were analyzed on 12/11/2013.

No difficulties were encountered during the TOC analysis.

All quality control parameters were within the acceptance limits.

PERCENT SOLIDS

Samples SO-SLTS-7-112613-0-1 (580-41446-1), SO-SLTS-7-112613-1-2 (580-41446-2), SO-SLTS-8-112613-1-2 (580-41446-3), SO-SLTS-22-112613-1-2 (580-41446-4) and SO-SLTS-22-112613-1-2-(01) (580-41446-5) were analyzed for percent solids in accordance with ASTM D2216. The samples were analyzed on 12/04/2013.

No difficulties were encountered during the % solids analysis.

All quality control parameters were within the acceptance limits.

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon

TestAmerica Job ID: 580-41446-1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: SO-SLTS-7-112613-0-1

Lab Sample ID: 580-41446-1

Date Collected: 11/26/13 09:30
Date Received: 11/26/13 10:47

Matrix: Solid
Percent Solids: 51.2

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	39		5.8		mg/Kg	☼	12/10/13 16:03	12/11/13 19:03	1
Lead	57		2.9		mg/Kg	☼	12/10/13 16:03	12/11/13 19:03	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.74		0.060		mg/L		12/19/13 12:38	12/19/13 18:33	1
Lead	0.42		0.030		mg/L		12/19/13 12:38	12/19/13 18:33	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	10.3				SU			12/04/13 14:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	2600		2000		mg/Kg			12/11/13 10:23	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	45		0.0097		%			12/02/13 13:31	1
Residue, Total	45		0.0097		%			12/02/13 13:31	1
Percent Moisture	55		0.0097		%			12/02/13 13:31	1
Percent Solids	51		0.10		%			12/04/13 10:16	1
Percent Moisture	49		0.10		%			12/04/13 10:16	1

Client Sample ID: SO-SLTS-7-112613-1-2

Date Collected: 11/26/13 09:40
Date Received: 11/26/13 10:47

Lab Sample ID: 580-41446-2

Matrix: Solid
Percent Solids: 56.4

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	88		5.1		mg/Kg	☼	12/10/13 16:03	12/11/13 19:25	1
Lead	66		2.6		mg/Kg	☼	12/10/13 16:03	12/11/13 19:25	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.41		0.060		mg/L		12/19/13 12:38	12/19/13 18:36	1
Lead	0.11		0.030		mg/L		12/19/13 12:38	12/19/13 18:36	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	9.81				SU			12/04/13 14:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	5300		2000		mg/Kg			12/11/13 10:27	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	47		0.0099		%			12/02/13 13:31	1
Residue, Total	47		0.0099		%			12/02/13 13:31	1
Percent Moisture	53		0.0099		%			12/02/13 13:31	1
Percent Solids	56		0.10		%			12/04/13 10:16	1
Percent Moisture	44		0.10		%			12/04/13 10:16	1

Client Sample ID: SO-SLTS-8-112613-1-2

Date Collected: 11/26/13 10:00
Date Received: 11/26/13 10:47

Lab Sample ID: 580-41446-3

Matrix: Solid
Percent Solids: 50.1

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	120		5.5		mg/Kg	☼	12/10/13 16:03	12/11/13 19:28	1
Lead	17		2.7		mg/Kg	☼	12/10/13 16:03	12/11/13 19:28	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.24		0.060		mg/L		12/19/13 12:38	12/19/13 18:40	1
Lead	ND		0.030		mg/L		12/19/13 12:38	12/19/13 18:40	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.17				SU			12/04/13 14:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	42000		2000		mg/Kg			12/11/13 10:31	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	54		0.0099		%			12/02/13 13:31	1
Residue, Total	54		0.0099		%			12/02/13 13:31	1
Percent Moisture	46		0.0099		%			12/02/13 13:31	1
Percent Solids	50		0.10		%			12/04/13 10:16	1
Percent Moisture	50		0.10		%			12/04/13 10:16	1

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon

TestAmerica Job ID: 580-41446-1

Client Sample ID: SO-SLTS-22-112613-1-2

Lab Sample ID: 580-41446-4

Date Collected: 11/26/13 10:10
Date Received: 11/26/13 10:47

Matrix: Solid
Percent Solids: 57.0

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	30		5.2		mg/Kg	☼	12/10/13 16:03	12/11/13 19:32	1
Lead	5.6		2.6		mg/Kg	☼	12/10/13 16:03	12/11/13 19:32	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.098		0.060		mg/L		12/19/13 12:38	12/19/13 18:43	1
Lead	ND		0.030		mg/L		12/19/13 12:38	12/19/13 18:43	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.06				SU			12/04/13 14:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	22000		2000		mg/Kg			12/11/13 10:36	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	57		0.0099		%			12/02/13 13:31	1
Residue, Total	57		0.0099		%			12/02/13 13:31	1
Percent Moisture	43		0.0099		%			12/02/13 13:31	1
Percent Solids	57		0.10		%			12/04/13 10:16	1
Percent Moisture	43		0.10		%			12/04/13 10:16	1

Client Sample ID: SO-SLTS-22-112613-1-2-(01)

Lab Sample ID: 580-41446-5

Date Collected: 11/26/13 10:10
Date Received: 11/26/13 10:47

Matrix: Solid
Percent Solids: 54.5

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	27		4.1		mg/Kg	☼	12/10/13 16:03	12/11/13 19:35	1
Lead	8.0		2.0		mg/Kg	☼	12/10/13 16:03	12/11/13 19:35	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.066		0.060		mg/L		12/19/13 12:38	12/19/13 18:46	1
Lead	ND		0.030		mg/L		12/19/13 12:38	12/19/13 18:46	1

General Chemistry

Analyte	Result	Qualifier	NONE	NONE	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.93				SU			12/04/13 14:00	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	26000		2000		mg/Kg			12/11/13 10:40	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	56		0.0099		%			12/02/13 13:31	1
Residue, Total	56		0.0099		%			12/02/13 13:31	1
Percent Moisture	44		0.0099		%			12/02/13 13:31	1
Percent Solids	54		0.10		%			12/04/13 10:16	1
Percent Moisture	46		0.10		%			12/04/13 10:16	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 580-150592/21-A
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 150592

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		3.0		mg/Kg		12/10/13 16:03	12/11/13 18:47	1
Lead	ND		1.5		mg/Kg		12/10/13 16:03	12/11/13 18:47	1

Lab Sample ID: LCS 580-150592/22-A
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	198		mg/Kg		99	80 - 120
Lead	50.0	49.5		mg/Kg		99	80 - 120

Lab Sample ID: LCSD 580-150592/23-A
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	199		mg/Kg		99	80 - 120	1	20
Lead	50.0	49.6		mg/Kg		99	80 - 120	0	20

Lab Sample ID: LCSSRM 580-150592/24-A
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	237	230		mg/Kg		97.0	71.3 - 129.1
Lead	103	98.1		mg/Kg		95.2	70.9 - 128.2

Lab Sample ID: 580-41446-1 MS
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: SO-SLTS-7-112613-0-1
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	39		359	372		mg/Kg	☼	93	80 - 120
Lead	57		89.8	146		mg/Kg	☼	100	80 - 120

Lab Sample ID: 580-41446-1 MSD
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: SO-SLTS-7-112613-0-1
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	39		365	376		mg/Kg	☼	92	80 - 120	1	20
Lead	57		91.2	145		mg/Kg	☼	97	80 - 120	1	20

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 580-41446-1 DU
Matrix: Solid
Analysis Batch: 150708

Client Sample ID: SO-SLTS-7-112613-0-1
Prep Type: Total/NA
Prep Batch: 150592

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	39		42.0		mg/Kg	☼	8	20
Lead	57		51.1		mg/Kg	☼	11	20

Lab Sample ID: MB 580-151021/1-B
Matrix: Solid
Analysis Batch: 151137

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 151089

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		12/19/13 12:38	12/19/13 17:45	1
Lead	ND		0.030		mg/L		12/19/13 12:38	12/19/13 17:45	1

Lab Sample ID: LCS 580-151021/2-B
Matrix: Solid
Analysis Batch: 151137

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 151089

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.41		mg/L		110	80 - 120
Lead	1.00	1.04		mg/L		104	80 - 120

Lab Sample ID: LCSD 580-151021/3-B
Matrix: Solid
Analysis Batch: 151137

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 151089

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	4.27		mg/L		107	80 - 120	3	20
Lead	1.00	1.02		mg/L		102	80 - 120	1	20

Lab Sample ID: LCSSRM 580-151021/4-B
Matrix: Solid
Analysis Batch: 151137

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 151089

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.35		mg/L		109	80 - 120
Lead	1.00	1.04		mg/L		104	80 - 120

Method: 160.3 - Solids, Total (TS)

Lab Sample ID: 580-41446-1 DU
Matrix: Solid
Analysis Batch: 150114

Client Sample ID: SO-SLTS-7-112613-0-1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	45		54.9		%		19	20
Residue, Total	45		54.9		%		19	20
Percent Moisture	55		45.1		%		19	20

Method: 9060 - Organic Carbon, Total (TOC)

Lab Sample ID: MB 580-150655/3
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon	ND		2000		mg/Kg			12/11/13 10:16	1

Lab Sample ID: LCS 580-150655/4
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon	2850	3980		mg/Kg		140	27.8 - 170

Lab Sample ID: LCSD 580-150655/5
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon	2850	3650		mg/Kg		128	27.8 - 170	9	35

Lab Sample ID: 580-41446-5 MS
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: SO-SLTS-22-112613-1-2-(01)
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon	26000		122000	162000		mg/Kg		111	50 - 140

Lab Sample ID: 580-41446-5 MSD
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: SO-SLTS-22-112613-1-2-(01)
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Total Organic Carbon	26000		116000	155000		mg/Kg		111	50 - 140	4	35

Lab Sample ID: 580-41446-5 DU
Matrix: Solid
Analysis Batch: 150655

Client Sample ID: SO-SLTS-22-112613-1-2-(01)
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Organic Carbon	26000		25000		mg/Kg		3	50

1 2 3 4 5 6 7 8 9 10 11

Client Sample ID: SO-SLTS-7-112613-0-1 Lab Sample ID: 580-41446-1

Date Collected: 11/26/13 09:30 **Matrix: Solid**
Date Received: 11/26/13 10:47 **Percent Solids: 51.2**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			150592	12/10/13 16:03	ZF	TAL SEA
Total/NA	Analysis	6010B		1	150708	12/11/13 19:03	HJM	TAL SEA
TCLP	Leach	1311			151021	12/18/13 11:42	ALC	TAL SEA
TCLP	Prep	3010A			151089	12/19/13 12:38	PAB	TAL SEA
TCLP	Analysis	6010B		1	151137	12/19/13 18:33	HJM	TAL SEA
Total/NA	Analysis	160.3		1	150114	12/02/13 13:31	ZF	TAL SEA
Total/NA	Analysis	D 2216		1	150254	12/04/13 10:16	SGH	TAL SEA
Total/NA	Analysis	9045C		1	150281	12/04/13 14:00	IWH	TAL SEA
Total/NA	Analysis	9060		1	150655	12/11/13 10:23	RSB	TAL SEA

Client Sample ID: SO-SLTS-7-112613-1-2 Lab Sample ID: 580-41446-2

Date Collected: 11/26/13 09:40 **Matrix: Solid**
Date Received: 11/26/13 10:47 **Percent Solids: 56.4**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			150592	12/10/13 16:03	ZF	TAL SEA
Total/NA	Analysis	6010B		1	150708	12/11/13 19:25	HJM	TAL SEA
TCLP	Leach	1311			151021	12/18/13 11:42	ALC	TAL SEA
TCLP	Prep	3010A			151089	12/19/13 12:38	PAB	TAL SEA
TCLP	Analysis	6010B		1	151137	12/19/13 18:36	HJM	TAL SEA
Total/NA	Analysis	160.3		1	150114	12/02/13 13:31	ZF	TAL SEA
Total/NA	Analysis	D 2216		1	150254	12/04/13 10:16	SGH	TAL SEA
Total/NA	Analysis	9045C		1	150281	12/04/13 14:00	IWH	TAL SEA
Total/NA	Analysis	9060		1	150655	12/11/13 10:27	RSB	TAL SEA

Client Sample ID: SO-SLTS-8-112613-1-2 Lab Sample ID: 580-41446-3

Date Collected: 11/26/13 10:00 **Matrix: Solid**
Date Received: 11/26/13 10:47 **Percent Solids: 50.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			150592	12/10/13 16:03	ZF	TAL SEA
Total/NA	Analysis	6010B		1	150708	12/11/13 19:28	HJM	TAL SEA
TCLP	Leach	1311			151021	12/18/13 11:42	ALC	TAL SEA
TCLP	Prep	3010A			151089	12/19/13 12:38	PAB	TAL SEA
TCLP	Analysis	6010B		1	151137	12/19/13 18:40	HJM	TAL SEA
Total/NA	Analysis	160.3		1	150114	12/02/13 13:31	ZF	TAL SEA
Total/NA	Analysis	D 2216		1	150254	12/04/13 10:16	SGH	TAL SEA
Total/NA	Analysis	9045C		1	150281	12/04/13 14:00	IWH	TAL SEA
Total/NA	Analysis	9060		1	150655	12/11/13 10:31	RSB	TAL SEA

Client Sample ID: SO-SLTS-22-112613-1-2

Lab Sample ID: 580-41446-4

Date Collected: 11/26/13 10:10
Matrix: Solid
Date Received: 11/26/13 10:47
Percent Solids: 57.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			150592	12/10/13 16:03	ZF	TAL SEA
Total/NA	Analysis	6010B		1	150708	12/11/13 19:32	HJM	TAL SEA
TCLP	Leach	1311			151021	12/18/13 11:42	ALC	TAL SEA
TCLP	Prep	3010A			151089	12/19/13 12:38	PAB	TAL SEA
TCLP	Analysis	6010B		1	151137	12/19/13 18:43	HJM	TAL SEA
Total/NA	Analysis	160.3		1	150114	12/02/13 13:31	ZF	TAL SEA
Total/NA	Analysis	D 2216		1	150254	12/04/13 10:16	SGH	TAL SEA
Total/NA	Analysis	9045C		1	150281	12/04/13 14:00	IWH	TAL SEA
Total/NA	Analysis	9060		1	150655	12/11/13 10:36	RSB	TAL SEA

Client Sample ID: SO-SLTS-22-112613-1-2-(01)

Lab Sample ID: 580-41446-5

Date Collected: 11/26/13 10:10
Matrix: Solid
Date Received: 11/26/13 10:47
Percent Solids: 54.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			150592	12/10/13 16:03	ZF	TAL SEA
Total/NA	Analysis	6010B		1	150708	12/11/13 19:35	HJM	TAL SEA
TCLP	Leach	1311			151021	12/18/13 11:42	ALC	TAL SEA
TCLP	Prep	3010A			151089	12/19/13 12:38	PAB	TAL SEA
TCLP	Analysis	6010B		1	151137	12/19/13 18:46	HJM	TAL SEA
Total/NA	Analysis	160.3		1	150114	12/02/13 13:31	ZF	TAL SEA
Total/NA	Analysis	D 2216		1	150254	12/04/13 10:16	SGH	TAL SEA
Total/NA	Analysis	9045C		1	150281	12/04/13 14:00	IWH	TAL SEA
Total/NA	Analysis	9060		1	150655	12/11/13 10:40	RSB	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Certification Summary

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon

TestAmerica Job ID: 580-41446-1

Laboratory: TestAmerica Seattle

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-04-14
California	NELAP	9	01115CA	01-31-14
L-A-B	DoD ELAP		L2236	01-19-16
L-A-B	ISO/IEC 17025		L2236	01-19-16
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-06-14
USDA	Federal		P330-11-00222	05-20-14
Washington	State Program	10	C553	02-17-14

Sample Summary

Client: Pacific Environmental and Redevelopment
Project/Site: Superlon

TestAmerica Job ID: 580-41446-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-41446-1	SO-SLTS-7-112613-0-1	Solid	11/26/13 09:30	11/26/13 10:47
580-41446-2	SO-SLTS-7-112613-1-2	Solid	11/26/13 09:40	11/26/13 10:47
580-41446-3	SO-SLTS-8-112613-1-2	Solid	11/26/13 10:00	11/26/13 10:47
580-41446-4	SO-SLTS-22-112613-1-2	Solid	11/26/13 10:10	11/26/13 10:47
580-41446-5	SO-SLTS-22-112613-1-2-(01)	Solid	11/26/13 10:10	11/26/13 10:47

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

☐ Rush
☐ Short Hold

Chain of Custody Record

Client: PERC
Client Contact: Jeff King
Date: 11/26/13
Chain of Custody Number: 20976
Address:
Telephone Number (Area Code)/Fax Number:
Lab Number: 41446
Page 1 of 1
City: State: Zip Code:
Sampler: Katie Kulha
Lab Contact: Pam Johnson
Project Name and Location (State): Superlon Tacoma, WA
Billing Contact:
Contract/Purchase Order/Quote No.:

Analysis (Attach list if more space is needed)

Special Instructions/ Conditions of Receipt

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Tot. Metals-As+Pb	pH	Moisture Cont.	Total Org. Carbon	TCLP Metals-As + Pb
So-SLTS-7-112613-0-1	11/26/13	9:30				X	2						X	X	X	X	X
So-SLTS-7-112613-1-2	11/26/13	9:40				X	2						X	X	X	X	X
So-SLTS-8-112613-1-2	11/26/13	10:00				X	2						X	X	X	X	X
So-SLTS-22-112613-1-2	11/26/13	10:10				X	2						X	X	X	X	X
So-SLTS-22-112613-1-2-(61)	11/26/13	10:10				X	2						X	X	X	X	X

A) 2.3 / 2.1
LG BLU WH
PACKS/BUBBLE
w/o CLIENT DO.

580-41446 Chain of Custody

Cooler: ☒ Yes ☐ No Cooler Temp: ____

Possible Hazard Identification: ☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☒ 10 Days ☐ 15 Days ☐ Other ____

QC Requirements (Specify)

	Sign/Print	Date	Time		Sign/Print	Date	Time
1. Relinquished By	Katie Kulha	11/26/13	10:47	1. Received By	R T McDaniel	11-26-13	10:47
2. Relinquished By				2. Received By			
3. Relinquished By				3. Received By			

Comments

DISTRIBUTION: WHITE – Stays with the Samples; CANARY – Returned to Client with Report; PINK – Field Copy

TAL-8274-580 (0210)

Login Sample Receipt Checklist

Client: Pacific Environmental and Redevelopment

Job Number: 580-41446-1

Login Number: 41446

List Source: TestAmerica Seattle

List Number: 1

Creator: McDaniel, Ronald T

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	Not present
Sample custody seals, if present, are intact.	N/A	Not present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Attachment C-2: MT2 Soil Stabilization Treatability Study Report

This page has been left blank intentionally to allow for double-sided printing.

TREATABILITY REPORT

Prepared for

Superlon Site, WA

Prepared by

MT2, LLC
14045 W 66th Ave
Arvada, CO 80004
888-435-6645 www.mt2.com

October 2014

This page has been left blank intentionally to allow for double-sided printing.

Table of Contents

1.0 OBJECTIVE

The objective of this report is to present the findings of a laboratory treatability study conducted on the Superlon Tacoma, WA. site samples by MT2. This report is designed to establish the SPLP leachable lead (Pb) and arsenic (As) concentration from the samples, and to develop a chemical formulation to pass the SPLP criteria for Pb and As, that ensures project criteria are met.

2.0 SAMPLE DESCRIPTION AND CHARACTERIZATION

Seven samples were collected by the client and delivered to MT2 Sample Receiving. Samples from each were selected for the treatability study and are presented in Table 1.

Table 1 Sample Description and Characterization

MT2 Sample #	Client I.D. #	Description
SLTS-7	SO-SLTS-7-112613-0-1	Moist fine sand with some rocks and pebbles
SLTS-17	SO-SLTS-17-110613-10-12	Moist fine sand with some rocks and pebbles
SLTS-28	SO-SLTS-28-110713-2-4	Moist fine sand with some rocks and pebbles
SLTS-42	SO-SLTS-42-110713-1-2	Moist fine sand with some rocks and pebbles
SLTS-43	SO-SLTS-43-110613-1-2	Moist fine sand with some rocks and pebbles
SLTS-49	SO-SLTS-49-110713-6-8	Moist fine sand with some rocks and pebbles
SLTS-51	SO-SLTS-51-110713-10-12	Moist fine sand with some rocks and pebbles

Samples were tested for Pb and As by using EPA's SW-846 Method No. 1312 "Synthetic Precipitation Leaching Procedure" (SPLP). The SPLP were processed and run in the ESC lab and then filtered according to the procedures.

Table 2 Pre-Treatment SPLP Results for Pb & As

MT2 Test #	Client I.D. #	Total Pb	Total As	Natural pH	SPLP Pb mg/L	SPLP As mg/L
SLTS-7	SO-SLTS-7-112613-0-1	66	88	9.8	0.65	<0.005
*SLTS-17	SO-SLTS-17-110613-10-12	350	170	7.9	0.40	<0.020
SLTS-28	SO-SLTS-28-110713-2-4	1350	90	8.5	0.033	0.044
*SLTS-42	SO-SLTS-42-110713-1-2	510	290	8.3	0.12	0.14
SLTS-43	SO-SLTS-43-110613-1-2	610	420	9.1	0.42	0.37
*SLTS-51	SO-SLTS-51-110713-10-12	18	61	12	0.0056	0.28

[1/] Analysis of the samples presented in this table were conducted at MT2 in-house laboratory and at NELAC Certified Laboratory ESC. * Samples SLTS-49 & SLTS-17 were used to continue optimization when SLTS-42 was consumed. SLTS-51 was consumed during Pre-treatment testing and therefore not subjected to further testing.

3.0 TREATMENT STUDIES

Treatment formulas were created based on the XRF readings and processed using the guidelines set forth in SW-846 Method 1312.

Various ECOBOND® formulas were applied and mixed with the samples. Some water was added to the samples (~5 weight %). After weighing measurements and complete mixing with the treatment material, the samples and treatment material were allowed to cure and stabilize. Sub-samples were taken and extracted for Pb and As implementing EPA's SW-846 Method No. 1312 SPLP. The results of the ECOBOND® treatment tests are presented in Table 3.

Table 3 ECOBOND® SPLP Treatment Data [1]

MT2 Test #	Client I.D. #	ECOBOND® Reagent	Treatment (wt %)	SPLP Pb (mg/L)	SPLP As (mg/L)
Initial Treatment					
SLTS-7	SO-SLTS-7-112613-0-1	B	4.0	0.005	<0.02
SLTS-17-A	SO-SLTS-17-110613-10-12	A	4.0	0.03	0.66
SLTS-43-A	SO-SLTS-43-110613-1-2	A	1.0	0.096	2.9
SLTS-49-A	SO-SLTS-49-110713-6-8	A/C	1.0/1.0	19	3.7
Refinement					
SLTS-17-B	SO-SLTS-17-110613-10-12	C	4.0	<0.005	1.1
SLTS-17-C	SO-SLTS-17-110613-10-12	B	4.0	0.087	0.097
SLTS-17-D	SO-SLTS-17-110613-10-12	A/B	1.0/3.0	0.15	0.034
SLTS-17-E	SO-SLTS-17-110613-10-12	A/B	2.0/2.0	0.12	0.046
SLTS-17-F	SO-SLTS-17-110613-10-12	A/B	1.0/4.0	0.0068	0.29
SLTS-43-B	SO-SLTS-43-110613-1-2	C	3.0	2.5	2.8
SLTS-49-B	SO-SLTS-49-110713-6-8	A/C	1.0/1.0	27	3.1
SLTS-49-C	SO-SLTS-49-110713-6-8	A	4.0	0.008	0.68

1/ Analysis of the samples presented in this table were conducted at MT2 in-house laboratory and at NELAC Certified Laboratory ESC.

4.0 CONCLUSIONS

MT2 treated samples with a combination of ECOBOND® Pb and ECOBOND® As. Several alternatives to standard ECOBOND® treatments were tried, but were not as effective as standard ECOBOND® treatments.

5.0 RECOMMENDATIONS

Based on successful As and Pb treatment of soils from Operating Units (OU's) at the DuPont Superlon site, MT2 recommends a 4% by weight combination of ECOBOND® Pb and ECOBOND® As as well as lime for pH adjustment as needed to treat soils from specific OU's. MT2 will therefore guarantee treatment of site soils with similar concentrations of As and Pb for this project.

For optimal treatment and expedited closure to SPLP criteria for full-scale treatment, MT2 further recommends that specific treatability studies be conducted for each OU to be treated. MT2 will complete OU specific treatability studies to ensure cost effective and timely treatment of each OU with lab analysis to confirm total As and Pb levels and corresponding SPLP leachate results.

Attachment C-3: ESC Post-Treatment Soil Stabilization Analytical Reports

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

Report Summary

Saturday March 15, 2014

Report Number: L686387
Samples Received: 03/06/14
Client Project:

Description: DuPont

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197,
FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016,
NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002,
SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612,
MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1,
TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

ESC Sample # : L686387-01

Date Received : March 06, 2014
Description : DuPont

Site ID :

Sample ID : SO-SLTS-7-112613-1-2

Project # :

Collected By : Michael Enos
Collection Date : 11/26/13 09:40

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	03/09/14	1
pH Final	9.58			1312	03/09/14	1
Arsenic	0.65	0.020	mg/l	6010B	03/15/14	1
Lead	BDL	0.0050	mg/l	6010B	03/15/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

Date Received : March 06, 2014
Description : DuPont

Sample ID : SO-SLTS-51-110713-10-10

Collected By : Michael Enos
Collection Date : 11/07/13 11:50

ESC Sample # : L686387-02

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	03/09/14	1
pH Final	11.44			1312	03/09/14	1
Arsenic	0.28	0.020	mg/l	6010B	03/15/14	1
Lead	0.0056	0.0050	mg/l	6010B	03/15/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

ESC Sample # : L686387-03

Date Received : March 06, 2014
Description : DuPont

Site ID :

Sample ID : SO-SLTS-51-110713-10-10

Project # :

Collected By : Michael Enos
Collection Date : 11/07/13 11:50

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic	0.28	0.020	mg/l	6010B	03/15/14	1
Lead	BDL	0.0050	mg/l	6010B	03/15/14	1
Water Extraction	-			1312	03/09/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

ESC Sample # : L686387-04

Site ID :

Project # :

Date Received : March 06, 2014
Description : DuPont

Sample ID : SO-SLTS-28-110713-2-4

Collected By : Michael Enos
Collection Date : 11/07/13 09:45

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	03/09/14	1
pH Final	9.23			1312	03/09/14	1
Arsenic	0.044	0.020	mg/l	6010B	03/15/14	1
Lead	0.033	0.0050	mg/l	6010B	03/15/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

Date Received : March 06, 2014
Description : DuPont

Sample ID : SO-SLTS-43-110613-1-2

Collected By : Michael Enos
Collection Date : 11/06/13 11:05

ESC Sample # : L686387-05

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	03/09/14	1
pH Final	9.63			1312	03/09/14	1
Arsenic	0.37	0.020	mg/l	6010B	03/15/14	1
Lead	0.42	0.0050	mg/l	6010B	03/15/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

Date Received : March 06, 2014
Description : DuPont

Sample ID : SO-SLTS-43-110613-1-2

Collected By : Michael Enos
Collection Date : 11/06/13 11:05

ESC Sample # : L686387-06

Site ID :

Project # :

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic	0.35	0.020	mg/l	6010B	03/15/14	1
Lead	0.38	0.0050	mg/l	6010B	03/15/14	1
Water Extraction	-			1312	03/09/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

March 15, 2014

ESC Sample # : L686387-07

Date Received : March 06, 2014
Description : DuPont

Site ID :

Sample ID : SO-SLTS-42-110713-1-2

Project # :

Collected By : Michael Enos
Collection Date : 11/07/13 12:50

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	03/09/14	1
pH Final	9.04			1312	03/09/14	1
Arsenic	0.14	0.020	mg/l	6010B	03/15/14	1
Lead	0.12	0.0050	mg/l	6010B	03/15/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 03/15/14 15:10 Printed: 03/15/14 15:10

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L686387-06	WG710289	SAMP	Arsenic	R2893740	O1
	WG710289	SAMP	Lead	R2893740	O1

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
O1	(ESC) The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
03/15/14 at 15:10:50

TSR Signing Reports: 134
R5 - Desired TAT

Sample: L686387-01 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-02 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-03 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-04 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-05 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-06 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.
Sample: L686387-07 Account: MT2WRCO Received: 03/06/14 09:30 Due Date: 03/13/14 00:00 RPT Date: 03/15/14 15:10
Rotate for PBICP and ASICP.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

YOUR LAB OF CHOICE

MT2
Michael Enos
14045 W. 66th Ave.

Arvada, CO 80004

Quality Assurance Report
Level II

L686387

March 15, 2014

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Arsenic	< .02	mg/l			WG710287	03/15/14 03:17
Lead	< .005	mg/l			WG710287	03/15/14 03:17
Arsenic	< .02	mg/l			WG710289	03/15/14 13:55
Lead	< .005	mg/l			WG710289	03/15/14 13:55

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Arsenic	mg/l	0.660	0.650	2.00	20	L686387-01	WG710287
Lead	mg/l	0.00520	0.00487	6.00	20	L686387-01	WG710287
Arsenic	mg/l	0.350	0.349	0.0	20	L686387-06	WG710289
Lead	mg/l	0.380	0.382	2.00	20	L686387-06	WG710289

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Arsenic	mg/l	1	1.01	101.	85-115	WG710287
Lead	mg/l	1	1.05	105.	85-115	WG710287
Arsenic	mg/l	1	0.974	97.0	85-115	WG710289
Lead	mg/l	1	1.00	100.	85-115	WG710289

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Arsenic	mg/l	1.68	0.650	1	100.	75-125	L686387-01	WG710287
Lead	mg/l	1.04	0.00487	1	100.	75-125	L686387-01	WG710287
Arsenic	mg/l	1.32	0.349	1	97.0	75-125	L686387-06	WG710289
Lead	mg/l	1.36	0.382	1	98.0	75-125	L686387-06	WG710289

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Arsenic	mg/l	1.68	1.68	103.	75-125	0.0	20	L686387-01	WG710287
Lead	mg/l	1.04	1.04	104.	75-125	1.00	20	L686387-01	WG710287
Arsenic	mg/l	1.32	1.32	97.2	75-125	0.0	20	L686387-06	WG710289
Lead	mg/l	1.36	1.36	98.0	75-125	0.0	20	L686387-06	WG710289

Post Spike

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

MT2
Michael Enos
14045 W. 66th Ave.

Arvada, CO 80004

Quality Assurance Report
Level II

L686387

March 15, 2014

Serial Dilution

Batch number /Run number / Sample number cross reference

WG709891: R2891967: L686387-01 02 04 05 07
WG709897: R2891969: L686387-03 06
WG710287: R2893678: L686387-01 02 04 05 07
WG710289: R2893740: L686387-03 06

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

MT2
Michael Enos
14045 W. 66th Ave.

Arvada, CO 80004

Quality Assurance Report
Level II

March 15, 2014

L686387

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

Report Summary

Wednesday May 21, 2014

Report Number: L699370
Samples Received: 05/16/14
Client Project: TACOMA-BASELINE

Description: DuPont Tacoma

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364, EPA - TN002

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-01

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-49

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 12:00

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	8.37			1312	05/17/14	1
Arsenic	0.037	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.065	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:27

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-02

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-28

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 12:10

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	9.39			1312	05/17/14	1
Arsenic	0.050	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.036	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:27

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-03

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-36

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 12:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	8.95			1312	05/17/14	1
Arsenic	BDL	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.14	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:27

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-04

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-6

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 12:30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	4.08			1312	05/17/14	1
Arsenic	BDL	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.062	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:27

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-05

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-35

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 12:40

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	12.45			1312	05/17/14	1
Arsenic	BDL	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	BDL	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:27

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

Date Received : May 16, 2014
Description : DuPont Tacoma

Sample ID : SLTS-26

Collected By : Michael Enos
Collection Date : 05/15/14 12:50

ESC Sample # : L699370-06

Site ID : TACOMA

Project # : TACOMA-BASELINE

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	10.23			1312	05/17/14	1
Arsenic	0.23	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.0085	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:28

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

Date Received : May 16, 2014
Description : DuPont Tacoma

Sample ID : SLTS-8

Collected By : Michael Enos
Collection Date : 05/15/14 13:00

ESC Sample # : L699370-07

Site ID : TACOMA

Project # : TACOMA-BASELINE

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	6.58			1312	05/17/14	1
Arsenic	0.025	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	BDL	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:28

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-08

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-51

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 13:10

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	11.65			1312	05/17/14	1
Arsenic	0.36	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.025	mg/l	6010B	05/20/14	5
Lead	0.014	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:28

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Michael Enos
MT2
14045 W. 66th Ave.
Arvada, CO 80004

May 21, 2014

ESC Sample # : L699370-09

Date Received : May 16, 2014
Description : DuPont Tacoma

Site ID : TACOMA

Sample ID : SLTS-17

Project # : TACOMA-BASELINE

Collected By : Michael Enos
Collection Date : 05/15/14 13:20

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
SPLP Extraction	-			1312	05/17/14	1
pH Initial	-			1312	05/17/14	1
pH Final	3.57			1312	05/17/14	1
Arsenic	BDL	0.020	mg/l	6010B	05/20/14	1
Cadmium	BDL	0.0050	mg/l	6010B	05/20/14	1
Lead	0.40	0.0050	mg/l	6010B	05/20/14	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 05/21/14 10:27 Printed: 05/21/14 10:28

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L699370-01	WG721452	SAMP	SPLP Extraction	R2923885	W2
L699370-02	WG721452	SAMP	SPLP Extraction	R2923885	W2
L699370-03	WG721452	SAMP	SPLP Extraction	R2923885	W2
L699370-08	WG721852	SAMP	Cadmium	R2925170	O
	WG721452	SAMP	SPLP Extraction	R2923885	W2
L699370-09	WG721452	SAMP	SPLP Extraction	R2923885	W2

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.
W2	(ESC) - Insufficient sample amount to perform method as required. Sample amount approved per client instruction.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC.
Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
05/21/14 at 10:28:01

TSR Signing Reports: 134
R4 - Rush: Three Day

Comment for TCLP/SPLP/WEXT/STLC - "Record both initial and final pH"

Sample: L699370-01 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-02 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-03 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-04 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-05 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-06 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-07 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-08 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP
Sample: L699370-09 Account: MT2WRCO Received: 05/16/14 10:00 Due Date: 05/21/14 00:00 RPT Date: 05/21/14 10:27
Record Inital and Final weight. Rotate for ASICP, PBICP, CDICP

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

ESC LAB SCIENCES
YOUR LAB OF CHOICE

MT2
Michael Enos
14045 W. 66th Ave.

Arvada, CO 80004

Quality Assurance Report
Level II

L699370

May 21, 2014

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Arsenic	< .02	mg/l			WG721852	05/20/14 20:40
Cadmium	< .005	mg/l			WG721852	05/20/14 20:40
Lead	< .005	mg/l			WG721852	05/20/14 20:40

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Arsenic	mg/l	1	1.07	107.	80-120	WG721852
Cadmium	mg/l	1	1.09	109.	80-120	WG721852
Lead	mg/l	1	1.10	110.	80-120	WG721852

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Arsenic	mg/l	1.04	1.07	104.	80-120	3.00	20	WG721852
Cadmium	mg/l	1.07	1.09	107.	80-120	1.00	20	WG721852
Lead	mg/l	1.07	1.10	107.	80-120	3.00	20	WG721852

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Arsenic	mg/l	1.09	0.0367	1	100.	75-125	L699370-01	WG721852
Cadmium	mg/l	1.08	0.00164	1	110.	75-125	L699370-01	WG721852
Lead	mg/l	1.13	0.0654	1	110.	75-125	L699370-01	WG721852

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Arsenic	mg/l	1.09	1.09	106.	75-125	1.00	20	L699370-01	WG721852
Cadmium	mg/l	1.05	1.08	105.	75-125	3.00	20	L699370-01	WG721852
Lead	mg/l	1.12	1.13	106.	75-125	0.0	20	L699370-01	WG721852

Post Spike

Serial Dilution

Batch number /Run number / Sample number cross reference

WG721452: R2923885: L699370-01 02 03 04 05 06 07 08 09
WG721852: R2925170: L699370-01 02 03 04 05 06 07 08 09

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

MT2
Michael Enos
14045 W. 66th Ave.

Arvada, CO 80004

Quality Assurance Report
Level II

May 21, 2014

L699370

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

This page has been left blank intentionally to allow for double-sided printing.

Appendix D: Perched Water Treatability Study

10/10/2014

This page has been left blank intentionally to allow for double-sided printing.

Contents

Tables

Attachments

This page has been left blank intentionally to allow for double-sided printing.

PERCHED WATER TREATABILITY STUDIES

D-1.1. Introduction

This appendix describes treatability studies that were conducted to further evaluate the technical and economic feasibility of applying selected technologies to Property perched water[1] impacted by metals. Section D-1.2 describes the objectives of the treatability studies. Section D-1.3 describes the Water Tectonics perched water treatability study and Section D-1.4 describes the Water & Waste Water Laboratory (WWL) perched water treatability study. Section D-1.5 provides the conclusion and recommendation of the studies.

D-1.2. Treatability Study Objectives

The goal of the perched water treatability study was to determine if commercial water treatment was available to treat perched water to a level equal to or below the perched water REL. The bench scale perched water treatability studies were conducted by Water Tectonics of Everett, Washington and Water and Waste Water Laboratories of Cleveland, Ohio. The focus of these studies was to:

- Confirm the suitability of the selected technologies for Property-specific perched water;
- Identify potential problems associated with the selected technologies for application at the Property; and,
- Identify additional treatability work that may need to be conducted prior to Remedial Design.

D-1.3. Water Tectonics Perched Water Treatability Study

A 5-gallon sample of perched water was obtained from the footprint of former Building B and was delivered to Water Tectonics who conducted the bench scale treatability study described in Attachment D-1: Water Tectonics PERC-SLON Project Treatment Summary. The perched water sample was thoroughly mixed to ensure homogeneity before an aliquot was taken for treatment. The sample was treated using a laboratory-scale electrocoagulation (EC) cell.

Electrocoagulation is the process of destabilizing suspended, emulsified, or dissolved contaminants in an aqueous medium by introducing an electrical current into the medium. The electrical current provides the electromotive force to drive the chemical reactions. When reactions are driven or forced, the elements or compound will approach the most stable state. Generally, this stable state is a solid that is either, less colloidal, less emulsifiable, or less soluble than the element or compound at equilibrium values. As this occurs, the contaminants form hydrophobic entities such as precipitates or phase separations, which can easily be removed by a number of secondary separation techniques.

[1]In the FS-OSP, perched water is the term used to represent surface water. Therefore, surface water in the treatability studies refers to the perched water.

A pre-treatment perched water sample was analyzed for total and dissolved arsenic, cadmium, and lead by EPA Method 200.8. Following EC, the water was mixed to help the flocculant maturate. After settling, the supernatant was filtered through an 8-µm paper filter, simulating granular media filtration. The post-treatment water was also analyzed by EPA Method 200.8, and analyzed for total and dissolved arsenic, cadmium, and lead. Table D-1-Water Tectonics Analytical Test Results for Superlon Perched Water presents the pre-treatment and post-treatment results and in all cases, the analytical results confirmed that post-treatment water would meet the project performance goals.

D-1.4. Water & Waste Water Laboratories Perched Water Treatability Study

An additional 5-gallon sample of perched water was obtained from the footprint of former Building B for the WWL perched water treatability study. This water was delivered to WWL who conducted the bench scale treatability study. WWL used SMI® which is a patented, iron-based granular media that has been commercially developed for the removal of contaminants from water. When water that contains metals is passed through the disposable SMI media, the heavy metals present bind with the sulphate, replacing the iron in the ferric sulphate. Sodium hypochlorite is then added, which binds with the iron and precipitates.

WWL adjusted the pH of the water samples to approximately 6.5 with $H_2SO_{4,}$ followed by running several bed volumes[2]through the sulphur modified iron (SMI@) media at a rate of about 2 gallons per minute per square foot (gpm/ft^2) for approximately 6 minutes of empty bed contact time. This was done to determine if the SMI@ process would be feasible in reducing metal concentrations in perched water.

No report was issued for this work, but pre-treatment and post-treatment laboratory reports were issued and are included in Attachment D-2, and the results are summarized in Table D-2. This method showed potential effectiveness for reducing metal concentrations, but additional phases of research were not pursued as part of the pre-FS testing.

D-1.5. Conclusion

This Water Tectonics perched water treatability study demonstrated that electrocoagulation is an effective means for reducing arsenic, cadmium, and lead concentrations to achieve the performance goals. Similarly, the WWL perched water treatability study showed potential effectiveness for reducing metal concentrations.

D-1.6. References for Appendix D

Water Tectonics Corporation. 2014. PERC/SLON Project Treatment Summary.

Attachment D-1: Water Tectonics PERC-SLON Project Treatment Summary

This page has been left blank intentionally to allow for double-sided printing.

6300 MERRILL CREEK PKWY, SUITE C-100
EVERETT, WA 98203
OFFICE (425) 349-4200 FAX (425) 349-4890

PERC – SLON Project

Treatment Summary

June 25, 2014

This page has been left blank intentionally to allow for double-sided printing.

Introduction

WaterTectonics conducted a surface water treatability study for Pacific Environmental and Redevelopment Corporation (PERC). This treatability study tested the efficacy of WaveIonics Electrocoagulation (EC) to remove arsenic, cadmium and lead from the water sample obtained from the Superlon Plastics Site. The goal of this treatability study was to treat the water to meet the goals established by the Project's Management Team.

Method

A five gallon bucket of the sample was thoroughly mixed to ensure homogeneity before an aliquot was taken for treatment. The sample was treated using a laboratory-scale EC cell. Following EC, the sample was mixed to help the floc maturate. After settling, the supernate was filtered through an 8 µm paper filter simulating granular media filtration.

Samples were tested for the parameters listed in Appendix A.

Results

The settled raw influent had a layer of brown settled solids at the bottom of the bucket with a clear supernatant. After mixing, the influent was cloudy due to the brown colored suspended solids. Following EC yellow colored floc formed and settled. After filtration, the final treated sample was clear and colorless (Figure 1). Treatment goals for arsenic and lead were met following treatment (Table 2). Cadmium was non-detect (< 0.001 mg/L) in the influent and all effluent samples.

Table 1 WaterTectonics analytical test results for PERC - SLON.

Parameter	Unit	Influent	EC Effluent
pH	standard units	7.56	8.07
Conductivity	µS/cm	535	402
Turbidity	NTU	134	0.45
Dissolved Oxygen	mg/L	7.58 (20.8°C, 85.4%)	7.71 (20.9°C, 87.5%)

Table 2 Third party laboratory analytical test results for PERC - SLON.

Parameter	Unit	Influent	EC Effluent
Arsenic	mg/L	3.6	0.021
Arsenic, Dissolved	mg/L	3.1	NS
Cadmium	mg/L	ND < 0.001	ND < 0.001

Parameter	Unit	Influent	EC Effluent
Cadmium, Dissolved	mg/L	ND < 0.001	NS
Lead	mg/L	1.4	ND < 0.001
Lead, Dissolved	mg/L	0.0015	NS

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
NS = Compound was not sampled for this parameter.

Figure 1 PERC - SLON; Influent (left), EC Effluent (center), Filtered EC Effluent (right).

Conclusion

WaveIonics Electrocoagulation was effective in treating the sample from the Superlon Plastics Site to meet treatment goals for arsenic, cadmium and lead.

Appendix A – Analytical Test Methods and Detection Limits

Table A Water Tectonics analytical test methods and detection limits.

Parameter	Unit	Method	Detection Limit
pH	standard units	Hach HQ40d meter	N/A
Conductivity	µS/cm	Hach HQ40d meter	N/A
Turbidity	NTU	Hach 2100P meter	0.01
Dissolved Oxygen	mg/L	Hach HQ40d meter	0.1

Table B Third party laboratory test methods and detection limits.

Parameter	Unit	Method	Detection Limit
Arsenic	mg/L	EPA 200.8	2.0
Arsenic, Dissolved	mg/L	EPA 200.8	2.0
Cadmium	mg/L	EPA 200.8	1.0
Cadmium, Dissolved	mg/L	EPA 200.8	1.0
Lead	mg/L	EPA 200.8	1.0
Lead, Dissolved	mg/L	EPA 200.8	1.0

6300 MERRILL CREEK PKWY SUITE C-100, EVERETT, WA 98203 | OFFICE (425) 349-4200 FAX (425) 349-4890| www.watertectonics.com

Table D-1: Water Tectonics Analytical Test Results for SuperIon Perched Water

Parameter	Unit	Influent (Pre-Treatment)	EC Effluent (Post-Treatment)
pH	standard units	7.56	8.07
Conductivity	uS/cm	535	402
Turbidity	NTC	134	0.45
Dissolved Oxygen	mg/L	7.58 (20.8"C,85.4%)	7.77 (20.9"C,87.5%)
Constituent			
Arsenic	mg/L	3.6	0.021
Arsenic, Dissolved	mg/L	3.1	--
Cadmium	mg/L	ND< 0.001	ND< 0.001
Cadmium, Dissolved	mg/L	ND< 0.001	ND< 0.001
Lead	mg/L	1.4	ND< 0.001
Lead, Dissolved	mg/L	0.0015	--

Notes:

-- = Compound was not sampled for this parameter

EC= Electrocoagulation

mg/L = milligrams per liter

ND = Not detected above the laboratory reporting

Attachment D-2: Water & Waste Water Laboratories Analytical Test Results for Superlon Perched Water

WATER & WASTEWATER LABORATORIES, INC.

Client: Water & Wastewater Equip.
Address: 32100 Solon Road
Solon, OH 44139
Attention: John Titus

Report Date: May 29, 2014
P.O. #: verbal

Column #	Sample Description	Sample Date	Recd. Date	Sample #
#1	Super Lon		5/15/14	**14-2043**
#2				
#3				

Parameter	#1	#2	Limit	Units	Method	Analyst	Date Analy
Total Metals				-	200.2	NA	5/19/2014
Cadmium	<0.005			mg/L	3111B	NA	5/20/2014
Calcium	22.9			mg/L	3111B	NA	5/20/2014
Lead	0.025			mg/L	3111B	NA	5/20/2014
Magnesium	5.0			mg/L	3111B	NA	5/20/2014
Boron	<0.5			mg/L	3111D	NA	5/20/2014
Arsenic	0.38			mg/L	3114B,4d	NA	5/22/2014
Silicon, soluble	6.49			mg/L	3111D	NA	5/19/2014
Alkalinity (as CaCO3)	89.3			mg/L	2320B	PS	5/27/2014
Hardness (as CaCO3)	77.8			mg/L	2340C	PS	5/22/2014
Oxidation Reduction Potential (ORP)	194			mV	2580B	JO	5/16/2014
Sulfate	29.5			mg/L	4110B	RK	5/19/2014
Total Dissolved Solids	132			mg/L	2540C	PS	5/16/2014
pH	7.8			std.	4500-HB	JA	5/15/2014

Unit Desc: mg/L = milligrams per liter (ppm), ug/L = micrograms per liter (ppb), mg/Kg = milligrams per Kilograms (ppm)
Std = Standard pH units, ng/L = nanograms per liter (ppt)
< = less than (not detected, below listed value). > = greater than (higher than listed value)

Analysis Certified By: ______________ Laboratory Manager
John Ondo

2779 Rockefeller Avenue • Cleveland, Ohio 44115 • (216) 696-0280 • FAX (216) 696-6831

WATER & WASTEWATER LABORATORIES, INC.

Comments 2:

Client: Water & Wastewater Equip.
Address: 32100 Solon Road
Solon, OH 44139
Attention: John Titus

Report Date: June 16, 2014
P.O. #: verbal

Column #	Sample Description	Sample Date	Recd. Date	Sample #
#1	Treated Groundwater #1	6/12/2014	6/12/14	**14-2546**
#2	Treated Groundwater #2	6/12/2014	6/12/14	**14-2547**
#3				

Parameter	#1	#2	#3	Units	Method	Analyst	Date Analy
Total Metals				-	200.2	JO/NA	6/13/2014
Iron	270	248		mg/L	3111B	JO	6/13/2014
Lead	<0.01	<0.01		mg/L	3111B	JO	6/13/2014
Arsenic	<0.005	0.090		mg/L	3114B,4d	NA	6/13/2014

Unit Desc: mg/L = milligrams per liter (ppm), ug/L = micrograms per liter (ppb), mg/Kg = milligrams per Kilograms (ppm)
Std = Standard pH units, ng/L = nanograms per liter (ppt)
< = less than (not detected, below listed value), > = greater than (higher than listed value)

Analysis Certified By: J. Ondo Laboratory Manager
John Ondo

2779 Rockefeller Avenue • Cleveland, Ohio 44115 • (216) 696-0280 • FAX (216) 696-6831

Table D-2: Water & Waste Water Laboratories Analytical Test Results for Superlon Perched Water

Parameter	Unit	Influent	Sample #1 Effluent	Sample #2 Effluent
Cadmium	mg/L	<0.005	--	--
Calcium	mg/L	22.9	--	--
Lead	mg/L	0.025	<0.01	<0.01
Magnesium	mg/L	5	--	--
Boron	mg/L	<0.5	--	--
Arsenic	mg/L	0.38	<0.005	0.09
Silicon, soluble	mg/L	6.49	--	--
Alkalinity (as CaCO3)	mg/L	89.3	--	--
Hardness (as CaCO3)	mg/L	77.8	--	--
Oxidation Reduction Potential (ORP)	mV	194	--	--
Sulfate	mg/L	29.5	--	--
Total Dissloved Solids	mg/L	132	--	--
pH	standard units	7.8	--	--

Notes:

ND = Not detected above the laboratory reporting

-- = Compound was not sampled for this parameter

Addendum 1 to the Feasibility Study for On-Property Soils and Perched Water

for the

Superlon Plastics Site Tacoma, Washington

Prepared for:

White Birch Group, LLC
2116 Taylor Way
Tacoma, WA 98401

and

The Chemours Company FC, LLC
6324 Fairview Road, Suite 200
Charlotte, NC 28210

June 2017

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

State of Washington Licensed Geologist 1727
JEFFREY D. KING

Pacific Environmental and Redevelopment Corporation
424 East Meadow Lake Drive
Snohomish, Washington 98290

and

PIONEER Technologies Corporation
5205 Corporate Center Ct. SE, Suite A
Olympia, Washington 98503-5901

Table of Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

Acronym/Abbreviation	**Description**
ARARs	Applicable or Relevant and Appropriate Requirement
Chemours	The Chemours Company FC, LLC
CL	Cleanup Level
COC	Constituent of Concern
CY	Cubic Yards
DCREL	Direct Contact Remediation Level
Ecology	Washington State Department of Ecology
FS-OSP	Feasibility Study for On-Property Soils and Perched Water
MM	Million
MTCA	Model Toxics Control Act
OU	Operable Unit
PERC	Pacific Environmental and Redevelopment Corporation
PIONEER	PIONEER Technologies Corporation
PPE	Personal Protective Equipment
Property	Superlon Plastics Property
PW	Perched Water
PWREL	Perched Water Remediation Level
RAO	Remedial Action Objective
RAU	Remedial Action Unit
REL	Remediation Level
SPWREL	Soil-to-Perched Water Remediation Level
TCLP	Toxicity Characteristic Leaching Procedure
White Birch	White Birch Group LLC
XRF	X-Ray Fluorescence

1. Introduction

The Chemours Company FC, LLC (Chemours) and White Birch Group LLC (White Birch) have been conducting remedial design activities at the Superlon Plastics Property (Property) since the Washington State Department of Ecology (Ecology) selected the preferred remedial alternative for the Property in 2015.[1] The results of remedial design activities indicate that a revised alternative may be more time- and cost-effective for achieving remedial action objectives (RAOs) than the selected preferred alternative.

To demonstrate that the proposed revised alternative will be more time- and cost-effective than the selected alternative, the revised alternative was compared to the preferred alternative initially presented in the Feasibility Study for On-Property Soils and Perched Water (FS-OSP; (Pacific Environmental & Redevelopment Corporation [PERC] and PIONEER Technologies Corporation [PIONEER] 2014).

The purpose of this addendum to the FS-OSPW is to present this comparison and propose the change in the selected alternative for the Property to the revised alternative.

The proposed revised alternative includes the following:

- Treating perched water on the Property;
- Excavating and disposing of soil with constituents of concern (COC) concentrations greater than site-specific direct contact remediation levels (DCRELs) in Operable Units (OUs) 4 and 6 (see Figure 1);
- Excavating and disposing of soil with COC concentrations greater than site-specific soil-to-perched water RELs (SPWRELs) in OUs 1, 2, and 3;
- Constructing a gravel cover on the Property; and
- Applying a Deed Restriction to limit the Property to industrial land use.

1.1 Initial FS-OSP Alternatives

Five alternatives were initially evaluated in the FS-OSP. Two of the alternatives (Alternative 1 and Alternative 2) did not meet the Model Toxics Substances Control (MTCA) four threshold criteria and were eliminated from the evaluation. The three remaining alternatives were evaluated further. Alternative 5 was rejected because it was clearly cost disproportionate, Alternative 3 was selected as the preferred alternative and Alternative 4 was selected as the "alternate" preferred alternative. The contents of Alternative 3 and 4 are summarized in the following table.

[1] Ecology cleanup project manager Marv Coleman communicated the approval of the alternative in a memo to Jeff King of Pacific Environmental & Redevelopment Corporation [PERC] dated January 26, 2015.

Alternative 3	Alternative 4
▪ Install a slurry or grout wall ▪ Treat perched water ▪ Excavate and dispose of soil with COC concentrations greater than DCRELs in OUs 4 and 6 ▪ Excavate and stabilize soil with COC concentrations greater than SPWRELs in OUs 1, 2, and 3 ▪ Install a cover ▪ Apply a Deed Restriction	▪ Install a slurry or grout wall ▪ Treat perched water ▪ Excavate and dispose of soil with COC concentrations greater than DCRELs in OUs 4 and 6 ▪ Excavate and dispose of soil with COC concentrations greater than SPWRELs in OUs 1, 2, and 3 ▪ Install a cover ▪ Apply a Deed Restriction

1.2 Proposed FS-OSP Addendum Alternative

The proposed revised alternative is most similar to initial Alternative 4 from the FS-OSP; therefore, the new alternative was referred to as Alternative 4(Rev).

The two major changes between the selected preferred alternative (Alternative 3) and the revised alternative (Alternative 4(Rev)) are as follows:

- Soils with COC concentrations greater than SPWRELs in OUs 1, 2, and 3 will be excavated and disposed of rather than being stabilized and reused on-site.
- Perched water will be treated in-situ with an additive rather than with the installation of a slurry/grout wall and a pump-and-treat system.

The initial Alternatives 3 and 4 and the Alternative 4 (Rev) are presented in the following table; however, only Alternatives 3 and 4(Rev) were evaluated and presented in this addendum.

Alternative 3	Alternative 4	Alternative 4(Rev)
▪ Install a slurry or grout wall ▪ Treat perched water ▪ Excavate and dispose of soil with constituent concentrations greater than DCRELs in OUs 4 and 6 ▪ Excavate and stabilize soil with COC concentrations greater than SPWRELs in OUs 1, 2, and 3 ▪ Install a cover ▪ Apply a Deed Restriction	▪ Install a slurry or grout wall ▪ Treat perched water ▪ Excavate and dispose of soil with constituent concentrations greater than DCRELs in OUs 4 and 6 ▪ Excavate and dispose of soil in COC concentrations greater than SPWRELs in OUs 1, 2, and 3 ▪ Install a cover ▪ Apply a Deed Restriction	▪ Treat perched water using an additive to treat water in-situ ▪ Excavate and dispose of soil with COC concentrations greater than DCRELs in Operable Units 4 and 6; ▪ Excavate and dispose of soil with COC concentrations greater than SPWRELs in OUs 1, 2, and 3 ▪ Install a gravel cover ▪ Apply a Deed Restriction

1.3 Document Organization

This document is organized as follows:

- Section 1: Introduction
- Section 2: Summary of New Information
- Section 3: Revised Alternative Analysis
- Section 4: Summary of Analysis
- Section 5: Conceptual Design of the New Preferred Remedial Alternative
- Section 6: References

2. Summary of New Information

During the remedial design process, additional investigations were conducted to develop the information necessary to complete the final design process. During these investigations, information was acquired that changed the understanding of the type of remediation processes that would most-effectively reduce COC concentrations to achieve RAOs. The key learnings from these investigations, the remedial design process and the way in which the revised alternative was designed to achieve RAOs are summarized in this section.

2.4 Remedial Design Process Key Learnings

2.4.1. Soil Volume Verification and XRF Demonstration

An investigation was conducted to verify the volume of soil to be excavated during remedial actions and to demonstrate that the X-Ray Fluorescence (XRF) analytical method is appropriate for use at the Property. A total of 184 soil samples were collected at 24 boring locations for this investigation and the results of the investigation were documented in a Soil Volume Verification and XRF Demonstration report (PERC/PIONEER 2017). The information from this investigation was used to determine chemical characteristics and the volume of soil that would need to be treated during remediation.

During the investigation, 810% more characteristically-hazardous soil was identified at the Property than was initially estimated during the FS-OPS&PW. In addition, the cubic yard (CY)-to-ton conversion rate was refined based on the results of the investigation. The changed conversion rate resulted in an increase in the tons of soil that need to be treated at the Property. The initial and updated soil volumes are shown in the table below.

	Cubic Yards			**Tons**			
Estimate	Total Waste	Total Hazardous Waste	Total Non-Hazardous Waste	Total Waste	Total Hazardous Waste	Total Non-Hazardous Waste	**CY-to-Ton Conversion Rate**
Initial FS-OPS&PW Volume	13,704	1,455	12,249	16,445	1,746	14,699	1.20
Updated Volume	12,000	8,567	3,433	19,800	14,136	5,664	1.65

2.4.2. Perched Water Bench-Scale and Field Pilot Studies

A new approach was identified for treating on-Property PW. The initial approach for treating perched water included installing a slurry or grout wall and using an ex-situ groundwater pump-and- treat system. However, SPWRELs will be achieved more efficiently and effectively using the new approach than the initial approach presented in the FS-OSP for the selected preferred alternative (Alternative 3). In the new approach, the additive is distributed throughout the perched zone of the Property. The additive will treat existing perched water and provide treatment capacity for future perched water. In the new approach, the treatment additive is applied directly to the perched water in each excavation; if perched water is not present, the excavation is backfilled with clean soil and treatment additive. Combining the additive with clean soil will evenly distribute the additive and create a highly-effective treatment zone for perched water on the Property now and in the future.

Three vendors were used to evaluate the new approach for treating perched water. Each vendor successfully completed a laboratory bench-scale study by combining their additives (e.g., Free Flow FS-200 + FS blend or Free Flow FS-200 + FS blend) with clean fill and adding it to perched water. The effectiveness of this approach was confirmed during the pilot studies when water from four different areas of the Property was treated by combining three additives with clean backfill. After treatment, the dissolved arsenic and lead concentrations were well below the SPWRELs. The laboratory and field data for the Perched Water Bench-Scale and Field Pilot Studies are presented in Appendix A.

2.4.3. Evaluation of Landfill Disposal Cost and Applicability

A review of regional landfills was conducted to determine if a more cost- and time-effective option was available. A new landfill (the LRI landfill in Puyallup, Washington) was identified as the preferred landfill for non-hazardous waste disposal rather than the Waste Management landfill in Arlington, Oregon causing non-hazardous waste disposal costs and time to complete the disposal process to decrease significantly. This change in landfills impacted the disposal costs and time to meet RAOs evaluation, which had influenced the selection of the preferred alternative. The changes in cost and time are due to the following:

- The significantly-shorter roundtrip distance between the Property and the LRI landfill than the Property and the Waste Management landfill (i.e., 31 miles instead of 522 miles) greatly impacted the Sustainability and Time to meet RAO test in the FS-OSP.
- The 56% reduction in unit rates for the disposal of waste (from $85.11 to $37.73 per ton of waste) greatly impacted the cost criterion in the FS-OSP.

2.4.4. Key Leanings from the Pilot Study

The results of the field pilot studies provided additional information about the time necessary to complete the remediation and meet RAOs. The estimated amount of time needed to complete the remediation has increased due to the size and configuration of the property, the volume of hazardous waste, and the impacts of weather.

The Size and Configuration of the Property

The on-property portion of the Site is approximately 3.1 acres in size. On-going operations of the Superlon Plastic Company require up to 66% of property for the construction of pipe and for storage of Superlon's inventory. This leaves a smaller section of property for the processing and stockpiling of impacted soils than initially anticipated in the FS-OSP. The Pilot study evaluated these limitations and determined:

- The excavation of impacted soils must be done on a small scale. This will be done by starting and completing each excavation area (typically a 37.5 foot by 37.5 foot sections of the property) one-at-a-time.
- The remediation will have to move in a controlled manner from one excavation to the next.
- Time will be required to re-locate Superlon's inventory to areas that will not be impacted by excavation, hauling and stockpiling of impacted soils.
- Time will be required to re-locate the safety exclusion zone as it moves from one excavation area to the next.
- Stockpile size must be limited to approximately 1,000 tons for both Hazardous and Non-hazardous soils. The disposal of soils will be required regularly as the stockpiles fill to capacity.
- Due the limited space on-Property excavation and disposal cannot be conducted concurrently.
- Material stockpile space is limited. As such, delivery and acceptance of materials, especially backfill soils and treatment additive super sacks, must be received on an "as-needed" basis.

The Volume of Hazardous Soil

The volume of characteristically-hazardous soils increased by 810% (section 2.4.1; therefore, the treatment to reduce the leachability of this soil prior to its disposal as non-hazardous waste increased.

The Impacts of Weather

Conducting remediation work between December 15th and March 1st is inefficient due to the increase in perched water in the excavations, an increase in drying time, and a decrease in productivity. As such, there will be no remediation work during that time period.

3. Changes in the Assumptions used in the FS-OSP

The key learnings listed above made it necessary to update the assumptions used to develop Alternative 3 in the FS-OSP prior to the start of the evaluation of the alternatives. Making this updated normalizes the alternatives so that an “apples to apples” comparison can be made. These changes are reflected in the time and cost assumptions through the screening process and on Table 1-1. The following changes were made:

Time

- Ninety-six (96) workdays were added to the schedule to account for the increased disposal frequency.
- One hundred ninety (190) calendar days were added to the schedule to account for the reduced number of work days due to the change to a December 15th to March 1st field season.
- One hundred thirteen (113) workdays were added to the schedule to account for the increase for soil treatment.

Cost

The delay in the start date of remediation and the change in landfill significantly impacted the cost criterion scoring for the selected alternative in the FS-OSP.

The approximately 1.5 year start date delay for remediation tasks (the initial start date was estimated to be March 2016) resulted in significant change to the cost of the selected alternative and the scoring of the cost criterion. The costs presented in the initial cost estimates (see Section 8 of the FS-OSP) have increased due to inflation.

4. Revised Alternative Analysis

Alternatives 3 and 4(Rev) were analyzed using the approach used for the FS-OSP; however, only the ranking criteria impacted by the changes are discussed in text. The scores for criteria not impacted by remedial action investigations will remain as presented in the 2014 Ecology-approved FS-OSP (PERC/PIONEER 2014). The cost estimates for Alternatives 3 and 4(Rev) are presented on Table 1-1.

4.1 MTCA Ranking Criteria

The criteria used to analyze the remedial alternatives included the MTCA balancing criteria, the MTCA disproportionate cost/benefit evaluation criteria (WAC 173-340-360(3)(e)), as well as sustainability of each alternative and safety. The following criteria were used to evaluate Alternatives 3 and 4(Rev):

- Protectiveness;
- Permanence;
- Long-term effectiveness;
- Short-term effectiveness;
- Implementability;
- Consideration of public concerns;
- Sustainability;
- Safety; and
- Cost.

4.1.1. Protectiveness

The protectiveness criterion addresses Ecology's preference for selecting remedial alternatives that are protective. This criterion is focused on the degree of protection each technology provides to human health and the environment, and the time required to reduce risk and obtain cleanup standards. Alternatives 3 and 4(Rev) meet the MTCA protectiveness criterion by addressing soil and perched water constituent concentrations that are above site-specific remediation levels (RELs).[2] As such, both of the retained alternatives will improve environmental quality as compared to the current conditions. The only variability between Alternative 3 and the Alternative 4(Rev) when considering protectiveness is the time required to achieve RAOs.

The timeframe for implementing Alternative 3 and 4(Rev) is influenced by how long it takes to complete the following tasks:

- Excavating;
- Performing verification sampling and analysis;
- Dewatering soil prior to loading; and
- Loading and transporting the contaminated soil to the landfill.

[2] RELs include cleanup levels as well as MTCA remediation levels.

The most limiting factor for completing the tasks is the small work area available at the Property and the slow rate of dewatering that is needed to allow for stabilization and disposal. Soil will need to be excavated, dewatered, and processed in increments no greater than 1,000 tons.[3]

The timeframe required to achieve perched water and soil RAOs is presented below for the two alternatives. The timeframe required for perched water remediation for Alternative 3 is 0.55 years longer than for Alternative 4(Rev). The timeframe for soil is limited by the time it takes to dewater materials for treatment and/or disposal and the time required to treat the soil prior to reuse or disposal.[4]

The main differences between the two alternatives are:

- The difference in time to will take to construct a slurry/grout wall and treat the perched water (estimated at 0.75 years longer than the soil remediation phase) and the process to be used in under Alternative 4(Rev) (estimated at 0.2 years longer than the soil remediation phase).

  The difference in time it will take to excavate and dispose of soil with COC concentrations greater than the SPWREL but less than the DCREL (estimated at 3,532 tons in the FS-OSP under Alternative 4(Rev) and the time required, under Alternative 3, to dry and treat the same soil prior to stabilization and reuse (Alternative 3).

The RAOs could be achieved 147 work days (0.4 years) quicker using Alternative 4A (3.1 years) than Alternative 3 (3.5 years). Alternative 4A would require between 2.6 and 3.6 years to complete, whereas Alternative 3 would require between 2.9 and 4.0 years.

The protectiveness evaluation is presented in the following table.

[3] The disposal assumptions were the same in both alternatives; therefore, disposal assumptions were not considered in this comparison.
[4] The time required to achieve RAOs under ideal conditions without weather related delays or other similar conditions for the actual remediation phase only. These estimates should be used for comparison only with other alternatives using the same criteria; not as a definitive estimation of time.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	A slurry/grout wall will be constructed along the perimeter of the Property and a pump-and-treat system will process the estimated 850,000 gallons of perched water two times. Approximately 0.75 years (assuming the treatment of perched water can performed concurrently with soil remediation) is required for this component of the alternative.	Perched water treatment can be performed concurrently with soil remediation and will only require additional time to mix the additive into the excavation. The estimated total additional time for treatment is 0.2 years.
Soil	In order to evenly mix the additive, the soil must be dried to <30% moisture content, which could take up to 3 months. Soil treatment could be performed concurrently with soil processing result. The drying time would add an additional 7 months to the remediation schedule. The space and drying limitations would apply to both alternatives, but the amount of drying required for stabilization is more than for off-site disposal.	The time required for excavation is offset by the time required for the disposal of waste. The disposal of 3,532 additional tons of waste is required in Alternative 4(Rev), compared to Alternative 3, which, when using the haul rate of 650 tons per day, equals an additional 5.4 haul days. The change in landfills resulted in the ability to have a higher moisture content in soil prior to disposal. In the initial FS-OPS&PW, the moisture content of the soil could not exceed 25%. Disposal at the LRI landfill requires the soil to pass "the paint filter test," which requires the soil be dried for a shorter period of time. In addition, more trips to the landfill can be accomplished because the haul distance is shorter.

4.1.2. Permanence

The permanence evaluation criterion addresses Ecology's preference for selecting remedial alternatives that utilize treatment technologies that permanently and significantly reduce toxicity, mobility, and volume of the constituents in Property soils. This evaluation also focuses on the ability of remedial alternatives to reduce the total volume of impacted soils, and irreversibly reduce mobility and toxicity of the constituents. Both alternatives are protective and will address soil COC concentrations greater than RELs.

Toxicity Reduction

The toxicity reduction evaluation was based on the ability of the alternative to destroy or convert the Property constituents to less toxic forms. Lead and arsenic in Property soils are elemental constituents; thus, the constituents cannot be destroyed, per se. However, lead and arsenic can exist in the environment as organic and inorganic complexes, which can have reduced bioavailability in living systems. In risk terms, a reduction in bioavailability is comparable to a reduction in toxicity (i.e., the dose is proportional to the reduction in the constituent's bioavailability).

Both Alternative 3 and 4(Rev) decrease arsenic and lead concentrations. Alternatives 3 and 4(Rev) decrease perched water dissolved arsenic and lead concentrations to below the RELs. Alternative 4(Rev) would result in much lower arsenic and lead concentrations in soil than Alternative 3, which would minimize the potential to impact future perched water. Neither alternative is intended to reduce the toxicity of lead or arsenic in soil. However, Alternative 4(Rev) will transfer all impacted soil off-site to a controlled landfill, thus reducing the toxicity of lead or arsenic in soil on the Property.

The toxicity reduction evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Arsenic and lead will be removed via a pump-and-treat system and disposed of off-site. However, perched water at the Property is discontinuous and would likely be difficult to treat all perched water on the Property with a pump-and-treat system.	Free Flow FF-200 + FS will be added to the perched water zone throughout the Property. The treatment is based on the sorption of arsenic and lead on ferric hydroxide, which is followed by the iron compound precipitating out of water and binding to particulates in the soil. The increased arsenic concentration in soil resulting from treating the perched water with 37.6 mg/L of arsenic went from 1.8 mg/kg to 9.1 mg/kg (see Free Flow Report in Appendix A). The increase in the lead concentration in soil due to treating perched water went from 2.5 mg/kg to 2.53 mg/kg. These concentrations are much lower than what would occur for Alternative 3 because the backfill soil for Alternative 4(Rev) is clean backfill.
Soil	Soil stabilization and soil re-use will likely result in the decreased bioavailability of lead, and possibly arsenic, in soil (PERC/PIONEER 2014). MT2 Company performed a study with lead-based paint treated with Ecobond® (the same material that was used in the Superlon soil treatability study) using a United State Environmental Protection Agency in-vitro bioaccessibility test, and found that there was a 50% to 75% reduction in relative lead bioavailability. Thus, in at least a qualitative sense, a reduction in lead bioavailability in soils treated with this same reagent can be expected.	All impacted soil will be transferred off-site to a controlled landfill, thus reducing the toxicity of lead or arsenic in soil on the Property.

Mobility Reduction

Mobility reduction is based on the alternative's ability to permanently prevent constituents from being transported in the environment. The potential exposure pathways considered in the FS-OSP were direct contact and impacts to groundwater. Both remedial alternatives involve excavation and disposal of soil with COC concentrations greater than DCRELs, and would permanently reduce the potential for direct contact exposure in the excavation area by removing the source of constituents.

The mobility reduction evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Both alternatives will cause the dissolved COCs to bind with a selected media.	
	The pump-and-treat system will filter the perched water to capture the COCs, which would be disposed of off-site.	COCs will bind to the clean backfill in a non-leachable state during the treatment process, thereby becoming unavailable in perched water. The resulting COC concentrations that bind to the clean backfill would not exceed permissible limits (i.e., 588 mg/kg of arsenic). While a relatively small amount of COCs will be deposited on the clean backfill soil, the mobility of the constituents will be reduced as part of the treatment process, making Alternative 4(Rev) equal to Alternative 3 in reducing mobility, though in a less secure environment.
Soil	Both alternatives include off-Property disposal at a controlled landfill. There, the mobility of the constituents would be controlled long-term by liner and cap containment.	
	A relatively smaller volume of soil is disposed of at an off-Property landfill in Alternative 3 than in Alternative 4(Rev); however, Alternative 3 directly reduces the mobility of the constituents as part of the stabilization process, making it equal to Alternative 4(Rev) in reducing mobility, though in a less secure environment.	The greatest volume of soil is disposed of with Alternative 4(Rev), and would have the greatest reduction in on-Property mobility resulting from off-site disposal.

Total Volume Reduction

Fewer COCs will be removed (total volume reduction) using the Alternative 3 than using Alternative 4(Rev). Additionally, 3,532 tons of impacted soil will be stabilized and reused under Alternative 3, whereas, the COCs will be disposed of off-Site under Alternative 4(Rev).

The total volume reduction evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	The COCs collected as part of the perched water treatment process under Alternative 3 would be collected and disposed of in a secure environment.	A relatively small amount of COCs are deposited on the clean-backfill soil as a result of the perched water treatment.
Soil	On-Property soil with concentrations greater than the DCREL will be excavated and transported to an engineered landfill.	The greatest amount of soil will be removed from the Property and placed in an engineered landfill using Alternative 4(Rev). Approximately 69% of the soil will be disposed of using Alternative 4(Rev), and as a result, on-Property volume reduction would be greatest under this alternative.

4.1.3. Long-term Effectiveness

The long-term effectiveness criterion addresses potential impacts after the cleanup action has been completed. The primary focus of this comparison is to weigh the controls that may be necessary to manage the treatment residuals or untreated soil. This comparison is performed two ways: (1) by assessing the magnitude of the residual risk, and (2) by assessing the adequacy of the individual controls to manage the treatment residuals or untreated soil.

Residual risk or controls that may be associated with the off-Property landfill remedial alternatives are not considered for long-term effectiveness. The evaluation of "certainty of success" was omitted from this evaluation, since the components of the two alternatives will need to result in concentrations less than RAOs before demobilization can occur. The cleanup of the Property will be performed over a period of time during which "success" can be measured with a high degree of certainty for each process.

Magnitude of Residual On-Property Risk

The relative magnitude of residual on-Property risk was evaluated for each alternative. Both remedial alternatives will have low residual risk, since each will leave only acceptable COCs below RELs on-Property; however, the alternatives differ in the levels of residual risk. Excavation of soil with concentrations greater than RELs means that the Property meets the RELs and RELs are based on acceptable levels of risk.

Both of the alternatives are considered permanent solutions. Off-Property landfill facility controls are acceptable based on environmental audits. Furthermore, bench-scale testing successfully bound perched water COCs to the soil. COC concentrations in perched water would be below site-specific RELs using both alternatives.

The magnitude of residual on-Property risk evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Bench-scale tests have shown equivalent reduction of residual arsenic and lead concentrations using Alternatives 3 and 4(Rev). The treatment in Alternative 4(Rev) reduced arsenic concentrations from 36.7 mg/L to 0.013 mg/L; the treatment in Alternative 3 reduced arsenic concentrations from 3.6 mg/L to below the detection limit of 0.001 mg/L.	
Soil	COC soil concentrations greater than SPWRELs will be stabilized to reduce leachability to below the SPWREL, thereby eliminating the soil-to-perched water pathway. Placement of a cover would reduce the potential for human and ecological exposure to the stabilized soils.	COC soil concentrations greater than the SPWRELs will be excavated and disposed of off-Property, thereby eliminating the soil-to-perched water pathway. Soil with COC concentrations greater than the RELs will be transported off-Property (i.e., no stabilized soil will be left on-Property). As a result, Alternative 4(Rev) represents the lowest risk for on-Property exposure.

Adequacy and Reliability of Controls

The adequacy and reliability of controls and how they relate to future land uses at the Property were evaluated for each alternative. Currently, the Property is zoned for industrial use, and that designation is unlikely to change in the future; therefore, site-specific RELs were calculated based on industrial land use. Non-potable groundwater standards were also used to develop RELs for both soil and perched water.

Both alternatives were developed assuming the future land use of the Property will remain industrial. Since the Property is currently zoned as industrial, and since a deed restriction specifying ongoing commercial/industrial land use will be a component of these remedies, the future land use controls are adequate.

Construction-grade clean soil will be used to backfill the excavations. Under Alternative 3, stabilized existing soils will remain on the Property, though this material will not have the same properties as the clean backfill and may not be as structurally sound. Under Alternative 4(Rev), no stabilized existing soils would remain on the Property and a greater volume of construction-grade backfill will be used for future development.

4.1.4. Short-term Effectiveness

The short-term effectiveness evaluation criterion addresses the effects of the alternatives during the construction and implementation phases of the cleanup action. Each alternative is evaluated with respect to the potential impact on human health in the surrounding community, Property workers, and the environment.

Potential Community Exposure during Implementation

This aspect of short-term effectiveness addresses any exposures that may result from implementation of the proposed alternative, such as dust generation during materials handling and transportation, or air emissions resulting from equipment operation. Dust generation may require monitoring so that the level of dust generated during soil handling does not exceed allowable levels in downwind areas. Dust control methods (e.g. applying water to work areas prior to and during excavation) could be required. The air quality impacts may be monitored to protect both the Property and the surrounding Property workers' health and safety. Soil excavation and handling along the southern Property boundary will require perimeter dust monitoring and dust prevention measures.

The high moisture content of the excavated soil and fill is one of the most significant factors mitigating significant dust generation. While transporting (by truck or rail) soil off-Property has a low potential for exposure, such exposures due to releases of soil or wastes during transport have been known to occur. As a result, the quantity of material being transported to an off-Property landfill was the basis for this evaluation.

The potential community exposure during implementation evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Both alternatives have the same potential for community exposure from the perched water treatment process.	
Soil	Alternative 3 will have the least potential for community exposure during implementation. This alternative requires the smallest volume of soil transport, since soils/wastes from OUs 1, 2, and 3 are intended to be stabilized and reused on-Property. Though it will require excavation of soils for stabilization and/or disposal, it is unlikely (due to high moisture content) that this activity will increase community exposure during implementation.	Alternative 4(Rev) will have the most potential for community exposure during implementation due to the higher volume of soil disposal and will require greater controls to minimize the risk associated with off-Property dust generation. Truck traffic will also be greater in Alternative 4(Rev) than Alternative 3 due to the additional 3,532 tons of soil being shipped off-Property, and a relatively larger volume of backfill being brought on-Property.

Potential Worker Exposure during Implementation

The potential worker exposure during implementation was evaluated based on the effectiveness and reliability of protective measures. Personal protective equipment (PPE) appropriate for the type of potential worker exposure will be worn during cleanup activities. Workers will receive health and safety training appropriate for their respective tasks, and receive equipment (e.g., trucks and backhoes) operation training. Workers will also be required to comply with the appropriate safety regulations.

Both remedial alternatives will generate dust and/or require transportation to a landfill during implementation. Dust generation will be managed by wetting the soil during handling, paving the centralized treatment area, and/or covering stockpiles when not adding or removing material. Transportation of soil to the landfill will be managed by conforming to applicable Department of Transportation regulations. Alternative 3 also involves excavation during installation of the slurry/grout wall, which could potentially increase safety risks to workers on the Property.

The relative magnitude of each alternative to reduce the risks associated with worker exposure during implementation is presented in the following table. The total volume of material handled, the use of water or extraction solutions, and the additional excavation and construction of the slurry/grout wall in Alternative 3 are the primary criteria for this evaluation.

The potential worker exposure during implementation evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	The likelihood of contacting perched water is greater under Alternative 3 because the perched water will be extracted from the subsurface and treated aboveground.	The likelihood of contacting perched water is less under Alternative 4(Rev) because all perched water will be treated in-situ.
Soil	Since the stabilization process under Alternative 3 will be performed ex-situ, the amount of excavation will be identical to the excavation in Alternative 4(Rev).	
	The physical handling of soil will be greater under Alternative 3, since the time required to stabilize the soil greater than the SPWREL but, less than the DCREL will be greater than the time required to load and dispose of the same soil under Alternative 4(Rev). Furthermore, the additional stabilization step in Alternative 3 could generate local dust if the soil is dry, which could increase the potential for worker exposure during implementation.	

Potential Environmental Impacts

The potential environmental impacts that may result from the implementation of one of the alternatives, and the mitigation measures that could be implemented to prevent or reduce these impacts, were evaluated. Potential environmental impacts include but are not limited to: dispersion of constituents, treatment water releases, spills, and wildlife exposure. All remedial alternatives have the same impacts during the initial soil excavation. Remedial alternatives that include stabilization have the potential for additional impacts.

The potential environmental impacts evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Environmental impacts associated with perched water will be greater under Alternative 3 than Alternative 4(Rev) because the perched water will be extracted from the subsurface and treated aboveground.	Environmental impacts associated with perched water will be less under Alternative 4(Rev) than Alternative 3 because all perched water will be treated in-situ.
Soil	The potential for environmental impacts associated with soil is low for Alternative 3. A slight increase in impacts is possible during the construction of the slurry/grout wall under Alternative 3.	The potential for environmental impacts associated with soil is low for Alternative 4(Rev). If a spill occurs during truck loading or at the stabilization plant, the soil will be promptly excavated and treated. The underlying soil will be sampled to ensure the completeness of any additional cleanup.

4.1.5. Implementability

The implementability criterion addresses the technical feasibility of implementing the alternative, as well as the availability of materials and services. This evaluation focuses on the:

- Ability and reliability of the technology to operate as required by the design and implementation schedule;
- Ease of undertaking additional cleanup actions; and,
- Availability of services and materials.

Additional criteria (e.g., availability of equipment, availability of commercially-demonstrated technologies, administrative and regulatory requirements, scheduling, availability of appropriately-sized equipment, construction access, and monitoring access) are considered to have minor impacts on the Alternative 3 and 4(Rev).

Ability and Reliability of Technology

The ability and reliability of technology was evaluated to compare the technical difficulties and unknowns associated with the alternatives. Technical problems associated with the implementation of the alternatives may prevent attainment of the RELs, or result in delays in the cleanup schedule.

The ability and reliability of technology evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	The potential for technical difficulties is greater for Alternative 3 than Alternative 4(Rev) because of the pump-and-treat system.	The potential for technical difficulties is less for Alternative 4(Rev) than Alternative 3 because the process of mixing the additive in perched water or with clean backfill is fairly simple.
Soil Treatment	Both of the alternatives could be readily implemented. No delays in the excavation and stabilization process are anticipated. Application of excavation and stabilization as part of the interim action for Building B has demonstrated the viability. Trained professionals are readily available to conduct the remedial activities, including the construction of the slurry/grout wall.	
	Alternative 3 could be readily implemented, but is more technically challenging than Alternative 4(Rev). Since this alternative requires the least volume of soil to be transported for off-Property disposal, limitations associated with the availability of waste transport vehicles and landfill capacity would be less than Alternative 4(Rev). Stabilization technologies have been proven on large scale at several sites and have been successful during interim actions at the Property. Only minor delays associated with the startup of a process containing a number of mechanical operations are anticipated.	Alternative 4(Rev) could be readily implemented. No limitations on the availability of transportation and/or landfill capacity are anticipated.

Ease of Undertaking Additional Actions

The ease of undertaking additional actions was evaluated to compare what possible future cleanup actions may be necessary, and how difficult it would be to implement any additional actions after one or more of the remedial alternatives have already been set in place.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Both alternatives are considered to be permanent solutions and will meet all RAOs. No further cleanup actions would be anticipated following the implementation of these permanent treatment and/or disposal remedial alternatives.	
Soil	Both alternatives are considered to be permanent solutions and will meet all RAOs. No further cleanup actions would be anticipated following the implementation of these permanent treatment and/or disposal remedial alternatives.	

Availability of Services and Materials

The availability of services and materials, as well as the availability of contractors to provide competitive bids for the work, was evaluated. Cleanup actions to address lead- and arsenic-impacted soil have been, and are currently being implemented throughout the Northwest — even throughout North America and Europe. Many vendors were interviewed to determine the efficacy and availability of the technology used and the information was used to screen the two alternatives. These same vendors continue to provide updates on the activities and new developments in the technologies in the form of soil treatment field demonstrations.

The ability of services and materials evaluation is presented in the following table.

Media	Alternative 3	Alternative 4(Rev)
Perched Water	The ability of services and materials to achieve the RAOs is not anticipated to be a limiting factor, and is unlikely to impact the schedule for the alternatives.	
Soil	The ability of services and materials to achieve the RAOs is not anticipated to be a limiting factor, and is unlikely to impact the schedule for the alternatives.	

4.1.6. Consideration of Public Concerns

MTCA requires the evaluation of any local community concerns regarding the alternative and how the alternative addresses those concerns. Consideration of public concerns related to truck traffic was evaluated. Truck traffic is common within the vicinity of the Property; however, effective staging truck traffic will reduce additional potential impacts. It is believed that truck traffic will be a minor concern to the public.

The consideration of public concern evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	All work under both alternatives will be performed on-Property; therefore, the potential for public concern will be the same for the perched water treatment process.	
Soil	The potential for public concern is lowest with Alternative 3 since it is the alternative with the smallest volume of soil leaving the Property and the smallest volume of required backfill (approximately 1,107 trucks). The installation of the cover will additionally minimize the potential for exposure.	The potential for public concern is highest with Alternative 4(Rev) since it is the alternative that requires the greatest volume of soil leaving the Property, and a relatively larger volume of backfill being brought on to the Property. Alternative 4(Rev) will require approximately 1,238 truckloads. Additional truck traffic will be of minor concern to the public.

4.1.7. Sustainability

Sustainability is not specifically required under MTCA as a screening criterion; however, it is an important consideration. Of the environmental stressors associated with sustainability, the greatest impact will be the emission of greenhouse gases resulting from waste transport by truck. A surrogate for the evaluation of greenhouse gas emissions can be the number of truck miles required to complete the alternative.

The sustainability evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Both alternatives have the same level of sustainability concerns related to the perched water treatment process.	
Soil	Approximately 1,107 trucks will be required to complete the remediation of the Property under Alternative 3, thus creating the least amount of greenhouse gases. Fifty percent of the trucks would be used for hauling backfill, cover, and cap soil, with a distance of 15 miles roundtrip. The other 50% of the trucks would travel 21 miles to dispose of waste at the landfill. This results in a total of 18,306 truck miles associated with this alternative which is lower than Alternative 4(Rev).	Approximately 1,238 trucks would be required to complete the remediation of the Property under Alternative 4(Rev). The number of trucks would create marginally more greenhouse gases than Alternative 3, due to the transport of a greater volume of soils and the import of backfill. Fifty percent of the trucks would be used for hauling backfill, cover, and cap soil, with a distance of 15 miles roundtrip. The other 50% of the trucks would travel approximately 21 miles to dispose of waste at the landfill. This results in a total of 22,824 truck miles, which is 22% more than Alternative 3.

4.1.8. Safety

The safety criterion was included because the Companies, PERC, and PIONEER believe that worker safety is always a primary consideration when performing any work, and because safety is an Applicable or Relevant and Appropriate Requirement (ARAR) under the Washington Industrial Safety and Health Act (RCW 49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926).

Each alternative presents a significant safety risk without proper training of health and safety procedures. Written procedures will need to be established, and an exclusion zone will be created to minimize potential hazards. All remediation workers would require appropriate training.

The safety evaluation is presented in the following table.

Medium	Alternative 3	Alternative 4(Rev)
Perched Water	Maintenance of the pump-and-treat system in Alternative 3 will require higher occupational exposure hours than Alternative 4(Rev). The treatment media will need to be changed and the withdrawal wells will need to be installed.	
Soil	Potential worker safety risks are higher for Alternative 3 than Alternative 4(Rev). This alternative will involve the same amount of excavation and processing of hazardous soil as Alternative 4(Rev) but will have the additional step of processing the soil with COC concentrations greater than the PWREL in OUs 1, 2, and 3. This alternative will also involve the potential exposure to the same soil during stabilization, which could potentially increase safety risks on the Property not only to those implementing the action, but to other workers on the Property.	Potential worker safety risks are lower for Alternative 4(Rev) than Alternative 3. This alternative will involve the least amount of material handling, which could potentially decrease safety risks on the Property not only to those implementing the action, but to other workers on the Property. A shorter remediation time and lower occupational exposure hours are required to meet RAOs for Alternative 4(Rev) than for Alternative 3.

4.1.9. Cost

This cost evaluation criterion addresses the costs that may be incurred to implement the cleanup action. The evaluation considers three cost categories: direct costs, indirect costs, and long-term operation and maintenance (O&M) costs, and presents the total cost for each alternative.

Cost Analysis

Direct Capital Costs

Direct capital costs are the costs associated with the implementation of each alternative. These costs are associated with construction, equipment, property preparation, operation/maintenance, and disposal. Direct costs were obtained from vendor solicitations and were based on previous experience and actual costs generated during interim actions and pilot studies at the Property.

Indirect Capital Costs

Indirect capital costs are those costs associated with administration, community relations, engineering design, construction oversight, and contingency for the alternative. These costs were estimated based on previous experience during interim actions.

Long-term O&M Costs

Long-term O&M costs associated with site remediation activities typically include items such as long-term monitoring, cap and cover maintenance, site security maintenance. These costs are most often associated with a site where there is an active on-going operation after completion of the remedy that is necessary to maintain the protectiveness of the site.

Capital Costs	Alternative 3	Alternative 4(Rev)
Direct Costs	The direct capital costs for Alternative 3 are between \$5.5 million (MM) and \$7.4MM.	The direct capital costs for Alternative 4(Rev) are between \$4.3MM and \$5.8MM. This makes Alternative 4(Rev) the most viable alternative with respect to direct capital costs.
Indirect Costs	The indirect capital costs for Alternative 3 are between \$0.71MM and \$0.96MM.	The indirect capital costs for the Alternative 4(Rev) are between \$0.65MM and \$0.87MM. This makes the Alternative 4(Rev) the most viable alternative with respect to indirect capital costs.
Long-term O&M Costs	Both alternatives are considered to be permanent solutions and will meet all RAOs. Further cleanup actions and ongoing long-term maintenance would not be anticipated following the implementation of the selected alternative. Any minor maintenance of the cover would likely be conducted as part of the normal operations of the business interest occupying the Property.	

Summary Cost Analysis

An estimate of the anticipated costs associated with each alternative is presented in Table 1. Alternative 3 had the highest estimated total cost (approximately \$7.3MM with a +/- 15% range between \$6.2MM and \$8.4MM). Alternative 4(Rev) had the lowest estimated cost (approximately \$5.8MM with a +/- 15% range between \$5.0MM and \$6.7MM). The average of the range for Alternative 4(Rev) was approximately 25% lower than the average for the range for Alternative 3.

Disproportionate Cost Analysis

According to MTCA (WAC 173-340-360(3)(e)), “costs are disproportionate to benefits if the incremental costs of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative.” Using this definition, the cost of Alternative 3 is clearly disproportionate to benefits over Alternative 4(Rev). The protectiveness, permanence, effectiveness over the long-term (especially as it applies to risk), management of short-term risks, consideration of public concerns, and the technical and administrative ease of implementation of Alternative 4(Rev) are similar to Alternative 3; however, the costs are significantly lower.

Accuracy of Estimate

The ranges of the estimated total costs for the two alternatives are presented on Table 1. These remedial action cost estimates were assumed to be accurate to within +/-15%. In effect, the estimated "Best Estimate" remedial action cost would be defined as the average of the high and low estimate. Cost estimates that overlap once the +/-15% factor is applied were considered equal for the purpose of this evaluation.

This cost estimate is NOT all-inclusive and does not include costs for documentation, studies, or related tasks. It also does not include costs for pilot studies, the remediation design process, or documentation, studies, pilot studies, and design of off-Property impacts to groundwater. This estimate should be used for comparison basis only.

5. Summary of Analysis

Alternatives 3 and 4(Rev) were evaluated based on the criteria presented in Section 3, and each criterion was scored based on the results of the analysis (see Table 2). Each criterion was assigned a score of 1 or 2 for each alternative based on the performance of the alternative compared to the other alternative. The lower value (i.e., 1) represents the best performance; the higher value (i.e., 2) represents the worst performance. In cases where it was not possible to distinguish performance between the alternatives an equal score was assigned.

The scores for each criterion (e.g. long-term effectiveness and implementability) and the overall score for all criteria are presented on Table 2. The results for the sub-criteria were equally weighted. This approach is consistent with MTCA guidance, which emphasizes the permanence of the selected remedial alternatives.

5.1 Analysis

Alternative 4(Rev) received a total score of 19 and Alternative 3 had a higher (less desirable) score of 24 (see Table 2). Alternative 4(Rev) scored lower than Alternative 3 for Protectiveness, Permanence, Long-term Effectiveness, Implementability, Safety, and Cost.

5.2 Proposed Preferred Alternative

Alternative 4(Rev) is the revised preferred alternative for the FS-OSP based the detailed analyses of alternatives and the total score presented in Table 2. Alternative 3 is the proposed secondary alternative.

As the preferred alternative, the conceptual design for the Alternative 4(Rev) is described in the next section of this addendum.

6. Conceptual Design of the Preferred Remedial Alternative

This section describes how the Property cleanup will be achieved using Alternative 4(Rev). A description of how the preferred alternative will be implemented to achieve RAOs is presented in Section 5.1. An estimate of the total remediation cost for on-Property soils and surface water, and an estimate of the time necessary to implement the preferred alternative are presented in Section 5.2.

6.1 Conceptual Design of the Preferred Remedial Alternative

A summary of how the preferred remedial alternative will be implemented is described in this section. The process will be described in more detail in the Remedial Design Report, which will be submitted to Ecology in July 2017.

6.1.1. Perched Water Treatment

Perched water is located throughout the Property and requires treatment. The volume of perched water at the Property is unknown due to its discontinuous nature, but it is estimated to be 850,000 U.S. gallons. The treatment method for perched water consists of adding Free Flow FF-200 FS (1:1 buffer:iron reagent) to clean imported soil which will be used to backfill the each excavation containing perched water, or directly to the perched water. The FF-200 FS treatment process removes arsenic and lead from the groundwater by binding the metals to the soil.

As the perched water at the Property is discontinuous and will not occur in each excavation area, the amount of water treatment must be determined on a case-by-case basis and at the time of excavation. In addition, the results of a pilot study indicated that a wide range of COC concentrations can be expected during remediation. These wide ranges of concentrations will require different additive dosing rates. Dosing rate adjustments will be made based upon available data and the location of the excavation.

The purpose of adding the perched water treatment additive to imported backfill soil is to introduce the perched water treatment additive directly to the water without the use of injection wells (or other similar methods). Placing the additive directly into the perched water will eliminate the uncertainty associated with distributing the additive throughout the water body.

6.1.2. Soil Treatment

Soil with COC concentrations greater than DCRELs and/or SPWRELs (depending on the OU) will be excavated. Excavation and associated tasks are described in this section and more detail will be presented in the Remedial Design Report.

Excavation Process

The excavation process for soil will consist of the following:

- Excavating, stockpiling and, if necessary, analyzing overburden[5];
- Excavating soil with COC concentrations greater than the SPWREL but below the concentration expected to be characteristically hazardous; and
- Excavating soil with COC concentrations greater than the concentration expected to be characteristically hazardous.

Overburden

Overburden will be excavated and stockpiled prior to impacted soil excavation and if present, between impacted soil layers within the excavation. Where necessary, the overburden will be field-screened using an XRF to determine if the soil can be used as backfill. This screening step is particularly important in sections of the Property where a geotextile barrier has not been installed at the overburden/impacted soil interface during a previous interim action.

Non-Hazardous Soil

Excavated soil that is designated as non-hazardous will not require sampling/analysis prior to stockpiling for de-watering and subsequent load-out for off-Property disposal. A plastic-lined or asphalt-based stockpile storage cell will be constructed to store non-hazardous soil prior to disposal. This storage cell will prevent contaminated soil from contacting underlying soil. All stockpiles will be covered with a 20 mil liner when not in use.

Hazardous Soil

Excavated soil designated as hazardous will be transported to and processed by the soil screening plant for size separation. All stockpiles will be covered with a 20 mil plastic when not in use.

Screened Soil

Soil will be separated into fine (3-inch minus) and coarse fractions (3-inch plus). The fine (3-inch minus) soil will be processed through the screen, collected below, and transported from the screen to the hazardous waste treatment cell. The 3-inch plus soil/rock and debris (which will remain hazardous) will be transported to the hazardous waste disposal cell for analysis and storage. The stockpiled debris will be sampled (on a rate of 1 sample per every 100 cubic yards of debris) and analyzed by the XRF to determine the total arsenic and lead COC concentrations in the sample. If the total COC concentrations are equal to or greater than the concentration expected to be characteristically hazardous, the sample will be delivered to the project laboratory for TCLP analysis. The results of the TCLP analysis will determine if the debris can be disposed of as non-hazardous waste. If the debris has a total COC concentration that is significantly greater than the concentration expected to be

[5] Overburden consisting of imported gravels will not require analysis.

characteristically hazardous or if the debris fails TCLP analysis it will be staged in the stockpile for disposal at the Chemical Waste Management Landfill in Arlington, Oregon.

Characteristically hazardous soil will be treated with EnviroBlend® 50/50 HXD (at a dosing rate of 4%) to lower the leachability so that it is no longer a D-listed waste and can be disposed of as non-hazardous waste.

Excavation and Backfill

The excavations will be backfilled to the approximate pre-construction grade using a combination of stockpiled reusable overburden soil and imported gravel borrow from a known source of uncontaminated fill. Stockpiled reusable overburden soil that meets RELs will be used preferentially over imported gravel borrow. Depending upon the condition of the subgrade material prior to backfill, quarry spalls may be required as a base for the backfilled materials.

The backfill soil will be placed in lifts and loosely compacted by the excavator. In cases where excavation is deep enough to potentially impact the aquitard, the excavation will be backfilled initially with locally-sourced pond-liner grade clay. This step will re-establish the aquitard and help eliminate preferential pathways to the groundwater. This is a precautionary step, as the perched water treatment process should eliminate the source of any environmental impacts to groundwater over time. To add structural strength to the backfilled excavation, a layer of woven filter fabric or geotextile will be added above the additive/imported backfill or the quarry spills.

6.2 Cost and Timing of the Preferred Remedial Alternative

The anticipated cost[6] of the proposed preferred alternative ranged from $5.0MM and $6.7MM (see Table 1). The completion of this alternative is estimated to require between 1.7 and 2.3 years.[7] The initial selected preferred alternative estimated cost was between $6.2MM and $8.4MM, and completion of the alternative was expected to take between 2.25 and 2.8 years.

[6] This estimate of cost is NOT all-inclusive and does not include costs for documentation, studies, or related tasks. It also does not include costs for pilot studies, design of the remediation process or for documentation, studies, pilot studies, and design of off-property impacts or groundwater. This estimate should be used for comparison purposes only.
[7] This estimate includes the time it will take to implement the remedy and time directly associated with the remedy; it does not include time for other items such as reporting, design, documentation, studies, pilot studies, and design of off-property impacts, or groundwater.

7. References

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

PERC/PIONEER. 2017. Soil Volume Verification and XRF Demonstration for the Superlon Plastics Site, Tacoma, Washington. January.

TABLES

Table 1: Estimated Implementation Costs for Alternatives 3 and 4(Rev)

Cost Comparison	Alternative 3	Alternative 4(Rev)
Direct Costs		
PW Treatment	**$494,949**	**$16,959**
Construction of Slurry Wall	$289,000	$0
Analytical Testing (Slurry Wall Waste)	$7,856	$0
Cost of Treatment Plant/Costs	$150,000	INCLUDED IN SOILS PROCESSING BELOW
Analytical Testing (Treated Water)	$48,093	$16,959
Soil Treatment	**$5,954,676**	**$5,054,248**
SOILS PROCESSING: Cost of Excavation of Overburden, Excavation of Impacted soils, Stabilization of Hazardous soils, Backfilling and Analytical	$3,963,058(1)	$3,162,332
Disposal of Waste (ALL Soil/Waste types)(1)	$785,100	$785,100
Disposal of Debris	$349,616	$349,616
Backfilling of Excavation	$688,272	$683,675
Cover Construction	$168,630	$73,525
Total Direct Cost	**$6,449,625**	**$5,071,207**
15% LOW	**$5,482,181**	**$4,310,526**
15% HIGH	**$7,417,069**	**$5,831,888**

Indirect Costs		
Project Management & Legal (Estimated at 5% of Direct Costs)	**$322,481**	**$253,560**
Construction Oversight (Estimated at 10% of Direct Costs)	**$644,963**	**$507,121**
Contingency NOT INCLUDED PER MTCA	**N/A**	**N/A**
Total Indirect Cost	**$832,118**	**$759,448**
15% LOW	**$707,300**	**$645,531**
15% HIGH	**$956,936**	**$873,365**

TOTAL COST OF ALTERNATIVE	$7,281,743	$5,830,655
15% LOW	**$6,189,482**	**$4,956,057**
15% HIGH	**$8,374,004**	**$6,705,253**

TOTAL TIME REQUIIRED TO COMPLETE ALTERNATIVE (YEARS)	3.5	3.1
15% LOW	**2.9**	**2.6**
15% HIGH	**4.0**	**3.6**

Note:
(1)Volume adjusted to equal the proposed preferred alternative

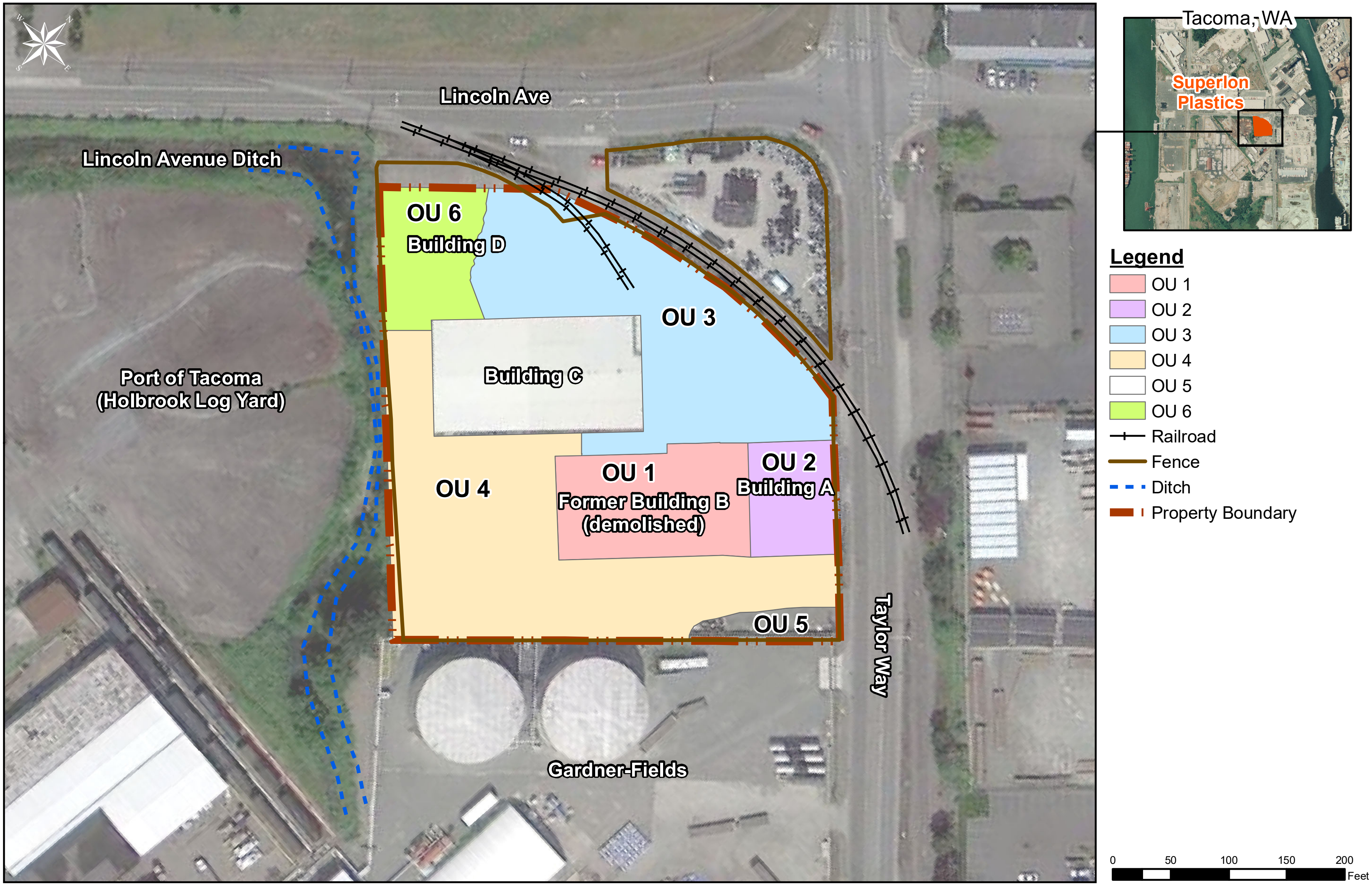
Table 2: Scoring of the Alternatives

Criterion	Alternative 3	Alternative 4(Rev)
Protectiveness		
Time to Achieve RAOs	2	1
Permanence		
Toxicity Reduction	1	1
Mobility Reduction	2	1
Total Volume Reduction	2	1
Long-term Effectiveness and Permanence		
Magnitude of Residual Risk On-Property	2	1
Adequacy and Reliability of Controls	1	1
Short-term Effectiveness		
Potential Community Exposure during Implementation	2	1
Potential Worker Exposure during Implementation	2	1
Potential Environmental Impacts	2	1
Implementability		
Ability and Reliability of Technology	2	1
Ease of Undertaking Additional Actions	1	1
Availability of Services and Materials	1	1
Consideration of Public Concern		
	1	2
Sustainability		
	1	2
Safety		
	2	1
Cost		
	2	1
Total	**26**	**18**

Notes:

The scores for each evaluation criteria category (e.g. long-term effectiveness, and implementability) and the total score for the sum of all criteria are presented in the bottom row of the table. Note that the lowest score indicates the best performance. The results for the sub-criteria were equally weighted. This approach is consistent with MTCA guidance, which emphasizes the permanence of the selected remedial alternatives.

FIGURES:



PIONEER
TECHNOLOGIES CORPORATION

Operable Units
Addendum 1 to the Feasibility Study for On-Property Soils and Perched Water
Superlon Plastics Property, Tacoma, Washington

Figure 1

Appendix A: Perched Water Treatability Studies

for the

Superlon Plastics Site Tacoma, Washington

Prepared for:

White Birch
2116 Taylor Way
Tacoma, WA 98401

and

The Chemours Company
6324 Fairview Road, Suite 200
Charlotte, NC 28210

June 2017

Pacific Environmental and Redevelopment Corporation
424 East Meadow Lake Drive
Snohomish, Washington 98290

and

PIONEER Technologies Corporation
5205 Corporate Center Ct. SE, Suite A
Olympia, Washington 98503-5901

Table of Contents

Tables

Figures

Attachments

Acronyms and Abbreviations

Acronym/Abbreviation	Description
Pilot	Field Pilot Treatability Study
Property	Superlon Plastics Property
PW	Perched Water
RELs	Remediation Levels

A1 Introduction

Laboratory bench-scale and field pilot treatability studies (Pilot) were conducted to evaluate the technical feasibility of applying three additive technologies to perched water (PW) at The Superlon Plastics Property (Property). The purpose of treating the water with additives was to reduce dissolved arsenic and lead concentrations to meet Site-specific groundwater remediation levels (RELs).[1] This appendix is organized as follows:

- Section A2 presents the objective, characterization, and methodology of the laboratory bench-scale PW treatability studies;
- Section A3 presents the PW bench-scale treatability study results for Free Flow (FF) Technologies;
- Section A4 presents the PW bench-scale treatability study results for Peroxychem (MetaFix);
- Section A5 presents the PW bench-scale treatability study results for Premier Magnesia (EnviroBlend HXD);
- Section A6 describes the transfer process of arsenic and lead to soil after water treatment,
- Section A7 describes the PW field pilot treatability results, selected additive test treatment conditions, and results; and
- Section A8 presents the conclusion and recommended additive for the full-scale remediation.

[1] For the purposes of this report, remediation levels (RELs) include soil-to-groundwater RELs and groundwater and perched water cleanup levels.

A2 Laboratory PW Bench-Scale Treatability Studies

A2.1 Goals and Objectives

The goal of the PW treatability studies was to determine if amending PW with different additives would be an effective means to reduce the dissolved arsenic and lead concentrations to achieve groundwater RELs. Three Laboratories conducted the PW treatability studies:

- Free Flow Technologies (TRC Laboratory conducted the study);
- Peroxychem; and
- Premier Magnesia (Ursus laboratory conducted the study).

Each PW treatability study focused on the following objectives:

- Confirm the suitability of the selected technologies for property PW;
- Identify the appropriate additive dose to achieve the objective; and
- Identify any potential problems associated with the selected technologies at the Property.

A2.2 PW Characterization

Groundwater was collected from two shallow aquifer locations using a peristaltic pump to represent PW with low and high arsenic and lead concentrations (see Figure A-1 and Table A-1):

- Monitoring well MW-11S to represent low arsenic and lead concentrations, and
- Monitoring well MW-12S to represent high arsenic and lead concentrations.

Water and clean soil samples were provided to each laboratory. Analytical results are presented in Table A-1.

Clean soil purchased from an off-Property source was included in the study as it will be used to back fill excavations. Clean soil samples were sent to the lab and mixed with an additive, and then combined with the PW. This approach was tested in the lab since it reflects the process that will take place in the field. Additional testing was performed to determine if applying the additive directly to the PW and then adding the clean soil was equally effective. The results of the laboratory PW bench-scale treatability study are presented in Section A-3 through A-5.

A2.3 Blended Additive and Clean Soil Methodology

The PW treatability study methodology and results are presented in the Free Flow, Peroxychem, and Premier Magnesia reports, which are included in Attachments A-2, A-3, and A-4, respectively. The three vendors blended the additives with clean back fill soil, added the mixture to Property PW, and then collected a treated water sample. In addition, Free Flow additive was used to determine the effectiveness of the treatment if the additive was blended with the PW and then clean soil was added. The water sample was then analyzed for dissolved arsenic and lead (see Free Flow Report Number 2). The laboratory reports are included with each vendors' reports in Attachments A-2, A-3, and A-4, respectively.

A3 Free Flow PW Bench-Scale Treatability Study Results

The bench-scale treatability study report documenting the ability of the Free Flow additive to treat Superlon PW is presented in Attachment A-2. The initial water samples had dissolved arsenic concentrations of 3.0 mg/L for the less concentrated water, and 36.7 mg/L for the more concentrated water (MW-11s) (see Table A-1). The initial lead concentrations in each sample were below the REL and are not discussed further. Each treatment dose successfully lowered the dissolved arsenic concentrations to below the target concentration of 0.66 mg/L. A 0.25% treatment dose of the FF-200 + FS (1:1 - buffer:iron ratio) brought the concentration of arsenic down to below the remedial level of 0.67 mg/L in the saturated soil test. In addition, the higher buffer:iron source ratios resulted in higher final pH values in the water. Since arsenic absorption is stronger at slightly acidic pH values, rather than at slightly basic pH values, the 1:1 buffer:iron reagent is recommended. Lower doses of reagent were not tested due to the difficulty of homogeneously mixing small amounts of dry treatment reagent in the soil to ensure uniform treatment. Based on the results of the study, a dose of 0.25% FF-200 FS (at a 1:1 ratio) was recommended.

A4 Peroxychem PW Bench-Scale Treatability Study Results

The bench-scale treatability study report documenting the ability of the Peroxychem Metafix® additive to treat Superlon PW is presented in Attachment A-3. The initial groundwater samples had dissolved arsenic concentrations of 2.9 mg/L (MW-12s) for the less concentrated water, and 30.9 mg/L (MW-11s)for the more concentrated water (see Table A-1). The results of treatability testing indicate that the Peroxychem MetaFix® treatment can reduce dissolved arsenic concentrations below the REL. The dissolved lead concentration was below the method detection limit in the untreated baseline water sample, and was not evaluated further.

The results indicate that the Peroxychem MetaFix I-6A formulation was the most effective for treatment of arsenic. The dose response results suggest that even the lowest evaluated dose of 0.25% w/w could result in achievement of the REL. The Peroxychem MetaFix® bench-scale treatability study results of increasing the additive dose indicates that higher dosages (i.e., 0.5% or 1.0%) would provide increased assurance of high removal efficiency. In addition, the use of a higher additive dose would make adequate distribution of the Peroxychem MetaFix® reagent within the backfill matrix easier to achieve.

A5 Premier Magnesia PW Bench-Scale Treatability Study Results

The treatability study report documenting the ability of the Premier Magnesia EnviroBlend® additive to treat Superlon PW is presented in Attachment A-4. The initial groundwater samples had dissolved arsenic concentrations of 2.75 mg/L (MW-12s) for the less concentrated water, and 36.7 mg/L (MW-11s) for the more concentrated water (see Table A-1). Enviroblend HXD was amended to backfill material with concentrations of 3%, 4%, and 5% and then the material was added to the PW (see Attachment A-4, Table 3). The less concentrated groundwater sample was effectively treated, and met the RELs with a 3% EnviroBlend® HXD dosage. A 4% EnviroBlend® HXD dosage met the REL for the more concentrated groundwater. In fact, the treatments reduced both arsenic and lead concentrations to below their respective detection limit.

A6 Transfer of Arsenic and Lead to Soil after Water Treatment

The treatment process removes arsenic from PW by binding arsenic to iron, and then to the particulates in the soil. This results in arsenic and lead being transferred from the PW to the soil after the water treatment.

In the laboratory bench-scale studies, the saturated soil samples, (which represents approximate field conditions) had a solid solution ratio of 5:1. This means that 500 g of soil will contain 100 mL water. Assuming the water has 100 mg/L arsenic, the increase in the arsenic soil concentration will be (100 mg/L arsenic x 0.10 L) / 500 g soil = 20 mg/kg arsenic. For the 36.7 mg/L arsenic concentration sample, the increase is 7.5 mg/kg arsenic (See Attachment A-2). These arsenic levels are below state background concentrations (20 mg/kg), default industrial cleanup levels (90 mg/kg), and the lowest Property-specific REL of 91 mg/kg for Operable Unit 2. This means that soil RELs will not be exceeded as a result of using of a water treatment additive.

A7 Field Pilot PW Treatability Studies

A7.1 Goals and Objectives

The goal of the PW field pilot treatability study was to confirm that amending PW with FF-200 FS (1:1 ratio), METAFIX I6i, and EnviroBlend® additives could be an effective means to reduce the dissolved arsenic and lead concentrations to achieve groundwater RELs. The PW field pilot treatability study was conducted in March and April of 2017 and focused on the following objectives:

- Confirming the suitability of the three additives for treating Property PW;
- Confirming the appropriate dose of the three additives to achieve PW RELs; and
- Identifying potential problems associated with mixing clean soil with additives at the Property.

A7.2 Methodology

The methodology used for the field pilot treatability study consisted of placing PW collected from four different source areas into 20-gallon drums and then treating the PW by adding soil amended with the three additives as follows:

PW Source	Free Flow FF 200 (1:1) Dose as W%/W% of Clean Backfill	Peroxychem Metafix I-6A Dose as W%/W% of Clean Backfill	Premier Magnesia Enviroblend HXD Dose as W%/W% of Clean Backfill
Former Building B Sampling Port	0.5	0.25	4
Monitoring Well 12s (MW-12S)	0.5	0.25	4
Pilot Study SL-79 Excavation	0.5	0.25	4
Pilot Study SL-90 Excavation	0.5	0.25	4

Representative arsenic and lead concentrations were obtained from PW samples prior to treatment with the additives. The PW from SL-79 excavation contained the highest concentrations of arsenic and/or lead obtainable and represented the worst case scenario. The PW from former Building B sampling ports represented the expected typical scenario. Treated water samples were collected one week later from each drum and the analytical results are presented in Table A-2.

A7.3 Results

Based on the results of the Pilot, FF 200 (1:1) was the most effective PW treatment under current field conditions (see table A-2 and the table below and Table A-2). FF 200 (1:1) successfully treated the water from Former Building B, Monitoring Well 12s and the Pilot SL-90 excavation whereas the other additives were only successful in treating water from the Former Building B. In addition, the treatment with FF 200 (1:1) resulted in dissolved arsenic concentrations that were more than an order of magnitude lower than the other additives for the Building B and MW-12 water.

	Achieve Groundwater REL		
PW Source	**Free Flow FF 200 (1:1) Dose as W%/W% of Clean Backfill**	**Peroxychem Metafix I-6A Dose as W%/W% of Clean Backfill**	**Premier Magnesia Enviroblend HXD Dose as W%/W% of Clean Backfill**
Former Building B Sampling Ports	Yes	No	Yes
Monitoring Well 12s (MW-12S)	Yes	No	No
Pilot SL-79 Excavation	No	No	No
Pilot SL-90 Excavation	Yes	Yes	Yes

The additives doses were too low to successfully treat the PW in SL-79 due to the sample collection method used in this excavation. An excavator bucket was used to collect the PW from the bottom of the excavation and a significant amount of suspended soil was inadvertently collected with the PW. The suspended soil in the PW sample resulted in unrealistically high arsenic and lead concentrations. The total arsenic concentration (which included solids) was 95 mg/L and the dissolved arsenic concentration (which did not include solids) was 6.1 mg/L; the total lead concentration (which included solids) was 137 mg/L and the dissolved lead concentration (which did not include solids) was 0.02 mg/L (see Attachment A-2).

Suspended soil in PW will not impact sample concentrations during the remedial action because suspended soil will be filtered from PW samples. In addition, during the remedial action, some of the suspended soil in PW will settle to the bottom of the excavation, and other suspended soil will be bound up to clean backfill as it is used to fill the excavation. This will result in dissolved PW concentrations that are expected to be approximately 10 times lower during the remedial action than they were in the Pilot SL-79 drums.

A7.3 Results

Based on the results of the Pilot, FF 200 (1:1) was the most effective PW treatment under current field conditions (see table A-2 and the table below and Table A-2). FF 200 (1:1) successfully treated the water from Former Building B, Monitoring Well 12s and the Pilot SL-90 excavation whereas the other additives were only successful in treating water from the Former Building B. In addition, the treatment with FF 200 (1:1) resulted in dissolved arsenic concentrations that were more than an order of magnitude lower than the other additives for the Building B and MW-12 water.

	Achieve Groundwater REL		
PW Source	**Free Flow FF 200 (1:1) Dose as W%/W% of Clean Backfill**	**Peroxychem Metafix I-6A Dose as W%/W% of Clean Backfill**	**Premier Magnesia Enviroblend HXD Dose as W%/W% of Clean Backfill**
Former Building B Sampling Ports	Yes	No	Yes
Monitoring Well 12s (MW-12S)	Yes	No	No
Pilot SL-79 Excavation	No	No	No
Pilot SL-90 Excavation	Yes	Yes	Yes

The additives doses were too low to successfully treat the PW in SL-79 due to the sample collection method used in this excavation. An excavator bucket was used to collect the PW from the bottom of the excavation and a significant amount of suspended soil was inadvertently collected with the PW. The suspended soil in the PW sample resulted in unrealistically high arsenic and lead concentrations. The total arsenic concentration (which included solids) was 95 mg/L and the dissolved arsenic concentration (which did not include solids) was 6.1 mg/L; the total lead concentration (which included solids) was 137 mg/L and the dissolved lead concentration (which did not include solids) was 0.02 mg/L (see Attachment A-2).

Suspended soil in PW will not impact sample concentrations during the remedial action because suspended soil will be filtered from PW samples. In addition, during the remedial action, some of the suspended soil in PW will settle to the bottom of the excavation, and other suspended soil will be bound up to clean backfill as it is used to fill the excavation. This will result in dissolved PW concentrations that are expected to be approximately 10 times lower during the remedial action than they were in the Pilot SL-79 drums.

A8 Conclusions

Treatability studies were performed to determine if on-Property PW could be treated to reduce dissolved arsenic and lead concentrations to achieve RELs. The results of the treatability studies demonstrated that Free Flow FF 200 (1:1) at a 0.5% dose was the most effective treatment for on-Property PW and that it will successfully treat on-Property PW to achieve site-specific groundwater RELs.

Tables

Table A-1: Bench-Scale Treatability Study Perched Water and Soil Concentrations

Sample Source	Lab Sample Number	Treatment	Additive	Dose % Weight of Backfill	Sample Number	Dissolved or Total?	Arsenic (mg/L)[1]	Lead (mg/L)[2]	pH (SU)
MW-12s	Free Flow (TRC Lab)	Baseline	None	None	GW-MW-11S-Low 102416-(20)	Dissolved	3	0.17	6.99
MW-11s	Free Flow (TRC Lab)	Baseline	None	None	GW-MW-11S-Low 102416-(20)	Dissolved	36.7	0.075	6.65
Clean Backfill Soil	Peroxychem	Baseline	None	None	Soil-SO Backfill-102416-0-0.5	Not Applicable	1.8[(3)]	2.5[(3)]	7.59
MW-12s	Peroxychem	Baseline	None	None	GW-MW-12S-High 102416-(20)	Dissolved	2.9	0.15	6.36
MW-11s	Peroxychem	Baseline	None	None	GW-MW-11S-Low 102416-(20)	Dissolved	30.9	<0.03	6.78
MW-12S	Premier Magnesia (Ursus Lab)	Baseline	None	None	GW-MW-12S-High 102416-(20)	Dissolved	2.75	0.29	6.81
MW-11s	Premier Magnesia (Ursus Lab)	Baseline	None	None	GW-MW-11S-Low 102416-(20)	Dissolved	36.7	0.76	6.41

Notes:

[1]Remedial level is 0.67 mg/L

[2]Remedial level is 1.65 mg/L

[3]Units are mg/kg for this sample

Table A-2: Pilot Study Treatability Study Laboratory Results

Sample Source	Lab Sample Number	Treatment	Additive	Dose % Weight of Backfill	Sample Number	Dissolved or Total?	Arsenic (mg/L)[1]	Lead (mg/L)[2]	pH (SU)
Bld_B	580-66530-2	Baseline	None	None	PP-Bld_B_Sample Ports-030317	Total	66	0.70	--
Bld_B	580-66905-1	Free Flow	FF-200 + FS (1:1 - buffer:iron ratio)	0.5	PP-BLD_B-Freeflow-PT-032217	Dissolved	0.091	0.0020	7.2
Bld_B	580-66905-2	Peroxychem	MetaFix I-6A	0.25	PP-BLD_B-MFIX-PT-032217	Dissolved	1.5	0.0020	7.3
Bld_B	580-66905-3	Peroxychem	MetaFix I-6A	0.25	PP-BLD_B-MFIX-PT-032217-(01)	Dissolved	1.4	0.0020	7.3
Bld_B	580-66905-4	Premier Magnesia	Enviroblend HXD	4	PP-BLD_B-PM-PT-032217	Dissolved	0.61	0.040	4.2
MW-12	580-66530-1	Baseline	None	None	GW-MW-12S-030317	Total	59	0.046	--
MW-12	580-66905-5	Free Flow	FF-200 + FS (1:1 - buffer:iron ratio)	0.5	PP-MW-12i-Freeflow-PT-032217	Dissolved	0.12	0.0020	7.1
MW-12	580-66905-6	Peroxychem	MetaFix I-6A	0.25	PP-MW-12i-MFIX-PT-032217	Dissolved	3.0	0.0020	7.6
MW-12	580-66905-7	Premier Magnesia	Enviroblend HXD	4	PP-MW-12i-PM-PT-032217	Dissolved	4.2	0.040	3.9
SL-79	580-66386-1	Baseline	None	None	PP-SL-79-022717	Total	330	380	--
SL-79	580-66905-8	Free Flow	FF-200 + FS (1:1 - buffer:iron ratio)	0.5	PP-SL-79-Freeflow-PT-032217	Dissolved	4.4	0.0036	7.0
SL-79	580-66905-9	Peroxychem	MetaFix I-6A	0.25	PP-SL-79-MFIX-PT-032217	Dissolved	11	0.0070	7.3
SL-79	580-66905-10	Premier Magnesia	Enviroblend HXD	4	PP-SL-79-PM-PT-032217	Dissolved	10	0.040	5.1
SL-90	580-66530-3	Baseline	None	None	PP-SL 90-030317	Total	1.1	1.5	--
SL-90	580-66905-11	Free Flow	FF-200 + FS (1:1 - buffer:iron ratio)	0.5	PP-SL-90-Freeflow-PT-032217	Dissolved	0.013	0.0066	12.7
SL-90	580-66905-12	Peroxychem	MetaFix I-6A	0.25	PP-SL-90-MFIX-PT-032217	Dissolved	0.017	0.055	12.8
SL-90	580-66905-13	Premier Magnesia	Enviroblend HXD	4	PP-SL-90-PM-PT-032217	Dissolved	0.10	0.040	6.8

Notes:

[1]Groundwater remediation level is 0.67 mg/L.

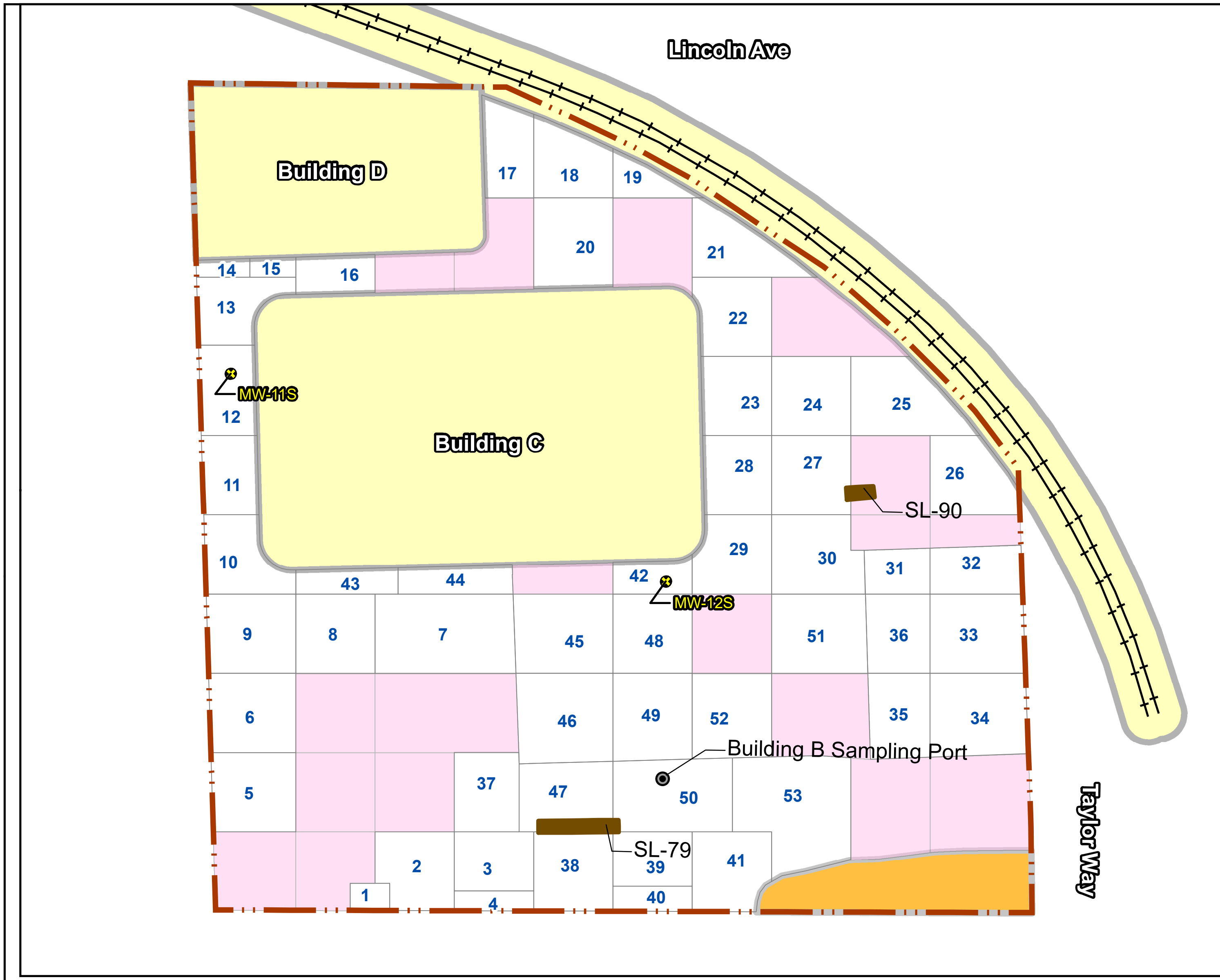
[2]Groundwater remediation level is 1.65 mg/L.

-- = Not analyzed for constituent

See Attachments A-2, A-3, and A-4 for laboratory reports for Free Flow, Peroxychem, and Premier Magnesia, respectively.

NA = Not applicable since criteria are for dissolved constituent concentrations

Figures



Legend

- Railroad
- Property Boundary
- Shallow Aquifer Sample Location
- Building B Sample Port Location
- Pilot Study Excavation
- Excavation Units that Require Remediation
- Excavation Units That Do Not Require Remediation
- Areas Not To Be Remediated (Under Buildings or in Buffer)
- No Remediation – Part of Gardner-Fields

Notes:
-The number in each excavation unit represents the sequential order of excavation.
-No remediation will occur within15 feet of the buildings or 12 feet from the railroad to avoid undermining infrastructure.

0 50 100 Feet

PIONEER TECHNOLOGIES CORPORATION

Perched Water Treatability Study Sample Locations
Remedial Design Report
Superlon Plastics Property, Tacoma, Washington

Figure A-1

Attachment A-1: Laboratory Reports

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-66386-1
Client Project/Site: Superlon Metals Fractionation

For:
Pioneer Technologies Corporation
5205 Corporate Ctr. Ct. SE
Ste A
Olympia, Washington 98503

Attn: Brad Grimsted

M. Elaine Walker

Authorized for release by:
3/8/2017 12:45:09 PM

Elaine Walker, Project Manager II
(253)248-4972
elaine.walker@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1
2
3
4
5
6
7
8
9
10
11

Table of Contents

Job ID: 580-66386-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-66386-1

Receipt

One sample was received on 2/27/2017 3:50 PM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 14.4º C.

Receipt Exceptions

The reference method requires samples to be preserved to a pH of 2 or less. The following sample was received with insufficient preservation at a pH of 6: PP-SL-79-022717 (580-66386-1). The sample was preserved with nitric aciid from lot 0000133393 to the appropriate pH at 0930 in the laboratory on the first of March in 2017.

Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: PP-SL-79-022717

Date Collected: 02/27/17 10:45
Date Received: 02/27/17 15:50

Lab Sample ID: 580-66386-1

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	330		0.50		mg/L		03/06/17 10:03	03/07/17 13:24	500
Lead	380		0.20		mg/L		03/06/17 10:03	03/07/17 13:24	500

QC Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66386-1

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 580-239776/21-A
Matrix: Water
Analysis Batch: 239958

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 239776

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0010		mg/L		03/06/17 10:03	03/07/17 11:31	1
Lead	ND		0.00040		mg/L		03/06/17 10:03	03/07/17 11:31	1

Lab Sample ID: LCS 580-239776/22-A
Matrix: Water
Analysis Batch: 239958

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 239776

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.05		mg/L		101	80 - 120
Lead	1.00	1.05		mg/L		105	80 - 120

Lab Sample ID: LCSD 580-239776/23-A
Matrix: Water
Analysis Batch: 239958

Client Sample ID: Lab Control Sample Dup
Prep Type: Total Recoverable
Prep Batch: 239776

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	3.99		mg/L		100	80 - 120	2	20
Lead	1.00	1.04		mg/L		104	80 - 120	1	20

Client Sample ID: PP-SL-79-022717
Date Collected: 02/27/17 10:45
Date Received: 02/27/17 15:50

Lab Sample ID: 580-66386-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			239776	03/06/17 10:03	MKN	TAL SEA
Total Recoverable	Analysis	6020A		500	239958	03/07/17 13:24	FCW	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Certification Summary

Client: Pioneer Technologies Corporation
TestAmerica Job ID: 580-66386-1
Project/Site: Superlon Metals Fractionation

Laboratory: TestAmerica Seattle

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-17
USDA	Federal		P330-14-00126	04-08-17
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66386-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-66386-1	PP-SL-79-022717	Water	02/27/17 10:45	02/27/17 15:50

66386

Chain of Custody Record

CHOC Number: 03_1.1_E52_40421_27022017

Send Results To:
munsons@uspioneer.com, jking@perc-nw.com,
sduggan@perc-nw.com

Site Contact:
PIONEER Technologies Corporation
Brad Grimsted
Phone: (360) 570-1700 Email: grimstedb@uspioneer.com

PIONEER Technologies Corporation,
5205 Corporate Ctr. Court SE, Suite A
Lacey, WA 98503
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com
PIONEER TECHNOLOGIES CORPORATION

Send Invoice To:
Pacific Environmental Redevelopment Coporation
Jeff King
Phone: 425-238-2212 Email: jking@perc-nw.com

Laboratory Information:
TestAmerica-Tacoma
ELAINE WALKER
Phone: 253.248.4972 Email:

CHOC Version: 0.99.05

Sample Information / **Analytes**

Special Lab Instructions Included ==>

Sample ID (Auto Generated)	Date (MM/DD/YYYY)	Time (0000 to 2400)	Sampler's Initials	Leachate	Filtered	MS/MSD	Metals in Water								Comments for Sample (<== Special Lab Instructions)
PP-SL-79-022717	02/27/2017	10:45	BG				X								Water from SL-79 excavation. A lot of s

TB___ Cooler IR5 Cor 14.4 w/o Unc 14.6
Cooler Dsc Med Blue @Lab___
~~Wet/Packs~~ Packing ___
cli dru

Cooler (Yes/No):	Turnaround Time:	Hazard Identification:	Sample Disposal:
Cooler Temp:	Std		

Preservative: HNO3

Lab Use Only:
580-66386 Chain of Custody

These data are protected by Attorney/Client Privelege. No Un-Authorized distribution is allowed.

QA/QC Requirements:

Sampling Event Comments:
Analyze for total arsenic and lead

Relinquished By: (Sign and Print)	Date/Time:	Received By: (Sign and Print)	Date/Time:
1. BRAD Grimsted	2/27/17 3:50	1. Tom	2/27/17 1550
2.		2.	
3.		3.	

Stat Form: 01 - 07/24/2015

3/8/2017

Login Sample Receipt Checklist

Client: Pioneer Technologies Corporation | Job Number: 580-66386-1

Login Number: 66386 | **List Source: TestAmerica Seattle**
List Number: 1
Creator: Blankinship, Tom X

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	Thermal preservation not required.
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	Required adjustment.
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-66530-1
Client Project/Site: Superlon Metals Fractionation

For:
Pioneer Technologies Corporation
5205 Corporate Ctr. Ct. SE
Ste A
Olympia, Washington 98503

Attn: Brad Grimsted

M. Elaine Walker

Authorized for release by:
3/17/2017 2:06:06 PM

Elaine Walker, Project Manager II
(253)248-4972
elaine.walker@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Case Narrative

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Job ID: 580-66530-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-66530-1

Receipt
Eleven samples were received on 3/3/2017 3:40 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 14.7º C.

Receipt Exceptions

The reference method requires samples to be preserved to a pH of 2 or less. The following sample was received with insufficient preservation at a pH of more than 2: PP-SL 90-030317 (580-66530-3). The sample was preserved to the appropriate pH in the laboratory using Nitric Acid Lot# 0000133393:

The following samples were received at the laboratory outside the required temperature criteria: GW-MW-12S-030317 (580-66530-1), PP-Bld_B_Sample Ports-030317 (580-66530-2), PP-SL 90-030317 (580-66530-3), SO-SL-90-Pilot_bottom-030317-12-12.5 (580-66530-4), SO-SL-90-Pilot_Interfac-030317-8-9 (580-66530-5), WD-SL-79debris_a-030217 (580-66530-6), WD-SL-79debris_a-030217-(01) (580-66530-7), WD-SL-79debris_b-030217 (580-66530-8), WD-SL-79debris_b-030217-(01) (580-66530-9), WD-SL-79debris_c-030217 (580-66530-10) and WD-SL-79debris_c-030217-(01) (580-66530-11). There was no cooling media present in the cooler. As these are samples for metals analysis, the temperature guidance is not applicable.

Metals
Method(s) 6010C: The laboratory control sample duplicate (LCSD) for preparation batch 580-240133, 580-240133, 580-240204 and 580-240204 and analytical batch 580-240412 recovered outside control limits for the following analytes: Se. These analytes were biased high in the LCSD and were not detected in the associated samples; therefore, the data have been reported.

Method(s) 6010C: The continuing calibration verification (CCV) associated with batch 580-240412 recovered above the upper control limit for Se. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

1 2 3 4 5 6 7 8 9 10 11

Client Sample ID: GW-MW-12S-030317
Date Collected: 03/03/17 01:15
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-1
Matrix: Water

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	59		0.50		mg/L		03/13/17 10:51	03/16/17 08:33	500
Lead	0.046		0.0020		mg/L		03/13/17 10:51	03/13/17 18:59	5

Client Sample ID: PP-Bld_B_Sample Ports-030317 Lab Sample ID: 580-66530-2

Date Collected: 03/03/17 01:40 **Matrix: Water**
Date Received: 03/03/17 15:40

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	66		0.50		mg/L		03/13/17 10:51	03/16/17 08:38	500
Lead	0.70		0.0020		mg/L		03/13/17 10:51	03/13/17 19:04	5

Client Sample ID: PP-SL 90-030317

Date Collected: 03/03/17 11:30
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-3

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Total Recoverable

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.1		0.0050		mg/L		03/13/17 10:51	03/13/17 19:08	5
Lead	1.5		0.0020		mg/L		03/13/17 10:51	03/13/17 19:08	5

Client Sample ID: SO-SL-90-Pilot_bottom-030317-12-12.5

Lab Sample ID: 580-66530-4

Date Collected: 03/03/17 10:35

Matrix: Solid

Date Received: 03/03/17 15:40

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	99.6		0.1		%			03/10/17 11:20	1
Percent Moisture	0.4		0.1		%			03/10/17 11:20	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: SO-SL-90-Pilot_bottom-030317-12-12.5
Lab Sample ID: 580-66530-4
Date Collected: 03/03/17 10:35
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 99.6

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.5		2.9		mg/Kg	☼	03/10/17 17:08	03/13/17 21:10	1
Lead	5.3		1.5		mg/Kg	☼	03/10/17 17:08	03/13/17 21:10	1

Client Sample ID: SO-SL-90-Pilot_Interfac-030317-8-9
Date Collected: 03/03/17 11:15
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-5
Matrix: Solid

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	99.1		0.1		%			03/10/17 11:22	1
Percent Moisture	0.9		0.1		%			03/10/17 11:22	1

Client Sample ID: SO-SL-90-Pilot_Interfac-030317-8-9
Lab Sample ID: 580-66530-5
Date Collected: 03/03/17 11:15
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 99.1

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	320		2.9		mg/Kg	☼	03/10/17 17:08	03/13/17 21:13	1
Lead	86		1.5		mg/Kg	☼	03/10/17 17:08	03/13/17 21:13	1

Client Sample ID: WD-SL-79debris_a-030217
Lab Sample ID: 580-66530-6
Date Collected: 03/02/17 08:50
Matrix: Solid
Date Received: 03/03/17 15:40

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**9.7**		0.060		mg/L		03/10/17 12:20	03/14/17 12:10	1
Barium	**0.31**		0.010		mg/L		03/10/17 12:20	03/13/17 17:06	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:06	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:06	1
Lead	**2.7**		0.030		mg/L		03/10/17 12:20	03/13/17 17:06	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:06	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:06	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 12:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**51.5**		0.1		%			03/15/17 16:39	1
Percent Moisture	**48.5**		0.1		%			03/15/17 16:39	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_a-030217
Date Collected: 03/02/17 08:50
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-6
Matrix: Solid
Percent Solids: 51.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**10000**		36		mg/Kg	☼	03/10/17 17:08	03/14/17 12:30	10
Lead	**8200**		18		mg/Kg	☼	03/10/17 17:08	03/14/17 12:30	10

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_a-030217-(01)

Lab Sample ID: 580-66530-7

Date Collected: 03/02/17 08:50
Date Received: 03/03/17 15:40

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**10**		0.060		mg/L		03/10/17 12:20	03/14/17 12:13	1
Barium	**0.30**		0.010		mg/L		03/10/17 12:20	03/13/17 17:10	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:10	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:10	1
Lead	**2.7**		0.030		mg/L		03/10/17 12:20	03/13/17 17:10	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:10	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:10	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**47.0**		0.1		%			03/10/17 11:22	1
Percent Moisture	**53.0**		0.1		%			03/10/17 11:22	1

Client Sample ID: WD-SL-79debris_a-030217-(01)

Lab Sample ID: 580-66530-7

Date Collected: 03/02/17 08:50
Date Received: 03/03/17 15:40

Matrix: Solid
Percent Solids: 47.0

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4000		5.7		mg/Kg	☼	03/10/17 17:08	03/13/17 21:20	1
Lead	710		2.9		mg/Kg	☼	03/10/17 17:08	03/13/17 21:20	1

Client Sample ID: WD-SL-79debris_b-030217

Lab Sample ID: 580-66530-8

Date Collected: 03/02/17 08:45

Matrix: Solid

Date Received: 03/03/17 15:40

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**3.3**		0.060		mg/L		03/10/17 12:20	03/14/17 12:17	1
Barium	**0.49**		0.010		mg/L		03/10/17 12:20	03/13/17 17:13	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:13	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:13	1
Lead	**2.9**		0.030		mg/L		03/10/17 12:20	03/13/17 17:13	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:13	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:13	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**51.8**		0.1		%			03/10/17 11:22	1
Percent Moisture	**48.2**		0.1		%			03/10/17 11:22	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

1 2 3 4 5 6 7 8 9 10 11

Client Sample ID: WD-SL-79debris_b-030217
Date Collected: 03/02/17 08:45
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-8
Matrix: Solid
Percent Solids: 51.8

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3500		4.7		mg/Kg	☼	03/10/17 17:08	03/13/17 21:24	1
Lead	1200		2.4		mg/Kg	☼	03/10/17 17:08	03/13/17 21:24	1

Client Sample ID: WD-SL-79debris_b-030217-(01)

Lab Sample ID: 580-66530-9

Date Collected: 03/02/17 08:45

Matrix: Solid

Date Received: 03/03/17 15:40

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**3.0**		0.060		mg/L		03/10/17 12:20	03/14/17 12:20	1
Barium	**0.45**		0.010		mg/L		03/10/17 12:20	03/13/17 17:16	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:16	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:16	1
Lead	**1.8**		0.030		mg/L		03/10/17 12:20	03/13/17 17:16	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:16	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:16	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**51.2**		0.1		%			03/10/17 11:55	1
Percent Moisture	**48.8**		0.1		%			03/10/17 11:55	1

Client Sample ID: WD-SL-79debris_b-030217-(01)

Lab Sample ID: 580-66530-9

Date Collected: 03/02/17 08:45
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 51.2

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4500		45		mg/Kg	☼	03/10/17 17:08	03/14/17 12:33	10
Lead	710		2.2		mg/Kg	☼	03/10/17 17:08	03/13/17 21:28	1

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_c-030217
Date Collected: 03/02/17 08:35
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-10
Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.4**		0.060		mg/L		03/10/17 12:20	03/14/17 12:23	1
Barium	**0.056**		0.010		mg/L		03/10/17 12:20	03/13/17 17:20	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:20	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:20	1
Lead	**1.7**		0.030		mg/L		03/10/17 12:20	03/13/17 17:20	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:20	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:20	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:56	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**46.2**		0.1		%			03/10/17 11:55	1
Percent Moisture	**53.8**		0.1		%			03/10/17 11:55	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_c-030217

Date Collected: 03/02/17 08:35
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-10
Matrix: Solid
Percent Solids: 46.2

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3800		5.6		mg/Kg	☼	03/10/17 17:08	03/13/17 21:31	1
Lead	900		2.8		mg/Kg	☼	03/10/17 17:08	03/13/17 21:31	1

Client Sample ID: WD-SL-79debris_c-030217-(01)
Lab Sample ID: 580-66530-11
Date Collected: 03/02/17 08:35
Matrix: Solid
Date Received: 03/03/17 15:40

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.8		0.060		mg/L		03/10/17 12:20	03/14/17 12:27	1
Barium	0.097		0.010		mg/L		03/10/17 12:20	03/13/17 17:23	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 17:23	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 17:23	1
Lead	0.87		0.030		mg/L		03/10/17 12:20	03/13/17 17:23	1
Selenium	ND	* ^	0.10		mg/L		03/10/17 12:20	03/13/17 17:23	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 17:23	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:58	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	45.4		0.1		%			03/10/17 11:55	1
Percent Moisture	54.6		0.1		%			03/10/17 11:55	1

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_c-030217-(01)

Date Collected: 03/02/17 08:35
Date Received: 03/03/17 15:40

Lab Sample ID: 580-66530-11
Matrix: Solid
Percent Solids: 45.4

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3600		6.4		mg/Kg	☼	03/10/17 17:08	03/13/17 21:35	1
Lead	430		3.2		mg/Kg	☼	03/10/17 17:08	03/13/17 21:35	1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 580-240266/20-A
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 240266

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		3.0		mg/Kg		03/10/17 17:08	03/13/17 20:06	1
Lead	ND		1.5		mg/Kg		03/10/17 17:08	03/13/17 20:06	1

Lab Sample ID: LCS 580-240266/21-A
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 240266

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	205		mg/Kg		103	80 - 120
Lead	50.0	52.1		mg/Kg		104	80 - 120

Lab Sample ID: LCSD 580-240266/22-A
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 240266

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	200	212		mg/Kg		106	80 - 120	3	20
Lead	50.0	53.8		mg/Kg		108	80 - 120	3	20

Lab Sample ID: LCSSRM 580-240266/23-A
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 240266

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	139	141		mg/Kg		101.6	70.4 - 140.3
Lead	133	144		mg/Kg		108.0	72.9 - 127.8

Lab Sample ID: MB 580-240133/1-C
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 240204

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		03/10/17 12:20	03/13/17 16:30	1
Barium	ND		0.010		mg/L		03/10/17 12:20	03/13/17 16:30	1
Cadmium	ND		0.020		mg/L		03/10/17 12:20	03/13/17 16:30	1
Chromium	ND		0.025		mg/L		03/10/17 12:20	03/13/17 16:30	1
Lead	ND		0.030		mg/L		03/10/17 12:20	03/13/17 16:30	1
Selenium	ND		0.10		mg/L		03/10/17 12:20	03/13/17 16:30	1
Silver	ND		0.050		mg/L		03/10/17 12:20	03/13/17 16:30	1

Lab Sample ID: MB 580-240133/1-C
Matrix: Solid
Analysis Batch: 240447

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 240204

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.060		mg/L		03/10/17 12:20	03/14/17 11:34	1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LCS 580-240133/2-C
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 240204

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.42		mg/L		110	80 - 120
Barium	4.00	4.00		mg/L		100	80 - 120
Cadmium	0.100	0.104		mg/L		104	80 - 120
Chromium	0.400	0.360		mg/L		90	80 - 120
Lead	1.00	0.970		mg/L		97	80 - 120
Selenium	4.00	4.65		mg/L		116	80 - 120
Silver	0.600	0.589		mg/L		98	80 - 120

Lab Sample ID: LCS 580-240133/2-C
Matrix: Solid
Analysis Batch: 240447

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 240204

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	4.34		mg/L		108	80 - 120

Lab Sample ID: LCSD 580-240133/3-C
Matrix: Solid
Analysis Batch: 240412

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 240204

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Barium	4.00	4.41		mg/L		110	80 - 120	10	20
Cadmium	0.100	0.114		mg/L		114	80 - 120	9	20
Chromium	0.400	0.398		mg/L		100	80 - 120	10	20
Lead	1.00	1.05		mg/L		105	80 - 120	8	20
Selenium	4.00	5.22	*	mg/L		131	80 - 120	12	20
Silver	0.600	0.653		mg/L		109	80 - 120	10	20

Lab Sample ID: LCSD 580-240133/3-C
Matrix: Solid
Analysis Batch: 240447

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 240204

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	4.26		mg/L		106	80 - 120	2	20

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: MB 580-240321/16-A
Matrix: Water
Analysis Batch: 240426

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 240321

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0010		mg/L		03/13/17 10:51	03/13/17 17:02	1
Lead	ND		0.00040		mg/L		03/13/17 10:51	03/13/17 17:02	1

Method: 6020A - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 580-240321/17-A
Matrix: Water
Analysis Batch: 240426

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 240321

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.00	3.96		mg/L		99	80 - 120
Lead	1.00	0.960		mg/L		96	80 - 120

Lab Sample ID: LCSD 580-240321/18-A
Matrix: Water
Analysis Batch: 240426

Client Sample ID: Lab Control Sample Dup
Prep Type: Total Recoverable
Prep Batch: 240321

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.00	4.01		mg/L		100	80 - 120	1	20
Lead	1.00	0.967		mg/L		97	80 - 120	1	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 580-240133/1-D
Matrix: Solid
Analysis Batch: 240341

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 240209

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.0020		mg/L		03/10/17 12:45	03/13/17 11:23	1

Lab Sample ID: LCS 580-240133/2-D
Matrix: Solid
Analysis Batch: 240341

Client Sample ID: Lab Control Sample
Prep Type: TCLP
Prep Batch: 240209

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.0200	0.0216		mg/L		108	80 - 120

Lab Sample ID: LCSD 580-240133/3-D
Matrix: Solid
Analysis Batch: 240341

Client Sample ID: Lab Control Sample Dup
Prep Type: TCLP
Prep Batch: 240209

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.0200	0.0215		mg/L		107	80 - 120	1	20

Client Sample ID: GW-MW-12S-030317

Lab Sample ID: 580-66530-1
Date Collected: 03/03/17 01:15
Matrix: Water
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			240321	03/13/17 10:51	ADB	TAL SEA
Total Recoverable	Analysis	6020A		5	240426	03/13/17 18:59	HJM	TAL SEA
Total Recoverable	Prep	3005A			240321	03/13/17 10:51	ADB	TAL SEA
Total Recoverable	Analysis	6020A		500	240691	03/16/17 08:33	FCW	TAL SEA

Client Sample ID: PP-Bld_B_Sample Ports-030317

Lab Sample ID: 580-66530-2
Date Collected: 03/03/17 01:40
Matrix: Water
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			240321	03/13/17 10:51	ADB	TAL SEA
Total Recoverable	Analysis	6020A		5	240426	03/13/17 19:04	HJM	TAL SEA
Total Recoverable	Prep	3005A			240321	03/13/17 10:51	ADB	TAL SEA
Total Recoverable	Analysis	6020A		500	240691	03/16/17 08:38	FCW	TAL SEA

Client Sample ID: PP-SL 90-030317

Lab Sample ID: 580-66530-3
Date Collected: 03/03/17 11:30
Matrix: Water
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total Recoverable	Prep	3005A			240321	03/13/17 10:51	ADB	TAL SEA
Total Recoverable	Analysis	6020A		5	240426	03/13/17 19:08	HJM	TAL SEA

Client Sample ID: SO-SL-90-Pilot_bottom-030317-12-12.5

Lab Sample ID: 580-66530-4
Date Collected: 03/03/17 10:35
Matrix: Solid
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:20	DSO	TAL SEA

Client Sample ID: SO-SL-90-Pilot_bottom-030317-12-12.5

Lab Sample ID: 580-66530-4
Date Collected: 03/03/17 10:35
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 99.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:10	HJM	TAL SEA

Lab Chronicle

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: SO-SL-90-Pilot_Interfac-030317-8-9 **Lab Sample ID: 580-66530-5**
Date Collected: 03/03/17 11:15 **Matrix: Solid**
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:22	DSO	TAL SEA

Client Sample ID: SO-SL-90-Pilot_Interfac-030317-8-9 **Lab Sample ID: 580-66530-5**
Date Collected: 03/03/17 11:15 **Matrix: Solid**
Date Received: 03/03/17 15:40 **Percent Solids: 99.1**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:13	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_a-030217 **Lab Sample ID: 580-66530-6**
Date Collected: 03/02/17 08:50 **Matrix: Solid**
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:06	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:10	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 12:01	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240630	03/15/17 16:39	Y1W	TAL SEA

Client Sample ID: WD-SL-79debris_a-030217 **Lab Sample ID: 580-66530-6**
Date Collected: 03/02/17 08:50 **Matrix: Solid**
Date Received: 03/03/17 15:40 **Percent Solids: 51.5**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		10	240447	03/14/17 12:30	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_a-030217-(01) **Lab Sample ID: 580-66530-7**
Date Collected: 03/02/17 08:50 **Matrix: Solid**
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:10	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA

Lab Chronicle

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Client Sample ID: WD-SL-79debris_a-030217-(01)

Lab Sample ID: 580-66530-7
Date Collected: 03/02/17 08:50
Matrix: Solid
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:13	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 11:45	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:22	DSO	TAL SEA

Client Sample ID: WD-SL-79debris_a-030217-(01)

Lab Sample ID: 580-66530-7
Date Collected: 03/02/17 08:50
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 47.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:20	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_b-030217

Lab Sample ID: 580-66530-8
Date Collected: 03/02/17 08:45
Matrix: Solid
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:13	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:17	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 11:47	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:22	DSO	TAL SEA

Client Sample ID: WD-SL-79debris_b-030217

Lab Sample ID: 580-66530-8
Date Collected: 03/02/17 08:45
Matrix: Solid
Date Received: 03/03/17 15:40
Percent Solids: 51.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:24	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_b-030217-(01) **Lab Sample ID: 580-66530-9**
Date Collected: 03/02/17 08:45 **Matrix: Solid**
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:16	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:20	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 11:49	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:55	DSO	TAL SEA

Client Sample ID: WD-SL-79debris_b-030217-(01) **Lab Sample ID: 580-66530-9**
Date Collected: 03/02/17 08:45 **Matrix: Solid**
Date Received: 03/03/17 15:40 **Percent Solids: 51.2**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:28	HJM	TAL SEA
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		10	240447	03/14/17 12:33	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_c-030217 **Lab Sample ID: 580-66530-10**
Date Collected: 03/02/17 08:35 **Matrix: Solid**
Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:20	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:23	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 11:56	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:55	DSO	TAL SEA

Client Sample ID: WD-SL-79debris_c-030217 **Lab Sample ID: 580-66530-10**
Date Collected: 03/02/17 08:35 **Matrix: Solid**
Date Received: 03/03/17 15:40 **Percent Solids: 46.2**

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:31	HJM	TAL SEA

Client Sample ID: WD-SL-79debris_c-030217-(01)

Lab Sample ID: 580-66530-11

Date Collected: 03/02/17 08:35

Matrix: Solid

Date Received: 03/03/17 15:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240412	03/13/17 17:23	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	3010A			240204	03/10/17 12:20	PAB	TAL SEA
TCLP	Analysis	6010C		1	240447	03/14/17 12:27	HJM	TAL SEA
TCLP	Leach	1311			240133	03/09/17 14:32	R1K	TAL SEA
TCLP	Prep	7470A			240209	03/10/17 12:45	PAB	TAL SEA
TCLP	Analysis	7470A		1	240341	03/13/17 11:58	FCW	TAL SEA
Total/NA	Analysis	D 2216		1	240182	03/10/17 11:55	DSO	TAL SEA

Client Sample ID: WD-SL-79debris_c-030217-(01)

Lab Sample ID: 580-66530-11

Date Collected: 03/02/17 08:35

Matrix: Solid

Date Received: 03/03/17 15:40

Percent Solids: 45.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			240266	03/10/17 17:08	PAB	TAL SEA
Total/NA	Analysis	6010C		1	240412	03/13/17 21:35	HJM	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Certification Summary

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Laboratory: TestAmerica Seattle

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-02-18
California	State Program	9	2901	01-31-18
L-A-B	DoD ELAP		L2236	01-19-19
L-A-B	ISO/IEC 17025		L2236	01-19-19
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-05-17
US Fish & Wildlife	Federal		LE058448-0	10-31-17
USDA	Federal		P330-14-00126	04-08-17
Washington	State Program	10	C553	02-17-18

Sample Summary

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66530-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-66530-1	GW-MW-12S-030317	Water	03/03/17 01:15	03/03/17 15:40
580-66530-2	PP-Bld_B_Sample Ports-030317	Water	03/03/17 01:40	03/03/17 15:40
580-66530-3	PP-SL 90-030317	Water	03/03/17 11:30	03/03/17 15:40
580-66530-4	SO-SL-90-Pilot_bottom-030317-12-12.5	Solid	03/03/17 10:35	03/03/17 15:40
580-66530-5	SO-SL-90-Pilot_Interfac-030317-8-9	Solid	03/03/17 11:15	03/03/17 15:40
580-66530-6	WD-SL-79debris_a-030217	Solid	03/02/17 08:50	03/03/17 15:40
580-66530-7	WD-SL-79debris_a-030217-(01)	Solid	03/02/17 08:50	03/03/17 15:40
580-66530-8	WD-SL-79debris_b-030217	Solid	03/02/17 08:45	03/03/17 15:40
580-66530-9	WD-SL-79debris_b-030217-(01)	Solid	03/02/17 08:45	03/03/17 15:40
580-66530-10	WD-SL-79debris_c-030217	Solid	03/02/17 08:35	03/03/17 15:40
580-66530-11	WD-SL-79debris_c-030217-(01)	Solid	03/02/17 08:35	03/03/17 15:40

Loc: 580

66530

Chain of Custody Record

CHOC Number: 05_1.1_E52_19868_03032017

Send Results To:
munsons@uspioneer.com, jking@perc-nw.com,
sduggan@perc-nw.com

Site Contact:
PIONEER Technologies Corporation
Brad Grimsted
Phone: (360) 570-1700 Email: grimstedb@uspioneer.com

PIONEER Technologies Corporation.
5205 Corporate Ctr. Court SE, Suite A
Lacey, WA 98503
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com
PIONEER TECHNOLOGIES CORPORATION

Send Invoice To:
Pacific Environmental Redevelopment Coporation
Jeff King
Phone: 425-238-2212 Email: jking@perc-nw.com

Laboratory Information:
TestAmerica-Tacoma
ELAINE WALKER
Phone: 253.248.4972 Email:

Sample Information / **Analytes**

Special Lab Instructions Included ==> / *<== Special Lab Instructions*

Sample ID (Auto Generated)	Date (MM/DD/YYYY)	Time (0000 to 2400)	Sampler's Initials	Leachate	Filtered	MS/MSD	EPA 6010C--Inorganic	Metals in Water	TCLP RCRA 8 Metals (X)	Comments for Sample
GW-MW-12S-030317	03/03/2017	01:15	BG					X		Water from MW-12S
PP-Bld_B_Sample Ports-030317	03/03/2017	01:40	BG					X		
PP-SL-90-030317	03/03/2017	11:30	BG					X		Water from Pilot SL-90 Excavation
~~SO-SL-79-022717-15~~	~~02/27/2017~~	~~00:00~~	~~BG~~				~~X~~			~~Pilot Study - Sample from bottom of...~~
SO-SL-90-Pilot_bottom-030317-12-12.5	03/03/2017	10:35	BG				X			
SO-SL-90-Pilot_Interfac-030317-8-9	03/03/2017	11:15	BG				X			
WD-SL-79debris_a-030217	03/02/2017	08:50	BG				X		X	
WD-SL-79debris_a-030217-(01)	03/02/2017	08:50	BG				X		X	
WD-SL-79debris_b-030217	03/02/2017	08:45	BG				X		X	
WD-SL-79debris_b-030217-(01)	03/02/2017	08:45	BG				X		X	
WD-SL-79debris_c-030217	03/02/2017	08:35	BG				X		X	
WD-SL-79debris_c-030217-(01)	03/02/2017	08:35	BG				X		X	

TB___ Cooler IR5 Cor 14.7 Unc 14.9
Cooler Dsc Med. blue white @Lab___
~~Wet/Packs~~ Packing none
none
Cli drop w/o CS

Cooler (Yes/No): Cooler Temp:	Turnaround Time: Std	Hazard Identification:	Sample Disposal:	Preservative: None	HNO3	None	Lab Use Only:

These data are protected by Attorney/Client Privelege. No Un-Authorized distribution is allowed.

QA/QC Requirements:

Sampling Event Comments:

1. Relinquished By: (Sign and Print) Brad Grimsted	Date/Time: 3/3/17 3:40	1. Received By: (Sign and Print) [signature] McDermott	Date/Time: 3/3/17 1540
2. Relinquished By: (Sign and Print)	Date/Time:	2. Received By: (Sign and Print)	Date/Time:
	Date/Time:	3. Received By: (Sign and Print)	Date/Time:

580-66530 Chain of Custody

Stat Form: 01 - 07/24/2015

Special Instructions for Laboratory

CHOC Number: 05_1.1_E52_19868_03032017

Send Results To: munsons@uspioneer.com, jking@perc-nw.com, sduggan@perc-nw.com	**Site Contact:** PIONEER Technologies Corporation Brad Grimsted Phone: (360) 570-1700 Email: grimstedb@uspioneer.com	PIONEER Technologies Corporation. 5205 Corporate Ctr. Court SE, Suite A Lacey, WA 98503 Phone: 360.570.1700 Fax: 360.570.1777 PIONEER TECHNOLOGIES CORPORATION
Send Invoice To: Pacific Environmental Redevelopment Coporation Jeff King Phone: 425-238-2212 Email: jking@perc-nw.com	**Laboratory Information:** TestAmerica-Tacoma ELAINE WALKER Phone: 253.248.4972 Email:	**CHOC Version: 0.99.05** **Copyright © 2003 - 2015.** **PIONEER Technologies Corporation** **All Rights Reserved**

Analytical Method	Lab Comments	Specified Analyte	Samples Included
EPA 6010C--Inorganic		Arsenic Inorganic Lead and Compounds	SO-SL-79-022717-15 WD-SL-79debris_a-030217 WD-SL-79debris_a-030217-(01) WD-SL-79debris_b-030217 WD-SL-79debris_b-030217-(01) WD-SL-79debris_c-030217 WD-SL-79debris_c-030217-(01) SO-SL-90-Pilot_bottom-030317-12-12.5 SO-SL-90-Pilot_Interfac-030317-8-9
TCLP RCRA 8 Metals	All 8 metals	Arsenic Inorganic Barium Chromium Total Lead and Compounds Mercury (elemental) Selenium Silver Cadmium	WD-SL-79debris_a-030217 WD-SL-79debris_a-030217-(01) WD-SL-79debris_b-030217 WD-SL-79debris_b-030217-(01) WD-SL-79debris_c-030217 WD-SL-79debris_c-030217-(01)
Metals in Water		Arsenic Inorganic Lead and Compounds	PP-SL-90-030317 PP-Bld_B_Sample Ports-030317 GW-MW-12S-030317

1 of 1

Login Sample Receipt Checklist

Client: Pioneer Technologies Corporation | Job Number: 580-66530-1

Login Number: 66530 | **List Source: TestAmerica Seattle**
List Number: 1
Creator: Gonzales, Steve

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	No ice
Cooler Temperature is acceptable.	False	Cooler temperature outside required temperature criteria.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Not requested on COC.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	pH adjusted
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Tel: (253)922-2310

TestAmerica Job ID: 580-66905-1
Client Project/Site: Superlon Metals Fractionation

For:
Pioneer Technologies Corporation
5205 Corporate Ctr. Ct. SE
Ste A
Olympia, Washington 98503

Attn: Brad Grimsted

Kristine D. Allen

Authorized for release by:
3/29/2017 3:18:47 PM

Kristine Allen, Manager of Project Management
(253)248-4970
kristine.allen@testamericainc.com

Designee for

Elaine Walker, Project Manager II
(253)248-4972
elaine.walker@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

1
2
3
4
5
6
7
8
9
10
11

Table of Contents

Job ID: 580-66905-1

Laboratory: TestAmerica Seattle

Narrative

Job Narrative
580-66905-1

Comments
No additional comments.

Receipt
The samples were received on 3/22/2017 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 8.1º C.

Metals
Method(s) 6020A: The following samples was diluted due to the nature of the sample matrix: PP-BLD_B-PM-PT-032217 (580-66905-4), PP-MW-12i-PM-PT-032217 (580-66905-7), PP-SL-79-PM-PT-032217 (580-66905-10) and PP-SL-90-PM-PT-032217 (580-66905-13). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method(s) 150.1, 9045D: The sample duplicate (DUP) precision for analytical batch 580-241403 was outside control limits. Sample matrix interference is suspected.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Qualifiers

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
F3	Duplicate RPD exceeds the control limit

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: PP-BLD_B-Freeflow-PT-032217

Lab Sample ID: 580-66905-1

Date Collected: 03/22/17 08:30

Matrix: Water

Date Received: 03/22/17 10:10

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.091		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:11	5
Lead	ND		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:11	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.2	HF			SU			03/27/17 09:34	1

Client Sample ID: PP-BLD_B-MFIX-PT-032217

Lab Sample ID: 580-66905-2

Date Collected: 03/22/17 08:30
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1.5		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:29	5
Lead	ND		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:29	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.3	HF			SU			03/27/17 09:37	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Client Sample ID: PP-BLD_B-MFIX-PT-032217-(01)
Lab Sample ID: 580-66905-3
Date Collected: 03/22/17 08:30
Matrix: Water
Date Received: 03/22/17 10:10

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**1.4**		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:34	5
Lead	ND		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:34	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**7.3**	**HF**			SU			03/27/17 09:39	1

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Client Sample ID: PP-BLD_B-PM-PT-032217
Date Collected: 03/22/17 08:30
Date Received: 03/22/17 10:10

Lab Sample ID: 580-66905-4
Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.61**		0.10	0.027	mg/L		03/24/17 16:46	03/27/17 19:56	100
Lead	ND		0.040	0.0034	mg/L		03/24/17 16:46	03/27/17 19:56	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**4.2**	**HF**			SU			03/27/17 09:41	1

1 2 3 4 5 6 7 8 9 10 11

Client Sample ID: PP-MW-12i-Freeflow-PT-032217

Lab Sample ID: 580-66905-5

Date Collected: 03/22/17 08:30
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.12		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:25	5
Lead	ND		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:25	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.1	HF			SU			03/27/17 09:44	1

Client Sample ID: PP-MW-12i-MFIX-PT-032217

Lab Sample ID: 580-66905-6

Date Collected: 03/22/17 08:30
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:38	5
Lead	ND		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:38	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.6	HF			SU			03/27/17 09:46	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Client Sample ID: PP-MW-12i-PM-PT-032217

Lab Sample ID: 580-66905-7

Date Collected: 03/22/17 08:45
Matrix: Water
Date Received: 03/22/17 10:10

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.2		0.10	0.027	mg/L		03/24/17 16:46	03/27/17 19:52	100
Lead	ND		0.040	0.0034	mg/L		03/24/17 16:46	03/27/17 19:52	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	3.9	HF			SU			03/27/17 09:48	1

Client Sample ID: PP-SL-79-Freeflow-PT-032217

Lab Sample ID: 580-66905-8

Date Collected: 03/22/17 08:45
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.4		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:43	5
Lead	0.0036		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:43	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.0	HF			SU			03/27/17 09:50	1

Client Sample Results

Client Sample ID: PP-SL-79-MFIX-PT-032217

Lab Sample ID: 580-66905-9

Date Collected: 03/22/17 08:45
Matrix: Water
Date Received: 03/22/17 10:10

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	11		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:47	5
Lead	0.0070		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:47	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	7.3	HF			SU			03/27/17 09:53	1

Client Sample ID: PP-SL-79-PM-PT-032217
Date Collected: 03/22/17 08:45
Date Received: 03/22/17 10:10

Lab Sample ID: 580-66905-10
Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	10		0.10	0.027	mg/L		03/24/17 16:46	03/27/17 20:01	100
Lead	ND		0.040	0.0034	mg/L		03/24/17 16:46	03/27/17 20:01	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	5.1	HF			SU			03/27/17 09:55	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Client Sample ID: PP-SL-90-Freeflow-PT-032217

Lab Sample ID: 580-66905-11

Date Collected: 03/22/17 09:00
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.013		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:16	5
Lead	0.0066		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:16	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	12.7	HF			SU			03/27/17 09:57	1

1 2 3 4 5 6 7 8 9 10 11

Client Sample ID: PP-SL-90-MFIX-PT-032217

Lab Sample ID: 580-66905-12

Date Collected: 03/22/17 09:00
Matrix: Water
Date Received: 03/22/17 10:10

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.017		0.0050	0.0014	mg/L		03/24/17 16:46	03/28/17 13:20	5
Lead	0.055		0.0020	0.00017	mg/L		03/24/17 16:46	03/28/17 13:20	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	12.8	HF			SU			03/27/17 09:59	1

Client Sample Results

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Client Sample ID: PP-SL-90-PM-PT-032217

Lab Sample ID: 580-66905-13

Date Collected: 03/22/17 09:00
Date Received: 03/22/17 10:10

Matrix: Water

Method: 6020A - Metals (ICP/MS) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.10	0.027	mg/L		03/24/17 16:46	03/27/17 20:06	100
Lead	ND		0.040	0.0034	mg/L		03/24/17 16:46	03/27/17 20:06	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**6.8**	**HF**			SU			03/27/17 10:00	1

1
2
3
4
5
6
7
8
9
10
11

Method: 6020A - Metals (ICP/MS)

Lab Sample ID: LCS 580-241356/18-A
Matrix: Water
Analysis Batch: 241499

Client Sample ID: Lab Control Sample
Prep Type: Total Recoverable
Prep Batch: 241356

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Arsenic			4.00	3.86		mg/L		97	80 - 120		
Lead			1.00	0.935		mg/L		94	80 - 120		

Lab Sample ID: LCSD 580-241356/19-A
Matrix: Water
Analysis Batch: 241499

Client Sample ID: Lab Control Sample Dup
Prep Type: Total Recoverable
Prep Batch: 241356

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic			4.00	3.89		mg/L		97	80 - 120	1	20
Lead			1.00	0.949		mg/L		95	80 - 120	1	20

Lab Sample ID: MB 580-241251/14-B
Matrix: Water
Analysis Batch: 241499

Client Sample ID: Method Blank
Prep Type: Dissolved
Prep Batch: 241356

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.010	0.0027	mg/L		03/24/17 16:46	03/27/17 15:56	10
Lead	ND		0.0040	0.00034	mg/L		03/24/17 16:46	03/27/17 15:56	10

Lab Sample ID: 580-66905-1 MS
Matrix: Water
Analysis Batch: 241499

Client Sample ID: PP-BLD_B-Freeflow-PT-032217
Prep Type: Dissolved
Prep Batch: 241356

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Arsenic	ND		4.00	3.81		mg/L		93	80 - 120		
Lead	ND		1.00	0.909		mg/L		91	80 - 120		

Lab Sample ID: 580-66905-1 MSD
Matrix: Water
Analysis Batch: 241499

Client Sample ID: PP-BLD_B-Freeflow-PT-032217
Prep Type: Dissolved
Prep Batch: 241356

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	ND		4.00	3.79		mg/L		93	80 - 120	1	20
Lead	ND		1.00	0.912		mg/L		91	80 - 120	0	20

Lab Sample ID: 580-66905-1 DU
Matrix: Water
Analysis Batch: 241499

Client Sample ID: PP-BLD_B-Freeflow-PT-032217
Prep Type: Dissolved
Prep Batch: 241356

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	ND			ND		mg/L				NC	20
Lead	ND			ND		mg/L				NC	20

Method: 150.1 - pH (Electrometric)

Lab Sample ID: 580-66905-13 DU
Matrix: Water
Analysis Batch: 241403

Client Sample ID: PP-SL-90-PM-PT-032217
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	6.8	HF	6.6	F3	SU		2	1

Client Sample ID: PP-BLD_B-Freeflow-PT-032217 **Lab Sample ID: 580-66905-1**
Date Collected: 03/22/17 08:30 **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:11	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:34	RSB	TAL SEA

Client Sample ID: PP-BLD_B-MFIX-PT-032217 **Lab Sample ID: 580-66905-2**
Date Collected: 03/22/17 08:30 **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:29	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:37	RSB	TAL SEA

Client Sample ID: PP-BLD_B-MFIX-PT-032217-(01) **Lab Sample ID: 580-66905-3**
Date Collected: 03/22/17 08:30 **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:34	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:39	RSB	TAL SEA

Client Sample ID: PP-BLD_B-PM-PT-032217 **Lab Sample ID: 580-66905-4**
Date Collected: 03/22/17 08:30 **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		100	241499	03/27/17 19:56	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:41	RSB	TAL SEA

Client Sample ID: PP-MW-12i-Freeflow-PT-032217 **Lab Sample ID: 580-66905-5**
Date Collected: 03/22/17 08:30 **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:25	FCW	TAL SEA

Client Sample ID: PP-MW-12i-Freeflow-PT-032217
Lab Sample ID: 580-66905-5
Date Collected: 03/22/17 08:30
Matrix: Water
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	150.1		1	241403	03/27/17 09:44	RSB	TAL SEA

Client Sample ID: PP-MW-12i-MFIX-PT-032217
Lab Sample ID: 580-66905-6
Date Collected: 03/22/17 08:30
Matrix: Water
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:38	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:46	RSB	TAL SEA

Client Sample ID: PP-MW-12i-PM-PT-032217
Lab Sample ID: 580-66905-7
Date Collected: 03/22/17 08:45
Matrix: Water
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		100	241499	03/27/17 19:52	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:48	RSB	TAL SEA

Client Sample ID: PP-SL-79-Freeflow-PT-032217
Lab Sample ID: 580-66905-8
Date Collected: 03/22/17 08:45
Matrix: Water
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:43	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:50	RSB	TAL SEA

Client Sample ID: PP-SL-79-MFIX-PT-032217
Lab Sample ID: 580-66905-9
Date Collected: 03/22/17 08:45
Matrix: Water
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:47	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:53	RSB	TAL SEA

Client Sample ID: PP-SL-79-PM-PT-032217 — **Lab Sample ID: 580-66905-10**
Date Collected: 03/22/17 08:45 — **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		100	241499	03/27/17 20:01	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:55	RSB	TAL SEA

Client Sample ID: PP-SL-90-Freeflow-PT-032217 — **Lab Sample ID: 580-66905-11**
Date Collected: 03/22/17 09:00 — **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:16	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:57	RSB	TAL SEA

Client Sample ID: PP-SL-90-MFIX-PT-032217 — **Lab Sample ID: 580-66905-12**
Date Collected: 03/22/17 09:00 — **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		5	241643	03/28/17 13:20	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 09:59	RSB	TAL SEA

Client Sample ID: PP-SL-90-PM-PT-032217 — **Lab Sample ID: 580-66905-13**
Date Collected: 03/22/17 09:00 — **Matrix: Water**
Date Received: 03/22/17 10:10

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Filtration	FILTRATION			241251	03/23/17 15:21	ADB	TAL SEA
Dissolved	Prep	3005A			241356	03/24/17 16:46	ADB	TAL SEA
Dissolved	Analysis	6020A		100	241499	03/27/17 20:06	FCW	TAL SEA
Total/NA	Analysis	150.1		1	241403	03/27/17 10:00	RSB	TAL SEA

Laboratory References:

TAL SEA = TestAmerica Seattle, 5755 8th Street East, Tacoma, WA 98424, TEL (253)922-2310

Laboratory: TestAmerica Seattle

The certifications listed below are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Oregon	NELAP	10	WA100007	11-05-17
Washington	State Program	10	C553	02-17-18

The following analytes are included in this report, but certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
150.1		Water	pH
6020A	3005A	Water	Arsenic
6020A	3005A	Water	Lead

Client: Pioneer Technologies Corporation
Project/Site: Superlon Metals Fractionation

TestAmerica Job ID: 580-66905-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
580-66905-1	PP-BLD_B-Freeflow-PT-032217	Water	03/22/17 08:30	03/22/17 10:10
580-66905-2	PP-BLD_B-MFIX-PT-032217	Water	03/22/17 08:30	03/22/17 10:10
580-66905-3	PP-BLD_B-MFIX-PT-032217-(01)	Water	03/22/17 08:30	03/22/17 10:10
580-66905-4	PP-BLD_B-PM-PT-032217	Water	03/22/17 08:30	03/22/17 10:10
580-66905-5	PP-MW-12i-Freeflow-PT-032217	Water	03/22/17 08:30	03/22/17 10:10
580-66905-6	PP-MW-12i-MFIX-PT-032217	Water	03/22/17 08:30	03/22/17 10:10
580-66905-7	PP-MW-12i-PM-PT-032217	Water	03/22/17 08:45	03/22/17 10:10
580-66905-8	PP-SL-79-Freeflow-PT-032217	Water	03/22/17 08:45	03/22/17 10:10
580-66905-9	PP-SL-79-MFIX-PT-032217	Water	03/22/17 08:45	03/22/17 10:10
580-66905-10	PP-SL-79-PM-PT-032217	Water	03/22/17 08:45	03/22/17 10:10
580-66905-11	PP-SL-90-Freeflow-PT-032217	Water	03/22/17 09:00	03/22/17 10:10
580-66905-12	PP-SL-90-MFIX-PT-032217	Water	03/22/17 09:00	03/22/17 10:10
580-66905-13	PP-SL-90-PM-PT-032217	Water	03/22/17 09:00	03/22/17 10:10

Chain of Custody Record

CHOC Number: 02_1.1_E52_197_21032017

Send Results To:	Site Contact:	
munsons@uspioneer.com, jking@perc-nw.com, grimstedb@uspioneer.com, sduggan@perc-nw.com	PIONEER Technologies Corporation Brad Grimsted Phone: (360) 570-1700 Email: grimstedb@uspioneer.com	PIONEER Technologies Corporation. 5205 Corporate Ctr. Court SE, Suite A Lacey, WA 98503 Phone: 360.570.1700 Fax: 360.570.1777 www.uspioneer.com PIONEER TECHNOLOGIES CORPORATION
Send Invoice To: Pacific Environmental Redevelopment Coporation Jeff King Phone: 425-238-2212 Email: jking@perc-nw.com	**Laboratory Information:** TestAmerica-Tacoma ELAINE WALKER Phone: 253.248.4972 Email:	CHOC Version: 0.99.05 Copyright © 2003 - 2015. PIONEER Technologies Corp. All Rights Reserved

Sample Information / Special Lab Instructions Included ==> / Analytes / <== Special Lab Instructions

Sample ID (Auto Generated)	Date (MM/DD/YYYY)	Time (0000 to 2400)	Sampler's Initials	Leachate	Filtered	MS/MSD	pH 150.2 USEPA	Dissolved Metals In Water							Comments for Sample
PP-BLD_B-Freeflow-PT-032217	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-BLD_B-MFIX-PT-032217	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-BLD_B-MFIX-PT-032217-(01)	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-BLD_B-PM-PT-032217	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-MW-12i-Freeflow-PT-032217	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-MW-12i-MFIX-PT-032217	03/22/2017	08:30	sm				X	X							Filter in Lab
PP-MW-12i-PM-PT-032217	03/22/2017	08:45	sm				X	X							Filter in Lab
PP-SL-79-Freeflow-PT-032217	03/22/2017	08:45	sm				X	X							Filter in Lab
PP-SL-79-MFIX-PT-032217	03/22/2017	08:45	sm				X	X							Filter in Lab
PP-SL-79-PM-PT-032217	03/22/2017	08:45	sm				X	X							Filter in Lab
PP-SL-90-Freeflow-PT-032217	03/22/2017	09:00	sm				X	X							Filter in Lab
PP-SL-90-MFIX-PT-032217	03/22/2017	09:00	sm				X	X							Filter in Lab
PP-SL-90-PM-PT-032217	03/22/2017	09:00	sm				X	X							Filter in Lab
Cooler (Yes/No): Cooler Temp:	Turnaround Time: Rush: 5 day TAT	Hazard Identification:	Sample Disposal:				HNO3	None							Lab Use Only:
							Preservative								

These data are protected by Attorney/Client Privelege. No Un-Authorized distribution is allowed.

QA/QC Requirements:

Sampling Event Comments:

580-66905 Chain of Custody

TB___ Cooler IR5 Cor 8.1 Unc 8.3
Cooler Dsc 4. blue wht Lab
Wet/Packs Packing bubble
Cl: drop w/o CS

1. Relinquished By: (Sign and Print)	Date/Time:	1. Received By: (Sign and Print)	Date/Time:
Stacy Munson	10:10am 3/22/17	M. [illegible]	3/22/17 1010
2. Relinquished By: (Sign and Print)	Date/Time:	2. Received By: (Sign and Print)	Date/Time:
3. Relinquished By: (Sign and Print)	Date/Time:	3. Received By: (Sign and Print)	Date/Time:

Stat Form: 01 - 07/24/2015 3/29/2017

Special Instructions for Laboratory

CHOC Number: 02_1.1_E52_197_21032017

Send Results To: munsons@uspioneer.com, jking@perc-nw.com, grimstedb@uspioneer.com, sduggan@perc-nw.com	**Site Contact:** PIONEER Technologies Corporation Brad Grimsted Phone: (360) 570-1700 Email: grimstedb@uspioneer.com	PIONEER Technologies Corporation. 5205 Corporate Ctr. Court SE, Suite A Lacey, WA 98503 Phone: 360.570.1700 Fax: 360.570.1777 P I O N E E R TECHNOLOGIES CORPORATION
Send Invoice To: Pacific Environmental Redevelopment Coporation Jeff King Phone: 425-238-2212 Email: jking@perc-nw.com	**Laboratory Information:** TestAmerica-Tacoma ELAINE WALKER Phone: 253.248.4972 Email:	CHOC Version: 0.99.05 Copyright © 2003 - 2015. PIONEER Technologies Corporation All Rights Reserved

Analytical Method	Lab Comments	Specified Analyte	Samples Included
150.2 USEPA pH			PP-BLD_B-Freeflow-PT-032217 PP-BLD_B-MFIX-PT-032217 PP-BLD_B-MFIX-PT-032217-(01) PP-BLD_B-PM-PT-032217 PP-MW-12i-Freeflow-PT-032217 PP-MW-12i-MFIX-PT-032217 PP-MW-12i-PM-PT-032217 PP-SL-79-Freeflow-PT-032217 PP-SL-79-MFIX-PT-032217 PP-SL-79-PM-PT-032217 PP-SL-90-Freeflow-PT-032217 PP-SL-90-MFIX-PT-032217 PP-SL-90-PM-PT-032217
Dissolved Metals In Water - 6010C		Arsenic Inorganic Lead and Compounds	PP-BLD_B-Freeflow-PT-032217 PP-BLD_B-MFIX-PT-032217 PP-BLD_B-MFIX-PT-032217-(01) PP-BLD_B-PM-PT-032217 PP-MW-12i-Freeflow-PT-032217 PP-MW-12i-MFIX-PT-032217 PP-MW-12i-PM-PT-032217 PP-SL-79-Freeflow-PT-032217 PP-SL-79-MFIX-PT-032217 PP-SL-79-PM-PT-032217 PP-SL-90-Freeflow-PT-032217 PP-SL-90-MFIX-PT-032217 PP-SL-90-PM-PT-032217

Login Sample Receipt Checklist

Client: Pioneer Technologies Corporation

Job Number: 580-66905-1

Login Number: 66905

List Source: TestAmerica Seattle

List Number: 1

Creator: Torres, Terri L

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	Received same day of collection; chilling process has begun.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Attachment A-2: Free Flow Technologies Bench-Scale Treatability Study Report

Superlon Soil Amendment Treatability Study
Prepared for Pioneer Technologies Corporation
By Robert Stanforth, Ph.D., TRC Applied Chemistry Laboratory
November, 2016

Background

A study was conducted on amendments that could be introduced into backfill material that will be placed in contact with arsenic-contaminated groundwater from the Superlon site in Tacoma Washington. Pioneer sent samples of the backfill soil and two samples of groundwater (nominally 2 mg/L and 100 mg/L arsenic) to the TRC Applied Chemistry for testing. Pioneer had originally contacted Free Flow Technologies, of Rockford, IL for testing of their reagents. Free Flow Technologies suggested that TRC do the testing directly for Pioneer. Since the contact came through Free Flow, the appropriate Free Flow products (specifically FF-200 + FS) were used in the testing.

Methods.

The backfill soil contained both fine and sand-size material as well as larger gravel size material. The gravel size material interferes with the testing, and so the backfill was sieved using a ¼" mesh size sieve, and the smaller fraction used in the testing. The smaller fraction consisted of 50% of the total, by weight.

FF-200 + FS contains two components – an iron source and a pH buffer. The treatment is based on the sorption of arsenic and lead on ferric hydroxide. The sorption process is much greater if the ferric hydroxide is freshly formed, so the reagent consists of an iron source and a buffer to precipitate the iron without raising the pH to too high a level. Various blends of these reagents were used in the testing, ranging from a 1:1 blend to a 2:1 blend of the buffer to iron source.

The soil was mixed with the treatment reagent, allowed to sit for about an hour, and then mixed with one of the two samples of groundwater. The slurry was allowed to sit overnight and then centrifuged, filtered, and the filtrate analyzed for arsenic and lead concentrations using inductively coupled plasma-atomic emission spectrometry (ICP).

Several rounds of testing were conducted using varying solid solution ratios (i.e. the amount of soil and groundwater in the sample). The solid:solution ratio is particularly important in this testing, as the additive is being added to the soil but then used to treat contaminants in the groundwater. Treatment depends on having sufficient iron in the soil to adsorb the arsenic in the groundwater. The amount of iron in contact with the water depends both on the amount of additive in the soil and on the amount of soil in contact with the water, as indicated by the solid:liquid ratio. Since the soil will be used as backfill, the groundwater will be present in the pores in the soil, which means that in the field there will be a very high solid:solution ratio and the treatment testing should reflect this high solid:liquid ratio. Since the soil is simply the carrier for the treatment additives being used to remediate the groundwater, the composition of the soil itself is not crucial, hence the removal of the larger particle size pieces from the soil does not influence the dose being used. The dose used in the testing is the same whether the complete soil is used or just the finer fraction. In other words, if the testing indicates that a 1.0% dose should be used then a 1.0% dose is needed for the total soil as well as for the finer fraction. No correction should be made for using just the finer fraction in the testing.

The initial tests used 20 mL or water mixed with 20 g soil (wet weight) or a 1:1 solid:solution ratio. The slurry was placed in 50 mL centrifuge tubes for ease in the separation. The soil settled to the bottom with a significant volume of water above it. However, in the field the solid:solution ratio will be much higher (i.e. the amount of water in the pores of the soil will be much less than the weight of the soil), and a second round of tests were run using more realistic solid:solution ratios. Also this testing was done by placing the soil and water in a 40 mL VOA vial that was completely filled, thus eliminating any air contact with the slurry. Two solid:solution ratios were used, one in which the vials was filled with backfill soil and then sufficient water added to saturate the soil, and a second which used half the amount of soil required to fill the vial, and then the vial was filled with water. Both the amount of soil and water were measured for each vial. The saturated vials had a solid:solution ratio of 5:1 (i.e. 50 g of soil contained 10 g (or mL) of water). The vials with half as much soil had a solid:solution ratio of 1.27:1. A picture of the vials is shown below:

Results

Treatment Testing

The results of the testing are given in Table 1. The groundwater samples had initial dissolved arsenic concentrations of 3.0 mg/L for the low arsenic water and 37.6 mg/L for the high arsenic water. All the treatment dosages added were successful in bring the arsenic concentrations to below the target concentration of 0.66 mg/L. A 0.25% dose of the FF-200 FS (1:1 ratio) brought arsenic down to below the treatment criterion in the saturated soil test. The higher buffer:iron source ratios resulted in higher final pH values in the water. Since arsenic adsorption is stronger at slightly acidic pH values than at slightly basic pH values, the 1:1 buffer:iron reagent is recommended. Lower doses of reagent were not tested due to the difficulty of homogeneously mixing such a small amount of dry treatment reagent in the soil to ensure uniform treatment.

Interestingly, the backfill itself with no treatment reagent lowered the arsenic concentration from the original groundwater concentration (as shown in the “None” row in the saturated soil sections of the table), presumably due to adsorption on the soil components in the backfill. The concentration was lowered to below the treatment criterion in the 3.0 mg/L sample (to 0.15 mg/L), and to slightly above the criterion in the 37.6 mg/L groundwater (to 0.94 mg/L versus the criterion of 0.66 mg/L). If the initial arsenic concentration had been higher, presumably the final concentration would be higher as well. This suggests that the soil used in areas with lower arsenic concentration groundwater may not need additional treatment. However, addition of a small amount of the FF-200 FS would provide insurance of the treatment effectiveness.

Based on the results, a dose of 0.25% FF-200 FS (at a 1:1 ratio) is recommended.

Compositional Analysis

The treatment process removes arsenic from the groundwater by binding the arsenic to particulates in the soil. During the process the compositional levels of arsenic in the soil will increase. The increase can be calculated if the solid:solution ratio is known. For the saturated soil samples (which approximates field conditions) the solid solution ratio was 5:1. Thus 500 g of soil will contain 100 mL water. Assuming the water has 100 mg/L arsenic, the increase in compositional arsenic will be

$$(100 \text{ mg/L As} \times 0.10 \text{ L}) / 500 \text{ g soil} = 20 \text{ mg/kg As}.$$

For the 37.6 mg/L arsenic concentration sample, the increase is 7.5 mg/kg arsenic.

Table 1. Groundwater Treatability Study Results

Sample		Results		
Reagent (FF-200 + FS)	Dose, %	pH	Arsenic, mg/L	Lead, mg/L
Treatment Criteria			0.66	Not Specified
Low Arsenic Groundwater				
Untreated		**6.99**	**3.0**	**0.17**
1:1 solid:liquid ratio				
1:1 FF-200:FS	0.50	6.64	0.049	0.017
	1.0	6.38	0.012	0.0286
	2.0	6.28	0.002	0.051
3:2 FF-200:FS	1.0	7.30	0.006	0.0104
	2.0	7.51	0.010	0.0165
2:1 FF-200:FS	1.0	7.93	0.023	0.0105
	2.0	9.33	0.011	0.0221
Saturated soil (5:1 solid:liquid ratio)				
1:1 FF-200:FS	None	Not Measured	0.150	0.083
	0.25		0.140	BD
	0.50		0.020	BD
	1.0		0.020	0.04
High Arsenic Groundwater				
Untreated		**6.65**	**37.6**	**0.075**
1:1 solid:liquid ratio				
1:1 FF-200:FS	0.50	6.56	0.013	0.0158
	1.0	6.19	BD	0.0246
	2.0	6.18	BD	0.0516
	3.0	6.09	BD	0.0861
	4.0	5.95	BD	0.138
3:2 FF-200:FS	1.0	7.50	0.053	0.016
	2.0	7.53	0.024	0.015
2:1 FF-200:FS	1.0	8.13	0.192	0.0383
	2.0	9.50	0.105	0.0146
1.27:1 solid:liquid ratio				
1:1 FF-200:FS	None	7.38	7.72	0.023
	0.25	6.96	0.113	0.0075
	0.50	6.65	0.031	0.022
	1.0	6.43	0.019	0.014
Saturated Soil (5:1 solid:liquid ratio)				
1:1 FF-200:FS	None	Not Measured	0.94	0.038
	0.25		0.059	BD
	0.50		0.257	BD
	1.0		0.229	BD

Superlon Site Perched Water Treatability Study
Prepared for Pioneer Technologies
By Robert Stanforth, Ph.D.
TRC Applied Chemistry Laboratory
June, 2017

Background
Some perched water samples form the Superlon site were found to contain elevated levels of arsenic and lead. Pioneer Technologies requested that a treatability study be run on the samples to see if one of the reagents used for treatment at the site – Free Flow 200-FS (1:1) – could be used to treat the perched water.

Methods and Results
A sample of the perched water labelled SL-79 was sent to the TRC Applied Chemistry Laboratory. The sample had a significant amount of suspended solids, which occupied approximately half the bottle when settled. Analysis of both the total and dissolved levels of arsenic and lead indicated that much of the arsenic and almost all the lead is contained in the particulates, with the supernatant concentrations being much lower (Table 1). Since the solids readily settle out, treatment testing was done on the supernatant after the solids have settled.

Table 1. Total and dissolved arsenic and lead concentrations in SL-79 water and solids

Sample	Results		
Perched Water			
Handling	pH	As, mg/L	Pb, mg/L
Total (including solids)	7.37	95	137
Dissolved		6.1	0.02

FF-200 FS consists of two components; FF-200 which is a pH buffer and FS. Treatment was conducted by adding varying amounts of FS to 250 mL samples of the SL-79 water. The reagent was allowed to react, then the sample divided into 50 aliquots in centrifuge tubes. Varying amounts of FF-200 were added and the samples shaken. The samples were then allowed to sit overnight, centrifuged and filtered, and the filtrate analyzed for arsenic and lead. The results are given in Table 2. The results indicate that the FF-200 FS 1:1 (i.e. the 0.1% FS : 0.1% FF-200 or 0.2% FS : 0.2% FF-200) effective treats the water. The lowest dose tested – 0.2% - brings both lead and arsenic to well below the treatment criteria for the water.

Conclusions

FF200-FS (1:1) can effectively treat the arsenic in the perched groundwater at SL-79 at doses of 0.2% and above.

Table 2. Treatment testing results on SL-79 water

Sample			Results		
FS	FF-200	Total Additive	pH	As, mg/L	Pb, mg/L
Untreated			7.50	4.43	0.03
0.1% FS	0	0.1%	6.31	<0.01	0.03
	0.1%	0.2%	6.64	0.03	0.02
	0.2%	0.3%	7.03	<0.01	0.03
	0.3%	0.4%	8.28	0.01	0.01
0.2% FS	0	0.2%	6.14	<0.01	0.05
	0.2%	0.4%	6.67	0.02	0.04
	0.4%	0.6%	7.01	0.02	0.03
	0.6%	0.8%	8.43	0.02	0.02
Treatment Criteria			-	0.66	Not Specified

Note: Doses based on weight of additive to volume of water, e.g. 0.1% = 1 g per 1000 mL water (or 0.1% by weight)

Attachment A-3: Peroxychem Bench-Scale Treatability Study Report

30 December 2016

Brad Grimsted M.S., M.B.A.
Project Manager
PIONEER Technologies Corporation
5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901

Subject: Phase I and Phase II Bench-scale Treatability Investigation Results, Superlon Site, Tacoma WA

Dear Mr. Grimsted:

A bench-scale treatability study was conducted to determine if aqueous concentrations of arsenic and lead in groundwater from the Superlon site in Tacoma, WA ("the Site") could be reduced by treatment with PeroxyChem's MetaFix® reagent. Sharp reductions in aqueous metal concentrations were observed during an initial bench-scale treatability test; however, a second bench-scale treatability study was commissioned to more accurately determine the dosage requirements of the MetaFix reagents. This report provides a summary of the results from both the original bench-scale study (Phase I) and the subsequent dosage optimization study (Phase II).

Phase I Treatability Test

Baseline Characterization of Groundwater Sample

A groundwater sample was received on 27 April 2016 and analyzed to determine the baseline pH and heavy metal concentrations. The water sample, GW-MW-125-042216, (hereinafter MW-125) was used in the Phase I treatability test.

The values reported for the MW-125 water represent soluble metals as determined by ICP analysis of a filtered (0.45 µm, glass fiber) water sample. Water samples were filtered prior to metals analyses to make the test more representative of flowing groundwater in the aquifer. Use of a 0.45 µm glass fiber filter is considered to be standard practice in metals treatment work because the pore size is small enough to remove most suspended particulate and the glass fiber filter composition ensures that colloidal organic particles will not be adsorbed. The baseline metals concentrations in Site groundwater sample are presented in Table 1.

Table 1: Baseline metals concentrations and pH in as received Site groundwater sample.

Sample ID	Units	Metals		GW pH (SU)
		Arsenic	Lead	
MW-125	mg/L	56.1	<0.03	5.14

Treatability Study Set-up for Phase I

Based on the observed baseline pH and heavy metals concentrations (Table 1), testing was conducted on 200 mL samples of the MW-125 groundwater in amber glass reaction vessels that had previously received the specified mass (1.0% or 2.0% w/w) of the appropriate MetaFix reagent (I-6A or I-7A). The reaction vessels were then sealed with Teflon® lined lids, and tumbled daily during a 7 day reaction period. Upon completion of the reaction period, the samples were filtered through a 0.45 µm glass fiber filter and analyzed for metals by ICP.

Phase I Results

Substantial reductions in soluble arsenic were observed in response to all MetaFix treatments. Soluble lead was below the detection limit in the control as well as all the treatments. The results of the treatability testing are presented in Table 2.

Table 2. Influence of MetaFix treatments on soluble heavy metals concentrations.

Control/Treatment	Units	Metals		pH
		Arsenic	Lead	(s.u.)
Control (no amendments)	mg/L	76	<0.03	7.34
1.0 wt% MetaFix I-6A	mg/L	0.14	<0.03	7.27
2.0 wt% MetaFix I-6A	mg/L	0.16	<0.03	7.80
1.0 wt% MetaFix I-7A	mg/L	0.06	<0.03	7.55
2.0 wt% MetaFix I-7A	mg/L	0.04	<0.03	8.02

Equivalent reductions in soluble arsenic were observed in response to the low (1.0% w/w) and high (2.0% w/w) doses of the two MetaFix reagents. The reduction in soluble arsenic for the I-6A reagent was approximately 99.8% to <0.2 mg/L. The reduction in soluble arsenic for the I-7A reagent was approximately 99.9% to <0.1 mg/L. Hence, both treatments at both the low and high doses reduced soluble arsenic to well below the remedial objective of 0.67 mg/L. The soluble lead concentration was below the method detection limit in the untreated control and all the MetaFix treatments so the influence of treatments upon soluble lead could not be determined.

Phase II Treatability Test

Baseline Characterization of Soil and Groundwater Samples

One soil and two groundwater samples were received on 26 October 2016 and submitted for determination of baseline pH and heavy metal concentrations. These samples were used for the Phase II treatability test.

- Soil-SO Backfill-102416-0-0.5 (hereinafter SO-Backfill)
- GW-MW-11S (hereinafter MW-11S)
- GW-MW-12S (hereinafter MW-12S)

For soil, the total compositional metals analysis was based on a simplified soil digestion procedure. The procedure is similar to the SW-846 Method 3050B; however, 6N HNO_3/4 N HCl (Aqua Regia, slightly diluted) was used rather than additions of concentrated acid as in the SW-846 method. Furthermore, in the compositional procedure, the samples were heated, and the total digestion time was 3 hours. The baseline metals values reported for the groundwater samples represent soluble metals determined by ICP analysis of filtered (0.45 µm, glass fiber) samples. Water samples were filtered prior to metals analyses to make the test more representative of flowing groundwater in the aquifer. The use of a 0.45 µm glass fiber filter is considered to be standard practice in metals treatment work because the pore size is small enough to remove most suspended particulate and the glass fiber filter composition ensures that colloidal organic particles will not be adsorbed. The baseline metals concentrations in Site soil and groundwater samples are presented in Table 3.

Table 3: Baseline metals concentrations and pH in as received Site groundwater and soil samples.

Sample ID	Units	Metals		pH (s.u.)
		Arsenic	Lead	
SO-Backfill	mg/kg	1.8	2.5	7.59
MW-12S	mg/L	2.9	0.15	6.36
MW-11S	mg/L	30.9	<0.03	6.78

Phase II Results

For the MW-12S groundwater/SO-Backfill soil blend (200 mL groundwater/50.0 g soil), the soluble arsenic concentration in the control was below the remedial goal (0.67 mg/L); however, substantial reductions in soluble arsenic were observed in response to each of the MetaFix treatments. The results suggest that, for this soil/groundwater blend, even the lowest MetaFix dosage tested (0.25% w/w) will result in reduction of soluble arsenic to below the method detection limit of 0.030 mg/L. This was true for both MetaFix I-6A and MetaFix I-7A. Soluble lead was below the detection limit in the control and all the treatments, hence, it is not possible to draw conclusions about the influence of the various MetaFix dosages on soluble lead in this soil/groundwater blend.

Table 4: Influence of MetaFix treatments on soluble metals concentrations in the MW-12S groundwater/SO-Backfill soil blend (200 mL groundwater/50.0 g soil).

Control/Treatment	Metals (mg/L)		pH (SU)
	Arsenic	Lead	
Control (no treatment)	0.24	<0.030	7.09
0.25% I-6A	<0.030	<0.030	7.18
0.5% I-6A	0.037	<0.030	7.22
1.0% I-6A	0.037	<0.030	7.24
2.0% I-6A	0.037	<0.030	7.31
0.25% I-7A	<0.030	<0.030	7.24
0.5% I-7A	<0.030	<0.030	7.23
1.0% I-7A	0.042	<0.030	7.27
2.0% I-7A	<0.030	<0.030	7.31

Table 5: Influence of MetaFix treatments on soluble metals concentrations in the MW-11S groundwater/SO-Backfill soil blend (200 mL groundwater/50.0 g soil).

Control/Treatment	Metals (mg/L)		pH (SU)
	Arsenic	Lead	
Control (no treatment)	5.69	<0.030	6.99
0.25% I-6A	0.23	<0.030	6.99
0.5% I-6A	0.072	<0.030	7.05
1.0% I-6A	<0.030	<0.030	7.06
2.0% I-6A	0.041	<0.030	7.14
0.25% I-7A	0.38	<0.030	7.05
0.5% I-7A	0.042	<0.030	7.09
1.0% I-7A	0.057	<0.030	7.17
2.0% I-7A	0.11	<0.030	7.26

For the MW-11S groundwater/SO-Backfill soil blend (200 mL groundwater/50.0 g soil), the soluble arsenic concentration in the control was 5.69 mg/L – nearly ten-fold above the remedial goal (0.67 mg/L). Substantial reductions in soluble arsenic were observed in response to each of the I-6A MetaFix treatments, and a positive dosage response was observed from as dosage was increased from 0.25% to 0.5% to 1.0% (w/w). At the 1.0% w/w dosage, soluble arsenic fell to below the method detection limit of 0.03 mg/L. When the I-6A dosage was further increased to 2.0% w/w the observed soluble arsenic concentration was 0.041 mg/L, which is probably not significantly different from the value observed for the 1.0% w/w dosage. The results suggest that, for this soil/groundwater blend, even the lowest MetaFix dosage tested (0.25% w/w) would result in reduction of soluble arsenic to below the remedial objective of 0.67 mg/L; however, more complete removal of arsenic was observed as dosage increased up to 1.0% w/w. The results also suggest that performance was slightly better with the I-6A than with the I-7A reagent. The observed performance, and the fact that the I-6A reagent has a lower selling price than the I-7A reagent, makes it clear that the best approach for treatment of arsenic at the Site would be MetaFix I-6A. Regarding dosage, our recommendation would be to go with either 0.5% or 1.0% w/w to provide a margin of safety and greater longevity of treatment.

As noted above, for the other groundwater/soil blend, the soluble lead concentration in the MW-11S groundwater/SO-Backfill soil blend lead was below the detection limit in the control and all the treatments, hence, it is not possible to draw conclusions about the influence of the various MetaFix dosages on soluble lead in this soil/groundwater blend.

Summary and Conclusions

In summary, the results of treatability testing reported here indicate that MetaFix treatment can reduce soluble concentrations of arsenic in water from the Site to well below the remedial objective. The results suggest also indicate that the MetaFix I-6A formulation is somewhat more effective than the I-7A formulation for treatment of arsenic. The dosage response results suggest that even the lowest evaluated dosage (0.25% w/w) could result in achievement of the Site remedial objective; however, the positive response to increasing dosage indicates that a one of the higher dosages (i.e., 0.5% or 1.0%) would provide increased assurance of high removal efficiency. It should also be noted that use of a higher dosage would make adequate distribution of the MetaFix reagent within the backfill matrix easier to achieve.

If you have questions regarding these results, please contact me at 949-514-1068.

Sincerely,

Alan Seech, Ph.D.
Senior Manager – Technology Applications
PeroxyChem Environmental Solutions

Copy: Stacey Telesz – PeroxyChem

Attachment A-4: Premier Magnesia Bench-Scale Treatability Study Report

200 E Lincoln Street
Mount Horeb, WI 53572
(608) 437-7413

November 28, 2016

Mr. Derek Pizarro
Premier Magnesia, LLC
1275 Drummers Lane, Suite 102
Wayne, PA 19087

Subject: Pioneer Technologies Corporation – Superlon Site Tacoma, WA.

Mr. Pizarro:

Ursus Remediation Testing & Technologies, LLC (Ursus) is pleased to provide Premier Magnesia LLC, (Premier) this report for treatability testing for the Pioneer Technologies Corporation – Superlon Site Tacoma, WA.

OBJECTIVE

The objective of the study was to evaluate the effectiveness of EnviroBlend® treated backfill material to lower dissolved phase arsenic and lead in groundwater when the treated backfill is placed in the saturated zone. The remedial objective is to reduce groundwater arsenic concentrations to < 666 ug/L and groundwater lead concentrations to < 1,650 ug/L.

BACKGROUND

One backfill material and two groundwater samples were received for the study on October 26, 2016. A description of the samples and comments are shown in Table 1.

Table 1.
Samples Received for Treatability Testing

Sample Name	Sample Date	Matrix	Comments
SO-Backfill-102416 0-0.5	10/24/16	Soil	Backfill material.
GW-MW-11S-Low 102416-(20). Low GW	10/24/16	GW	Sample received in 4 individual liter plastic containers, unpreserved. Some headspace in each container.
GW-MW-11S-High 102416-(20). High GW	10/24/16	GW	Sample received in 4 individual liter plastic containers, unpreserved. Some headspace in each container.

MATERIAL & METHODOLOGY

Backfill material was sieved to separate material > 3/8" in size. Material sized < 3/8" was treated with EnviroBlend® HXD. The EnviroBlend® HXD backfill was leached with the low concentration groundwater (GW-MW-11S-Low 102416-(20)) Low GW and the high concentration groundwater (GW-MW-11S-High 102416-(20)) High GW.

Leaching was performed in a Zero Headspace Extractor (ZHE) to retain redox conditions of groundwater. The mobility of arsenic is dependent on the oxidation state of arsenic. If groundwater arsenic is as arsenite (reduced As) and leached with exposure to air/headspace, then arsenite can be oxidized to arsenate. Arsenate is less soluble than arsenite; possibly biasing the treatment effectiveness by lowering dissolved phase total arsenic due to redox changes of arsenic. Therefore, if the groundwater is exposed to air during treatment/leaching in the laboratory, it may not model the disposal setting and may give false positives of performance.

Backfill material to groundwater ratio was performed at a 1:20 ratio (10g of backfill to 200 mls of GW). A ratio of 1:20 was performed to show the capacity of EnviroBlend® HXD treated backfill to stabilize arsenic and lead containing groundwater over time. Leachates where filtered through a 0.45µ filter prior to metal analysis.

Ursus is not a NELAC certified laboratory; therefore, results are screening results. Screening results are not intended for regulatory compliance.

RESULTS

Sizing of the backfill material was performed where the mass of backfill material > 3/8" and < 3/8" were determine. Testing found 54% by weight of the backfill was < 3/8" and 46% of the backfill material was > 3/8". For treatability testing, only the 3/8" material was used.

Compositional analysis of the < 3/8/" backfill material was performed. Testing found a total arsenic concentration of 0.88 mg/kg dry wt., 2.22 mg/kg lead dry wt., a total solids of 95%, and a bulk density of 2.18 tons/yard^3.

Total background analysis of the low and high GW samples is shown in Table 2. Arsenic concentrations exceeded the remedial objective of 666 ug/L (0.666 mg/L) for the Low GW and high GW samples. Low GW and High GW samples did not exceed the lead remedial objective of 1,650 ug/L (1.650 mg/L). Therefore, arsenic is the primary driver for treatment.

Table 2.
Dissolved Arsenic, Lead and pH of the Low and High Groundwater.

Sample Name	Arsenic, mg/L	Lead, mg/L	pH
Remedial Objective	0.666	1.650	-
GW-MW-11S-Low 102416-(20). Low GW	2.75	0.29	6.81
GW-MW-12S-High 102416-(20). High GW	36.7	0.076	6.41

Backfill material (<3/8/") was leached with the Low GW sample and the High GW sample in an "as is" untreated manner to determine baseline concentrations of GW with backfill alone. Leaching of untreated backfill material with the Low and High GW samples (Table 3) found lower arsenic concentrations when compared to background concentrations (Table 2). Thereby, the backfill material alone has properties to stabilize arsenic, but the level of stabilization is not enough to meet the remedial objective.

The <3/8" backfill material was treated with EnviroBlend® HXD at 3%, 4% and 5% by weight and leached with Low and High GW (Table 3). The low GW sample was effectively treated and met the remedial objective with a 3% EnviroBlend® HXD dosage. A 4% EnviroBlend® HXD dosage met the remedial objective for the High GW sample. In fact, the treatments reduced both arsenic and lead below their respective detection limit.

Table 3.
Screening Leaching Results of Untreated and EnviroBlend® HXD Treated Samples

Sample Name	EnviroBlend® Dosage		Treated Water Test Results, Dissolved Metals (<0.45u)		
	Chemical	Percentage wt./wt.	Final pH	Arsenic, mg/L	Lead, mg/L
Remedial Objective	-	-	-	0.666	1.650
GW-MW-11S-Low 102416-(20). Low GW	Untreated	-	7.28	1.92	0.092
	EnviroBlend® HXD	3%	6.52	<0.030	<0.030
GW-MW-12S-High 102416-(20). High GW	Untreated	-	7.26	23.0	<0.030
	EnviroBlend® HXD	3%	6.24	1.31	<0.030
		4%	6.06	<0.030	<0.030
		5%	5.66	<0.030	<0.030

This study designed testing to minimize oxidation of arsenite to arsenate by leaching samples in a ZHE. The ZHE provided a leaching environment free of air so arsenic oxidation could not occur. This better represents the disposal setting where groundwater low in oxygen and low in ORP will be exposed to treated backfill.

EnviroBlend® HXD was shown to be effective in treating arsenic and lead in groundwater at the Superlon site. EnviroBlend® HXD has demonstrated the ability to treat at least 100 PV of GW that may infiltrate the backfill material to <0.030 mg/L As and <0.030 mg/L Pb.

Sincerely,

Andrew Wenzel
Principal