

PACIFIC CREST ENVIRONMENTAL

1531 BENDIGO BOULEVARD NORTH · PO BOX 952 · NORTH BEND, WA 98045
T 425.888.4990 F 425.888.4994

January 12, 2018

Mr. Christopher Maurer
Toxics Cleanup Program
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue Southeast
Bellevue, Washington 98008

**RE: CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON INVESTIGATION
REPORT
PETRICH MARINE DOCK/MARINE IRON WORKS
1118-1120 EAST D STREET
TACOMA, WASHINGTON
FACILITY/SITE No.: 414876
VCP No.: SW0754
PACIFIC CREST NO. 129-001**

Dear Mr. Maurer:

Enclosed for your review is one hard copy and one electronic copy of the Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) Investigation Report (cPAH Report) dated January 9, 2018 prepared by Pacific Crest Environmental, LLC (Pacific Crest) for the Petrich Marine Dock (PMD)/Marine Iron Works (MIW) Site located at 1118-1120 East D Street in Tacoma, Washington (the Site). The purpose of the scope of work described in this cPAH Report was to collect further investigation data in order to respond to Washington State Department of Ecology (Ecology) comments and fill data gaps that will provide technical support for a preferred cleanup alternative.

In 2017, Ecology requested additional investigation of cPAHs in soil in the area formerly occupied by two warehouses and a boat building at the PMD Property. Previous investigation results identified areas of soil with concentrations of cPAHs that exceeded the Site-Specific Cleanup Level of 6.6 milligrams per kilogram (mg/kg) for cPAHs in this area. Based on the Site history, the results were likely associated with burial of debris from a fire at the PMD Property in 1950. As part of the final cleanup for the Site, the Draft Cleanup Action Plan included an asphalt cap over this area and an Environmental Covenant to maintain the integrity of the cap.

In accordance with a Sampling and Analysis Plan approved by Ecology, Pacific Crest collected and analyzed samples from five locations. Only one of the five sampling locations (P1) exceeded the Site-Specific Cleanup Level. Further analysis of this sample indicates the cPAHs are pyrogenic in nature (*i.e.*, combustion-related), which is consistent with debris from a fire. A biogenic PAH was also detected that is likely related to dredged sediment that was historically used as fill. The results of this investigation are consistent with previous investigations and support the cleanup approach proposed in the Draft Cleanup Action Plan dated May 27, 2016.

We trust that the information presented herein is sufficient for your needs. If you have any questions regarding the information presented herein, please do not hesitate to contact the undersigned at 425-888-4990 should you have questions, or require additional information.

Sincerely,

PACIFIC CREST ENVIRONMENTAL, LLC



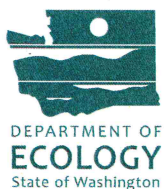
William E. Carroll, L.H.G.

Principal Hydrogeologist

Attachment: Carcinogenic Polycyclic Aromatic Hydrocarbon Investigation Report dated January 9, 2018 (3 hard copies and 1 electronic copy)

cc: Mr. Martin Petrich
Mr. Tod Gold
Ms. Clare Petrich
Ms. Kim Seely

LGH/WEC:dm



Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

REQUEST FOR OPINION FORM

Use this form to request a written opinion on your planned or completed independent remedial action under the Voluntary Cleanup Program (VCP). Attach to this form the plans or reports documenting the remedial action. Please submit only one form for each request.

Step 1: IDENTIFY HAZARDOUS WASTE SITE

Please identify below the hazardous waste site for which you are requesting a written opinion under the VCP. This information may be found on the VCP Agreement.

Facility/Site Name: Petrich Marine Dock

Facility/Site Address: 1118-1120 EAST D STREET

Facility/Site No: 414876

VCP Project No.: SW0754

Step 2: REQUEST WRITTEN OPINION ON PLAN OR REPORT

What type of independent remedial action plan or report are you submitting to Ecology for review under the VCP? Please check all that apply.

- ☐ Remedial investigation plan
- ☐ Remedial investigation report
- ☐ Feasibility study report
- ☐ Property cleanup* plan (* cleanup of one or more parcels located within the Site)
- ☐ Property cleanup* report
- ☐ Site cleanup plan
- ☐ Site cleanup report
- ☒ Other – please specify: cPAH Investigation Report

Do you want Ecology to provide you with a written opinion on the planned or completed independent remedial action?

☒ Yes ☐ No

Please note that Ecology's opinion will be limited to:

- Whether the planned or completed remedial action at the site meets the substantive requirements of the Model Toxics Control Act (MTCA), and/or
- Whether further remedial action is necessary at the site under MTCA.

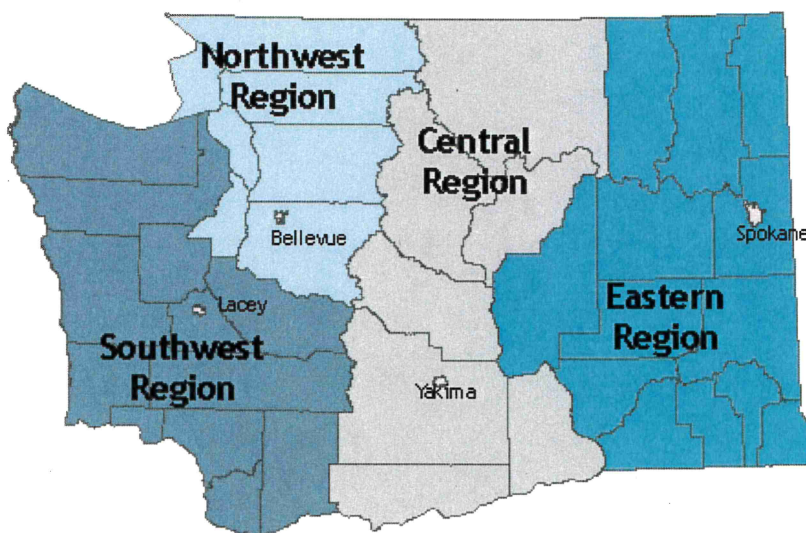
Step 3: REPRESENTATIONS AND SIGNATURE

The undersigned representative of the Customer hereby certifies that he or she is fully authorized to request services from Ecology under the Agreement for this VCP Project.

Name: Lauren Carroll		Title: Principal Hydrogeologist	
Signature: 		Date: 01/12/2018	
Organization: Pacific Crest Environmental, LLC			
Mailing address: PO Box 952			
City: North Bend		State: WA	Zip code: 98045
Phone: 425-888-4990	Fax: 425-888-4994	E-mail: lcarroll@pcenv.com	

Step 4: SUBMITTAL

Please mail your completed form and the independent remedial action plan or report that you are requesting Ecology review to the site manager Ecology assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region: Attn: VCP Coordinator 3190 160 th Ave. SE Bellevue, WA 98008-5452	Central Region: Attn: VCP Coordinator 15 W. Yakima Ave., Suite 200 Yakima, WA 98902
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	Eastern Region: Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

If you need this publication in an alternate format, please call the Toxics Cleanup Program at 360-407-7170. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

PACIFIC CREST ENVIRONMENTAL

1531 BENDIGO BOULEVARD NORTH PO BOX 952 NORTH BEND, WA 98045
T 425.888.4990 F 425.888.4994

**CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
INVESTIGATION REPORT**

**PETRICH MARINE DOCK/MARINE IRON WORKS
1118 - 1120 EAST D STREET
TACOMA, WASHINGTON 98422
FS ID 414876
VCP PROJECT NO. SW0754**

Submitted by:

**Pacific Crest Environmental, LLC
1531 Bendigo Boulevard North
North Bend, Washington 98045**

Pacific Crest PN: 129-001

For:

**Marine Iron Works, Inc.
5205 Orca Drive
Tacoma, Washington 98422**

January 9, 2018

Prepared by:



**Michael J. Black
Staff Engineer**

Reviewed by:



**William Carroll, L.G., LHG
Principal Hydrogeologist**



TABLE OF CONTENTS

1.0 INTRODUCTION.....	1-1
1.1 PURPOSE	1-1
1.2 REMEDIAL ACTION RESPONSIBILITIES.....	1-1
2.0 BACKGROUND.....	2-1
2.1 SITE HISTORY	2-1
2.1.1 Site Discovery and Regulatory Status	2-1
2.1.2 Property Description	2-1
2.1.3 Surrounding Properties.....	2-1
2.1.4 Property Development and Uses.....	2-2
2.2 NATURAL CONDITIONS	2-2
2.2.1 Physiographic Setting	2-2
2.2.2 Geologic Setting	2-2
2.2.3 Hydrogeologic Setting.....	2-3
2.2.4 Surface Water.....	2-3
2.3 HISTORIC SITE INVESTIGATION ACTIVITIES	2-3
3.0 SITE INVESTIGATION	3-1
3.1 SCOPE OF WORK.....	3-1
3.2 INVESTIGATION ACTIVITIES	3-1
3.2.1 Underground Utility Locating	3-1
3.2.2 Soil Borings.....	3-1
3.2.2.1 Sample Analysis Rationale and Data Usability	3-2
3.2.3 Decontamination and Waste Management.....	3-3
3.3 RESULTS AND DISCUSSION	3-3
4.0 CONCLUSIONS.....	4-1
5.0 REFERENCES.....	5-1
6.0 LIMITATIONS	6-1

FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan
Figure 3	Site Plan with Exceedances of Soil Cleanup Levels
Figure 4	Site Plan with Extent of cPAH Contamination in Soil
Figure 5	Site Map with Cleanup Action Elements

TABLES AND GRAPHS

Table 1	Laboratory Analytical Results - Soil
Table 2	Laboratory Analytical Results and Source Identification Ratios

APPENDICES

Appendix A	Summary of Historic Investigation and Interim Measure Activities
Appendix B	Boring Logs
Appendix C	Laboratory Analytical Reports and Histogram

EXECUTIVE SUMMARY

Pacific Crest Environmental, LLC (Pacific Crest) has prepared this Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) Investigation Report (Report) to document the results of the investigation activities conducted in August 2017 at the Marine Iron Works (MIW) Site located at the Petrich Marine Dock (PMD) Property at 1118 to 1120 East D Street in Tacoma, Washington. Previous investigations on the PMD Property to define the Site have detected concentrations of volatile organic compounds (VOCs), primarily trichloroethene (TCE); cPAHs; and metals (arsenic, cadmium, and lead) at concentrations in soil, groundwater, and/or indoor air that exceed the applicable Model Toxics Control Act (MTCA) Cleanup Regulation (Chapter 173-340 of the Washington Administrative Code [WAC 173-340] as amended October 2007) Cleanup Levels for industrial properties and/or Site-specific Cleanup Levels proposed in the Draft Cleanup Action Plan (CAP) and Remedial Design Report dated May 27, 2016 (Pacific Crest 2016).

In 2017, Ecology requested additional investigation of cPAHs in soil in the area formerly occupied by two warehouses and a boat building at the Petrich Marine Dock Site (PMD Site). Previous investigation results identified areas of soil with concentrations of cPAHs that exceeded the Site-Specific Cleanup Level of 6.6 mg/kg for carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in this area. Based on the Site history, the results were likely associated with burial of debris from a fire at the PMD Property in 1950. As part of the final cleanup for the Site, the Draft CAP included an asphalt cap over this area and an Environmental Covenant to maintain the integrity of the cap.

In accordance with a Sampling and Analysis Plan approved by Ecology, Pacific Crest collected and analyzed samples from five locations. Only one of the five sampling locations (P1) exceeded the Site-Specific Cleanup Level. Further analysis of this sample indicates the cPAHs are pyrogenic in nature (*i.e.*, combustion-related), which is consistent with debris from a fire. A biogenic PAH was also detected that is likely related to dredged sediment that was historically used as fill.

PAHs in the environment are strongly partitioned into organic-containing materials, including soil. There is little indication that PAHs in soil at the Site are mobile. Since 2009, cPAHs have not been detected in the groundwater monitoring well downgradient from the area exceeding the Site-Specific Cleanup Level (MW-10).

As explained in the Draft Cleanup Action Plan, the asphalt cap over the area impacted by cPAHs is protective of human health and the environment. The owner of the Site has agreed to record an Environmental Covenant that will maintain the integrity of the asphalt cap. The cost to excavate soil from this area is disproportionate to the cost of maintaining the asphalt cap.

1.0 INTRODUCTION

Pacific Crest Environmental, LLC (Pacific Crest) has prepared this Carcinogenic Polycyclic Aromatic Hydrocarbon (cPAH) Investigation Report (Report) to document the results of the investigation activities conducted in August 2017 to resolve data gaps identified by the Washington State Department of Ecology (Ecology) for the Marine Iron Works (MIW) Site¹ located at the Petrich Marine Dock (PMD) Property at 1118 to 1120 East D Street in Tacoma, Washington (Figure 1). Previous investigations² on the PMD Property to define the Site have detected concentrations of volatile organic compounds (VOCs), primarily trichloroethene (TCE); cPAHs; and metals (arsenic, cadmium, and lead) at concentrations in soil, groundwater, and/or indoor air that exceed the applicable Model Toxics Control Act (MTCA) Cleanup Regulation (Chapter 173-340 of the Washington Administrative Code [WAC 173-340] as amended October 2007) Cleanup Levels for industrial properties and/or Site-specific Cleanup Levels proposed in the Draft Cleanup Action Plan (CAP) and Remedial Design Report dated May 27, 2016 (Pacific Crest 2016).

The Site is enrolled in Ecology's Voluntary Cleanup Program (VCP) and has been assigned VCP Project No. SW0754 and Facility/Site No. 414876 by Ecology. The cleanup action is being implemented to mitigate confirmed concentrations of contaminants of concern (COCs) in the media of concern that exceed the Site-specific Cleanup Levels established during the remedial investigation (RI). The Cleanup Levels for the Site COCs were developed in accordance with MTCA and have been approved by Ecology.

1.1 PURPOSE

Ecology is in the process of reviewing a revised draft CAP prepared by Pacific Crest, dated May 27, 2016, but has not yet issued an Opinion Letter. During the past several months, Ecology's VCP Project Manager (Mr. Christopher Maurer) has communicated with Pacific Crest in a series of emails that requested additional information about specifics presented in the draft CAP. Ecology's comments on the draft CAP focused on an area defined by sample locations B-8, B-63, MW-9, P-1-NM55:1.5, P1-UV58:6, B-70, P12-K25:2.5, P12-O20:7, and, P12-ST37:2.5, and on data gaps associated with cPAH concentrations in soil that exceed a remediation level of 20 milligrams per kilogram (mg/kg).

The purpose of the scope of work described in this Report is to collect further investigation data in order to respond to Ecology's comments and fill data gaps that will provide technical support for a preferred cleanup alternative.

1.2 REMEDIAL ACTION RESPONSIBILITIES

The remedial action is being conducted under the direction of MIW:

Marine Iron Works, Inc.
Mr. Martin Petrich

¹ A Site, as defined in MTCA (WAC 173-340-200), is "...any area where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed or otherwise come to be located."

² Multiple "phased" environmental investigations have been performed by different companies at the PMD Property.

5205 Orca Drive
Tacoma, Washington 98422

The environmental consultants for the remedial action are:

Mr. William Carroll
Pacific Crest Environmental, LLC
P.O. Box 952
1531 Bendigo Boulevard North
North Bend, Washington 98045

2.0 BACKGROUND

2.1 SITE HISTORY

2.1.1 Site Discovery and Regulatory Status

In 1993, during a preliminary due diligence subsurface investigation performed by Hart Crowser, Inc. (Hart Crowser) (Hart Crowser 1994), laboratory analysis detected metals; VOCs; semi-volatile organic compounds (SVOCs); and total petroleum hydrocarbons (TPH) at concentrations above preliminary screening levels (PSLs) established for the Site. MTCA Method A and Method B Cleanup Levels were used as PSLs to identify contaminants of potential concern (COPCs) prior to the development of the current Site-specific Cleanup Levels. Further investigation on the PMD Property identified apparent source areas where releases occurred (EPI 2005; EPI 2006; EPI 2008; Pacific Crest 2009; and Pacific Crest 2010).

In 2008, MIW enrolled the Site in the VCP for the purpose of obtaining Opinion Letters from Ecology regarding the sufficiency of the remedial action activities in meeting the substantive requirements of MTCA and, ultimately, to obtain a No Further Action (NFA) determination for the Site. In an Opinion Letter dated October 8, 2010 (Ecology 2010), Ecology: provided concurrence with the Remedial Investigation (RI) COCs; established cleanup standards for soil, groundwater, and indoor air; provided concurrence with the selected alternative for the cleanup of CVOCs; requested additional characterization of metals in soil and the vapor intrusion (VI) pathway; and provided further information regarding the proposed disposition of cPAHs.

2.1.2 Property Description

The PMD Property consists of an approximately 2.5-acre rectangular parcel located south of the 11th Street Bridge between East D Street and the Thea Foss Waterway in Tacoma, Washington. The PMD Property is flat and currently developed with two structures identified as the Former Puget Sound Heat Treating Building (Former PSHT Building) and the Former MIW Building. Historical structures on the PMD Property that were demolished to facilitate remedial activities are identified as: Warehouse No. 1; Warehouse No. 2; Warehouse No. 3; Warehouse No. 4; and an office area located on the northwest side of the Former MIW Building (Former PMD Office). The portion of the PMD Property located adjacent to the Thea Foss Waterway consists of bulkhead and shoreline that is armored with rip-rap. Current and former structures on the PMD Property are illustrated on Figure 2.

The City of Tacoma zoning designations for the PMD Property are summarized below:

- **Mixed Use Zone - Site Area No. 1 (SA-1)** - The western portion (approximately 51,613 square feet) of the PMD Property is located within the Thea Foss Waterway Shoreline District (S-8) and zoned Combined Shoreline (S), a mixed-use designation that allows for commercial and residential development.
- **Industrial Zone - Site Area No. 2 (SA-2)** - The eastern portion (approximately 65,145 square feet) of the PMD Property is zoned Heavy Industrial (M2).

2.1.3 Surrounding Properties

Adjacent land use is briefly summarized as follows:

- To the east, the PMD Property is bordered by East D Street and beyond by a vacant lot;
- To the north, the PMD Property is bordered by East 11th Street and the 11th Street Bridge;
- To the south, the PMD Property is bordered by property owned by the Woodworth Family Foundation (Woodworth); and
- To the west, the PMD Property is bordered by the Thea Foss Waterway.

2.1.4 Property Development and Uses

Industrial activities have been conducted on the PMD Property since the early 1900s. The historic operations on the PMD Property included:

- 1910 to 1938 – Vermont Marble occupied a portion of the PMD Property.
- 1940s – Western Boat Building Company conducted wooden-hulled ship building activities inside a large enclosed structure (Western Boat Building No. 1), illustrated on Figure 2.
- 1940s to 1993 – MIW operated within a portion of Western Boat Building No. 1 in the 1940s. Western Boat Building No. 1 burned completely to the ground in 1950 and was subsequently rebuilt to house MIW operations (Former MIW Building). MIW operations included forging and machining metal components for marine and aerospace applications. Chemicals used in the MIW operations included: chlorinated solvents for degreasing; petroleum based solvents and fuels; machine cutting oil; and various paints.
- Other companies that operated on the PMD Property included: Charles B. Rogers Company, a battery manufacturer; Puget Sound Heat Treating; Drury and Petrich, a marine equipment consultant and vessel retro-fit contractor; Pan Alaska Fisheries; Dutch Harbor Seafood; and West Air Filters.
- Equipment and vessels used in operations on the PMD Property included: parts degreaser, paint booth, boiler, catch basins, concrete filled sump, quench tanks, and catch basins

2.2 NATURAL CONDITIONS

2.2.1 Physiographic Setting

The Site surface elevation is approximately 12 feet above mean sea level (amsl) on level ground. The Thea Foss Waterway is located directly east of the property and discharges into Commencement Bay, approximately 0.6 miles to the north.

In the late 1800s, the southern and eastern shoreline of Commencement Bay consisted of tide flats formed as part of the Puyallup River delta. Dredge and fill activities conducted since the 1920s have significantly changed the estuarine nature of this shoreline and the tide flats. The historic meandering streams and rivers were dredged to form waterways; and the intertidal areas between the waterways were filled with dredge material to create usable land. The newly created land has since been used by commercial and industrial operations including: shipbuilding, chemical manufacturing, ore smelting, oil refining, food preservation, and transportation facilities.

2.2.2 Geologic Setting

The regional unconsolidated geology in the vicinity of the Site consists primarily of interbedded Pleistocene Era clays, silts, and sands deposited as a result of glacial activity. Glacial outwash

sediments in the region were deposited, eroded, and re-deposited by rivers and streams. The advance and retreat of glacial ice sheets also resulted in the compaction of underlying clay sediments into glacial till. Alluvial deposits in the region are present in the vicinity of streams in the major regional river valleys and typically consist of unconsolidated, stratified, clay, silt, and very fine to fine sand, with considerable organic matter. Medium to coarse sand and gravel units underlie much of the fine-grained floodplain sediment in the region and are common in small stream valley bottoms (Galster and Laprade 1991).

2.2.3 Hydrogeologic Setting

Water resources that influence the Site groundwater include the Thea Foss Waterway and upland non-potable groundwater aquifers. Groundwater aquifers in the Puget Sound Region are generally confined to recent alluvial deposits of sands and gravel. These aquifers are delimited by aquitards consisting of glacial till deposits. Discontinuous perched shallow groundwater zones may be seasonally or locally present above the glacial till deposits (Galster and Laprade 1991).

The Thea Foss Waterway is tidally influenced and average water level fluctuations range from +0.57 Mean Lower Low Water (MLLW) to +12.4 feet Mean Higher High Water (MHHW). Groundwater is encountered in the monitoring wells installed on the PMD Property at depths ranging from approximately 6 to 12 feet below ground surface (bgs), and groundwater elevations are influenced by tidal fluctuations in the Thea Foss Waterway. Due to the close proximity of the Thea Foss Waterway, groundwater has elevated salinity and subsequently meets the MTCA criteria for non-potability [WAC 173-340-720(2)]. The direction of groundwater flow beneath the PMD Property is to the west under a hydraulic gradient which has averaged 0.004 feet/foot. Due to the tidal influence, the east to west gradient becomes steeper at low tide and more gradual at high tide.

2.2.4 Surface Water

The PMD Property is located adjacent to the Thea Foss Waterway and Commencement Bay. In 1983, the United States Environmental Protection Agency (EPA) placed portions of Commencement Bay, including the Thea Foss Waterway, on the Superfund National Priorities List due to widespread contamination of the water, sediments, and upland areas.

2.3 HISTORIC SITE INVESTIGATION ACTIVITIES

Since 1993, subsurface investigations have been conducted on the PMD Property to assess the nature and extent of COPCs in the media of concern and to characterize the geologic and hydrogeologic conditions at the Site. The historic investigation activities included: advancing soil borings; installing groundwater monitoring wells; and collecting soil, catch basin sediment, and groundwater samples for laboratory analysis. Beginning in 2007, interim remedial action (IRA) activities have been conducted on the PMD Property to remediate affected media. The Site features relevant to the investigation and cleanup are illustrated on Figure 2. A chronologic summary of investigation and IRA activities is presented in Appendix A.

2.3.1 PAHs in Soil and Groundwater

Carcinogenic and non-carcinogenic PAHs are ubiquitous in the environment due to their presence in naturally occurring materials and their formation through incomplete combustion. The fate and transport of PAHs in the environment is a function of the physical and chemical properties of PAHs. PAHs are more soluble in oil than in water; and PAHs with greater numbers of aromatic

rings (and therefore higher molecular weights) are less water-soluble and less volatile than those with fewer aromatic rings. PAHs are also generally recalcitrant to biological degradation processes. As a result of their chemical properties, PAHs in the environment are strongly partitioned into organic-containing materials, including soil, sediment, and oil-containing substances, relative to water or air.

When establishing cleanup levels or remediation levels under MTCA, a mixture of cPAHs is considered as a single hazardous substance using the reference substance benzo(a)pyrene. The toxicity equivalency factor (TEF) for each cPAH is an estimate of the relative toxicity of the cPAH compound compared to benzo(a)pyrene. The Cleanup Levels for cPAHs proposed in the draft CAP dated May 27, 2016 are summarized below

Media of Concern	Exposure Pathway	Site Area No. 1 and No. 2
		National Toxics Rule (40 CFR 131)
Air	Not Applicable	
Surface Water	Human Ingestion of Biota	0.049 µg/L
Groundwater	Protection of Surface Water	
Soil	Protection of Surface Water	6.6 mg/kg

The extent of cPAHs at concentrations above these Site-Specific Cleanup Levels in the media of concern is discussed below:

- **Groundwater and Surface Water** –The laboratory analysis of the groundwater sample collected from Well MW-10 during the June 2008 groundwater monitoring event detected total TEF-modified cPAHs at a concentration exceeding the RI Cleanup Level. Laboratory analysis of the groundwater sample collected from Well MW-10 between March 2009 and March 2014 did not detect concentrations of total TEF-modified cPAHs above either the practical quantitation limit (PQL) of the analytical method or the Site-Specific Cleanup Level.
- **Soil** – Historically, TEF-modified cPAHs have been detected in soil at concentrations ranging from 0.01 mg/kg to 33.4 mg/kg. Concentrations of cPAHs in select soil samples exceed the proposed Site-Specific Cleanup Levels of 6.6 mg/kg. The primary cPAH source area characterized during the IRA activities is located in the vicinity of Former Western Boat Building No. 1, Warehouse No. 1 and Former Warehouse No. 2.

3.0 SITE INVESTIGATION

3.1 SCOPE OF WORK

The investigation activities were conducted in August 2017 to assess the nature and extent of the cPAHs in the vicinity of former Western Boat Building No. 1, Warehouse No. 1, and Warehouse No. 2. The scope of work for the Data Gap Investigation is provided below:

- Conducting underground utility locating activities at the proposed boring locations; and,
- Advancing five soil borings (P1 through P5) in the footprint of Warehouse No. 1 and Warehouse No. 2 using direct-push drilling methods, and collecting soil samples for laboratory analysis.

The scope of work was conducted in accordance with the Sampling and Analysis Plan (SAP) dated July 27, 2017. The SAP was reviewed by Ecology and the scope was approved in an email dated July 31, 2017. A narrative summary of the investigation activities is provided in the following sections.

3.2 INVESTIGATION ACTIVITIES

3.2.1 Underground Utility Locating

On August 1, 2017, Pacific Crest met with utility locators from Puget Sound Energy and, on August 15, 2017, Pacific Crest and Applied Professional Services of North Bend, Washington conducted subsurface utility locating activities to determine the location of conductible utilities in the vicinity of the proposed boring locations. The Washington One-Call public utility locating service was also contacted at least 72 hours prior to initiation of field activities.

3.2.2 Soil Borings

On August 15, 2017, borings P1 through P5 were advanced using direct-push sampling methods to total depths of 8.0-feet bgs by ESN Northwest, Inc. (ESN NW) under the direction of a Pacific Crest engineer. Borings P1 and P2 were located in the footprint of former Warehouse No. 1 and borings P3, P4 and P5 were located in the footprint of former Warehouse No. 2. All five borings were located within the footprint of former Western Boat Building No. 1.

Soil samples collected from the borings were described in accordance with the Unified Soils Classification System (USCS), and inspected for evidence of visual and olfactory indications of contamination. Soil vapor headspace analysis was conducted to field screen the samples for total volatile organic compound (TVOC) concentrations using a photoionization detector (PID). The soil vapor headspace analysis was performed by placing a portion of soil from each sample interval into a re-sealable plastic bag, allowing the sample to warm for several minutes, and recording the highest TVOC concentration inside the bag measured over a 30-second span using a PID. The USCS descriptions, observations of contamination, and field screening data were recorded on boring logs. Copies of the boring logs are provided in Appendix B.

Two soil samples were collected from each soil boring: one sample from between approximately 0.5 ft bgs and 3 ft bgs (Shallow Zone) and one sample from between approximately 5 ft bgs and 8 ft bgs (Deep Zone). Soil samples collected for laboratory analysis of non-VOCs were prepared in accordance with Environmental Protection Agency (EPA) guidelines and Pacific Crest Standard

Operating Procedures (SOPs). Soil samples selected for potential chemical analysis of cPAH related contaminants were placed into laboratory-prepared sample containers, appropriately labeled, placed into a cooler on ice, and transported to Apex Laboratories, LLC (Apex) of Tigard, Oregon, under standard chain-of-custody protocols. Apex analyzed samples for cPAHs by SW-846 Method 8270, TPH as diesel range organics (DRO) and oil range organics (ORO) by Ecology Method NWTPH-Dx, Parent and Alkylated PAHs, and High Resolution GC Fingerprint (ASTM D2887). In order to assess the impact of particles greater than 2 millimeters (mm) in size, Apex used a sieve to mechanically remove larger particles from select samples, as described in the following section.

Soil samples collected for laboratory analysis of halogenated VOCs (HVOCs) were prepared in accordance with SW-846 Method 5035A. The samples were placed into laboratory-prepared sample containers, appropriately labeled, placed into a cooler on ice, and transported to OnSite Environmental, Inc. (OnSite), under standard chain-of-custody protocols. OnSite analyzed the samples for HVOCs by SW-846 Method 8260.

Copies of the laboratory analytical reports are provided in Appendix C.

3.2.2.1 Sample Analysis Rationale and Data Usability

Laboratory analytical methods for soil samples were selected by Pacific Crest in an iterative approach. The MTCA Method A Cleanup Levels for Industrial Properties were used as PSLs and the values presented in the dCAP were used as the Site Specific Cleanup Levels. The selection process is described below:

- **Step 1 – Initial Analysis** - All soil samples collected from the Shallow Zone were analyzed for cPAHs by SW-846 Method 8270 and for HVOCs by SW-846 Method 8260.
- **Step 2 – Data Analysis and Sample Selection for Further Testing (Part 1)** - The initial results and decision process for further analysis are described below:
 - o **P1:** Laboratory analysis of the Shallow Zone sample detected cPAHs at concentrations above the PSL and above the Site-Specific Cleanup Level. The Shallow and Deep Zone samples were sieved to remove particles greater than 2 mm and selected for further analysis of DRO, ORO and cPAHs.
 - o **P4:** Laboratory analysis of the Shallow Zone sample detected cPAHs at concentrations above the PSL, but below the Site-Specific Cleanup Level. The Shallow and Deep Zone were sieved to remove particles greater than 2 mm and selected for further analysis of DRO, ORO and cPAHs.
 - o **P5:** Laboratory analysis of the Shallow Zone sample detected cPAHs at a concentration below the PSL. The Deep Zone sample was sieved to remove particles greater than 2 mm and selected for further analysis of cPAHs.
 - o **P2 and P3:** Laboratory analysis of the Shallow Zone samples either detected cPAHs at concentrations below the PSL or cPAHs were not detected. Further analysis of samples from borings P2 and P3 was deemed unnecessary due to the absence of contamination in the Shallow Zone samples.
- **Step 3 - Data Analysis and Sample Selection for Further Testing (Part 2)** - The results from Step 2 and decision process for further analysis are described below:

- o **P1:** Laboratory analysis of the sieved Shallow and Deep Zone samples detected cPAHs at concentrations above the PSL and above the Site-Specific Cleanup Level. Laboratory analysis of the Shallow Zone sample detected ORO at a concentration below the PSL and did not detect DRO. The sieved Shallow Zone sample was selected for further analysis as follows: Parent and Alkylated PAHs by SW-846 Method 8270, and High Resolution GC Fingerprint (ASTM D2887).
- o **P4:** Laboratory analysis of the sieved Deep Zone sample detected cPAHs at concentrations below the PSL. Laboratory analysis of the sieved Shallow Zone sample detected ORO at a concentration below the PSL and did not detect DRO. Further analysis of samples from boring P4 was deemed unnecessary.
- o **P5:** Laboratory analysis of the sieved Deep Zone sample detected cPAHs at concentrations below the PSL. Further analysis of samples from boring P5 was deemed unnecessary.

3.2.3 Decontamination and Waste Management

All non-dedicated field sampling equipment was cleaned and decontaminated between each use and prior to leaving the Site using an aqueous solution of Alconox, and triple rinsed in distilled water. Investigation-derived waste, including decontamination wash water, was temporarily contained on the PMD Property in sealed and appropriately labeled Washington State Department of Transportation-approved steel drums pending waste profiling and proper disposal.

3.3 RESULTS AND DISCUSSION

The results of the investigation are discussed below:

- The subsurface soil encountered in borings P1 through P5 consisted of silt-sand mixtures with gravel. Debris (brick, wood, glass, and slag) was also observed in borings P1, P2, and P4 between five and eight feet bgs.
- When sampling soil to determine compliance with the MTCA regulations, solid particles greater than 2 mm in size should be removed (WAC 173-340-740(7)(a)). In order to prevent false positives for soil contamination, select samples were sieved to remove large particles and re-analyzed.
- Laboratory analytical results are summarized in Table 1 and illustrated on Figure 3. The results are discussed below:
 - o Laboratory analysis of the un-sieved Shallow Zone sample collected from the boring P1 detected Total TEF Modified cPAHs at a concentration of 32.3 mg/kg, exceeding the TEF Modified cPAH Site-Specific Cleanup Level of 6.6 mg/kg. The Shallow Zone sample was sieved and reanalyzed for cPAHs. Laboratory analysis of the sieved sample detected Total TEF Modified cPAHs at a concentration of 38.1 mg/kg, exceeding the TEF Modified cPAH Site Specific Cleanup Level.
 - o Laboratory analysis of the Shallow Zone soil sample from boring P4 detected cPAHs at a concentration of 2.9 mg/kg, exceeding the MTCA Method A Cleanup Level for Total TEF Modified cPAHs of 2 mg/kg, but not exceeding the Site-Specific Cleanup Level. The detected concentrations in shallow soil samples collected from borings P-2, P-3, and P-5 were below the Site-specific Cleanup Level.

- o Laboratory analysis of the un-sieved Shallow Zone samples from boring P2, P3, and P5 and the sieved Deep Zone samples collected from borings P4 and P5 did not exceed the MTCA Method A Cleanup Level for Total TEF Modified cPAHs of 2 mg/kg.
 - o Laboratory analysis of the Shallow Zone soil sample from boring P5 detected TCE at a concentration of 0.5 mg/kg, exceeding the Site-Specific Cleanup Level of 0.13 mg/kg. The detected concentrations in shallow soil samples collected from borings P1 through P4 were below the Site-specific Cleanup Level.
 - o Concentrations of the other COCs were either detected below their respective MTCA Method A or B Cleanup Levels or were not detected at or above the laboratory method detection.
- In order to evaluate the likely source of the cPAHs in soil, the analytical data compared to published data (Whitacre 2015) for the following ratios of combustion products petrogenic and pyrogenic materials (Table 2):
 - o **PAH Apportionment** - Individual compounds can be assigned to one of four categories: pyrogenic, petrogenic, biogenic, or not-apportioned (Sout et. al 2004) on the basis of chemical properties and experimental data. Laboratory analysis of the Shallow Zone sample collected from boring P1 detected PAHs that are assigned to the pyrogenic, biogenic or not-apportioned categories. None of the petrogenic compounds were detected.
 - o **Fluoranthene to Pyrene (FI0/PY0) Ratio** - Provides an indication of the temperature of formation. The ratio calculated for analytical data was not within either the petrogenic or pyrogenic ranges.
 - o **Benzo(a)Anthracene to Chrysene (BaA/C0) Ratio** - Provides an indication of a combustion or non-combustion source. The ratio calculated using the Site data indicate that the source is combustion (pyrogenic) related.
 - o **Pyrene to Benzo(a)Pyrene (PY0/BaP) Ratio** - Provides an indication of a combustion or non-combustion source. The ratio calculated using the Site data indicate that the source is combustion (pyrogenic) related.
 - o **Perylene (PER)** – Perylene is considered a biogenic PAH and is not an indicator of either petrogenic or pyrogenic processes. Elevated concentrations of perylene have been used as an indicator of natural processes in marine sediments. The Site data indicate that biogenic sources have contributed to the total concentrations of PAHs. Considering the proximity to the Thea Foss Waterway, use of dredge material as fill is a potential additional source of PAHs on the Site.
 - o **Indeno(1,2,3,-cd)pyrene to Benzo(g,h,i)perylene (IP/ghi) Ratio** - Used to distinguish/apportion distinct pyrogenic sources. The ratio calculated using the Site data indicate that the source is combustion (pyrogenic) related.

4.0 CONCLUSIONS

The conclusions of the investigation activities described in this Report are summarized below:

- The observed distribution of cPAHs at the Site appears correlated with increased prevalence of fill material in the area of the former Western Boat Building No. 1 that burned down in 1950.
- The majority of the cPAHs detected in soil appear to be pyrogenic in nature and are likely related to the fire that destroyed the Western Boat Building No. 1. A biogenic PAH was also detected in soil that is likely related to dredge material used as fill. Carcinogenic and non-carcinogenic PAHs that are associated with petroleum products were not detected in soil.
- Laboratory analysis detected concentrations of cPAHs exceeding the Site Specific Cleanup Level in only one of the five sampling locations (P1). The results of the recent sampling indicate a smaller footprint of cPAH contaminated, as illustrated on Figure 4.
- Since 2009, cPAHs have not been detected in the groundwater monitoring well downgradient from the area exceeding the Site-Specific Cleanup Level (MW-10).
- The cleanup approach proposed in the Draft CAP date May 27, 2016 for cPAHs in soil is capping with asphalt to prevent exposure and recording an Environmental Covenant to maintain the integrity of the asphalt cap (Figure 5). Based on the results of the recent soil and historic groundwater characterization and the apparent pyrogenic/biogenic origin of the cPAHs, the proposed cleanup approach is protective of human health and the environment and the cost of excavation and off-site disposal of soil with concentrations of cPAHs greater than Ecology's proposed remediation level of 20 mg/kg is likely to be disproportionate to the cost of maintaining an asphalt cap as an engineered barrier.

5.0 REFERENCES

- Ecology (Washington State Department of Ecology). 2010. *Opinion Letter on Proposed Cleanup – Petrich Marine Dock*. October 8.
- Environmental Partners, Inc. (EPI). 2005. *Remedial Investigation Report, Petrich Marine Dock, 1118 – 1120 East D Street, Tacoma, Washington*. March 28.
- EPI. 2006. *Cleanup Action Plan, Petrich Marine Dock, 1118 – 1120 East D Street, Tacoma, Washington*. May 19.
- EPI. 2008. *Interim Remedial Action Report – Petrich Marine Dock, 1120 East D Street, Tacoma Washington*. November 26.
- Galster, R.W. and W.T. Laprade. 1991. *Geology of Seattle, Washington, United States of America*. Bulletin of the Association of Engineering Geologists Vol. XXVIII, No. 3: 235-302.
- Hart Crowser. 1994. *Preliminary Environmental Assessment, Marine Ironworks and Puget Sound Heat Treating, Tacoma Washington*. March 2.
- Pacific Crest (Pacific Crest Environmental, LLC). 2009. *Draft Remedial Investigation/Feasibility Study Report – Petrich Marine Dock, Tacoma, Washington*. November 13.
- Pacific Crest. 2010. *Addendum to the Draft Remedial Investigation/Feasibility Study– Marine Iron Works Site, Petrich Marine Dock, Tacoma, Washington*. April 16.
- Pacific Crest. 2016. *Draft for Ecology Review Cleanup Action Plan and Remedial Design – Marine Iron Works Site, Petrich Marine Dock, Tacoma, Washington*. May 27.
- Whitacre, D.M. (ed.). 2015. *Reviews of Environmental Contamination and Toxicology Volume 234, Reviews of Environmental Contamination and Toxicology. Source Characterization of Polycyclic Aromatic Hydrocarbons by Using Their Molecular Indices: An Overview of Possibilities*. pp 49 – 133. Springer International Publishing Switzerland

6.0 LIMITATIONS

The conclusions and recommendations contained in this report are based on professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted hydrogeologic and engineering standards and practices applicable to this location and are subject to the following inherent limitations:

- **Accuracy of Information.** Certain information used by Pacific Crest in this report has been obtained, reviewed, and evaluated from various sources believed to be reliable. Although the conclusions, opinions, and recommendations are based in part on such information, Pacific Crest's services did not include the verification of its accuracy or authenticity. Should such information prove to be inaccurate or unreliable, Pacific Crest reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

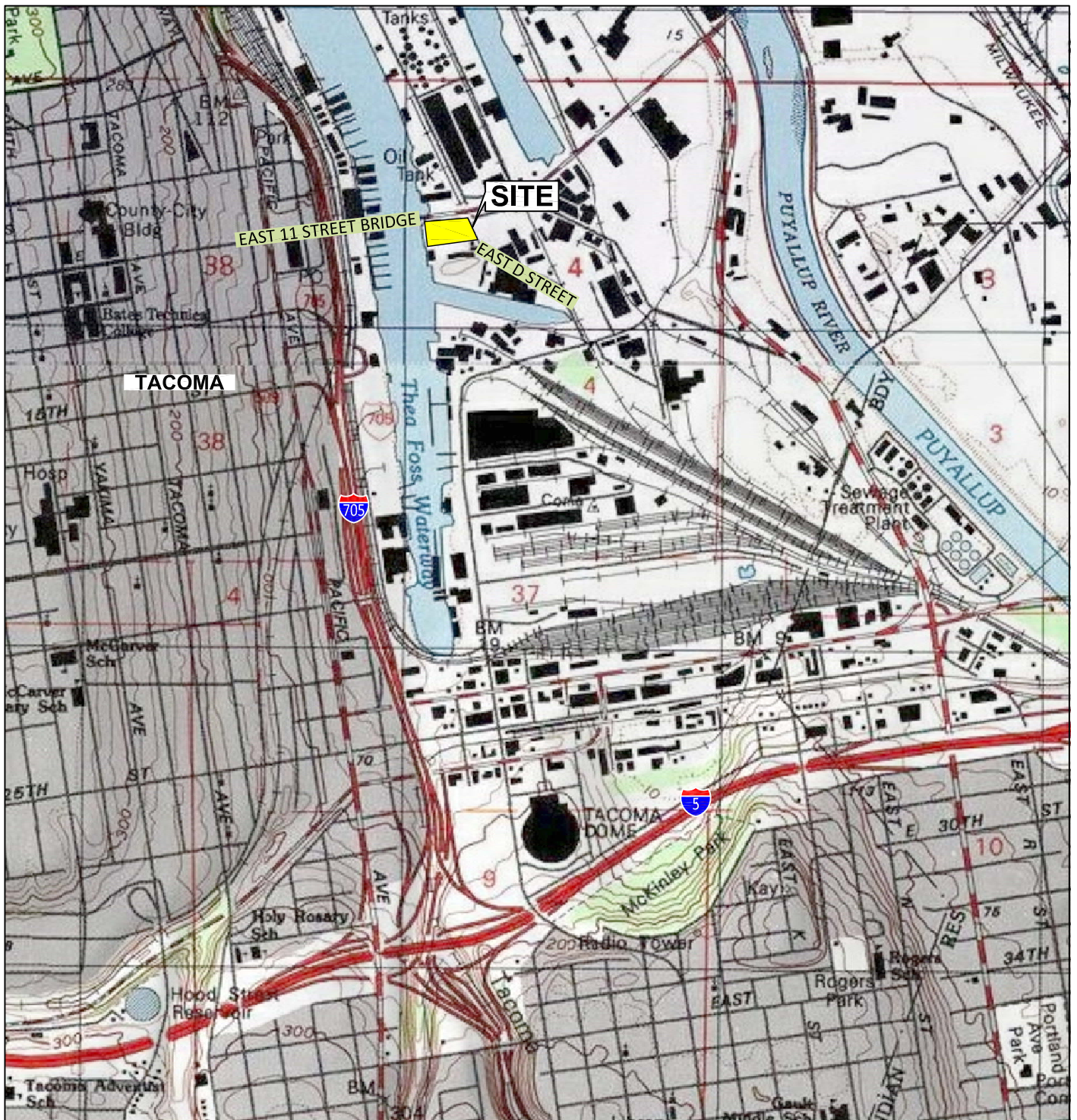
The findings herein may only be accurate at the locations where sampling was conducted. Pacific Crest makes no guarantee regarding the presence or absence of potential contaminants for which laboratory analyses was not conducted, or at locations from which samples were not collected.

FIGURES

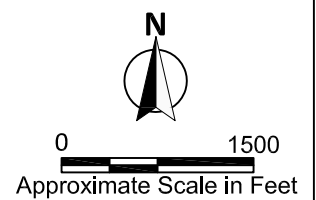
**CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
INVESTIGATION REPORT**

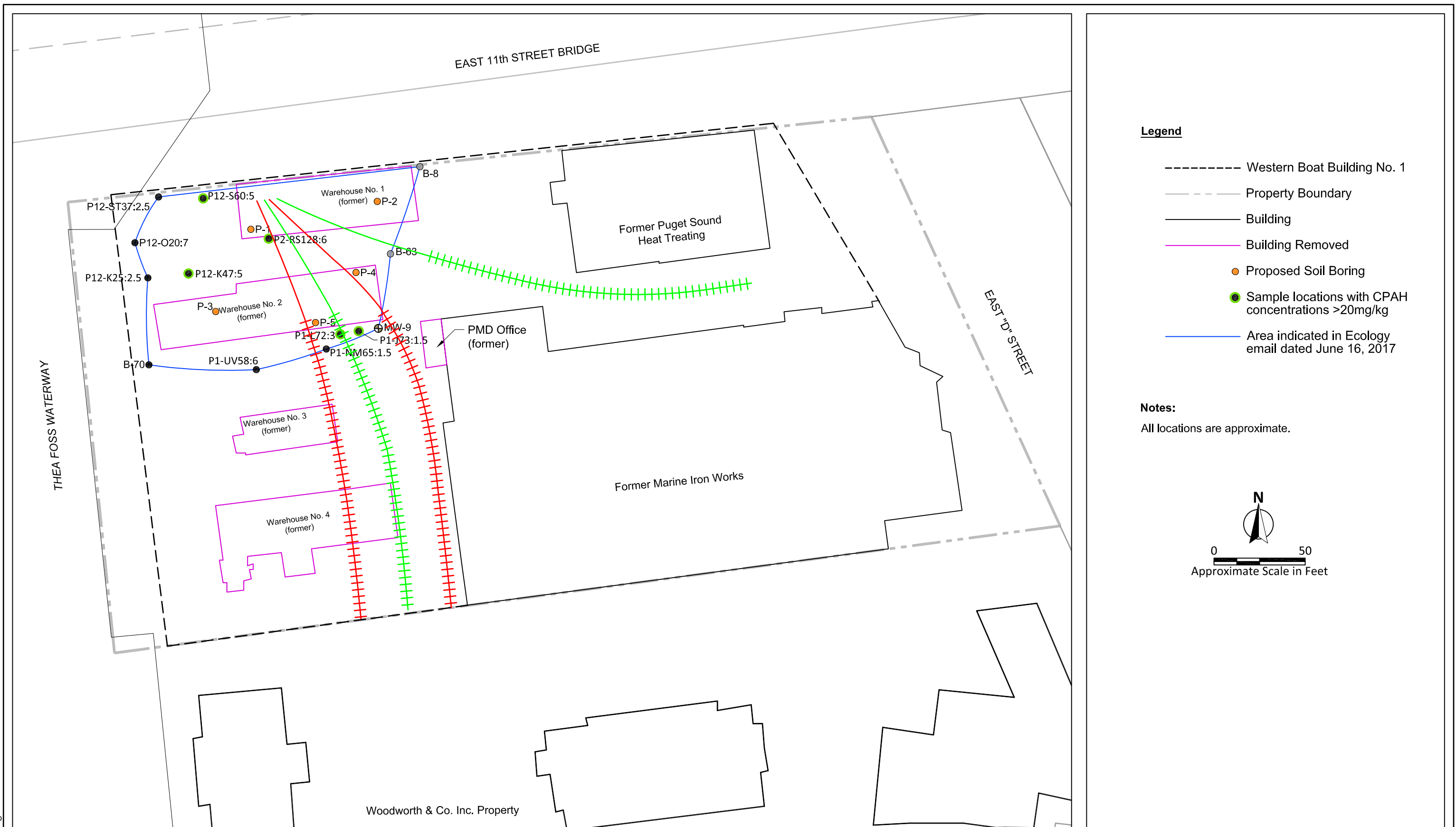
**MARINE IRON WORKS, INC.
1120 EAST D STREET
TACOMA, WASHINGTON**

Pacific Crest PN: 129-001

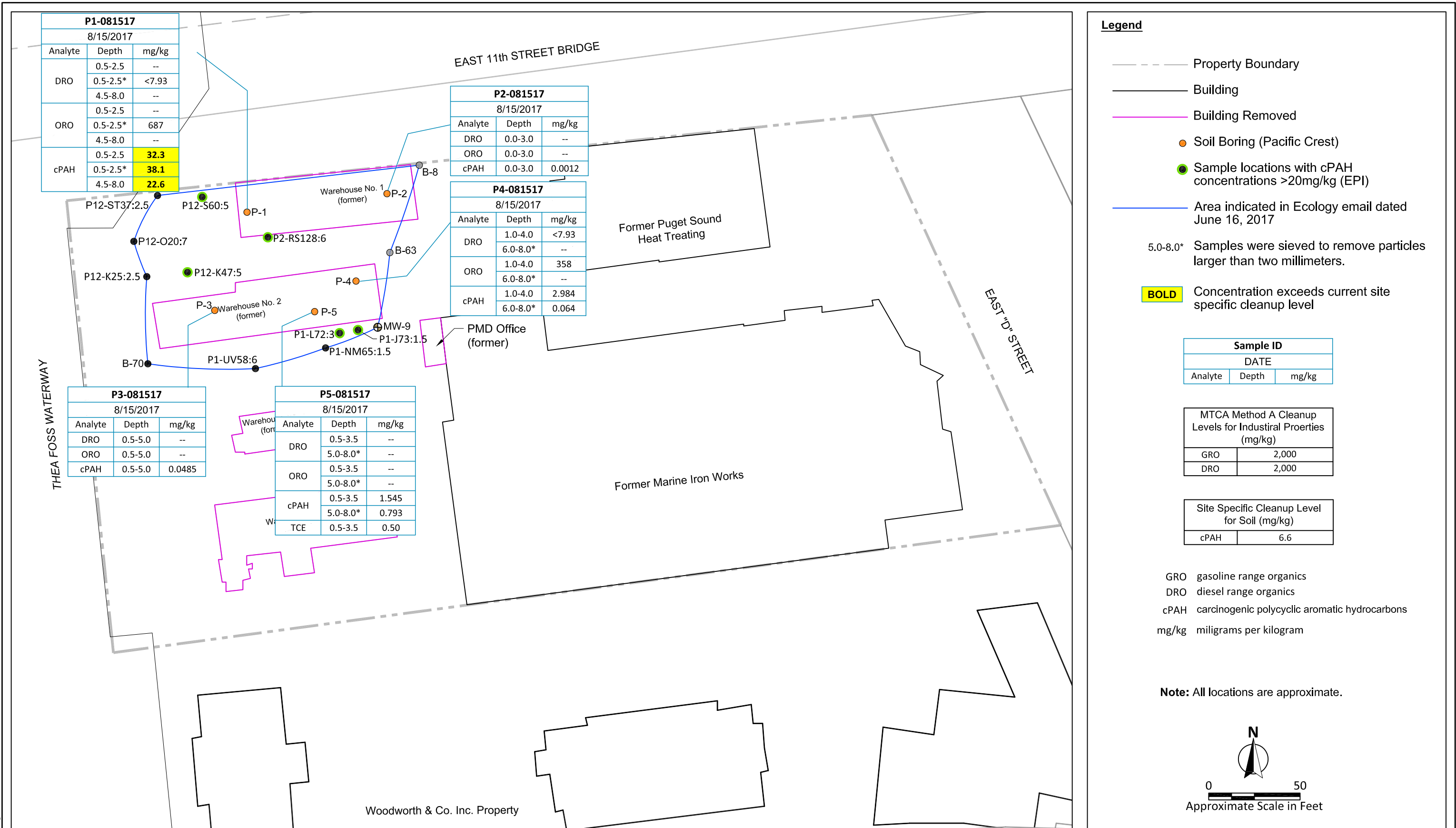


Source: TOPO! 2007

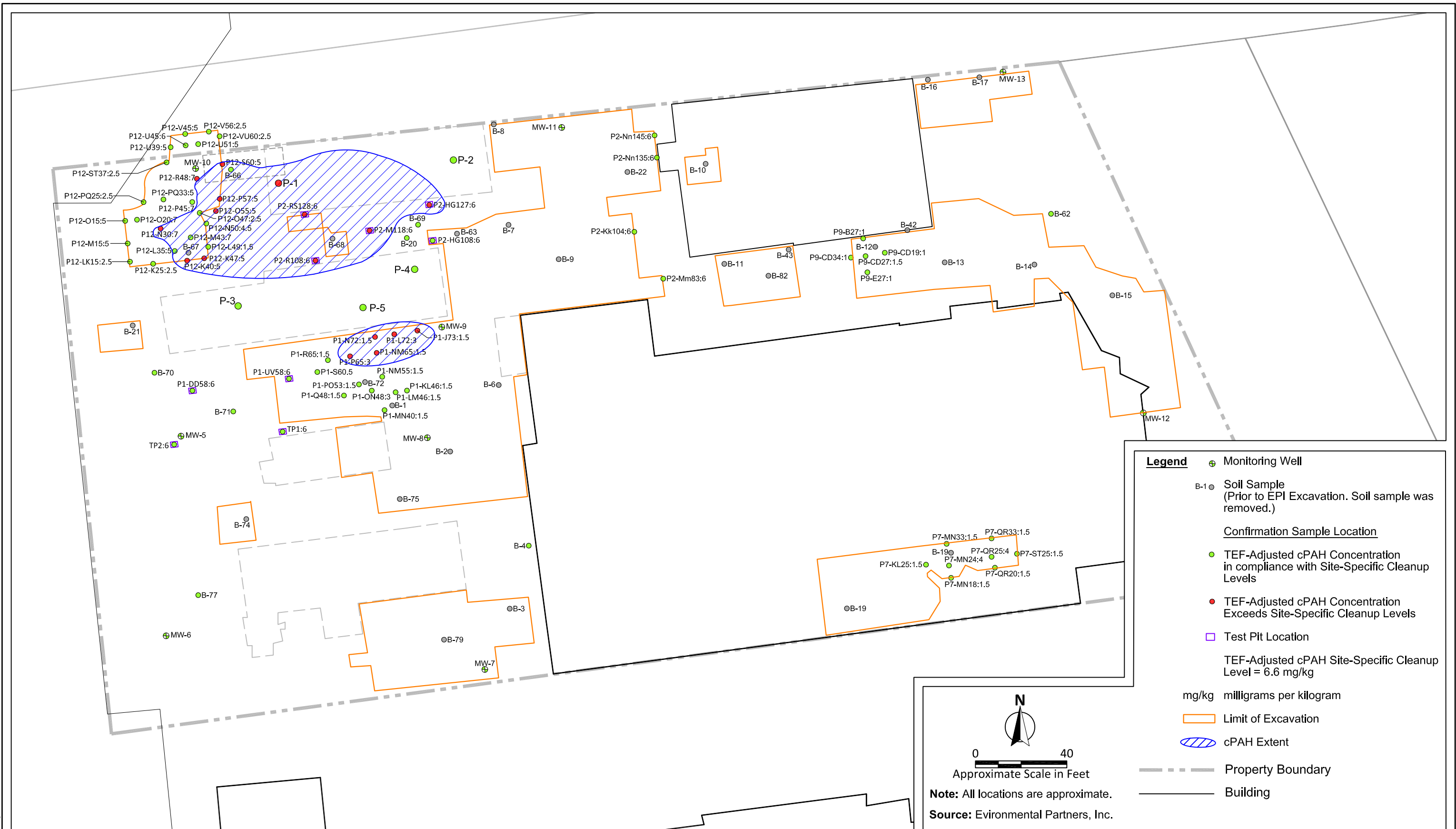




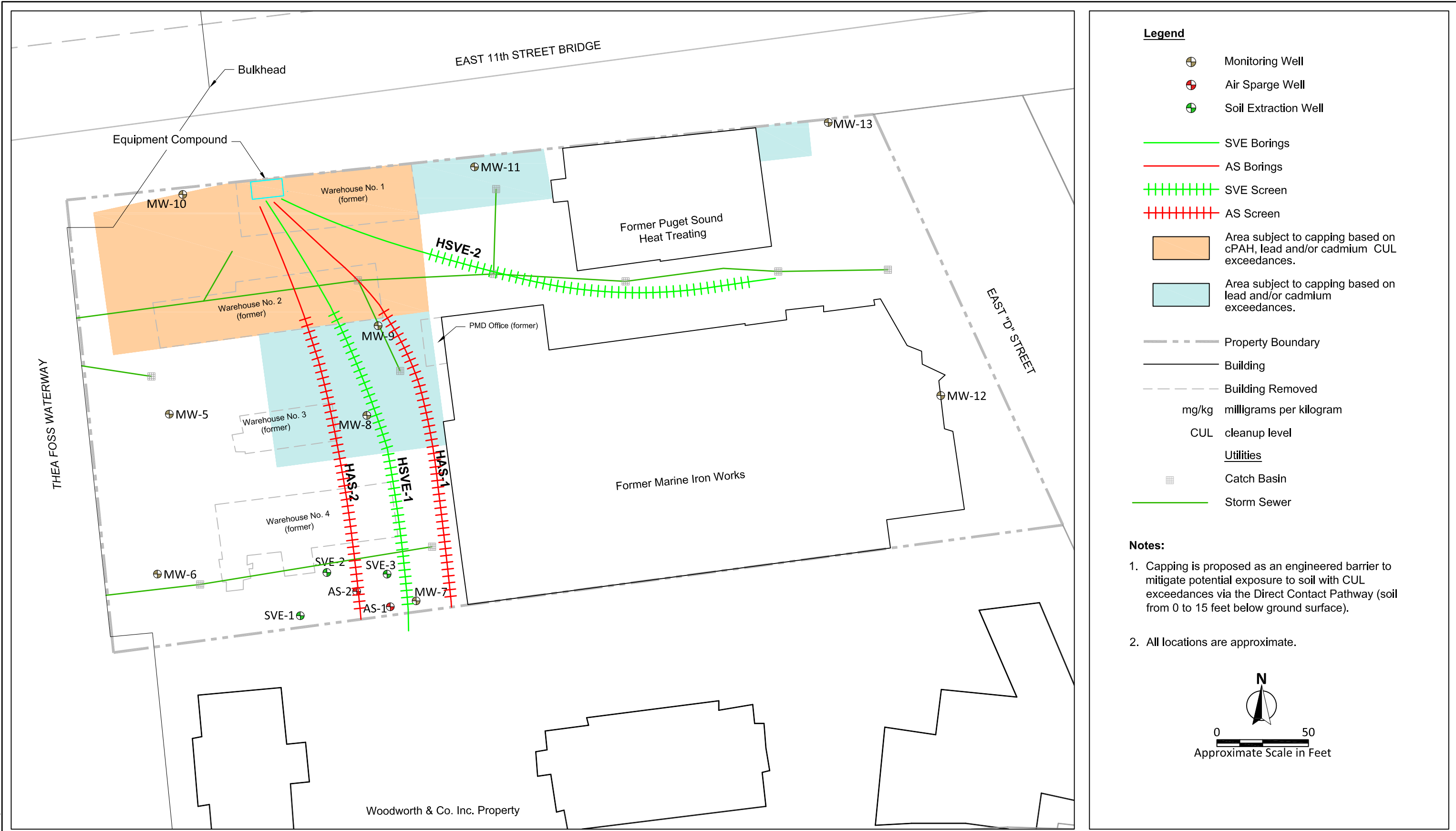
1/12/2018 129-001-068.dwg FIG 3



1/12/2018 129-001-069.dwg FIG 4 cPAH



1/12/2018 129-001-070.dwg FIG 5



Marine Iron Works Site
1120 East D Street
Tacoma, Washington
PN: 129-001

TABLES

CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON INVESTIGATION REPORT

**MARINE IRON WORKS, INC.
1120 EAST D STREET
TACOMA, WASHINGTON**

Pacific Crest PN: 129-001

Table 1
Laboratory Analytical Results - Soil
Marine Iron Works
Tacoma, Washington
Pacific Crest PN: 129-001

Location ID	Sample ID	Sample Date	Sample Depth	Sieved to Remove Particles >2 mm	Soil Analytical Result HVOCs (mg/kg)		Total Petroleum Hydrocarbons		Soil Analytical Results - cPAHs (mg/kg)							
					PCE	TCE	DRO	ORO	Benzo(a)pyrene	Chrysene	Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	Benz(a)anthracene	Benzo(b)fluoranthene	Total TEF Modified cPAHs ³
P1	P1-081517-0.5-2.5	8/15/2017	0.5-2.5	No	<0.052	0.0023	--	--	23.3	15.0	6.41	29.2	13.0	10.3	30.0	32.3
	P1-081517-0.5-2.5*	8/15/2017	0.5-2.5	Yes	--	--	<7.93	687	27.9	16.4	7.22	32.4	12.6	11.5	36.7	38.1
	P1-081517-4.5-8.0*	8/15/2017	4.5-8.0	Yes	--	--	--	--	17.6	9.41	3.03	15.4	6.81	6.82	17.0	22.6
P2	P2-081517-0.0-3.0	8/15/2017	0.0-3.0	No	<0.0012	0.0024	--	--	<0.0107	<0.0107	<0.0107	<0.0107	<0.0107	<0.0107	0.0117	0.0012
P3	P3-081517-0.5-5.0	8/15/2017	0.5-5.0	No	<0.0010	0.0017	--	--	0.0368	0.0258	<0.0104	0.0358	0.0168	0.0176	0.0441	0.0485
P4	P4-081517-1.0-4.0	8/15/2017	1.0-4.0	No	<0.0011	0.016	--	--	2.24	1.28	0.435	2.41	1.03	0.896	2.54	2.984
	P4-081517-1.0-4.0*	8/15/2017	1.0-4.0	Yes	--	--	<7.93	358	-	-	-	-	-	-	-	-
	P4-081517-6.0-8.0*	8/15/2017	6.0 - 8.0	Yes	--	--	-	-	0.0490	0.0530	<0.0117	0.0320	0.0182	0.0416	0.0570	0.064
P5	P5-081517-0.5-3.5	8/15/2017	0.5-3.5	No	0.0037	0.5	--	--	1.13	0.732	0.257	1.31	0.568	0.474	1.47	1.545
	P5-081517-5.0-8.0*	8/15/2017	5.0-8.0	Yes	--	--	--	--	0.621	0.601	<0.106	0.395	0.196	0.476	0.596	0.793
cPAH Toxicity Equivalent Fraction					N/A	N/A	N/A	N/A	1	0.01	0.1	0.1	0.1	0.1	0.1	N/A
MTCA Method A Soil Cleanup Levels for Industrial Properties					0.05	0.03	2,000	2,000	2	NE	NE	NE	NE	NE	NE	2
MTCA Method B Cleanup Levels for Soil					476	12	NE	NE	0.14	NE	NE	NE	NE	NE	NE	0.14
Remediation Level					NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	20
Site Specific Cleanup Level For Soil					1.04	0.13	NE	NE	NE	NE	NE	NE	NE	NE	NE	6.6

NOTE:

BOLD denotes concentrations above Site Specific cleanup levels.

mg/kg = milligrams per kilogram

*denotes sieving partilces larger than two millimeters from the samples

< denotes result is less than laboratory practical quantitation limit listed or analyte not detected at or above the reporting limit.

Total Carcinogenic PAHs are calculated by summing the product of each cPAH multiplied by its toxicity equivalency fraction per WAC 173-340-708(8).

Table 745-1 of the Cleanup Levels under the Method A Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 of the Washington Administrative Code, updated November 2007.

Cleanup Levels and Risk Calculations under the Method B Model Toxics Control Act Cleanup Regulation, Version 3.1, Ecology Publication No. 94-145, updated November 2007.

Remediation Level determined during a phone call with Ecology in August 2017.

Site specific cleanup level in CAP dated May 27, 2016

Pacific Crest = Pacific Crest Environmental, LLC

Sample depth in feet below ground surface.

N/A = not applicable

NE = not established

TEF = toxicity equivalency fraction

cPAHs = carcinogenic polynuclear aromatic hydrocarbons by SW-846 Method 8270

HVOC = Halogenated Volatile Organic Compounds by SW-846 Method 8260

Table 2
Laboratory Analytical Results and Source Identification Ratios
Marine Iron Works
Tacoma, Washington
Pacific Crest PN: 129-001

Sample Location	Sample ID	Date	Depth	Polychcyclic Aromatic Hydrocarbons (mg/kg)																Ratios			
				Phenanthrene (PN)	Pyrene (PY0)	Fluoranthene (FL0)	Benz(a)anthracene (BaA)	Chrysene (C0)	Benzo(b)fluoranthene (BbF)	Benzo(k)fluoranthene (BkF)	Benzo(e)pyrene (BeP)	Benzo(a)pyrene (BaP)	Perylene (PER)	Indeno(1,2,3-cd)pyrene (IP)	Dibenzo(a,h)anthracene (DA)	Benzo(g,h,i)perylene (ghi)	C1-Fluoranthrenes/Pyrenes	C1-Chrysenes/Benz(a)anthracenes	C2-Chrysenes/Benz(a)anthracenes	FL0/PY0	BaA/C0	PY0/BaP	IP/ghi
P1	P1-081517-0.5-2.5	8/15/2017	0.5-2.5	1.65	8.56	7.13	11.5	16.4	36.7	12.6	21.8	27.9	5.87	32.4	7.22	31.7	2.7	6.19	2.22	0.83294	0.701219512	0.30681	1.02208
PAH Source Apportionment				NA	Py	Py	Py	Py	Py	Py	Py	Py	Bio	Py	Py	Py	Py	Py	Py	--	--	--	--
Pyrogenic Criteria				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	>1.5	>0.5 - 1	<10	>1
Petrogenic Criteria				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.5	<0.25 - 0.5	>10	<0.25

Notes:

PAH Apportionment assigns individual compounds to one of four categories: Pyrogenic (Py), Petrogenic (Pt), Biogenic (Bio), or Not Apportioned (NA) (Sout et. al 2004)

FL0/PY0 Ratio provides an indication of the temperature of fomation.

BaA/C0 Ratio provides an indication of a combustion or non-combustion source

PY0/BaP Ratio provides an indication of a combustion or non-combustion source

IP/ghi Ratio has been used to distinguish/apportion distinct pyrogenic sources

-- = Not applicable

**APPENDIX A
SUMMARY OF HISTORIC INVESTIGATION AND INTERIM
MEASURE ACTIVITIES**

**CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
INVESTIGATION REPORT**

**MARINE IRON WORKS, INC.
1120 EAST D STREET
TACOMA, WASHINGTON**

Pacific Crest PN: 129-001

APPENDIX A

REMEDIAL INVESTIGATION AND INTERIM ACTION

Since 1993, subsurface investigations have been conducted on the PMD Property to assess the nature and extent of contaminants of potential concern (COPCs) in the media of concern and to characterize the geologic and hydrogeologic conditions at the Site. The historic investigation activities included: advancing soil borings; installing groundwater monitoring wells; and collecting soil, catch basin sediment, and groundwater samples for laboratory analysis. Beginning in 2007, interim remedial action (IRA) activities have been conducted on the PMD Property to remediate affected media.

A chronologic summary of activities is presented below:

- In 1994, Hart Crowser, Inc. (Hart Crowser) conducted a preliminary environmental investigation on the PMD Property. The investigation activities consisted of advancing soil borings (MW-1 through MW-3, HC-1, and HA-1 through HA-5); installing monitoring wells (MW-1 through MW-3); and collecting soil, catch basin sediment, and groundwater samples for laboratory analysis. The preliminary investigation results are presented in the Preliminary Environmental Assessment Report (Hart Crowser 1994).
- Between 2002 and 2004, Environmental Partners, Inc. (EPI) conducted three phases of RI activities to define the nature and extent of COPCs in soil and groundwater and to develop Site-specific screening levels (RI Screening Levels) for COCs. The results of the RI activities are presented in the RI Report (EPI 2005) and summarized below:
 - o Phase 1 – In 2002, EPI conducted RI activities that consisted of advancing 22 soil borings (B-1 through B-22) and collecting soil and groundwater samples for laboratory analysis.
 - o Phase 2 – In 2002, EPI conducted further RI activities on the basis of the results of Phase 1. The RI activities consisted of advancing 44 soil borings (B-23 through B-63 and MW-4 through MW-6); installing three monitoring wells (MW-4 through MW-6); and collecting soil and groundwater samples for laboratory analysis.
 - o Phase 3 – In 2004, EPI conducted further RI activities on the basis of the results of Phase 2. The investigation activities consisted of advancing 19 soil borings (B-66 through B-84) and collecting soil and groundwater samples for laboratory analysis.
- In 2006, EPI submitted a Cleanup Action Plan (CAP), dated May 19, 2006 (EPI 2006), to Ecology for review under the VCP. The CAP proposed excavation of thirteen Preliminary Remediation Areas (PRAs) and monitored natural attenuation (MNA) of the RI COCs in groundwater. The boundaries of the PRAs were based on the areal extent of the RI COCs in soil within the PMD Property boundaries. In an Opinion Letter dated July 14, 2006 (Opinion #1), Ecology indicated that the CAP did not meet the substantive requirements of MTCA.
- In correspondence dated October 16, 2006, EPI provided a response to Ecology (Opinion #1 Response) to address the comments presented in the Opinion #1. The Opinion #1 Response proposed that the excavation of soil in the PRAs be conducted as an IRA and requested that Ecology provide an Opinion Letter stating that the revised approach met the substantive requirements of MTCA. In an Opinion Letter dated January 23, 2007 (Opinion #2), Ecology indicated that the proposed IRA approach and revisions to the scope of work did not meet the substantive requirements of MTCA.

- In response to Opinion #2, EPI submitted an IRA Work Plan dated February 28, 2007. In an Opinion Letter dated March 2, 2007 (Opinion #3), Ecology indicated that, subject to minor revisions, the approach presented in the IRA Work Plan would likely meet the substantive requirements of MTCA. EPI submitted a Revised IRA Work Plan dated March 15, 2007, to Ecology in response to the comments provided in Opinion #3.
- In 2007 and 2008, MIW implemented the IRA proposed in the Revised IRA Work Plan (First IRA). The First IRA consisted of excavating soil in 13 PRAs and transporting the soil off-site for disposal. Approximately 1,405.9 tons of soil designated as hazardous waste was transported to the Waste Management, Inc. (Waste Management) Subtitle C Landfill in Arlington, Oregon, for disposal, and approximately 5,592.4 tons of non-hazardous soil were transported to the Land Recovery, Inc. (LRI) Subtitle D Landfill in Graham, Washington, for disposal. EPI collected 941 performance samples for laboratory analysis of one or more of the RI COCs. The IRA excavations in the PRAs were advanced to the extent practicable within the limitations of the PMD Property boundary, the depth to groundwater, and proximity to buildings. During the First IRA, four monitoring wells (MW-1, MW-2, MW-3, and MW-4) were abandoned by over-excavation. The results of the interim measure were documented in the Interim Remedial Action Report (EPI 2008).
- In 2008, Pacific Crest conducted a second-phase IRA (Second IRA) to address the areas with concentrations of TCE that exceeded the hazardous waste criteria which were inaccessible during the First IRA. Soil with concentrations of PCE, lead, arsenic, and cadmium above the RI Screening Levels was also removed as part of the Second IRA. The Second IRA consisted of excavating metals and TCE-impacted soil designated as hazardous waste underlying the former locations of Warehouse No. 3 and the PMD Office. PCE has only been detected at the Site in soil samples collected in the area below Former Warehouse No. 3. Approximately 119 tons of hazardous materials were excavated from beneath Former Warehouse No. 3, and approximately 231 tons of hazardous materials were excavated from beneath the Former PMD Office. The excavated material was transported off-site for disposal.
- In 2009, Pacific Crest conducted RI and feasibility study (FS) activities to delineate the nature and extent of COPCs in soil and groundwater and to assess potential cleanup action alternatives. The additional scope of RI activities included: advancing seven soil borings (MW-7 through MW-13) to a maximum depth of 20 feet bgs; collecting soil samples from the borings (MW-7 through MW -13) for laboratory analysis of RI COCs and COPCs; converting the soil borings into groundwater monitoring wells; conducting groundwater monitoring and sampling of groundwater wells MW-5 through MW-13 for total petroleum hydrocarbons (TPH) as diesel range organics (DRO), TPH as oil range organics (ORO), VOCs, cPAHs, polychlorinated biphenyls (PCBs), and dissolved metals; and advancing an additional five soil borings for conversion into two AS wells and three SVE wells (AS-1, AS-2, SVE-1, SVE-2, and SVE-3) to maximum depths of 20 feet bgs and 12 feet bgs, respectively. One reconnaissance soil boring (SBW-1) was also advanced to a depth of 20 feet bgs on the Woodworth Property, located south of the PMD Property, to define the southern extent of the Site with respect to VOCs. The FS activities consisted of pilot tests for SVE and AS using wells AS-1, AS-2, SVE-1, SVE-2, and SVE-3. The Second IRA and RI/FS activities were documented in a Draft RI/FS Report, dated November 13, 2009 (Pacific Crest 2009), that was submitted to Ecology for review under the VCP.
- In 2010, Pacific Crest submitted an Addendum to the Draft RI/FS Report (Addendum), dated April 16, 2010 (Pacific Crest 2010), to Ecology for review under the VCP, which provided further assessment of the nature and distribution of arsenic, lead, and cadmium in soils and implications for source areas. The objective of this analysis was to provide an

assessment of the potential sources of metals in soils located north of the PMD Property. In an Opinion Letter dated October 8, 2010 (Opinion #4), Ecology provided concurrence with the RI COCs; established cleanup standards for soil, groundwater, and indoor air; provided concurrence with the selected alternative for the cleanup of CVOCs; requested additional characterization of metals in soil and the vapor intrusion (VI) pathway; and provided further information regarding the proposed disposition of cPAHs.

- In an Electronic Mail Correspondence (EMC) dated March 2, 2011 (Pacific Crest 2011), transmitted by Ms. Lauren Carroll of Pacific Crest to Mr. Scott Rose at Ecology, Pacific Crest provided concurrence on the final RI COCs in tabularized format; provided a written response to address each of the outstanding issues raised by Ecology in the Opinion #4, as mutually agreed upon in a December 13, 2010, meeting attended by representatives of Ecology, PMD, and MIW; and provided follow up correspondence between MIW and PMD. The EMC included, by attachment, a Substantial and Disproportionate Cost Analysis (DCA) for cPAHs in soil and described the use of a restrictive covenant and engineered barrier for residual metals and cPAHs in soil. Ecology provided written notification of concurrence with the EMC (including DCA) in a response by electronic mail dated March 3, 2011 (Ecology 2011).
- In response to comments provided by Ecology in Opinion #4, Pacific Crest conducted additional investigation activities consisting of collecting indoor air samples for analysis of VOCs and collecting soil samples for analysis of metals (arsenic, lead and cadmium). The further investigation activities are presented in the Data Gap Investigation Report (Pacific Crest 2014) and summarized below.
 - o In 2011, Pacific Crest collected indoor and ambient air samples to evaluate the possibility that the intrusion of VOC vapors from the subsurface to indoor air may be impacting air quality within buildings located on the PMD Property. The activities associated with the indoor air monitoring included: collecting three indoor air samples at locations within the two buildings currently located on the PMD Property; collecting one ambient (outdoor) air sample at the Site for use as background data; submitting the samples for laboratory analysis of select VOCs; evaluating the results of the air sampling activities; and identifying appropriate additional remedial or mitigation methods, as necessary. The sample locations are illustrated on Figure 2.
 - o In 2011, Pacific Crest collected soil samples for screening of metals using x-ray fluorescence (XRF) and for laboratory analysis in an effort to differentiate on-site and off-site sources of metal contamination. The investigation included: advancing 14 shallow soil borings; and collecting soil samples from each boring for XRF and laboratory analysis of arsenic, cadmium, and lead. A total of 11 soil borings were located north of the PMD Property boundary, and three soil borings were located on the PMD Property. The sample locations are illustrated on Figure 2.
- Between 2009 and 2014, Pacific Crest conducted groundwater monitoring and sampling at the Site on the following dates: November 17 and 18, 2009; November 2, 2010; October 12, 2012; May 1, 2013; July 23, 2013; September 5, 2013; November 13, 2013; and March 17, 2014. The results of the groundwater monitoring activities are presented in the Cleanup Action Progress Report dated May 6, 2014.
- In 2013, Pacific Crest conducted a second indoor air sampling event to evaluate the possibility that the intrusion of VOC vapors from the subsurface to indoor air may be impacting air quality within buildings located on the PMD Property. The results of the

indoor air sampling activities are presented in the Cleanup Action Progress Report dated May 6, 2014.

- Between 2011 and 2014, MIW initiated the preferred cleanup action alternative that was accepted by Ecology as likely to meet the substantive requirements of MTCA as an interim measure. The purpose of implementation was to make progress in remediation of the Site while the CAP was prepared. The interim measure activities consisted of: construction permitting; horizontal wells installation; SVE and AS system equipment installation; system start-up and operation; limited excavation of soil with wood debris and paving of areas of the PMD Property. Descriptions of the interim measure activities are provided in the Cleanup Action Progress Report dated May 6, 2014.
- Between 2015 and 2016, MIW operated the SVE/AS system, and, conducted groundwater and air sampling. Descriptions of the SVE/AS system operation and maintenance and progress monitoring are provided in the Cleanup Action Progress Reports dated January 7, 2015, May 27, 2015, and June 10, 2016.
- In January 2015, MIW submitted a CAP and Remedial Design Report dated January 6, 2015 to Ecology for review. Ecology, PMD and MIW met with Ecology on June 17, 2015 to discuss the cleanup action alternatives and the CAP.
- In May 2016, MIW submitted a revised CAP and Remedial Design Report dated May 27, 2016 to Ecology for review. Ecology has not provided formal comments on the revised CAP.

**APPENDIX B
BORING LOGS**

**CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
INVESTIGATION REPORT**

**MARINE IRON WORKS, INC.
1120 EAST D STREET
TACOMA, WASHINGTON**

Pacific Crest PN: 129-001

LOG OF BORING P-1

(Page 1 of 1)

Date/Time Started : 8/15/2017 - 1130
 Date/Time Completed : 8/15/2017 - 1140
 Total Boring Depth (bgs) : 8.0'
 Depth to Water ATD (bgs) : N/A
 Elevation (ft) : N/A
 Drilling Method : Direct Push
 Sampler Type : 5' Macro Core



PACIFIC CREST ENVIRONMENTAL
 WWW.PCENV.COM 425-888-4990

Site Name: Marine Iron Works

Client: Marine Iron Works

Project #: 129-001

Depth In Feet	Sample	% Recovery	PID (ppm)	Sample ID	GRAPHIC	USCS	DESCRIPTION
0							0.0-0.5 Asphalt
1							0.5-4.0 SAND with silt (75% fine sand, 25% silt), dark brown, dry, no odor.
2		60%	0.2	P1-081517 0.5-2.5		SM	
3							
4						SM	4.0-5.0 SAND with silt and slag (55% fine sand, 25% silt, 20% green slag), dark brown, dry, no odor.
5							5.0-8.0 SAND and WOOD with slag, minor silt (30% medium sand, 30% wood, 25% green slag, 15% silt), brown, moist, no odor.
6		10%				SM	
7			N/A	P1-081517 4.5-8.0			
8							Bottom of boring advanced to 8 feet below ground surface.
9							
10							

Drilling Company : ESN
 Drilling Foreman : Don Harden
 Pacific Crest Rep. : M. Black
 Equipment :
 Back-Fill Material : Bentonite

LOG OF BORING P-1

(Page 1 of 1)

LOG OF BORING P-2

(Page 1 of 1)



Site Name: Marine Iron Works

Client: Marine Iron Works

Project #: 129-001

Date/Time Started : 8/15/2017 - 0905
 Date/Time Completed : 8/15/2017 - 0915
 Total Boring Depth (bgs) : 8.0'
 Depth to Water ATD (bgs) : N/A
 Elevation (ft) : N/A
 Drilling Method : Direct Push
 Sampler Type : 5' Macro Core

Depth In Feet	Sample	% Recovery	PID (ppm)	Sample ID	GRAPHIC	USCS	DESCRIPTION
0							0.0-0.5 Asphalt
1		50%	34.5	P2-081517 0.0-3.0		SM	0.5-1.5 Silty SAND (60% fine sand, 40% silt), brown, dry, no odor.
2						SM	1.5-3.0 Silty SAND (50% fine sand, 50% silt), white, dry, no odor.
3							3.0-5.0 Silty SAND (60% fine sand, 40% silt), brown, dry, no odor.
4						SM	
5							5.0-6.5 Silty SAND (50% fine sand, 50% silt), brown and white, dry, no odor.
6						SM	
7		60%	0.3	P2-081517 6.0-8.0		SM	6.5-7.0 WOOD with sand and silt (50% wood, 25% sand, 25% silt), brown and white, dry, no odor.
8						SM	7.0-8.0 Silty SAND with wood and glass (35% medium sand, 30% silt, 20% wood, 15% medium glass), brown, moist, no odor.
9							Bottom of boring advanced to 8 feet below ground surface.
10							

Drilling Company : ESN
 Drilling Foreman : Don Harden
 Pacific Crest Rep. : M. Black
 Equipment :
 Back-Fill Material : Bentonite

LOG OF BORING P-2

(Page 1 of 1)

LOG OF BORING P-3

(Page 1 of 1)



Site Name: Marine Iron Works

Client: Marine Iron Works

Project #: 129-001

Date/Time Started : 8/15/2017 - 1100
 Date/Time Completed : 8/15/2017 - 1110
 Total Boring Depth (bgs) : 8.0'
 Depth to Water ATD (bgs) : N/A
 Elevation (ft) : N/A
 Drilling Method : Direct Push
 Sampler Type : 5' Macro Core

Depth In Feet	Sample	% Recovery	PID (ppm)	Sample ID	GRAPHIC	USCS	DESCRIPTION
0							0.0-0.5 Asphalt
1						SM	0.5-1.5 Silty SAND, minor gravel (60% medium sand, 30% silt, 10% medium to coarse gravel), light brown, dry, no odor.
2						GM	1.5-3.0 GRAVEL, minor sand and silt (70% medium to coarse gravel, 15% silt, 15% medium sand), gray, dry, no odor.
3	40%	0.0		P3-081517 0.5-5.0		SM	3.0-5.0 Silty SAND, minor gravel (60% medium sand, 30% silt, 10% medium to coarse gravel), light brown, dry, no odor.
4						SM	
5						SM	5.0-6.0 SAND with silt (65% fine to coarse sand, 35% silt), dark brown, moist, no odor.
6	40%	33.4		P3-081517 5.0-8.0		SM	6.0-7.5 Silty SAND, minor gravel (50% fine sand, 40% silt, 10% coarse gravel), dark brown, moist, no odor.
7						SM	
8						SM	7.5-8.0 SAND with silt (65% fine to coarse sand, 35% silt), dark brown, moist, no odor.
9							Bottom of boring advanced to 8 feet below ground surface.
10							

Drilling Company : ESN
 Drilling Foreman : Don Harden
 Pacific Crest Rep. : M. Black
 Equipment :
 Back-Fill Material : Bentonite

LOG OF BORING P-3

(Page 1 of 1)

LOG OF BORING P-4

(Page 1 of 1)

Date/Time Started : 8/15/2017 - 0953
 Date/Time Completed : 8/15/2017 - 1005
 Total Boring Depth (bgs) : 8.0'
 Depth to Water ATD (bgs) : N/A
 Elevation (ft) : N/A
 Drilling Method : Direct Push
 Sampler Type : 5' Macro Core



Site Name: Marine Iron Works

Client: Marine Iron Works

Project #: 129-001

Depth In Feet	Sample	% Recovery	PID (ppm)	Sample ID	GRAPHIC	USCS	DESCRIPTION
0							0.0-0.5 Asphalt
1						GW	0.5-1.0 GRAVEL (100% fine to coarse gravel)
2							1.0-4.0 Silty SAND (55% fine sand, 45% silt), brown, dry, no odor.
3		60%	0.7	P4-081517 1.0-4.0		SM	
4						SM	4.0-4.5 Silty SAND (50% fine sand, 50% silt), brown/pink, dry, no odor.
5						SM	4.5-5.0 Silty SAND (50% fine sand, 50% silt), dark brown, moist, no odor.
6						SM	5.0-6.5 Silty SAND (65% fine to medium sand, 35% silt), dark brown, moist, no odor.
7		66%	80.1	P4-081517 6.0-8.0		SM	6.5-7.0 SAND with silt (80% fine to medium sand, 20% silt), dark brown, moist, no odor.
8							7.0-7.5 WOOD (100% wood), moist, no odor.
9						SM	7.5-8.0 SAND with silt (60% fine to medium sand, 40% silt), dark brown, moist, no odor.
10							Bottom of boring advanced to 8 feet below ground surface.

Drilling Company : ESN
 Drilling Foreman : Don Harden
 Pacific Crest Rep. : M. Black
 Equipment :
 Back-Fill Material : Bentonite

LOG OF BORING P-4

(Page 1 of 1)

LOG OF BORING P-5

(Page 1 of 1)

Date/Time Started : 8/15/2017 - 1025
 Date/Time Completed : 8/15/2017 - 1035
 Total Boring Depth (bgs) : 8.0'
 Depth to Water ATD (bgs) : N/A
 Elevation (ft) : N/A
 Drilling Method : Direct Push
 Sampler Type : 5' Macro Core



Site Name: Marine Iron Works

Client: Marine Iron Works

Project #: 129-001

Depth In Feet	Sample	% Recovery	PID (ppm)	Sample ID	GRAPHIC	USCS	DESCRIPTION
0							0.0-0.5 Asphalt
1						SM	0.5-1.0 Silty SAND (55% fine sand, 45% silt), dark brown, moist, no odor.
2	55%	26.5		P5-081517 0.5-3.5		SM	2.0-3.5 SAND with silt, minor gravel (60% medium sand, 20% silt, 10% fine to coarse gravel), light brown, moist, no odor.
3						SM	
4						SM	3.5-5.0 Silty SAND (60% fine sand, 40% silt), dark brown, moist, no odor.
5						SM	5.0-6.0 SAND with silt, minor gravel (60% medium sand, 30% silt, 10% fine to coarse gravel), light brown, moist, no odor.
6	20%	N/A		P5-081517 5.0-8.0		GW	6.0-7.0 GRAVEL (100% fine to coarse gravel)
7						SM	7.0-8.0 SAND with silt, trace gravel (70% medium sand, 25% silt, 10% coarse gravel), medium stiff, brown, moist, no odor.
8							Bottom of boring advanced to 8 feet below ground surface.
9							
10							

Drilling Company : ESN
 Drilling Foreman : Don Harden
 Pacific Crest Rep. : M. Black
 Equipment :
 Back-Fill Material : Bentonite

LOG OF BORING P-5

(Page 1 of 1)

**APPENDIX C
LABORATORY ANALYTICAL REPORTS**

**CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBON
INVESTIGATION REPORT**

**MARINE IRON WORKS, INC.
1120 EAST D STREET
TACOMA, WASHINGTON**

Pacific Crest PN: 129-001



14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 24, 2017

Bill Carroll
Pacific Crest Environmental, LLC
P.O. Box 952
North Bend, WA 98045

Re: Analytical Data for Project 129-001 Task 25
Laboratory Reference No. 1708-219

Dear Bill:

Enclosed are the analytical results and associated quality control data for samples submitted on August 16, 2017.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

A handwritten signature in black ink, appearing to read 'DB', with a long horizontal flourish extending to the right.

David Baumeister
Project Manager

Enclosures



OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: August 24, 2017
Samples Submitted: August 16, 2017
Laboratory Reference: 1708-219
Project: 129-001 Task 25

Case Narrative

Samples were collected on August 15, 2017 and received by the laboratory on August 16, 2017. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Volatiles EPA 8260C Analysis

Per EPA Method 5035A, samples were received by the laboratory in pre-weighed 40 mL VOA vials within 48 hours of sample collection. They were stored in a freezer at between -7°C and -20°C until extraction or analysis.

The last two internal standards did not meet acceptance criteria for sample P1-081517-0.5-2.5 due to matrix effects. The sample was re-extracted and re-analyzed with similar results. The sample was therefore re-analyzed a third time at the lowest possible dilution allowed by Method 5035 and analytes associated with the last two internal standards were reported. Consequently, the MTCA Method A cleanup levels for Tetrachloroethene and 1,2-Dibromoethane are not achievable.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID: P2-081517-0.0-3.0						
Laboratory ID: 08-219-01						
Dichlorodifluoromethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Chloromethane	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
Vinyl Chloride	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Bromomethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Chloroethane	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
Trichlorofluoromethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Iodomethane	ND	0.0098	EPA 8260C	8-17-17	8-17-17	
Methylene Chloride	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
(trans) 1,2-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
2,2-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
(cis) 1,2-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Bromochloromethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Chloroform	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1,1-Trichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Carbon Tetrachloride	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Trichloroethene	0.0024	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Dibromomethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Bromodichloromethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
2-Chloroethyl Vinyl Ether	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
(cis) 1,3-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
(trans) 1,3-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:		P2-081517-0.0-3.0				
Laboratory ID:		08-219-01				
1,1,2-Trichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Tetrachloroethene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,3-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Dibromochloromethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromoethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Chlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1,1,2-Tetrachloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Bromoform	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
Bromobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,1,2,2-Tetrachloroethane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
2-Chlorotoluene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
4-Chlorotoluene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,3-Dichlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,4-Dichlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2-Dichlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromo-3-chloropropane	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
1,2,4-Trichlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
Hexachlorobutadiene	ND	0.0060	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-17-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	93	73-134				
<i>Toluene-d8</i>	99	81-124				
<i>4-Bromofluorobenzene</i>	90	80-131				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID: P4-081517-1.0-4.0						
Laboratory ID: 08-219-03						
Dichlorodifluoromethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Chloromethane	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
Vinyl Chloride	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Bromomethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Chloroethane	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
Trichlorofluoromethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Iodomethane	ND	0.0086	EPA 8260C	8-17-17	8-17-17	
Methylene Chloride	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
(trans) 1,2-Dichloroethene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
2,2-Dichloropropane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
(cis) 1,2-Dichloroethene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Bromochloromethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Chloroform	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1,1-Trichloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Carbon Tetrachloride	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloropropene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Trichloroethene	0.016	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloropropane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Dibromomethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Bromodichloromethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
2-Chloroethyl Vinyl Ether	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
(cis) 1,3-Dichloropropene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
(trans) 1,3-Dichloropropene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	P4-081517-1.0-4.0					
Laboratory ID:	08-219-03					
1,1,2-Trichloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Tetrachloroethene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,3-Dichloropropane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Dibromochloromethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromoethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Chlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1,1,2-Tetrachloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Bromoform	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
Bromobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,1,2,2-Tetrachloroethane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichloropropane	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
2-Chlorotoluene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
4-Chlorotoluene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,3-Dichlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,4-Dichlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2-Dichlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromo-3-chloropropane	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
1,2,4-Trichlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
Hexachlorobutadiene	ND	0.0053	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichlorobenzene	ND	0.0011	EPA 8260C	8-17-17	8-17-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>100</i>	<i>73-134</i>				
<i>Toluene-d8</i>	<i>101</i>	<i>81-124</i>				
<i>4-Bromofluorobenzene</i>	<i>96</i>	<i>80-131</i>				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID: P5-081517-0.5-3.5						
Laboratory ID: 08-219-05						
Dichlorodifluoromethane	ND	0.0015	EPA 8260C	8-17-17	8-18-17	
Chloromethane	ND	0.0059	EPA 8260C	8-17-17	8-18-17	
Vinyl Chloride	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Bromomethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Chloroethane	ND	0.0059	EPA 8260C	8-17-17	8-18-17	
Trichlorofluoromethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Iodomethane	ND	0.0059	EPA 8260C	8-17-17	8-18-17	
Methylene Chloride	ND	0.0090	EPA 8260C	8-17-17	8-18-17	
(trans) 1,2-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
2,2-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
(cis) 1,2-Dichloroethene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Bromochloromethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Chloroform	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,1,1-Trichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Carbon Tetrachloride	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,2-Dichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Trichloroethene	0.50	0.054	EPA 8260C	8-18-17	8-18-17	
1,2-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Dibromomethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Bromodichloromethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
2-Chloroethyl Vinyl Ether	ND	0.0082	EPA 8260C	8-17-17	8-18-17	
(cis) 1,3-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
(trans) 1,3-Dichloropropene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	P5-081517-0.5-3.5					
Laboratory ID:	08-219-05					
1,1,2-Trichloroethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Tetrachloroethene	0.0037	0.0012	EPA 8260C	8-17-17	8-18-17	
1,3-Dichloropropane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Dibromochloromethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,2-Dibromoethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Chlorobenzene	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
1,1,1,2-Tetrachloroethane	ND	0.0012	EPA 8260C	8-17-17	8-18-17	
Bromoform	ND	0.0059	EPA 8260C	8-17-17	8-18-17	
Bromobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,1,2,2-Tetrachloroethane	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,2,3-Trichloropropane	ND	0.054	EPA 8260C	8-18-17	8-18-17	
2-Chlorotoluene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
4-Chlorotoluene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,3-Dichlorobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,4-Dichlorobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,2-Dichlorobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
1,2-Dibromo-3-chloropropane	ND	0.27	EPA 8260C	8-18-17	8-18-17	
1,2,4-Trichlorobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
Hexachlorobutadiene	ND	0.27	EPA 8260C	8-18-17	8-18-17	
1,2,3-Trichlorobenzene	ND	0.054	EPA 8260C	8-18-17	8-18-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>109</i>	<i>73-134</i>				
<i>Toluene-d8</i>	<i>93</i>	<i>81-124</i>				
<i>4-Bromofluorobenzene</i>	<i>91</i>	<i>80-131</i>				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID: P3-081517-0.5-5.0						
Laboratory ID: 08-219-07						
Dichlorodifluoromethane	ND	0.0013	EPA 8260C	8-17-17	8-18-17	
Chloromethane	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
Vinyl Chloride	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Bromomethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Chloroethane	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
Trichlorofluoromethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Iodomethane	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
Methylene Chloride	ND	0.0076	EPA 8260C	8-17-17	8-18-17	
(trans) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
2,2-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
(cis) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Bromochloromethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Chloroform	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1,1-Trichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Carbon Tetrachloride	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2-Dichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Trichloroethene	0.0017	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Dibromomethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Bromodichloromethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
2-Chloroethyl Vinyl Ether	ND	0.0069	EPA 8260C	8-17-17	8-18-17	
(cis) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
(trans) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	P3-081517-0.5-5.0					
Laboratory ID:	08-219-07					
1,1,2-Trichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Tetrachloroethene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,3-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Dibromochloromethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2-Dibromoethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Chlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1,1,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Bromoform	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
Bromobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,1,2,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2,3-Trichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
2-Chlorotoluene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
4-Chlorotoluene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,3-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,4-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
1,2-Dibromo-3-chloropropane	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
1,2,4-Trichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
Hexachlorobutadiene	ND	0.0050	EPA 8260C	8-17-17	8-18-17	
1,2,3-Trichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-18-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>101</i>	<i>73-134</i>				
<i>Toluene-d8</i>	<i>98</i>	<i>81-124</i>				
<i>4-Bromofluorobenzene</i>	<i>95</i>	<i>80-131</i>				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID: P1-081517-0.5-2.5						
Laboratory ID: 08-219-09						
Dichlorodifluoromethane	ND	0.0018	EPA 8260C	8-17-17	8-18-17	
Chloromethane	ND	0.0071	EPA 8260C	8-17-17	8-18-17	
Vinyl Chloride	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Bromomethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Chloroethane	ND	0.0071	EPA 8260C	8-17-17	8-18-17	
Trichlorofluoromethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethene	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Iodomethane	ND	0.0071	EPA 8260C	8-17-17	8-18-17	
Methylene Chloride	ND	0.011	EPA 8260C	8-17-17	8-18-17	
(trans) 1,2-Dichloroethene	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloroethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
2,2-Dichloropropane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
(cis) 1,2-Dichloroethene	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Bromochloromethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Chloroform	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
1,1,1-Trichloroethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Carbon Tetrachloride	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
1,1-Dichloropropene	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
1,2-Dichloroethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Trichloroethene	0.0023	0.0014	EPA 8260C	8-17-17	8-18-17	
1,2-Dichloropropane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Dibromomethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
Bromodichloromethane	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
2-Chloroethyl Vinyl Ether	ND	0.0098	EPA 8260C	8-17-17	8-18-17	
(cis) 1,3-Dichloropropene	ND	0.0014	EPA 8260C	8-17-17	8-18-17	
(trans) 1,3-Dichloropropene	ND	0.052	EPA 8260C	8-18-17	8-22-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES EPA 8260C
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	P1-081517-0.5-2.5					
Laboratory ID:	08-219-09					
1,1,2-Trichloroethane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
Tetrachloroethene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,3-Dichloropropane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
Dibromochloromethane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,2-Dibromoethane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
Chlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,1,1,2-Tetrachloroethane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
Bromoform	ND	0.26	EPA 8260C	8-18-17	8-22-17	
Bromobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,1,2,2-Tetrachloroethane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,2,3-Trichloropropane	ND	0.052	EPA 8260C	8-18-17	8-22-17	
2-Chlorotoluene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
4-Chlorotoluene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,3-Dichlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,4-Dichlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,2-Dichlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
1,2-Dibromo-3-chloropropane	ND	0.26	EPA 8260C	8-18-17	8-22-17	
1,2,4-Trichlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
Hexachlorobutadiene	ND	0.26	EPA 8260C	8-18-17	8-22-17	
1,2,3-Trichlorobenzene	ND	0.052	EPA 8260C	8-18-17	8-22-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	<i>120</i>	<i>73-134</i>				
<i>Toluene-d8</i>	<i>103</i>	<i>81-124</i>				
<i>4-Bromofluorobenzene</i>	<i>96</i>	<i>80-131</i>				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID: MB0817S2						
Dichlorodifluoromethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Chloromethane	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
Vinyl Chloride	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Bromomethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Chloroethane	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
Trichlorofluoromethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Iodomethane	ND	0.0081	EPA 8260C	8-17-17	8-17-17	
Methylene Chloride	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
(trans) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
2,2-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
(cis) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Bromochloromethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Chloroform	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1,1-Trichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Carbon Tetrachloride	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Trichloroethene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Dibromomethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Bromodichloromethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
2-Chloroethyl Vinyl Ether	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
(cis) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
(trans) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID: MB0817S2						
1,1,2-Trichloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Tetrachloroethene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,3-Dichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Dibromochloromethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromoethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Chlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1,1,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Bromoform	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
Bromobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,1,2,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichloropropane	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
2-Chlorotoluene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
4-Chlorotoluene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,3-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,4-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2-Dichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
1,2-Dibromo-3-chloropropane	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
1,2,4-Trichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
Hexachlorobutadiene	ND	0.0050	EPA 8260C	8-17-17	8-17-17	
1,2,3-Trichlorobenzene	ND	0.0010	EPA 8260C	8-17-17	8-17-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	93	73-134				
<i>Toluene-d8</i>	96	81-124				
<i>4-Bromofluorobenzene</i>	95	80-131				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
 page 1 of 2

Matrix: Soil
 Units: mg/kg

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID:	MB0818S2					
Dichlorodifluoromethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Chloromethane	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
Vinyl Chloride	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Bromomethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Chloroethane	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
Trichlorofluoromethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1-Dichloroethene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Iodomethane	ND	0.0067	EPA 8260C	8-18-17	8-18-17	
Methylene Chloride	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
(trans) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1-Dichloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
2,2-Dichloropropane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
(cis) 1,2-Dichloroethene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Bromochloromethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Chloroform	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1,1-Trichloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Carbon Tetrachloride	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1-Dichloropropene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2-Dichloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Trichloroethene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2-Dichloropropane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Dibromomethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Bromodichloromethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
2-Chloroethyl Vinyl Ether	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
(cis) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
(trans) 1,3-Dichloropropene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
METHOD BLANK QUALITY CONTROL
 page 2 of 2

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Laboratory ID: MB0818S2						
1,1,2-Trichloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Tetrachloroethene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,3-Dichloropropane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Dibromochloromethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2-Dibromoethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Chlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1,1,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Bromoform	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
Bromobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,1,2,2-Tetrachloroethane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2,3-Trichloropropane	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
2-Chlorotoluene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
4-Chlorotoluene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,3-Dichlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,4-Dichlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2-Dichlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
1,2-Dibromo-3-chloropropane	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
1,2,4-Trichlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
Hexachlorobutadiene	ND	0.0050	EPA 8260C	8-18-17	8-18-17	
1,2,3-Trichlorobenzene	ND	0.0010	EPA 8260C	8-18-17	8-18-17	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Dibromofluoromethane</i>	92	73-134				
<i>Toluene-d8</i>	92	81-124				
<i>4-Bromofluorobenzene</i>	89	80-131				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
SB/SBD QUALITY CONTROL

Matrix: Soil
 Units: mg/kg

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits		RPD	Limit	Flags
					Recovery				RPD		
SPIKE BLANKS											
Laboratory ID:	SB0817S2										
	SB	SBD	SB	SBD	SB	SBD					
1,1-Dichloroethene	0.0528	0.0525	0.0500	0.0500	106	105	66-127	1		15	
Benzene	0.0473	0.0490	0.0500	0.0500	95	98	76-122	4		15	
Trichloroethene	0.0553	0.0551	0.0500	0.0500	111	110	78-120	0		15	
Toluene	0.0493	0.0499	0.0500	0.0500	99	100	83-120	1		15	
Chlorobenzene	0.0527	0.0543	0.0500	0.0500	105	109	81-120	3		15	
Surrogate:											
Dibromofluoromethane					92	95	73-134				
Toluene-d8					94	95	81-124				
4-Bromofluorobenzene					94	96	80-131				



Date of Report: August 24, 2017
 Samples Submitted: August 16, 2017
 Laboratory Reference: 1708-219
 Project: 129-001 Task 25

VOLATILES by EPA 8260C
SB/SBD QUALITY CONTROL

Matrix: Soil
 Units: mg/kg

Analyte	Result		Spike Level		Percent Recovery		Recovery Limits		RPD	RPD Limit	Flags
					Recovery						
SPIKE BLANKS											
Laboratory ID:	SB0818S2										
	SB	SBD	SB	SBD	SB	SBD					
1,1-Dichloroethene	0.0502	0.0531	0.0500	0.0500	100	106	66-127	6	15		
Benzene	0.0457	0.0481	0.0500	0.0500	91	96	76-122	5	15		
Trichloroethene	0.0531	0.0533	0.0500	0.0500	106	107	78-120	0	15		
Toluene	0.0473	0.0486	0.0500	0.0500	95	97	83-120	3	15		
Chlorobenzene	0.0507	0.0508	0.0500	0.0500	101	102	81-120	0	15		
Surrogate:											
Dibromofluoromethane					99	92	73-134				
Toluene-d8					97	94	81-124				
4-Bromofluorobenzene					96	91	80-131				



Date of Report: August 24, 2017
Samples Submitted: August 16, 2017
Laboratory Reference: 1708-219
Project: 129-001 Task 25

% MOISTURE

Date Analyzed: 8-17-17

Client ID	Lab ID	% Moisture
P2-081517-0.0-3.0	08-219-01	9
P4-081517-1.0-4.0	08-219-03	9
P5-081517-0.5-3.5	08-219-05	7
P3-081517-0.5-5.0	08-219-07	6
P1-081517-0.5-2.5	08-219-09	7





Data Qualifiers and Abbreviations

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
- B - The analyte indicated was also found in the blank sample.
- C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
- E - The value reported exceeds the quantitation range and is an estimate.
- F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
- H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
- I - Compound recovery is outside of the control limits.
- J - The value reported was below the practical quantitation limit. The value is an estimate.
- K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
- L - The RPD is outside of the control limits.
- M - Hydrocarbons in the gasoline range are impacting the diesel range result.
- M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
- N - Hydrocarbons in the lube oil range are impacting the diesel range result.
- N1 - Hydrocarbons in diesel range are impacting lube oil range results.
- O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.
- P - The RPD of the detected concentrations between the two columns is greater than 40.
- Q - Surrogate recovery is outside of the control limits.
- S - Surrogate recovery data is not available due to the necessary dilution of the sample.
- T - The sample chromatogram is not similar to a typical _____.
- U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- U1 - The practical quantitation limit is elevated due to interferences present in the sample.
- V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
- W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
- X - Sample extract treated with a mercury cleanup procedure.
- X1 - Sample extract treated with a Sulfuric acid/Silica gel cleanup procedure.
- Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.
- Z -
- ND - Not Detected at PQL
- PQL - Practical Quantitation Limit
- RPD - Relative Percent Difference





Onsite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Company: Pacific Crest		Turnaround Request (in working days)		Laboratory Number: 08-219															
Project Number: 129-001 TASC 25		☐ Same Day ☐ 1 Day																	
Project Name: MLW		☐ 2 Days ☐ 3 Days																	
Project Manager: W. C. B. C.		☒ Standard (7 Days) (TYP analysis 5 Days)																	
Sampled by: M. B. C.		☐ (other)																	
Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers														
1	P2-081517 - 0.0-3.0	8/15/17	0905	Soil	4														
2	P2-081517 - 6.0-8.0		0915																
3	P4-081517 - 1.0-4.0		0955																
4	P4-081517 - 6.0-8.0		1005																
5	P5-081517 - 0.5-3.5		1030																
6	P6-081517 - 5.0-8.0		1046																
7	P3-081517 - 0.5-5.0		1050																
8	P3-081517 - 5.0-8.0		1100																
9	P1-081517 - 0.5-2.5		1130																
10	P1-081517 - 4.5-8.0		1140																
Signature		Company		Date		Time		Comments/Special Instructions											
Relinquished		Pacific Crest		8/16/17		1200		PLEASE CC RESULTS TO MBUC@PCENV.COM											
Received		SPB		8/16/17		1200													
Relinquished		SPB		8/16/17		1245													
Received		JBE		8/16/17		1245													
Relinquished																			
Received																			
Reviewed/Date		Reviewed/Date						Data Package: Standard ☐ Level III ☐ Level IV ☐											
								Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐											

Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Monday, August 28, 2017

Bill Carroll
Pacific Crest
1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

RE: MIW / 129-001 Task 75

Enclosed are the results of analyses for work order A7H0517, which was received by the laboratory on 8/17/2017 at 9:45:00AM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

08/28/17 16:43

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
P2-081517-0.0-3.0	A7H0517-01	Soil	08/15/17 09:05	08/17/17 09:45
P4-081517-1.0-4.0	A7H0517-03	Soil	08/15/17 09:55	08/17/17 09:45
P5-081517-0.5-3.5	A7H0517-05	Soil	08/15/17 10:30	08/17/17 09:45
P3-081517-0.5-5.0	A7H0517-07	Soil	08/15/17 10:50	08/17/17 09:45
P1-081517-0.5-2.5	A7H0517-09	Soil	08/15/17 11:30	08/17/17 09:45

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

08/28/17 16:43

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P2-081517-0.0-3.0 (A7H0517-01)			Matrix: Soil	Batch: 7080798				
Benz(a)anthracene	ND	---	0.0107	mg/kg dry	1	08/21/17 13:27	EPA 8270D (SIM)	
Benzo(a)pyrene	ND	---	0.0107	"	"	"	"	
Benzo(b)fluoranthene	0.0117	---	0.0107	"	"	"	"	M-02
Benzo(k)fluoranthene	ND	---	0.0107	"	"	"	"	
Chrysene	ND	---	0.0107	"	"	"	"	
Dibenz(a,h)anthracene	ND	---	0.0107	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	---	0.0107	"	"	"	"	
<i>Surrogate: 2-Fluorobiphenyl (Surr)</i>			<i>Recovery: 84 %</i>	<i>Limits: 44-120 %</i>	"	"	"	
<i>p-Terphenyl-d14 (Surr)</i>			<i>89 %</i>	<i>Limits: 54-127 %</i>	"	"	"	
P4-081517-1.0-4.0 (A7H0517-03)			Matrix: Soil	Batch: 7080798				
Benz(a)anthracene	0.896	---	0.0533	mg/kg dry	5	08/21/17 13:53	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	2.24	---	0.0533	"	"	"	"	
Benzo(b)fluoranthene	2.54	---	0.0533	"	"	"	"	M-02
Benzo(k)fluoranthene	1.03	---	0.0533	"	"	"	"	M-02
Chrysene	1.28	---	0.0533	"	"	"	"	M-02
Dibenz(a,h)anthracene	0.435	---	0.0533	"	"	"	"	
Indeno(1,2,3-cd)pyrene	2.41	---	0.0533	"	"	"	"	
<i>Surrogate: 2-Fluorobiphenyl (Surr)</i>			<i>Recovery: 96 %</i>	<i>Limits: 44-120 %</i>	"	"	"	
<i>p-Terphenyl-d14 (Surr)</i>			<i>103 %</i>	<i>Limits: 54-127 %</i>	"	"	"	
P5-081517-0.5-3.5 (A7H0517-05)			Matrix: Soil	Batch: 7080798				
Benz(a)anthracene	0.474	---	0.0493	mg/kg dry	5	08/21/17 14:20	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	1.13	---	0.0493	"	"	"	"	
Benzo(b)fluoranthene	1.47	---	0.0493	"	"	"	"	M-02
Benzo(k)fluoranthene	0.568	---	0.0493	"	"	"	"	M-02
Chrysene	0.732	---	0.0493	"	"	"	"	M-02
Dibenz(a,h)anthracene	0.257	---	0.0493	"	"	"	"	
Indeno(1,2,3-cd)pyrene	1.31	---	0.0493	"	"	"	"	
<i>Surrogate: 2-Fluorobiphenyl (Surr)</i>			<i>Recovery: 97 %</i>	<i>Limits: 44-120 %</i>	"	"	"	
<i>p-Terphenyl-d14 (Surr)</i>			<i>100 %</i>	<i>Limits: 54-127 %</i>	"	"	"	
P3-081517-0.5-5.0 (A7H0517-07RE1)			Matrix: Soil	Batch: 7080798				
Benz(a)anthracene	0.0176	---	0.0104	mg/kg dry	1	08/21/17 19:39	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	0.0368	---	0.0104	"	"	"	"	
Benzo(b)fluoranthene	0.0441	---	0.0104	"	"	"	"	M-02
Benzo(k)fluoranthene	0.0168	---	0.0104	"	"	"	"	M-02

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P3-081517-0.5-5.0 (A7H0517-07RE1)			Matrix: Soil		Batch: 7080798			
Chrysene	0.0258	---	0.0104	mg/kg dry	1	"	EPA 8270D (SIM)	M-02
Dibenz(a,h)anthracene	ND	---	0.0104	"	"	"	"	
Indeno(1,2,3-cd)pyrene	0.0358	---	0.0104	"	"	"	"	
<i>Surrogate: 2-Fluorobiphenyl (Surr)</i>			<i>Recovery: 86 %</i>	<i>Limits: 44-120 %</i>	"	"	"	
<i>p-Terphenyl-d14 (Surr)</i>			<i>97 %</i>	<i>Limits: 54-127 %</i>	"	"	"	
P1-081517-0.5-2.5 (A7H0517-09)			Matrix: Soil		Batch: 7080798			
Benz(a)anthracene	10.3	---	0.104	mg/kg dry	10	08/21/17 15:13	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	23.3	---	0.104	"	"	"	"	
Benzo(b)fluoranthene	30.0	---	0.104	"	"	"	"	M-02
Benzo(k)fluoranthene	13.0	---	0.104	"	"	"	"	M-02
Chrysene	15.0	---	0.104	"	"	"	"	M-02
Dibenz(a,h)anthracene	6.41	---	0.104	"	"	"	"	
Indeno(1,2,3-cd)pyrene	29.2	---	0.104	"	"	"	"	
<i>Surrogate: 2-Fluorobiphenyl (Surr)</i>			<i>Recovery: 107 %</i>	<i>Limits: 44-120 %</i>	"	"	"	
<i>p-Terphenyl-d14 (Surr)</i>			<i>120 %</i>	<i>Limits: 54-127 %</i>	"	"	"	

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

08/28/17 16:43

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P2-081517-0.0-3.0 (A7H0517-01)			Matrix: Soil		Batch: 7080807			
% Solids	90.6	---	1.00	% by Weight	1	08/21/17 08:43	EPA 8000C	
P4-081517-1.0-4.0 (A7H0517-03)			Matrix: Soil		Batch: 7080807			
% Solids	91.7	---	1.00	% by Weight	1	08/21/17 08:43	EPA 8000C	
P5-081517-0.5-3.5 (A7H0517-05)			Matrix: Soil		Batch: 7080807			
% Solids	96.6	---	1.00	% by Weight	1	08/21/17 08:43	EPA 8000C	
P3-081517-0.5-5.0 (A7H0517-07)			Matrix: Soil		Batch: 7080807			
% Solids	91.4	---	1.00	% by Weight	1	08/21/17 08:43	EPA 8000C	
P1-081517-0.5-2.5 (A7H0517-09)			Matrix: Soil		Batch: 7080807			
% Solids	92.2	---	1.00	% by Weight	1	08/21/17 08:43	EPA 8000C	

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7080798 - EPA 3546						Soil						
Blank (7080798-BLK1)			Prepared: 08/18/17 10:12 Analyzed: 08/18/17 14:32									
EPA 8270D (SIM)												
Acenaphthene	ND	---	0.00833	mg/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Anthracene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Chrysene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Dibenzofuran	ND	---	0.00833	"	"	---	---	---	---	---	---	
Fluoranthene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Fluorene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	0.00833	"	"	---	---	---	---	---	---	
1-Methylnaphthalene	ND	---	0.00833	"	"	---	---	---	---	---	---	
2-Methylnaphthalene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Naphthalene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Phenanthrene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Pyrene	ND	---	0.00833	"	"	---	---	---	---	---	---	
Surr: 2-Fluorobiphenyl (Surr)			Recovery: 86 %		Limits: 44-120 %		Dilution: 1x					
p-Terphenyl-d14 (Surr)			101 %		54-127 %		"					

LCS (7080798-BS1)

Prepared: 08/18/17 10:12 Analyzed: 08/18/17 14:58

EPA 8270D (SIM)

Acenaphthene	0.759	---	0.0100	mg/kg wet	1	0.800	---	95	40-122%	---	---
Acenaphthylene	0.692	---	0.0100	"	"	"	---	87	32-132%	---	---
Anthracene	0.734	---	0.0100	"	"	"	---	92	47-123%	---	---
Benz(a)anthracene	0.705	---	0.0100	"	"	"	---	88	49-126%	---	---
Benzo(a)pyrene	0.673	---	0.0100	"	"	"	---	84	45-129%	---	---
Benzo(b)fluoranthene	0.725	---	0.0100	"	"	"	---	91	45-132%	---	---
Benzo(k)fluoranthene	0.717	---	0.0100	"	"	"	---	90	47-132%	---	---
Benzo(g,h,i)perylene	0.717	---	0.0100	"	"	"	---	90	43-134%	---	---
Chrysene	0.761	---	0.0100	"	"	"	---	95	50-124%	---	---
Dibenz(a,h)anthracene	0.697	---	0.0100	"	"	"	---	87	45-134%	---	---
Dibenzofuran	0.731	---	0.0100	"	"	"	---	91	44-120%	---	---

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Lisa Domenighini, Client Services Manager

Pacific Crest1531 Bendigo Blvd PO Box 952
North Bend, WA 98045Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

QUALITY CONTROL (QC) SAMPLE RESULTS**Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM**

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7080798 - EPA 3546						Soil						
LCS (7080798-BS1)				Prepared: 08/18/17 10:12 Analyzed: 08/18/17 14:58								
EPA 8270D (SIM)												
Fluoranthene	0.734	---	0.0100	mg/kg wet	"	"	---	92	50-127%	---	---	
Fluorene	0.737	---	0.0100	"	"	"	---	92	43-125%	---	---	
Indeno(1,2,3-cd)pyrene	0.690	---	0.0100	"	"	"	---	86	45-133%	---	---	
1-Methylnaphthalene	0.724	---	0.0100	"	"	"	---	90	40-120%	---	---	
2-Methylnaphthalene	0.743	---	0.0100	"	"	"	---	93	38-122%	---	---	
Naphthalene	0.728	---	0.0100	"	"	"	---	91	35-123%	---	---	
Phenanthrene	0.699	---	0.0100	"	"	"	---	87	50-121%	---	---	
Pyrene	0.727	---	0.0100	"	"	"	---	91	47-127%	---	---	
Surr: 2-Fluorobiphenyl (Surr)		Recovery: 91 %		Limits: 44-120 %		Dilution: 1x						
p-Terphenyl-d14 (Surr)		106 %		54-127 %		"						

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

08/28/17 16:43

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7080807 - Total Solids (Dry Weight)							Soil					

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest1531 Bendigo Blvd PO Box 952
North Bend, WA 98045Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

SAMPLE PREPARATION INFORMATION**Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM****Prep: EPA 3546**

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 7080798							
A7H0517-01	Soil	EPA 8270D (SIM)	08/15/17 09:05	08/18/17 15:29	10.35g/5mL	10g/5mL	0.97
A7H0517-03	Soil	EPA 8270D (SIM)	08/15/17 09:55	08/18/17 15:29	10.22g/5mL	10g/5mL	0.98
A7H0517-05	Soil	EPA 8270D (SIM)	08/15/17 10:30	08/18/17 15:29	10.5g/5mL	10g/5mL	0.95
A7H0517-07RE1	Soil	EPA 8270D (SIM)	08/15/17 10:50	08/18/17 15:29	10.48g/5mL	10g/5mL	0.95
A7H0517-09	Soil	EPA 8270D (SIM)	08/15/17 11:30	08/18/17 15:29	10.42g/5mL	10g/5mL	0.96

Percent Dry Weight**Prep: Total Solids (Dry Weight)**

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 7080807							
A7H0517-01	Soil	EPA 8000C	08/15/17 09:05	08/18/17 12:27	1N/A/1N/A	1N/A/1N/A	NA
A7H0517-03	Soil	EPA 8000C	08/15/17 09:55	08/18/17 12:27	1N/A/1N/A	1N/A/1N/A	NA
A7H0517-05	Soil	EPA 8000C	08/15/17 10:30	08/18/17 12:27	1N/A/1N/A	1N/A/1N/A	NA
A7H0517-07	Soil	EPA 8000C	08/15/17 10:50	08/18/17 12:27	1N/A/1N/A	1N/A/1N/A	NA
A7H0517-09	Soil	EPA 8000C	08/15/17 11:30	08/18/17 12:27	1N/A/1N/A	1N/A/1N/A	NA

Apex Laboratories



Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

08/28/17 16:43

Notes and Definitions

Qualifiers:

M-02 Due to matrix interference, this analyte cannot be accurately quantified. The reported result is estimated.

Notes and Conventions:

DET Analyte DETECTED

ND Analyte NOT DETECTED at or above the reporting limit

NR Not Reported

dry Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry' designation are not dry weight corrected.

RPD Relative Percent Difference

MDL If MDL is not listed, data has been evaluated to the Method Reporting Limit only.

WMSC Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.

Batch QC Unless specifically requested, this report contains only results for Batch QC derived from client samples included in this report. All analyses were performed with the appropriate Batch QC (including Sample Duplicates, Matrix Spikes and/or Matrix Spike Duplicates) in order to meet or exceed method and regulatory requirements. Any exceptions to this will be qualified in this report. Complete Batch QC results are available upon request. In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.

Blank Policy Apex assesses blank data for potential high bias down to a level equal to ½ the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.

For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.

Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.

--- QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

*** Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

A7140517
Page 1 of 1

Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: Pacific Crest
Project Number: 129-001 Task 75
Project Name: MIW
Project Manager: W Carroll
Sampled by: M. Blach

Laboratory Number:

Turnaround Request (in working days)
(Check One)
☐ Same Day
☐ 1 Day
☐ 2 Days
☐ 3 Days
☒ Standard (7 Days)
 (TPI analysis 5 Days)
☐ (other) _____

Number of Containers: 2

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix
1	P2-081517-00-3-0	8/15/17	0905	Soil
2	P2-081517-60-8-0		0915	
3	P4-081517-10-4-0		0905	
4	P4-081517-60-8-0		1005	
5	P5-081517-05-3-2		1030	
6	P5-081517-50-6-0		1040	
7	P3-081517-05-5-0		1050	
8	P3-081517-50-8-0		1100	
9	P1-081517-05-2-5		1130	
10	P1-081517-45-8-0		1140	

Refined/Quished: [Signature]
 Received: [Signature]
 Refined/Quished: [Signature]
 Received: [Signature]
 Refined/Quished: [Signature]
 Received: [Signature]
 Reviewed/Date: _____

Company: Pacific Crest
Apex Labs
Apex Labs
Apex Labs

Date: 8/16/17
8/16/17
8/16/17
8/17/17

Time: 1050
1050
1215
945

Comments/Special Instructions:
PLEASE CC RESULTS TO
MBLACH@PACREST.COM
HOLD OTHER SAMPLING

Electronic Data Deliverables (EDDs): _____
 Data Package: Standard ☐ Level III ☐ Level IV ☐

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

08/28/17 16:43

APEX LABS COOLER RECEIPT FORM

Client: Pacific Crest Element WO#: A7H0517
Project/Project #: MIW 129-001 Task 75

Delivery info:

Date/Time Received: 8/17/17 @ 945 By: (Signature)

Delivered by: Apex ☐ Client ☐ ESS ☐ FedEx ☒ UPS ☐ Swift ☐ Senvoy ☐ SDS ☐ Other ☐

Cooler Inspection Inspected by: (Signature) : 8/17/17 @ 945

Chain of Custody Included? Yes ☒ No ☐ Custody Seals? Yes ☐ No ☒

Signed/Dated by Client? Yes ☒ No ☐

Signed/Dated by Apex? Yes ☒ No ☐

Cooler #1 Cooler #2 Cooler #3 Cooler #4 Cooler #5 Cooler #6 Cooler #7

Temperature (deg. C) 4.6

Received on Ice? ☒ (Y/N)

Temp. Blanks? (Y/N) ☒

Ice Type: (Gel/Rea/Other) Rea

Condition: Good

Cooler out of temp? ☒ (Y/N) Possible reason why:

If some coolers are in temp and some out, were green dot applied to out of temperature samples? Yes/No NA

Samples Inspection Inspected by: (Signature) : 8/17/17 @ 1340

All Samples Intact? Yes ☒ No ☐ Comments:

Bottle Labels/COCs agree? Yes ☐ No ☒ Comments: P4-081517-1.0-4.0 containers read

T of 1030, P4-081517-6.0-8.0 containers read T of 1040, P5-081517-0.5-3.2

Containers/Volumes Received Appropriate for Analysis? Yes ☒ No ☐ Comments:

Do VOA Vials have Visible Headspace? Yes ☐ No ☐ NA ☒

Comments:

Water Samples: pH Checked and Appropriate (except VOAs): Yes ☐ No ☐ NA ☒

Comments:

Additional Information:

Labeled by: (Signature) Witness: (Signature) Cooler Inspected by: (Signature) See Project Contact Form: Y

Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Wednesday, September 6, 2017

Bill Carroll
Pacific Crest
1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

RE: MIW / 129-001 Task 75

Enclosed are the results of analyses for work order A7H0801, which was received by the laboratory on 8/29/2017 at 8:25:00AM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

DRAFT REPORT, DATA SUBJECT TO CHANGE

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
P4-081517-1.0-4.0 - After Processing	A7H0801-02	Soil	08/15/17 09:55	08/29/17 08:25
P4-081517-6.0-8.0 - After Processing	A7H0801-04	Soil	08/15/17 10:05	08/29/17 08:25
P5-081517-5.0-8.0 - After Processing	A7H0801-06	Soil	08/15/17 10:40	08/29/17 08:25
P1-081517-0.5-2.5 - After Processing	A7H0801-08	Soil	08/15/17 11:30	08/29/17 08:25
P1-081517-4.5-8.0 - After Processing	A7H0801-10	Soil	08/15/17 11:40	08/29/17 08:25

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

ANALYTICAL SAMPLE RESULTS

Diesel and/or Oil Hydrocarbons by NWTPH-Dx

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P4-081517-1.0-4.0 - After Processing (A7H0801-02)			Matrix: Soil		Batch: 7090313			H-06
Diesel	ND	---	7.93	mg/kg dry	1	09/05/17 23:52	NWTPH-Dx	
Oil	358	---	15.9	"	"	"	"	F-03
<i>Surrogate: o-Terphenyl (Surr)</i>			<i>Recovery: 71 %</i>	<i>Limits: 50-150 %</i>	"	"	"	
P1-081517-0.5-2.5 - After Processing (A7H0801-08)			Matrix: Soil		Batch: 7090313			H-06
Diesel	ND	---	7.98	mg/kg dry	1	09/06/17 00:52	NWTPH-Dx	
Oil	687	---	16.0	"	"	"	"	F-03
<i>Surrogate: o-Terphenyl (Surr)</i>			<i>Recovery: 84 %</i>	<i>Limits: 50-150 %</i>	"	"	"	

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

09/06/17 13:55

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P4-081517-6.0-8.0 - After Processing (A7H0801-04)			Matrix: Soil		Batch: 7081080			H-05
Benzo(a)anthracene	0.0416	---	0.0117	mg/kg dry	1	08/31/17 13:12	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	0.0490	---	0.0117	"	"	"	"	
Benzo(b)fluoranthene	0.0570	---	0.0117	"	"	"	"	M-02
Benzo(k)fluoranthene	0.0182	---	0.0117	"	"	"	"	M-02
Chrysene	0.0530	---	0.0117	"	"	"	"	M-02
Dibenz(a,h)anthracene	ND	---	0.0117	"	"	"	"	
Indeno(1,2,3-cd)pyrene	0.0320	---	0.0117	"	"	"	"	
Surrogate: 2-Fluorobiphenyl (Surr)			Recovery: 80 %	Limits: 44-120 %	"	"	"	
p-Terphenyl-d14 (Surr)			95 %	Limits: 54-127 %	"	"	"	
P5-081517-5.0-8.0 - After Processing (A7H0801-06)			Matrix: Soil		Batch: 7081080			H-05
Benzo(a)anthracene	0.476	---	0.106	mg/kg dry	10	08/31/17 13:38	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	0.621	---	0.106	"	"	"	"	
Benzo(b)fluoranthene	0.596	---	0.106	"	"	"	"	M-02
Benzo(k)fluoranthene	0.196	---	0.106	"	"	"	"	M-02
Chrysene	0.601	---	0.106	"	"	"	"	M-02
Dibenz(a,h)anthracene	ND	---	0.106	"	"	"	"	
Indeno(1,2,3-cd)pyrene	0.395	---	0.106	"	"	"	"	
Surrogate: 2-Fluorobiphenyl (Surr)			Recovery: 86 %	Limits: 44-120 %	"	"	"	
p-Terphenyl-d14 (Surr)			101 %	Limits: 54-127 %	"	"	"	
P1-081517-4.5-8.0 - After Processing (A7H0801-10)			Matrix: Soil		Batch: 7081080			H-05
Benzo(a)anthracene	6.82	---	0.213	mg/kg dry	20	08/31/17 14:05	EPA 8270D (SIM)	M-02
Benzo(a)pyrene	17.6	---	0.213	"	"	"	"	
Benzo(b)fluoranthene	17.0	---	0.213	"	"	"	"	M-02
Benzo(k)fluoranthene	6.81	---	0.213	"	"	"	"	M-02
Chrysene	9.41	---	0.213	"	"	"	"	M-02
Dibenz(a,h)anthracene	3.03	---	0.213	"	"	"	"	
Indeno(1,2,3-cd)pyrene	15.4	---	0.213	"	"	"	"	
Surrogate: 2-Fluorobiphenyl (Surr)			Recovery: 78 %	Limits: 44-120 %	"	"	"	
p-Terphenyl-d14 (Surr)			94 %	Limits: 54-127 %	"	"	"	

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

09/06/17 13:55

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
P4-081517-1.0-4.0 - After Processing (A7H0801-02)			Matrix: Soil	Batch: 7081109				
% Solids	91.9	---	1.00	% by Weight	1	08/31/17 08:01	EPA 8000C	
P4-081517-6.0-8.0 - After Processing (A7H0801-04)			Matrix: Soil	Batch: 7081109				
% Solids	83.9	---	1.00	% by Weight	1	08/31/17 08:01	EPA 8000C	
P5-081517-5.0-8.0 - After Processing (A7H0801-06)			Matrix: Soil	Batch: 7081109				
% Solids	88.7	---	1.00	% by Weight	1	08/31/17 08:01	EPA 8000C	
P1-081517-0.5-2.5 - After Processing (A7H0801-08)			Matrix: Soil	Batch: 7081109				
% Solids	92.9	---	1.00	% by Weight	1	08/31/17 08:01	EPA 8000C	
P1-081517-4.5-8.0 - After Processing (A7H0801-10)			Matrix: Soil	Batch: 7081109				
% Solids	91.2	---	1.00	% by Weight	1	08/31/17 08:01	EPA 8000C	

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest1531 Bendigo Blvd PO Box 952
North Bend, WA 98045Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

QUALITY CONTROL (QC) SAMPLE RESULTS**Diesel and/or Oil Hydrocarbons by NWTPH-Dx**

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7090313 - EPA 3546 (Fuels)						Soil						
Blank (7090313-BLK1)						Prepared: 09/05/17 15:02 Analyzed: 09/05/17 23:12						
NWTPH-Dx												
Diesel	ND	---	7.27	mg/kg wet	1	---	---	---	---	---	---	
Oil	ND	---	14.5	"	"	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)		Recovery: 71 %		Limits: 50-150 %		Dilution: 1x						
LCS (7090313-BS1)						Prepared: 09/05/17 15:02 Analyzed: 09/05/17 23:32						
NWTPH-Dx												
Diesel	100	---	8.00	mg/kg wet	1	125	---	80	70-130%	---	---	
Surr: o-Terphenyl (Surr)		Recovery: 89 %		Limits: 50-150 %		Dilution: 1x						
Duplicate (7090313-DUP1)						Prepared: 09/05/17 15:02 Analyzed: 09/06/17 00:12						
QC Source Sample: P4-081517-1.0-4.0 - After Processing (A7H0801-02)												
NWTPH-Dx												
Diesel	ND	---	8.00	mg/kg dry	1	---	ND	---	---	---	30%	
Oil	326	---	16.0	"	"	---	358	---	---	9	30%	F-03
Surr: o-Terphenyl (Surr)		Recovery: 63 %		Limits: 50-150 %		Dilution: 1x						

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7081080 - EPA 3546						Soil						
Blank (7081080-BLK1)						Prepared: 08/30/17 08:39 Analyzed: 08/30/17 16:44						
EPA 8270D (SIM)												
Acenaphthene	ND	---	0.00909	mg/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Anthracene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Chrysene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Dibenzofuran	ND	---	0.00909	"	"	---	---	---	---	---	---	
Fluoranthene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Fluorene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	0.00909	"	"	---	---	---	---	---	---	
1-Methylnaphthalene	ND	---	0.00909	"	"	---	---	---	---	---	---	
2-Methylnaphthalene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Naphthalene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Phenanthrene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Pyrene	ND	---	0.00909	"	"	---	---	---	---	---	---	
Surr: 2-Fluorobiphenyl (Surr)			Recovery: 91 %		Limits: 44-120 %		Dilution: 1x					
p-Terphenyl-d14 (Surr)			129 %		54-127 %		"					
												S-06

LCS (7081080-BS1)

Prepared: 08/30/17 08:39 Analyzed: 08/30/17 17:11

EPA 8270D (SIM)

Acenaphthene	0.820	---	0.0100	mg/kg wet	1	0.800	---	103	40-122%	---	---	
Acenaphthylene	0.764	---	0.0100	"	"	"	---	95	32-132%	---	---	
Anthracene	0.820	---	0.0100	"	"	"	---	102	47-123%	---	---	
Benz(a)anthracene	0.751	---	0.0100	"	"	"	---	94	49-126%	---	---	
Benzo(a)pyrene	0.747	---	0.0100	"	"	"	---	93	45-129%	---	---	
Benzo(b)fluoranthene	0.769	---	0.0100	"	"	"	---	96	45-132%	---	---	
Benzo(k)fluoranthene	0.827	---	0.0100	"	"	"	---	103	47-132%	---	---	
Benzo(g,h,i)perylene	0.808	---	0.0100	"	"	"	---	101	43-134%	---	---	
Chrysene	0.828	---	0.0100	"	"	"	---	103	50-124%	---	---	
Dibenz(a,h)anthracene	0.793	---	0.0100	"	"	"	---	99	45-134%	---	---	
Dibenzofuran	0.791	---	0.0100	"	"	"	---	99	44-120%	---	---	

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7081080 - EPA 3546						Soil						
LCS (7081080-BS1)				Prepared: 08/30/17 08:39 Analyzed: 08/30/17 17:11								
EPA 8270D (SIM)												
Fluoranthene	0.771	---	0.0100	mg/kg wet	"	"	---	96	50-127%	---	---	
Fluorene	0.793	---	0.0100	"	"	"	---	99	43-125%	---	---	
Indeno(1,2,3-cd)pyrene	0.988	---	0.0100	"	"	"	---	123	45-133%	---	---	
1-Methylnaphthalene	0.836	---	0.0100	"	"	"	---	104	40-120%	---	---	
2-Methylnaphthalene	0.797	---	0.0100	"	"	"	---	100	38-122%	---	---	
Naphthalene	0.762	---	0.0100	"	"	"	---	95	35-123%	---	---	
Phenanthrene	0.806	---	0.0100	"	"	"	---	101	50-121%	---	---	
Pyrene	0.768	---	0.0100	"	"	"	---	96	47-127%	---	---	
Surr: 2-Fluorobiphenyl (Surr)		Recovery: 88 %		Limits: 44-120 %		Dilution: 1x						
p-Terphenyl-d14 (Surr)		116 %		54-127 %		"						

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest 1531 Bendigo Blvd PO Box 952 North Bend, WA 98045	Project: MIW Project Number: 129-001 Task 75 Project Manager: Bill Carroll	Reported: 09/06/17 13:55
--	---	------------------------------------

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight											
--------------------	--	--	--	--	--	--	--	--	--	--	--

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 7081109 - Total Solids (Dry Weight)							Soil					

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest1531 Bendigo Blvd PO Box 952
North Bend, WA 98045Project: **MIW**

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

SAMPLE PREPARATION INFORMATION**Diesel and/or Oil Hydrocarbons by NWTPH-Dx****Prep: EPA 3546 (Fuels)**

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 7090313							
A7H0801-02	Soil	NWTPH-Dx	08/15/17 09:55	09/05/17 15:03	10.98g/2mL	10g/2mL	0.91
A7H0801-08	Soil	NWTPH-Dx	08/15/17 11:30	09/05/17 15:03	10.79g/2mL	10g/2mL	0.93

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM**Prep: EPA 3546**

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 7081080							
A7H0801-04	Soil	EPA 8270D (SIM)	08/15/17 10:05	08/30/17 16:31	10.18g/5mL	10g/5mL	0.98
A7H0801-06	Soil	EPA 8270D (SIM)	08/15/17 10:40	08/30/17 16:31	10.65g/5mL	10g/5mL	0.94
A7H0801-10	Soil	EPA 8270D (SIM)	08/15/17 11:40	08/30/17 16:31	10.3g/5mL	10g/5mL	0.97

Percent Dry Weight**Prep: Total Solids (Dry Weight)**

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 7081109							
A7H0801-02	Soil	EPA 8000C	08/15/17 09:55	08/30/17 15:03	1N/A/1N/A	1N/A/1N/A	NA
A7H0801-04	Soil	EPA 8000C	08/15/17 10:05	08/30/17 15:03	1N/A/1N/A	1N/A/1N/A	NA
A7H0801-06	Soil	EPA 8000C	08/15/17 10:40	08/30/17 15:03	1N/A/1N/A	1N/A/1N/A	NA
A7H0801-08	Soil	EPA 8000C	08/15/17 11:30	08/30/17 15:03	1N/A/1N/A	1N/A/1N/A	NA
A7H0801-10	Soil	EPA 8000C	08/15/17 11:40	08/30/17 15:03	1N/A/1N/A	1N/A/1N/A	NA

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: **MIW**

Project Number: 129-001 Task 75
Project Manager: Bill Carroll

Reported:

09/06/17 13:55

Notes and Definitions

Qualifiers:

- F-03 The result for this hydrocarbon range is elevated due to the presence of individual analyte peaks in the quantitation range that are not representative of the fuel pattern reported.
- H-05 Sample received without adequate lead time to perform analysis within hold time.
- H-06 This sample was received, or the analysis requested, outside the recommended holding time.
- M-02 Due to matrix interference, this analyte cannot be accurately quantified. The reported result is estimated.
- S-06 Surrogate recovery is outside of established control limits.

Notes and Conventions:

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry' designation are not dry weight corrected.
- RPD Relative Percent Difference
- MDL If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
- WMSC Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
- Batch QC Unless specifically requested, this report contains only results for Batch QC derived from client samples included in this report. All analyses were performed with the appropriate Batch QC (including Sample Duplicates, Matrix Spikes and/or Matrix Spike Duplicates) in order to meet or exceed method and regulatory requirements. Any exceptions to this will be qualified in this report. Complete Batch QC results are available upon request. In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.
- Blank Policy Apex assesses blank data for potential high bias down to a level equal to 1/2 the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.

For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.

Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.
- QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
- *** Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

Pacific Crest

1531 Bendigo Blvd PO Box 952
North Bend, WA 98045

Project: MIW

Project Number: 129-001 Task 75

Project Manager: Bill Carroll

Reported:

09/06/17 13:55

*Relogged
A7 H0801 *

A7H0517

Page 1 of 1

Chain of Custody

Turnaround Request (in working days)		Laboratory Number:	
(Check One)			
Same Day	1 Day		
2 Days	3 Days		
Standard (7 Days)			
(TPH analysis 5 Days)			
(other)			
Company:	Pacific Crest		
Project Number:	129-001 Task 75		
Project Name:	MIW		
Project Manager:	W Carroll		
Sampled by:	M Bunch		
Lab ID	Sample Identification	Date Sampled	Time Sampled
1	P2-08517-0.0-3.0	8/5/17	0905
2	P2-08517-6.0-8.0	8/5/17	0915
3	P4-08517-1.0-4.0	8/5/17	0905
4	P4-08517-6.0-8.0	8/5/17	1005
5	P5-08517-0.5-3.8	8/5/17	1030
6	P5-08517-5.0-8.0	8/5/17	1040
7	P3-08517-0.5-5.6	8/5/17	1050
8	P3-08517-5.0-8.0	8/5/17	1100
9	P1-08517-0.5-2.5	8/5/17	1130
10	P1-08517-4.5-8.0	8/5/17	1140
Relinquished	Signature	Company	Date
Received	Signature	Pacific Crest	8/16/17
Relinquished	Signature	Apex Labs	8/16/17
Received	Signature	Apex Labs	8/16/17
Relinquished	Signature	Apex Labs	8/17/17
Received	Signature	Apex Labs	8/17/17
Reviewed/Date		Reviewed/Date	

Comments/Special Instructions	Time
PLEASE CC RESULTS TO MBUNCH@PACREST.COM HOLD OTHER SAMPLING	1050
	1050
	1215
	945

Chromatograms with final report

DRAFT REPORT

The results provided in this report are PRELIMINARY and are subject to change based on subsequent analysis, QC validation or final data review. Please use these results with the understanding that they may have not been finalized by the laboratory

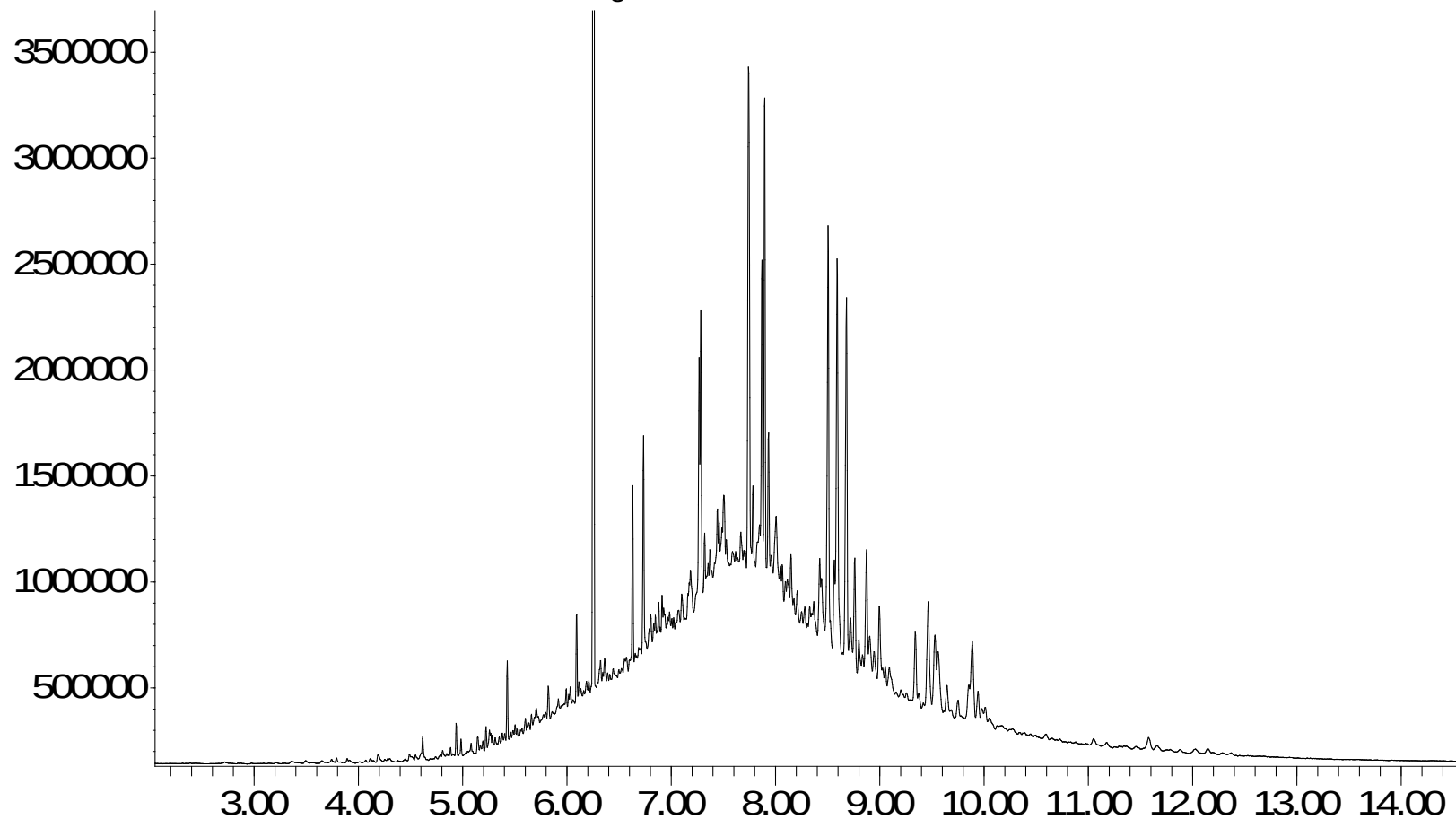
Soil Sample: P4-081517-1.0-4.0 (A7H0801-02)

Pacific Crest - MIW

Date Analyzed: September 5, 2017

Response_

Signal: 7F090512.D\FID1A.CH



Time

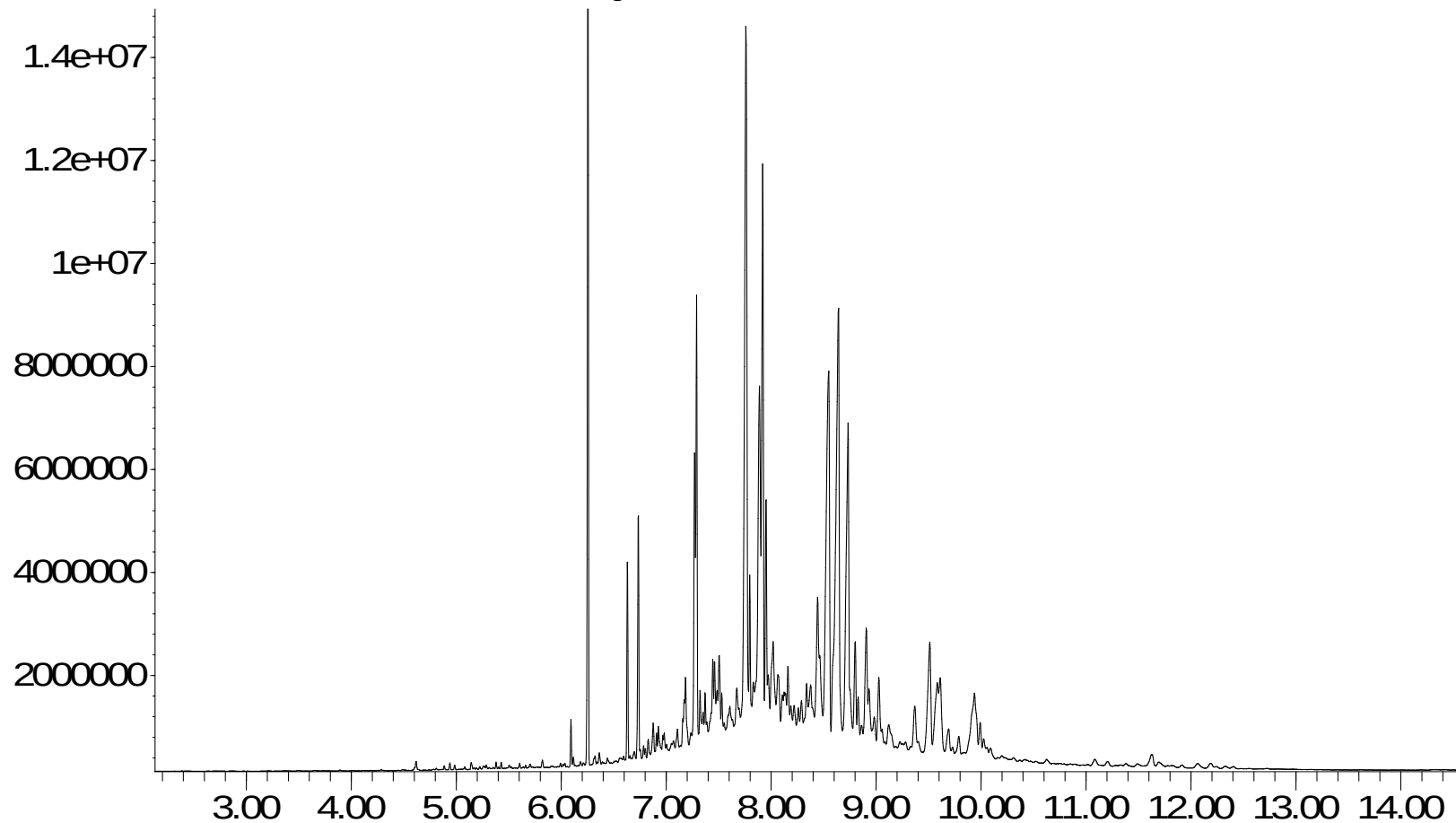
Soil Sample: P1-081517-0.5-2.5 (A7H0801-08)

Pacific Crest - MIW

Date Analyzed: September 5, 2017

Response_

Signal: 7F090515.D\FID1A.CH

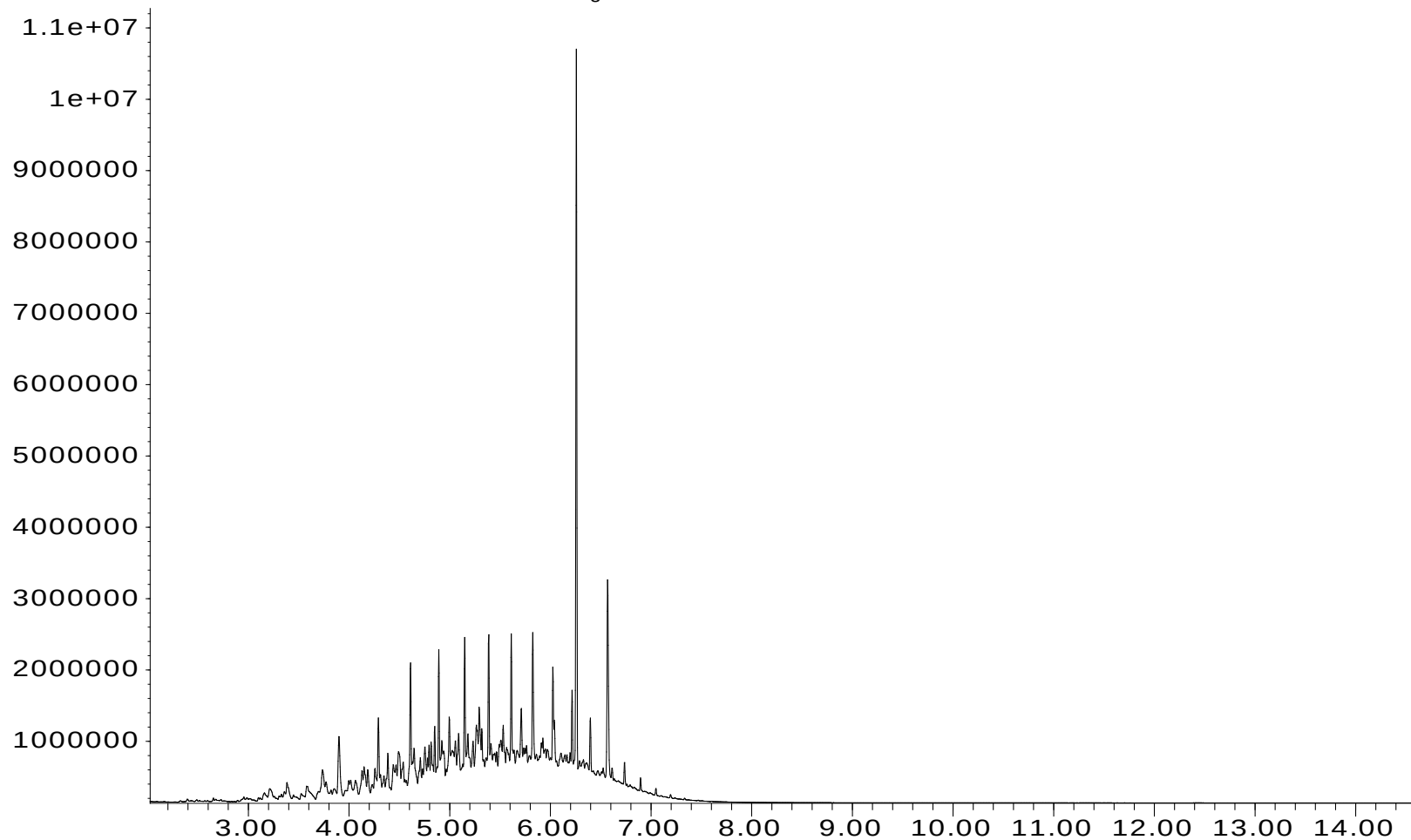


Time

QC Sample: 7I05049-CCV1
Pacific Crest - MIW
Date Analyzed: September 5, 2017

Response_

Signal: 7F090502.D\FID1A.CH

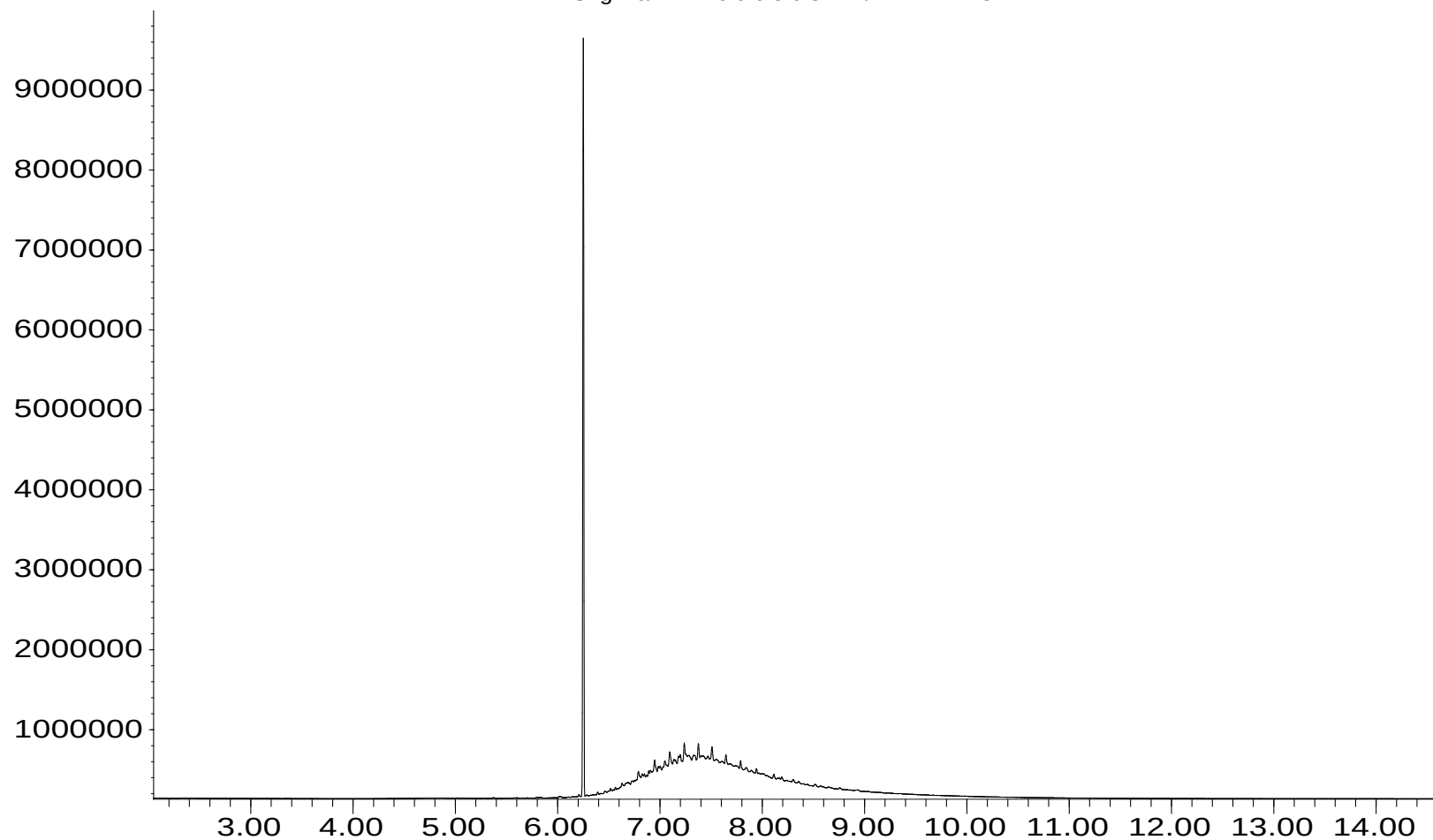


Time

QC Sample: 7I05049-CCV2
Pacific Crest - MIW
Date Analyzed: September 5, 2017

Response_

Signal: 7F090503.D\FID1A.CH

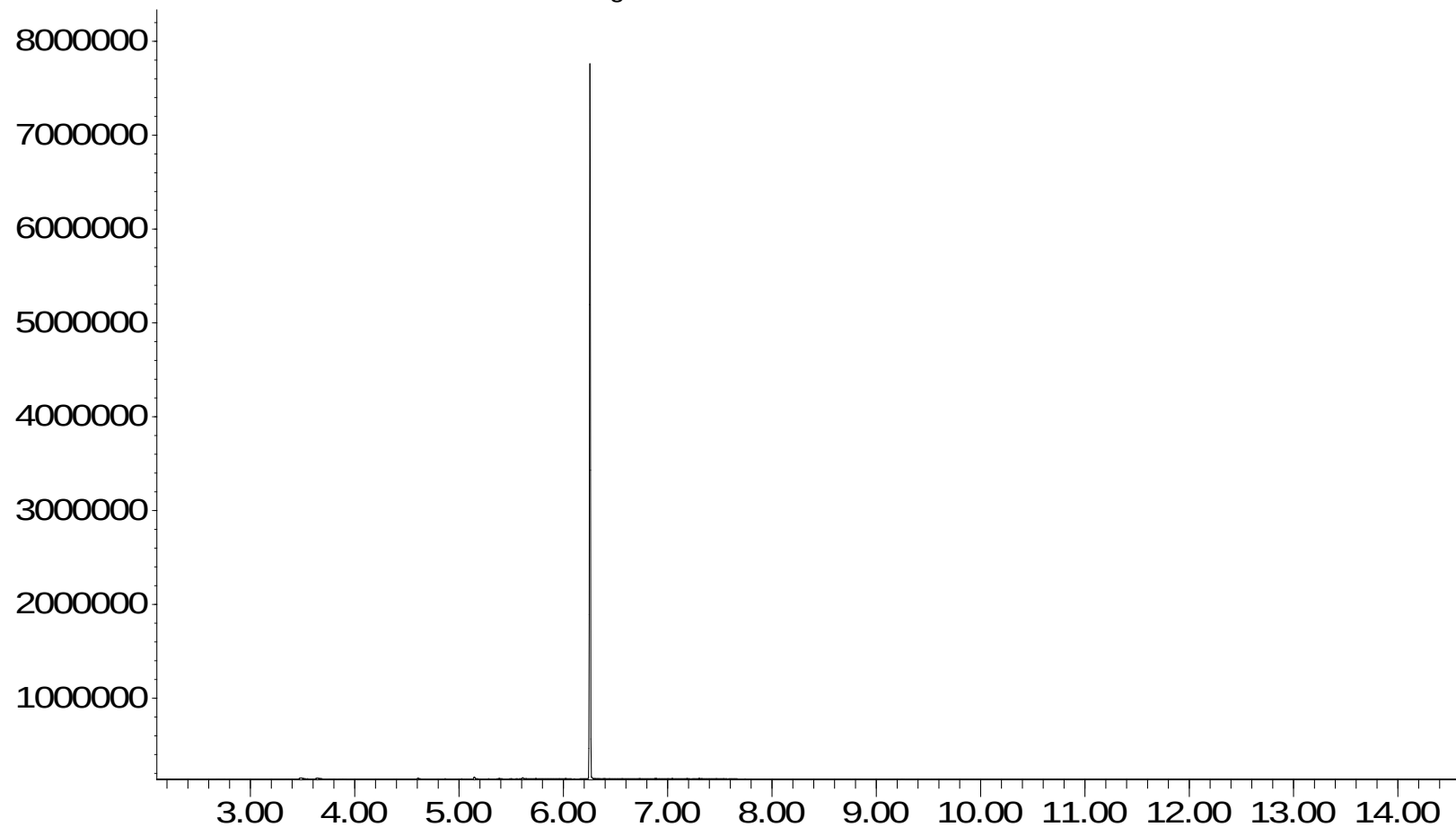


Time

QC Sample: Method Blank
Pacific Crest - MIW
Date Analyzed: September 5, 2017

Response_

Signal: 7F090505.D\FID1A.CH



Time

P1-081517-0.5-2.5

