Whitehead Tyee Site

Interim Action Work Plan

Prepared for

Seattle Iron & Metals Corporation
601 S. Myrtle Street
Seattle, WA 98108

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FINAL

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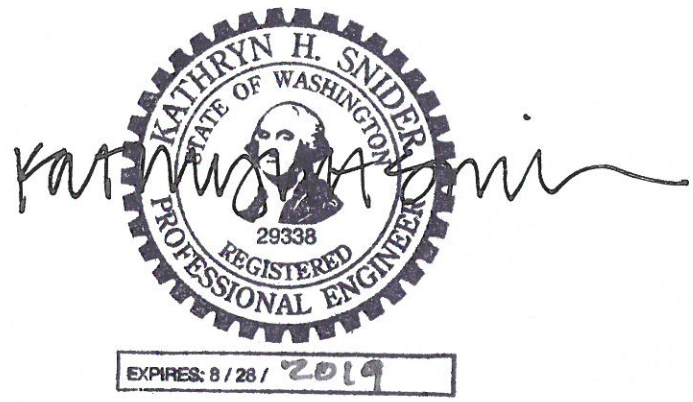
INTERIM ACTION WORK PLAN

CERTIFICATION

This document has been prepared for 730 Myrtle, LLC and Seattle Iron & Metals Corporation.

The proposed remedial actions will be completed at the Whitehead Tyee Site (730 S. Myrtle Street in Seattle, Washington) in accordance with the April 2017 Interim Action Work Plan (IAWP) prepared by Floyd|Snider and the associated Washington State Department of Ecology's (Ecology's) approval of the IAWP dated April 26, 2017. The proposed remedial actions and cleanup objectives in this IAWP are consistent with the Model Toxics Control Act Cleanup Regulation and are being conducted pursuant to Agreed Order (AO) No. DE 13458.



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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Definition
°F	Degrees Fahrenheit
AO	Agreed Order
bgs	Below ground surface
BMP	Best management practice
BTEX	Benzene, toluene, ethylbenzene, and xylenes
City	City of Seattle

Acronym/ Abbreviation	**Definition**
COC	Contaminant of concern
CSGP	Construction Stormwater General Permit
CUL	Cleanup level
cVOC	Chlorinated volatile organic compound
CY	Cubic yard
DAHP	Department of Archaeology and Historic Preservation
DCE	Dichloroethene
DNS	Determination of Nonsignificance
DOSH	Department of Occupational Safety and Health
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Fox Avenue Site	Fox Avenue MTCA Cleanup Site
IA	Interim action
IAWP	Interim Action Work Plan
ISGP	Industrial Stormwater General Permit
KPFF	KPFF Consulting Engineers
LCS	Laboratory control sample
LDW	Lower Duwamish Waterway
µg/L	Micrograms per liter
mg/kg	Milligrams per kilogram
MS	Matrix spike
MSD	Matrix spike duplicate
MTCA	Model Toxics Control Act
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
penta	Pentachlorophenol
PID	Photoionization detector
ppmv	Parts per million by volume
Property	730 S. Myrtle Street property
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
Reliable	Reliable Transfer & Storage Co.
RI/FS	Remedial Investigation/Feasibility Study
RL	Remediation level
ROW	Right-of-way
RPD	Relative percent difference
SAP	Sampling and Analysis Plan

Acronym/ Abbreviation	Definition
SEPA	State Environmental Policy Act
SIM	Seattle Iron & Metals
Site	Whitehead Tyee Site
SoundEarth	SoundEarth Strategies
sVOC	Semivolatile organic compound
TCE	Trichloroethene
TPH	Total petroleum hydrocarbon
Tyee Lumber	Tyee Lumber and Manufacturing Company
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
WAC	Washington Administrative Code
Whitehead	The Whitehead Company, Inc.

1.0 Introduction

This Interim Action Work Plan (IAWP) was prepared by Floyd|Snider at the request of Seattle Iron & Metals (SIM), pursuant to Agreed Order (AO) No. DE 13458. The IAWP describes the background, approach, and procedures to complete an interim action (IA) at the former Tyee Lumber and Manufacturing Company (Tyee Lumber) facility located at 730 S. Myrtle Street in Seattle, Washington and referred to as the Whitehead Tyee Site (the Site). The Washington Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340) defines a "Site" as where hazardous substances have come to be located (WAC 173-340-100). The Site boundary will be more specifically determined as part of the future Remedial Investigation/Feasibility Study (RI/FS). Figure 1.1 presents the geographic location of the Site and Figure 1.2 shows the 730 S. Myrtle Street property (Property) and adjacent properties. For clarity in this report, "Site" will be used when referring to the area of known contamination and "Property" will be used when referring to the 730 S. Myrtle Street parcel only.

In addition to describing the IA, the primary objectives of this IAWP as outlined in MTCA (WAC 173-340-430) are to detail soil management, site control, and health and safety practices that will be employed during the IA construction. The IAWP includes a Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) that describe the organization, objectives, and specific quality assurance/quality control (QA/QC) procedures for field and laboratory activities associated with sample collection proposed for the IA.

1.1 PURPOSE OF THE INTERIM ACTION

Per MTCA, an IA is distinguished from a cleanup action in that an IA "only partially addresses the cleanup of a site" (WAC 173-340-430). IAs are remedial actions that are implemented prior to completion of the RI/FS. "Per WAC 173-340-430(1), an IA is:

(a) A remedial action that is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility;

(b) A remedial action that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed; or

(c) A remedial action needed to provide for completion of a site hazard assessment, remedial investigation/feasibility study or design of a cleanup action."

The IA will be implemented in accordance with WAC 173-340-430 and the AO, and is designed in a manner that will not preclude reasonable remediation alternatives for any final cleanup action that may be required. An IA is appropriate for the Site because it corrects a problem that may cost substantially more to address if the remedial action is delayed; it is intended to remediate known subsurface contamination in areas where construction of a stormwater conveyance system could preclude future access to these contaminated soils. In addition, the Property will be paved subsequent to installation of a stormwater conveyance system, and excavation of known contamination prior to paving will minimize future disturbance of the new asphalt surface. Furthermore, the installation of paving on the Property as part of the installation of the proposed stormwater conveyance system will limit infiltration into the subsurface and ultimately reduce the leaching potential of residual contamination in subsurface soil into groundwater.

Therefore, the IA is appropriate under MTCA because delaying the cleanup of subsurface contamination in these areas until after the completion of the RI/FS would significantly reduce the practicability and increase the cost of any necessary future remedial action. Because the IA, which involves subsurface excavation and removal of known contaminated soils, is proposed to be conducted concurrent with the installation of the proposed stormwater conveyance system at the Property, other interim actions were not evaluated. The only other relevant action would be “no action” and the intent is to address known contaminated soil prior to the installation of stormwater system piping and structures. Because access to subsurface soil would be limited once the piping and structures are in place, “no action” is not considered an appropriate action. A full evaluation of cleanup options for contaminated soil and groundwater will be conducted as part of the future RI/FS. The completion of the IA will not preclude future soil and groundwater remediation at the Site.

1.2 REGULATORY BACKGROUND AND OVERVIEW OF INTERIM ACTION

The following sections summarize the Site’s regulatory history and summarize the IA that will be implemented to fulfill regulatory requirements.

1.2.1 Toxics Cleanup Program

Contamination at the Site was identified as early as 1991 during investigations conducted for the Fox Avenue MTCA Cleanup Site (Fox Avenue Site) located immediately adjacent to and north of the Site (refer to Figure 1.2). Since then, information regarding known contamination has been reported to the Washington State Department of Ecology’s (Ecology) Toxics Cleanup Program. Chlorinated volatile organic compounds (cVOCs) associated with the Fox Avenue Site are present in the subsurface in the north/northwestern portion of the Site and are being addressed as part of Fox Avenue Site cleanup actions. The primary contaminants of concern (COCs) that have been identified in soil and groundwater at the Site include pentachlorophenol (penta) and total petroleum hydrocarbons (TPHs), both as Stoddard solvent and heavy oil. Elevated concentrations of penta and Stoddard solvent primarily exist in soil and groundwater near the former penta dip tank and penta underground storage tank (UST) located in the S. Myrtle Street right-of-way (ROW), with groundwater and limited soil contamination extending north inside the Property boundary. In addition, localized elevated concentrations of heavy oil-range organics were detected in soil on the east central portion of the Property. In August 2016, Ecology issued AO No. DE 13458 to SIM and 730 Myrtle LLC to address this Site contamination.

The proposed IA will be conducted concurrent with the installation of stormwater system infrastructure, as described further in Section 1.2.2, and prior to the completion of a RI for the Site. Additional investigation to evaluate the nature and extent of the known COCs and to further identify and assess any potential additional COCs will be conducted as part of the RI, along with a full evaluation of all potential exposure pathways and relevant cleanup levels for contaminated media.

1.2.2 Water Quality

SIM's operations on the property are covered by an Industrial Stormwater General Permit (ISGP; WAR-125002), issued to SIM on May 31, 2011, by Ecology's Water Quality Program (referred to hereafter as Water Quality) and modified on May 16, 2012. SIM has been out of compliance with the ISGP since it was issued, and has been working cooperatively with Water Quality toward a comprehensive stormwater solution for the property. The property is currently unpaved with no stormwater conveyance system. To bring the property back into compliance with the ISGP, the property will be graded and paved, and a stormwater conveyance and treatment system (including pre-treatment) is proposed to be installed in summer 2017. This stormwater conveyance and treatment system is being installed pursuant to Water Quality's Administrative Order No. 13739 issued on September 20, 2016.

The stormwater conveyance system construction project will provide stormwater treatment in two phases. The first phase (Phase 1) will include grading and paving of the property and installation of the stormwater collection and conveyance system, detention, flow control structure, and discharge piping from the property to the City of Seattle (City) storm drain in S. Myrtle Street, as well as pre-treatment installation and a pump station manhole. After installation of pre-treatment and Phase 1 improvements, 6 months of data will be collected to target selection of the appropriate primary treatment for property operations. This is in part because existing data (for an unpaved site) do not resemble data that would be collected from a paved site's stormwater runoff post-pretreatment, even if the property use remains the same. Phase 2 treatment will consist of an above grade, targeted treatment system tailored to specific pollutant(s) based on test results from the Phase 1 improvements.

1.2.3 Overview of Interim Action

The IA has been designed to address known soil contamination under the Toxics Cleanup Program while simultaneously addressing ISGP compliance. The construction of the stormwater system will include trenching for conveyance piping and excavation for manholes and other subsurface treatment structures in areas of elevated contaminant concentrations on the property. Figure 1.3 presents the locations of the former penta dip tank and penta UST located off-property and the proposed location of the stormwater system on the Property. Overall, the stormwater system has been designed to avoid installation of significant structures in contaminated areas to the extent possible, and therefore only isolated areas of contamination are expected to be encountered during stormwater system construction. The IA will include removal of contaminated soil that is encountered during trenching and excavation necessary for the installation of the proposed stormwater conveyance system. The IA will also include removal of soil in an area that has known Stoddard solvent soil contamination immediately adjacent to the excavation of the proposed detention area for the stormwater system. Lastly, the IA will include a focused soil excavation in the east central portion of the property to remove an area of shallow and localized soil contaminated with heavy oil-range organics. The IA is intended to remediate a portion of the Site within the property boundary prior to final grading and paving of the property. Cleanup levels (CULs) have not yet been established for the Site; therefore, the MTCA CULs for residential and/or industrial properties will be used as remediation levels (RLs), as appropriate per MTCA, described further in Section 3.2.

2.0 Site Description

The Property is a 3.22-acre unpaved gravel lot used for container and truck storage by SIM. A small open-air metal shed is located on the east/central portion of the property, and is the only structure present. This shed is used for light maintenance activities on containers, such as spot welding. The Site's geographic, geologic, and hydrogeologic settings, as well as current and former Site uses, are described in further detail in the following sections. Pertinent Site features are shown on Figure 2.1.

2.1 SITE LOCATION AND ADJACENT PROPERTIES

The Property is bounded by S. Myrtle Street to the south and Fox Avenue S. to the west, and is located in a mixed commercial and industrial use area of Seattle, consistent with the area's zoning. The property is bordered by Cascade Columbia Distribution (the Fox Avenue Site) to the north; Seattle Boiler Works to the west (across Fox Avenue S.); SIM to the southwest (across S. Myrtle Street); a former nightclub to the east (historically a gasoline station); and Commercial Welding, Caffe D'Arte Roasting Plant, Sea Native USA WA (seafood processing), and United Rentals Trench Safety to the south. The Fox Avenue Site is a MTCA cleanup site that has been undergoing active remediation since 2012 primarily for chlorinated solvents in soil and groundwater. Adjacent properties are shown on Figure 1.2.

The property is located approximately 450 to 500 feet east of the Lower Duwamish Waterway (LDW), which is the portion of the Duwamish River that extends from downstream of the upper turning basin at River Mile 4.8 to its outlet into Elliott Bay. The entire segment of the LDW in the vicinity of the SIM facility is designated as a Superfund Site by the U.S. Environmental Protection Agency (USEPA) due to sediment contamination.

2.2 GEOLOGY AND HYDROGEOLOGY

Soils on the property generally consist of coarse gravel used for grading at the ground surface, and 1 to 5 feet of sandy fill soils containing gravel and minor amounts of anthropogenic debris such as asphalt fragments. The fill soils are underlain by dark gray, fine sand and silty sand presumed to be native Lower Duwamish Valley alluvial deposits.

Groundwater is generally encountered at depths ranging from 9 to 11 feet below ground surface (bgs) and is presumed to flow from the northeast to the southwest across the property, ultimately discharging to the LDW to the southwest (at the S. Myrtle Street embayment, refer to Figure 1.2). Tidal variations in the LDW, however, have also been shown to cause temporary reversals in flow direction in shallow groundwater in areas immediately adjacent to the LDW.

2.3 HISTORICAL AND CURRENT OWNERSHIP AND OPERATIONS

Corson Avenue historically passed from northeast to southwest through the eastern portion of the Property (Figure 2.1) dividing the property into the larger western portion and a smaller eastern portion. The property was historically used for lumber mill operations under several transitioning ownerships from 1918 to 1986. Sometime between 1929 and 1949, Tyee Lumber took over operations on the western property. By the early 1950s, Tyee operated on both the western and eastern portions of the property and continued operations until 1986. Tyee operations included the treatment of lumber in a penta top-loading dip tank, and penta was stored in an adjacent UST. The eastern side of the property was operated as an automotive and truck repair shop from 1949 to the early 1950s, after which the lumber operations expanded and took over. More detailed operation history is included in the August 2016 Data Summary Report (Floyd|Snider 2016).

The Whitehead Company Inc. (Whitehead) and Reliable Transfer & Storage (Reliable) acquired the property in 1986, at which time the penta dip tank and penta UST were decommissioned. SIM leased the property from Whitehead and Reliable from 1999 to 2015 for truck and container storage before purchasing the property in December 2015. Currently, SIM continues to use the property for storage and light maintenance on containers. No metal processing is conducted on this property, and no metal shred, automobile shredder residue, or related materials are stored on-property. The property is considered “Local Trucking with Storage” (SIC Code 4214).

The property is currently divided into three operational areas by internal fencing and/or usage running north to south. The western most area is used as an equipment staging yard, typically used for truck or car parking, the center area as the export yard, and the eastern most area as the empty container and equipment storage yard. Normal operations consist of trucks and trailers entering from S. Myrtle Street through the unfenced equipment staging yard and proceeding into the fenced export yard. Trucks and trailers can also enter the export yard from S. Myrtle Street through the entrance gate of the container storage yard. Trucks typically enter in the eastern container storage yard to drop off or pick up empty containers. The export yard in the central portion of the property is used for staging loaded shipping containers bound for delivery. These primary operation areas are rearranged as needed based on current operation spatial needs.

3.0 Summary of Existing Data

Soil and groundwater investigations were conducted on- and off-property by Floyd|Snider in March 2013, December 2015, and March 2016; and by SoundEarth Strategies (SoundEarth) in December 2013, January 2014, and April 2014 (SoundEarth 2013, 2014a, and 2014b). Soil and groundwater samples were collected to characterize the extent of known contaminants including penta, TPH, Stoddard solvent, and dioxins/furans. Soil boring and monitoring well locations are shown on Figure 3.1. A more detailed description of the investigations and all available data are presented in the *Whitehead Tyee Site Data Summary Report* submitted to Ecology on September 1, 2016 (Floyd|Snider 2016).

An RI/FS has not yet been conducted at the Site, but sufficient data exist to define the IAs for the 730 S. Myrtle Street portion of the Site (on-property). The Site extends off-property into the S. Myrtle Street ROW and downgradient, but the actual boundaries of the "Site" will be defined as part of the RI/FS.

Since this IAWP describes the IA to be conducted on-property as part of stormwater system construction, the Site conditions summarized in the following sections focus primarily on the contamination present on-property that may pose a direct contact risk to workers during construction and implementation of the IA. Off-property data are not included in this section or associated data tables or figures in this IAWP.

3.1 PRELIMINARY INTERIM ACTION CONTAMINANTS OF CONCERN

IA COCs are defined as those contaminants that have resulted from prior site operations and are present on-property at concentrations greater than their respective MTCA CULs. Based on the analytical data collected to date, the IA COCs present on-property include penta, Stoddard solvent, and heavy oil-range organics. A summary of the known nature and extent of these COCs in soil is included in Section 3.3. RLs for the IA include the MTCA CULs for residential and/or industrial use properties, including site-specific CULs as appropriate per MTCA, as described further in Section 3.2.

Other contaminants that have been detected at the Site at concentrations greater than the MTCA CULs include:

- **Gasoline-Range Organics:** Stoddard solvent, a mineral spirits product, is quantifiable by both gasoline- and diesel-range organics analytical methods. Some previous soil and groundwater investigations have used the gasoline-range organics analytical method to quantify Stoddard solvent at the Site; however, the diesel-range organics analytical method is the preferred means of quantification as described in Section 3.1.1.
- **Chlorinated Volatile Organic Compounds:** Low-level concentrations of cVOCs slightly exceeding their MTCA CULs have been detected in soil and groundwater in the northwestern and north-central portions of the Site. These detections are associated with the adjacent Fox Avenue Site and are discussed in Section 3.1.2.

- **Benzene:** Low-level concentrations of benzene (5.3 micrograms per liter [µg/L] in well WT-MW-04 and 8 µg/L in well WT-MW-07) have been detected in groundwater at concentrations greater than the MTCA Method A CUL of 5 µg/L. Benzene is a COC for groundwater for the Fox Avenue Site and may be part of the downgradient groundwater plume associated with the Fox Avenue Site. Benzene is not present in Stoddard solvent and has not been detected at concentrations greater than the laboratory detection limits in 19 soil samples collected at the Site. Therefore, there is not a known source of benzene at the Site, and it is not a preliminary COC for the IA.
- **Dioxins/Furans:** Dioxins/furans are a byproduct of penta manufacturing and are associated with the former penta dip tank and penta UST, which were located off-property in the S. Myrtle Street ROW. Dioxin/furan toxic equivalent concentrations exceeding the most stringent MTCA CUL for industrial properties (MTCA Method C) have been detected in soils below approximately 7 feet bgs within the footprint of the former penta dip tank and penta UST, and below approximately 10 feet bgs to the east of the dip tank where wet lumber after dipping was likely transported and stored. Dioxins/furans are highly immobile in soil, were less than the CUL in soil samples collected immediately adjacent to the former penta dip tank and penta UST source area, and are not expected to exceed the MTCA CUL on the property.

3.1.1 Discussion of Stoddard Solvent Analyses

Stoddard solvent is a petroleum product with hydrocarbon constituents that have between 8 and 12 carbon atoms (i.e., C_8 to C_{12}) and is typically composed of at least 65 percent C_{10} to C_{12} constituents, with a boiling point range of 270 to 400 degrees Fahrenheit (°F; Mallincrodt Baker 1996). There were several different Stoddard solvent formulations; the actual composition depended on the manufacturer. Gasoline mixtures, meanwhile, range from C_4 to C_{12}, with boiling points between 85 and 400 °F whereas diesel fuel mixtures range from C_{10} to C_{24}, with boiling points between 340 and 680 °F (Advanced Motor Fuels 1999). In order to capture the low boiling constituents, gasoline-range organics analysis uses a purge-and-trap extraction method (Ecology 1997), in which the sample is extracted with solvent and the resulting liquid is purged with an inert gas at low temperature to liberate volatile organic compounds (VOCs). The VOCs are adsorbed onto a solid sorbent, then desorbed and transferred to the chromatography column for analysis. This methodology is best suited for extracting lighter hydrocarbon constituents and is less effective at volatilizing the heavier hydrocarbon constituents that comprise the bulk of the Stoddard solvent mixture. Diesel-range organics analysis uses a total extraction method (Ecology 1997), in which the sample is extracted with solvent and the entire liquid fraction is injected into the chromatography column. This methodology is effective at extracting the Stoddard solvent hydrocarbon constituents (C_8 to C_{12}), resulting in chromatograms that can be more effectively used to identify the Stoddard solvent product.

For this Site, the release of Stoddard solvent occurred at least 30 years ago, with the last known use in 1986, and the remaining Stoddard solvent in subsurface soil is weathered. Recent analyses of Stoddard solvent were performed using Ecology's NWTPH-Dx Method, calibrated to a Stoddard solvent standard, which is C_8 to C_{12}. A review of the chromatograms indicates that the lighter end is not present and the majority of the Stoddard solvent (greater than 90 percent) is between C_9 and C_{12}. The similarity between the petroleum product that remains in the soil and the Stoddard solvent standard is strong, with the primary difference in the C_8 to C_9 area where the soil samples have less mass than the standard due to either differences in the original formulation or weathering, or both. Given the identity of the material and its carbon range, the more accurate method to use is the NWTPH-Dx Method with a Stoddard solvent standard.

Additionally, there is a very low risk of product loss during compositing. The low-boiling range of Stoddard solvents begins at 270 °F (C_8); therefore, the loss of volatiles during compositing on even a hot summer day is miniscule and samples may be homogenized in a bowl prior to placement in the sample jar, allowing for composite sample collection. This compositing scheme is discussed further in Section 4.6.2 and Section 7.2.

Therefore, the diesel-range organics analysis method (NWTPH-Dx) was selected as a more appropriate means of quantifying Stoddard solvent at the Site due to the nature of the weathered product. This method provides higher quality chromatograms for identification of product, a more effective means of extraction, and compatibility with the proposed IA sample collection scheme.

3.1.2 Discussion of Contaminants Associated with Fox Avenue Site

As discussed in Section 1.2.1, contamination at the Site was first discovered during investigations of the adjacent Fox Avenue Site to the north. The Fox Avenue Site is the former location of the Great Western Chemical Company and was contaminated with cVOCs during chemical handling and transfer operations. The Fox Avenue Site is currently undergoing remediation for cVOCs.

The northwestern portion of the Site lies downgradient of the area of cVOC releases at the Fox Avenue Site, and shallow groundwater in this area (about the northern half of the property, west of the interior property fence) has been contaminated by tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride at concentrations exceeding their MTCA CULs. cVOCs exceeding their CULs have been detected at wells B-49 and MW-09 (both Fox Avenue Site wells) and WT-MW-04 on the property. The cVOC contamination in groundwater is being addressed by ongoing cleanup at the Fox Avenue Site, and cVOCs are not considered Site COCs. However, cVOCs in groundwater will be addressed in further detail in the RI/FS.

3.2 INTERIM ACTION CLEANUP AND REMEDIATION LEVELS

Based on the information presented in Section 3.1, Stoddard solvent, penta, and heavy oil-range organics are the primary COCs that are expected to be encountered during implementation of the IA. The IA addresses limited areas of contaminated soil only; groundwater cleanup is not part of the IA. Therefore, groundwater RLs or CULs are not presented or applicable for the purposes of the IA, and will be addressed in the site-wide RI/FS.

3.2.1 Model Toxics Control Act Cleanup Levels

Applicable soil CULs for the Site as presented in WAC 173-340-740 and 173-340-745 (Table 745-1, Ecology 2007) are shown in the following table.

Analyte	Cleanup Level Concentration	Cleanup Level Basis
Stoddard solvent	100 mg/kg[1]	MTCA Method A Unrestricted and Industrial[2]
Pentachlorophenol	2.5 mg/kg (cancer)	MTCA Method B Direct Contact
	328 mg/kg (cancer) and 17,500 mg/kg (non-cancer)	MTCA Method C
Heavy oil-range organics	2,000 mg/kg	MTCA Method A Unrestricted and Industrial

Notes:

1 Stoddard solvent, a mineral spirits product that does not contain benzene, is considered to be gasoline-range organics for the purposes of MTCA CUL application. The MTCA Method A CUL for gasoline-range organics with no detectable benzene is 100 mg/kg.

2 The CUL provided for Stoddard solvent in Table 745-1 is the MTCA Method A CUL, which is the same for unrestricted and industrial use properties. A site-specific MTCA Method B CUL may also be calculated, as described in Section 3.2.2.

Abbreviation:

mg/kg Milligrams per kilogram

3.2.2 Site-Specific Stoddard Solvent Remediation Level

The MTCA cleanup regulation allows the use of site-specific petroleum composition to calculate site-specific MTCA Method B TPH CULs. This site-specific value accounts for the toxicity of the aromatic and aliphatic petroleum fractions present in the contaminated soil, with lighter contaminants generally exhibiting greater toxicity than heavier contaminants. Petroleum fractionation results are not available for the Site; however, the Ecology guidance for remediation of petroleum-contaminated sites (Ecology 2016) lists maximum residual TPH saturation screening values allowed when calculating a site-specific MTCA Method B CUL. A residual saturation screening level is defined as the concentration at which the petroleum product is not mobile in groundwater. The maximum residual saturation allowable for "middle distillates," a term that refers to petroleum mixtures that have boiling points greater than that of gasoline but less than heavy oils, is 2,000 mg/kg. For comparison, the maximum residual saturation level for weathered gasoline is 1,000 mg/kg. However, a calculated site-specific MTCA Method B CUL exceeding the maximum residual saturation level can be established if data can be presented to demonstrate that greater concentrations will be protective of groundwater; typical calculated site-specific MTCA values cited in the Ecology guidance range from 1,300 mg/kg to 3,700 mg/kg for gasoline-range organics.

For the IA, an RL of 1,000 mg/kg will be used for Stoddard solvent to meet cleanup objectives. This value is consistent with the more conservative residual saturation screening level for weathered gasoline, and is likely to be less than a calculated Site-specific CUL as described above. A site-specific MTCA Method B CUL will be calculated for the Site in the future as part of the RI.

3.2.3 Remediation Levels for Interim Action

CULs have not yet been established for the Site; therefore, relevant MTCA CULs for residential and/or industrial properties in addition to site-specific CULs as appropriate per MTCA will be used as RLs for the IA, as follows.

Analyte	Remediation Level Concentration	Remediation Level Basis
Stoddard solvent	1,000 mg/kg[1]	Residual saturation screening level for weathered gasoline
Penta	2.5 mg/kg (cancer)	MTCA Method B Direct Contact
Heavy oil-range organics	2,000 mg/kg	MTCA Method A Unrestricted and Industrial

Final CULs for the Site will be evaluated as part of the future RI/FS and established as part of the Cleanup Action Plan for the Site. Additional soil remediation may be necessary as part of the final remedy selected for the Site should the final CULs be significantly less than the RLs proposed for the IA. Additional soil remediation will be evaluated in the RI/FS process.

3.3 OVERVIEW OF SOIL QUALITY

The nature and extent of known soil impacts is based on both historical (collected as part of the Fox Ave Site) and recent soil data collection. A general overview of soil quality and the likely source(s) of contamination are described in the following sections and were used to define the IA excavation limits, as described in subsequent sections of this IAWP. A comprehensive data summary report has been prepared separately for the Site and has been submitted to Ecology for review. A summary of compounds that have been analyzed for and not detected in Site soils is presented in Table 3.1. A summary of detected analytes and their concentration ranges in Site soil is presented in Table 3.2. Detailed soil data relevant to the trenching and excavation areas are presented in subsequent sections of the IAWP.

3.3.1 Stoddard Solvent and Pentachlorophenol

Historical lumber treatment with penta has caused impacts to subsurface soil and groundwater in the vicinity of the proposed stormwater conveyance and treatment system. The Site has a permeable gravel ground surface, and historically the surface was likely the same in the vicinity of the former penta dip tank. Contamination was likely released at the ground surface in the area surrounding the former penta dip tank and within the vadose zone surrounding the UST, with handling of wet lumber likely contributing to a "halo" of contamination in the interior of the Site near the proposed stormwater system.

A commonly used product for wood treatment for the type of finished wood products manufactured by Tyee Lumber consisted of a blend of Stoddard solvent and penta (the exact penta concentration used by Tyee Lumber is unknown) that, when released to the ground surface, would have migrated downward in the vadose zone and dispersed laterally when the product reached the water table at approximately 9 to 11 feet bgs. Stoddard solvent, which is the lightest and most mobile of the wood treatment chemicals and would have likely represented 90 to 95 percent of the wood treatment solution, has been transported the farthest laterally and to the southwest in the downgradient direction. Penta, which would have likely represented 5 to 10 percent of the wood treatment solution, has been dispersed similarly to Stoddard solvent, though it is slightly less widespread. Both chemicals are present in a roughly 2-to 5-foot-thick layer of soil at the water table interface/smear zone based on field indications of contamination, which is likely representative of seasonal fluctuations in the water table elevation.

Stoddard solvent and penta occurrences in soil are primarily focused in the footprint of the former penta dip tank and penta UST source area in the S. Myrtle Street ROW, and extend in a "halo" around this source area, including on-property. The greatest concentrations are found in the smear zone, immediately above and below the water table, and the vertical impact zone extends from approximately 5 to 14 feet bgs. Penta has been detected in saturated soils in the "halo" around the source area, and is indicative of the groundwater plume.

Vadose zone soils are generally not impacted by the penta and Stoddard solvent release; Stoddard solvent has not been detected in soil samples collected above approximately 9 feet bgs within the property, and has only exceeded the CUL in shallower soils below approximately 5 feet bgs within the footprint of the former penta dip tank and penta UST in the S. Myrtle Street ROW. Likewise, penta is generally not detected in vadose zone soils on the property and only exceeds the CUL in vadose soils within the former penta dip tank penta UST footprint. Penta has been detected at very low levels in vadose zone soils collected from two soil borings on-property, WT-SB-01 at a concentration of 0.130 mg/kg and WT-GP-10 at 0.189 mg/kg. Both of these detections are outside the influence of the penta dip tank and UST source area, but both of these areas will be addressed (i.e., soil removed) as part of the IA and the stormwater conveyance system installation.

Stoddard solvent contamination is present in soils below approximately 9 to 10 feet bgs between the detention area of the proposed stormwater system footprint and the property line, and near the former automotive repair shop area at concentrations exceeding the MTCA Method A CUL for weathered gasoline of 100 mg/kg. This CUL is not wholly appropriate as a CUL for Stoddard solvent, as discussed in Section 3.2.2. Several borings to the south of the stormwater system detention piping, including WT-MW-01, WT-GP-2, WT-GP-3, WT-GP-4 and WT-SB-09 have Stoddard solvent present in saturated soils at concentrations exceeding the MTCA Method A CUL and the RL. Penta is also present in concentrations greater than the RL south of the stormwater system detention piping, in locations WT-GP-2, WT-GP-3, WT-GP-4 and WT-SB-09. Stoddard solvent and penta results for those sample locations in the vicinity of the IA and stormwater system footprint are shown on Figure 3.2.

3.3.2 Heavy Oil-Range Organics

Historical automotive repair operations in the south-central portion of the Site appear to have caused localized impacts to shallow soils from heavy oil-range organics. Heavy oil does not migrate readily, and these impacts appear to be limited to a small area of vadose soil. Surface soils are generally more permeable sand and gravels (fill), with less permeable silty sand and sandy silt below 5 feet bgs. The presence of heavy oil appears to be localized at this transition from fill to native soil and is likely a result of a minor historical surface release. In the vicinity of the former automotive repair shop and along the proposed stormwater conveyance piping, heavy oil-range organics were detected at concentrations exceeding the MTCA Method A CUL in shallow soils from 4 to 5 feet bgs in soil borings WT-MW-110 and WT-SB-20 and in a 0- to 5-foot composite soil sample from WT-GP-10.

Heavy oil was also detected at concentrations less than the RL of 2,000 mg/kg in several soil samples collected across the west and central portion of the Property. Heavy oil occurrences may be associated with former industrial equipment and/or vehicular use across the Site during typical operations, as a result of small and incidental releases to the gravel (unpaved) surface. One sample collected from WT-B17, located off-property in the vicinity of the former penta dip tank and penta UST, had heavy oil-range organics exceeding the MTCA Method A CUL. This detection is localized, potentially associated with roadway use, and will not be encountered during implementation of the IA. Heavy oil-range organics results are shown on Figure 3.3.

3.3.3 Surface Soil Quality

Surface soils were collected during previous investigations to assess general surface soil quality throughout the property. A total of three 0 to 10 feet bgs composite samples, five 0 to 5 feet bgs composite samples, and five 0 to 2 feet bgs composite samples have been collected on the property. Surface soil samples were analyzed for TPH, metals, semivolatile organic compounds (SVOCs), VOCs and polychlorinated biphenyls (PCBs). Surface soils results generally indicate that Stoddard solvent, gasoline-range organics (indicative of Stoddard solvent), diesel-range organics (Stoddard solvent and heavy oil), and SVOCs including penta are not detected or present at concentrations less than their respective CULs. Metals are generally non-detect or present at concentrations less than their MTCA Method A CULs. Low-level concentrations of heavy oil-range organics less than the CUL were detected in scattered surface samples across the property, consistent with truck traffic and equipment use. Chromium slightly exceeding the CUL was also detected at WT-SB-01 at the southwest corner of the property, and both chromium and benzo(a)pyrene were detected at WT-MW-110 in the vicinity of the former automotive repair shop; both of these areas are planned to be excavated as part of the IA. Surface soil data are presented in Table 3.3.

3.3.4 Other Contaminants that are Not Site Contaminants of Concern

Other contaminants that have been detected on the property at low levels include metals and miscellaneous SVOCs. Detected metals concentrations are all less than their respective MTCA CULs, except for two surface soil samples with slightly elevated chromium concentrations, as described in Section 3.3.3. SVOCs other than penta have only been detected in surface soils, at concentrations less than their CULs with the exception of WT-MW-110 as described in Section 3.3.3.

3.4 OVERVIEW OF GROUNDWATER QUALITY

Historical wood treatment operations at the Site have caused Stoddard solvent, penta, and dioxin/furan impacts to groundwater; however, only penta and Stoddard solvent were detected in the monitoring wells nearest the proposed stormwater system area. An isolated area of Stoddard solvent and penta contamination at WT-SB-10 to the east of the former penta dip tank and penta UST may have been caused by transfer and storage of wet treated lumber on the wood platform that was previously located nearby.

Penta and Stoddard solvent are present in groundwater in the southwestern portion of the Site extending from the former penta dip tank and penta UST source area into the proposed stormwater system construction and IA area. Penta and Stoddard solvent have been encountered at concentrations exceeding the MTCA Method C CULs in the adjacent upgradient groundwater "halo" from the source area around the detention piping area of the stormwater system. Dioxins/furans have also been detected at concentrations exceeding the CUL in groundwater collected from WT-MW-01, immediately south of this area.

cVOCs associated with the Fox Avenue Site have been detected at concentrations greater than their MTCA CULs on the northwestern portion of the Site, where stormwater system components will be installed above the water table. cVOCs have also been detected at low levels in the southwestern portion of the Site at WT-MW-01. Maximum concentrations of contaminants detected in groundwater and the frequency of exceedances of the applicable Site or MTCA CULs are presented in Table 3.4. Penta and Stoddard solvent concentrations in groundwater, which are the COCs expected to be encountered at concentrations greater than their CULs during excavation, are shown on Figure 3.4.

3.5 PRELIMINARY CONCEPTUAL SITE MODEL

Historical wood treatment with penta caused impacts to subsurface soil in the vicinity of the former penta dip tank and UST, which are off-property. The Site, including the S. Myrtle Street ROW where the former dip tank and UST were located, currently has a permeable gravel ground surface, and historically the surface was likely the same. Contamination was likely released at the ground surface in the area surrounding the former penta dip tank (treating and handling wet lumber) and within the vadose zone surrounding the UST, likely contributing to a "halo" of contamination in the interior of the Site upgradient of the former penta dip tank and UST.

A commonly used product for wood treatment for the type of finished wood products manufactured by Tyee Lumber consisted of a blend of Stoddard solvent and penta (the exact penta concentration used by Tyee Lumber is unknown) that, when released to the ground surface, would have migrated downward in the vadose zone and dispersed laterally when the product reached the water table at approximately 9 to 11 feet bgs. Stoddard solvent, which is the lightest and most mobile of the wood treatment chemicals and would have likely represented 90 to 95 percent of the wood treatment solution, has been transported the farthest laterally and to the southwest in the downgradient direction. Penta, which would have likely represented 5 to 10 percent of the wood treatment solution, has been dispersed similarly to Stoddard solvent, though it is slightly less widespread. Both chemicals are present in a roughly 3-to 5-foot-thick layer of saturated soil at the water table interface/smear zone based on field indications of contamination, which is likely representative of seasonal fluctuations in the water table elevation. Both penta and Stoddard solvent are generally not present at detectable concentrations in the vadose zone.

Dioxins/furans are also present in soil in the vicinity of the former penta dip tank and UST; dioxins/furans are a byproduct of the penta manufacturing process and are often detected in areas with penta contamination. Dixons/furans have low solubility in water and partition strongly to soil particles, and, therefore, appear to be limited to the areas immediately adjacent to the former penta dip tank and UST. Further evaluation of the nature and extent of COCs, along with a more detailed evaluation of dioxin/furan occurrences and the correlation to penta occurrences will be further evaluated as part of the future RI.

Historical wood treatment operations at the Site have caused Stoddard solvent, penta, and dioxin/furan impacts to groundwater, although the dioxins/furans are likely to be adsorbed to fine particles in the groundwater. Similarly to the soil contamination described above, Stoddard solvent, penta, and dioxins/furans exceeding their respective CULs in the vicinity of the former penta dip tank and UST have likely been transported to the north and southwest with groundwater flow and via lateral movement on the water table. An isolated area of Stoddard solvent and penta contamination to the east of the former penta dip tank and UST at MW-110 may have been caused by transfer and storage of wet treated lumber on the wood platform that was previously located nearby.

Historical auto repair operations in the south-central portion of the Site appear to have caused localized impacts to shallow soils from heavy oil-range organics. Heavy oil does not migrate readily, and these impacts appear to be limited to a small area of vadose soil. Surface soils are generally more permeable sand and gravels (fill), with less permeable silty sand and sandy silt below 5 feet. The presence of heavy oil appears to be localized at this transition from fill to native soil and is likely a result of a minor historical surface release.

Groundwater at the Site has been impacted by cVOCs due to contamination at the adjacent Fox Avenue Site to the north. Residual cVOC contamination in groundwater originating from the Fox Avenue Site has migrated from the main source area on the Fox Avenue Site downgradient to the southwest and is present on the western portion of the Site. This contamination attenuates to concentrations less than the CULs to the southwest of the Site, and is expected to further attenuate because source removal of cVOCs on the Fox Avenue Site occurred in 2013 and enhanced reductive dechlorination injections for downgradient plume remediation are on-going.

4.0 Interim Action Description

The purpose of the IA is to remove known or encountered contaminated soil during construction of the proposed stormwater conveyance system. The proposed IA will consist of three separate actions.

- **Stormwater System Construction:** Contaminated soil that is encountered during trenching and excavation activities for the stormwater conveyance system will be removed, stockpiled separately, and disposed of off-site at a permitted landfill.
- **Stoddard Solvent Excavation:** Soil located immediately adjacent to the proposed detention area will be excavated to remove contaminated soil, as penta and Stoddard solvent have been detected at concentrations greater than their RLs in this area.
- **Focused Heavy Oil-Range Organics Excavation:** A known area of relatively shallow soil contaminated with heavy oil-range organics exists in the east central portion of the property. A focused excavation will be completed to remove this known area of petroleum-contaminated soil, prior to paving.

Figure 4.1 presents the proposed excavation areas. Figure 4.1a provides additional detail regarding the Stoddard solvent excavation and Figure 4.1b provides additional detail regarding the heavy oil excavation.

This IA is scheduled to occur prior to the RI/FS and will be completed concurrently with the construction of the new stormwater conveyance and treatment system at the property. Construction activities that take place during removal of contaminated soil will be conducted in accordance with WAC 173-340-430. The removal of contaminated soil during construction will substantially reduce or eliminate exposure pathways at the Site and provide protection of human health and the environment. The IA is intended to achieve RLs for soil for portions of the Site, within the property boundary, as described in the following sections.

4.1 SUMMARY OF STORMWATER CONVEYANCE SYSTEM CONSTRUCTION

The proposed stormwater conveyance system will include the installation of catch basins, collection and conveyance piping, manhole structures, detention piping, a flow splitter structure, a pre-treatment unit, and a stormwater pump station. System configuration will include surface grading and paving in order to direct stormwater to a system of catch basins located on the property. The grading will include shallow excavation of surface soil from the northern portion of the Site, and filling with imported soil or clean on-site excavated soil on the southern portion, to achieve a positive slope toward the proposed catch basins located in the property interior. The stormwater will be conveyed from the catch basins through subsurface piping to an on-site, below-ground system of detention pipes with associated manholes located on the southwestern portion of the property. From the detention pipes, water will be directed through a below-ground pre-treatment unit, with a stormwater pump station installed for future (Phase 2) primary treatment in an aboveground treatment system. After final treatment, water will be discharged via a belowground pipe that exits the property along its western boundary and connects to the S. Myrtle Street outfall.

Construction of the IA will likely begin with excavation of the heavy oil-range organics-contaminated soils, as described in Section 4.5. Following this focused IA excavation, the trenching and excavation for the stormwater system and supplemental excavation of Stoddard solvent-contaminated soil, as described in Sections 4.3 and 4.4, will be completed with actual construction sequencing to be determined by the contractor. It is expected that trenching will begin near the stormwater treatment and detention structures at the southwest corner of the Site and proceed to the east.

A more detailed summary of the necessary trenching and excavation for the catch basins, piping manhole structures, and belowground treatment system components is provided in Section 4.3. An overview of the components of the stormwater conveyance system is presented in Figure 1.3 and detailed conveyance system drawings are provided in Appendix A. Refer to the Engineering Design Report (EDR) and EDR Addendum (KPFF 2013 and 2016) for specific engineering details regarding the proposed stormwater conveyance system.

4.2 PERMITS AND APPROVALS REQUIRED FOR THE INTERIM ACTION

The planned stormwater system construction and associated IA will be conducted under several City- and State-issued permits. The following permits are required for the construction of the stormwater system, specific to the Water Quality's Administrative Order:

- **City Master Use Permit:** In order to construct a stormwater system, the permitted property use must be changed from "vacant" to "outdoor storage" by the City. The Master Use Permit application was submitted to the City by KPFF Consulting Engineers (KPFF) in February 2016 and is pending.
- **City Grading Permit:** Grading permits are required for ground-disturbing activities in the City with a cumulative volume greater than 50 cubic yards (CY). The grading permit will submitted to the City by KPFF prior to construction.
- **State Environmental Policy Act (SEPA) Checklist and Determination of Nonsignificance (DNS):** The City is the lead agency for environmental review of the planned stormwater system construction; the City must determine that the project will not have a significant adverse environmental impact and issue a DNS. The SEPA Checklist for construction was submitted to the City in February 2016 and is pending.
- **Construction Stormwater General Permit (CSGP):** The CSGP is issued by Ecology for construction on sites that disturb an area greater than 1 acre. Conditions of the CSGP will also include development of a stormwater pollution prevention plan, and implementation of erosion control measures and periodic inspections of these measures by a certified erosion and sediment control lead. The CSGP may also be used for approval of discharge of treated dewatering water to surface waters of the State.

The following permits or approvals are additionally required for the IA, specific to the Toxics AO:

- **SEPA Checklist and DNS:** Ecology is the lead agency for environmental review of the IA (contaminated soil removal); Ecology must determine that the project will not have a significant adverse environmental impact and issue a DNS. A SEPA Checklist has been prepared in conjunction with this IAWP and was submitted to Ecology concurrent with submittal of the draft for public comment IAWP in December 2016. A DNS was subsequently issued by Ecology on February 3, 2017, for public comment; the public comment period ended on March 5, 2017.
- **Waste Disposal Authorizations:** The IA is expected to generate waste soil and water, which will be disposed of at permitted facilities. Authorization for disposal will be granted by the facilities on an as-needed basis.

Applications for these permits have been or will be prepared separately from the IAWP. Permits will be acquired prior to the start of construction.

The SIM property is located within the Duwamish watershed, which is considered to be located within a high-probability area for encountering historic and pre-contact archaeological sites by the Washington State Department of Archaeology and Historic Preservation (DAHP). As a precaution, DAHP's online database, Washington Information System for Architectural and Archaeological Records Data, was searched for archaeological site records, historic properties listed in or eligible for listing in the National Register of Historic Places (NRHP) or Washington Heritage Register (WHR), and cemetery records. No previously recorded archaeological sites, isolates, cemeteries, or historic register properties have been identified for the Property. However, one archaeological site, one register-listed property, and three cemeteries were identified within ¼ mile of the Property.

Regardless, an Inadvertent Discovery Plan will be prepared and followed for the stormwater conveyance system construction and the IA in the event that an unanticipated discovery of human remains or historic and/or pre-contact archaeological materials are encountered during excavation activities. After the SEPA determination is made for the project(s), the Inadvertent Discovery Plan review requirements will be evaluated, as consultation with stakeholders may be necessary.

4.3 INTERIM ACTION: STORMWATER SYSTEM CONSTRUCTION

Trenching and excavation for the stormwater conveyance piping, manholes, and other structures will be completed using an excavator to the elevations determined in the final design drawings. The final layout will achieve a 5 percent slope toward the central detention and treatment structures. The depth of the buried piping on the property will range from approximately 5 to 7 feet bgs. Additional conveyance piping to connect to the S. Myrtle Street will range in depths from about 6 feet bgs where it exits the property to about 8 feet bgs at the connection to the City storm drainage system.

Excavation will be required for deeper structures, such as pre-treatment and treatment vaults and the detention piping area. In the central detention structure, the largest manhole structure excavation (i.e., the flow control structure) will be approximately 12 feet deep. The pre-treatment structure will have an approximate excavation depth of about 16 feet bgs. The pump station manhole excavation will have approximate bottom depth of 13 to 14 feet bgs depending on the size of the sump chosen for the pump station. As described in Section 2.2, the groundwater table at the site has been encountered at depths of 9 to 11 feet bgs. Although work will be conducted in the summer when the water table elevation is at a seasonal low, there is still potential to encounter groundwater when excavating for the pre-treatment structure and pump station manhole. Groundwater management is discussed in Section 4.8. Confirmation samples will be collected to document soil conditions at the base of the trenches and stormwater system components and verify that no future remediation is necessary in areas beneath these components, as described in Section 7.2.2.

The total volume of soil to be removed from the on-property portion of the Site during trenching and excavation for stormwater system construction is estimated to be 2,000 to 2,500 CY.

Additional trenching will also be completed off-property in the S. Myrtle Street ROW in order to connect the property’s stormwater system to the City’s stormwater conveyance system. Soils excavated during this trenching will be field screened for potential contamination and managed according to the protocols for on-property trenching and excavation. One three-point composite trench bottom confirmation sample will be collected from off-property trenching to document soil quality in this area; the data will not be used for decision purposes.

4.3.1 Summary of Existing Data in Trenching and Excavation Areas

Excavation for the stormwater detention piping, pre-treatment structure, and pump station will occur largely outside of areas of known soil contamination. However, the detention pipes are located to the north of an area of Stoddard solvent contamination in soil at concentrations of 109 to 5,290 mg/kg from approximately 10 to 15 feet bgs. This contamination lies below the proposed detention pipe excavation (approximately 8 feet bgs); however a supplemental excavation to prevent the need for future remediation in this area will be performed adjacent to the pipe location, as described further in Section 4.4. Both Stoddard solvent and penta have been detected in groundwater at concentrations exceeding their respective CULs in the southwestern portion of the Site at nearby wells WT-MW-108 and WT-MW-04. Stoddard solvent concentrations of up to 1,200 µg/L and penta concentrations of up to 200 µg/L have been detected at these wells during recent monitoring events. Excavation below the water table in this area is likely to be necessary for the construction of the flow control structure, pre-treatment structure, and pump station manhole. Protocols for handling contaminated dewatering water, if dewatering is necessary, are addressed in Section 4.8.

Trenches for stormwater catch basins and conveyance piping are planned to span a large portion of the property in order to efficiently collect stormwater for treatment. The majority of these trenches, which will be excavated to depths of approximately 5 to 7 feet bgs, do not pass through areas of known soil contamination and are situated above the water table. However, one small segment of piping in the eastern portion the Site is located adjacent to previous borings WT-GP-10 and WT-SB-20, and well WT-MW-110. At these locations, heavy oil-range organics exceeding the CUL with concentrations ranging from 2,960 to 22,900 mg/kg were detected from 4 to 5 feet bgs. The soil sample collected from soil boring WT-GP-10 was a composite collected from 0 to 5 feet bgs, which indicated heavy oil contamination in that zone. Soil boring WT-MW-110 was subsequently located directly adjacent to WT-GP-10 to better delineate the vertical profile of heavy oil. Soil samples were collected from more discrete intervals (0 to 2 feet bgs and 4 to 5 feet bgs), and data indicated that the heavy oil concentration at 4 to 5 feet bgs was greater than the RL, and the heavy oil concentration from 0 to 2 feet bgs was much less than the RL. Excavation to address this shallow soil contamination is described in Section 4.5.

Relevant soil analytical results for the areas where stormwater system components will be installed are presented in Table 4.1. Relevant soil samples include those that fall within or in close proximity to proposed stormwater conveyance system trenching and excavation areas described in this section.

4.3.2 Contaminated Soil Segregation

Based on existing data described above, contaminated soil is not expected to be encountered during trenching and excavation. However, due to the historical operations at the Site, it is possible that localized areas of contamination that have not previously been identified may be encountered. Therefore, during trenching and excavation, soil will be screened for field indications of contamination. Indications of contamination include staining or other visual observations of contamination (i.e., discoloration), petroleum- or solvent-like odors, elevated headspace VOC concentrations (i.e., greater than 10 parts per million by volume [ppmv]) as measured with a photoionization detector (PID), or the presence of sheens or free product. If field indications suggest that potential contamination is present below the final grade of the excavation for the stormwater structures, excavation will be extended until field indications are no longer present. Confirmation samples will be collected to document that IA RLs have been met; confirmation samples are discussed in further detail in Section 7.2.2. General soil types and the presence of debris or other large particles will also be noted.

Based on the field screening, soils will be segregated into the following three separate stockpiles:

1. Soils that are potentially or likely contaminated based on existing analytical data, the presence of strong odors, sheens, or PID readings greater than 10 ppmv for off-site disposal.
2. Soils that are visibly unsuitable for backfill due to debris, clay, or jagged or large particles greater than 3 inches in diameter, but presumed or unlikely to be chemically impacted, for off-site disposal.
3. Soils presumed or unlikely to be contaminated (i.e., have low-level PID readings less than 10 ppmv and no other field indications of contamination) to be tested for chemical suitability as backfill.

Details regarding waste characterization and backfill testing requirements are described in Section 4.7.2 and Sections 7.2.3 and 7.2.4, respectively.

4.4 INTERIM ACTION: STODDARD SOLVENT EXCAVATION

In order to prevent future cleanup in areas immediately adjacent to the detention piping or structures, the IA will include additional excavation beyond the limits necessary for installation of the detention piping that includes a supplemental buffer to be excavated in the areas adjacent to contaminated soil (south and southeast as shown on Figure 4.1a). The purpose for this excavation is to allow for potential future remediation of Stoddard solvent and penta, if necessary, to be conducted in soil and groundwater adjacent to the detention piping and associated structures without disturbing or compromising the stormwater conveyance system.

In this area, the buffer required for potential future remediation has been determined to be 5 lateral feet from detention pipes, based on the distance from the toe of the slope beneath the closest pipe to a depth of 16 feet bgs. This buffer would allow future excavation adjacent to the stormwater detention piping down to approximately 16 feet (assumed depth of any future adjacent excavation) without disturbing the piping or associated bedding material. Because the backfill material that will be placed in the supplemental excavation will be in contact with Stoddard solvent- and penta-contaminated soil, and any future cleanup action will likely include excavation of contaminated soil south of the detention piping in the former penta dip tank and penta UST source area, an additional 2-foot buffer of backfill material has been added to the supplemental excavation to account for potential recontamination of clean backfill. Therefore, the Stoddard solvent excavation has been conservatively designed to over-excavate 7 lateral feet beyond the necessary limits for stormwater system construction. The planned additional excavation is shown on Figures 4.1a and 4.2 and will extend deeper than the base of the stormwater detention pipe excavation, which will be approximately 8 feet bgs. The supplemental excavation will be extended to 16 feet bgs or until field indications of contamination are no longer present. Confirmation samples will be collected from the final depth of the excavation to document that IA RLs have been met. Confirmation samples are discussed in further detail in Section 7.2.2. Groundwater is expected to be encountered during the supplemental excavation. Groundwater management is discussed in Section 4.8.

The total anticipated volume of soil to be removed for the additional buffer excavation is 630 to 850 CY, of which 250 to 350 CY is expected to be contaminated with Stoddard solvent and penta.

4.4.1 Summary of Existing Data in Excavation Area

The Stoddard solvent excavation area is an approximately 16-foot-wide area beneath and surrounding the stormwater detention pipes to the south and west in which Stoddard solvent has been detected in soil borings at concentrations exceeding the RL of 1,000 mg/kg. Penta is also present in saturated soil in this area at concentrations greater than the IA RL; penta has not been detected in the vadose zone in this area. Previous borings WT-GP-2, WT-GP-4 and WT-SB-09 indicate the need for a buffer. At these locations, Stoddard solvent exceeding the RL with concentrations ranging from 2,970 to 5,290 mg/kg have been detected from depths of 12 to

14 feet bgs, with field observations (PID field screening and visual/olfactory) indicating that detectable Stoddard solvent is likely present from about 10 to 16 feet bgs, but may extend deeper. The western limit of the excavation is delineated by WT-GP-3, where Stoddard solvent slightly exceeded the CUL but was less than the RL. The northern limit of the excavation is delineated by WT-GP-8, where field indications of Stoddard solvent contamination were not observed. Additionally, WT-GP-08 was analyzed for both gasoline and diesel-range organics, both of which were not detected. Since Stoddard solvent falls into the carbon range between gasoline and diesel, it is also not detected. Boring WT-SB-06, located in the central portion of the detention area excavation did not contain Stoddard solvent at concentrations greater than the laboratory detection limit.

Figure 4.2 presents two cross-sections (identified on Figure 4.1a) of the excavation area that is co-located with contaminated soil (north of the Site source area). The figure shows the conveyance and detention structures and the known contaminated soil extent. As discussed above, the contamination in this area extends deeper than the planned stormwater detention pipes, which will have a bottom depth of about 8 feet bgs.

Groundwater, which is known to be contaminated in this area, is expected to be encountered during this excavation to a depth of approximately 16 feet bgs. The well immediately upgradient, WT-MW-04, has had maximum prior Stoddard solvent detections of 1,200 µg/L and penta detections of 200 µg/L. The well immediately downgradient, WT-MW-01, has had maximum prior Stoddard solvent detections of 2,300 µg/L and penta detections of 730 µg/L. Groundwater encountered during excavation is likely to have contaminant concentrations within these ranges. Groundwater management, in the event that dewatering is necessary, is discussed in Section 4.8.

Relevant soil analytical results for the additional Stoddard solvent excavation area are presented in Table 4.2 and shown on Figure 4.1a. Groundwater analytical results for penta and Stoddard solvent are shown on Figure 3.4.

4.4.2 Contaminated Soil Segregation

It is expected that approximately 8 to 10 feet of clean overburden soil overlying the Stoddard solvent contamination are present in the excavation. During excavation, soil will be screened for field indications of contamination. Stoddard solvent can be readily detected with a PID; boring logs for the Site indicate that Stoddard solvent has not been detected at concentrations greater than laboratory detection limits when PID measurements are less than 20 ppmv. Indications of contamination include staining or other visual observations of contamination (i.e., discoloration), petroleum- or solvent-like odors, elevated headspace VOC concentrations (i.e., greater than 20 ppmv) as measured with a PID, or the presence of sheens or free product.

Soil will be segregated as contaminated from 10 and 16 feet bgs, and at any intervals that are likely contaminated based on strong odors, sheens, or PID readings greater than 20 ppmv for off-site disposal. As for the stormwater system construction, contaminated soil, potentially clean overburden soil, and soil that is visually unsuitable for backfill will be stockpiled separately.

4.5 INTERIM ACTION: FOCUSED HEAVY OIL-RANGE ORGANICS EXCAVATION

In the eastern central part of the Property there is a shallow area of known heavy oil-range organics-contaminated soil that will be excavated concurrent with or immediately prior to construction. The planned excavation will be advanced to a depth of 6 feet bgs, within the focused excavation area shown on Figure 4.1b. Completing the excavation of this small and focused area during construction is intended to achieve RLs for this portion of the Site. Confirmation samples will be collected to verify that the RLs have been met and no future remediation is necessary in the heavy oil-range organics excavation area, as described in Section 7.2.2.

The total anticipated volume of soil to be removed during the focused heavy oil-range organics investigation is 250 to 300 CY.

4.5.1 Summary of Existing Data in Excavation Area

The vertical and horizontal extents of the focused heavy oil-range organics excavation area are in part defined by previous borings WT-MW-110, WT-GP-10, and WT-SB-20, where heavy oil-range organics were detected at concentrations exceeding the RL of 2,000 mg/kg, ranging from 2,960 mg/kg to 22,900 mg/kg at depths of approximately 3 to 5 feet bgs. The soil sample collected from soil boring WT-GP-10 was a composite collected from 0 to 5 feet bgs, which indicated heavy oil contamination in that zone. Soil boring WT-MW-110 was subsequently located directly adjacent to WT-GP-10 to better delineate the vertical profile of heavy oil. Soil samples were collected from more discrete intervals (0 to 2 feet bgs and 4 to 5 feet bgs), and data indicated that the heavy oil concentration at 4 to 5 feet bgs was greater than the RL, and the heavy oil concentration from 0 to 2 feet bgs was much less than the RL.

This focused heavy-oil excavation area is delineated by non-detect results at WT-SB-15 to the southwest, WT-SB-14 to the northwest, and WT-SB-18 to the southeast. Samples collected deeper than 6 feet bgs within the area of heavy oil-range organics contamination were also less than the RL. Relevant soil analytical results for the additional heavy oil-range organics excavation area are presented in Table 4.3 and on Figure 4.1b.

4.5.2 Contaminated Soil Segregation

Excavated soil from the heavy oil-range organics area will be direct loaded to trucks or containers for disposal. Based on existing data, it is expected that the top 2 feet of overburden overlying the soil contaminated with heavy oil-range organics does not warrant cleanup (low-level heavy oil detection in surface soils) within the focused excavation area. Due to its small volume, this soil will be commingled with the contaminated soil for handling and disposal to facilitate construction.

4.6 DATA-DRIVEN ACTIONS FOR INTERIM ACTION

The primary goal of the IA is to remove contaminated soil (both known and unknown) that is encountered during the construction of the proposed stormwater conveyance system. During construction, compliance monitoring will be conducted to ensure that the IA objectives are met. Specifically, field monitoring and soil sample collection, as described in the following sections, will be used to determine if additional actions are necessary during IA construction to ensure that the IA goals are met.

4.6.1 Field Observations during Construction

During trenching and excavation for the stormwater system and the focused IA excavations described in Sections 4.3, 4.4, and 4.5, excavated soil will be screened for field indications of contamination. Indications of contamination include staining, petroleum- or solvent-like odors, elevated headspace VOC concentrations (i.e., greater than 20 ppmv) as measured with a PID, or the presence of sheens or free product. Based on prior subsurface investigations at the Site, the presence of Stoddard solvent in the subsurface can be identified using a PID. Penta is often co-located with Stoddard solvent, but is less widespread and is typically at lesser concentrations than Stoddard solvent (refer to Section 3.5). Visual, olfactory, and PID field screening will be performed routinely during excavation. Based on a review of Site boring logs, Stoddard solvent is generally detected in soils (unsaturated and saturated) at concentrations greater than the laboratory method detection limit when PID measurements are 20 ppmv or greater. Therefore, if PID measurements are greater than 20 ppmv in unsaturated soils at the base of an excavation, the excavation will be extended in 2-foot lifts (i.e., 2 feet deeper) until PID measurements are less than 20 ppmv or until the water table is reached, whichever occurs first.

In saturated soil on the Property, Stoddard solvent and penta impacts are generally encountered within the groundwater plume and are associated with groundwater impacts, and not a soil source area. In the area of the Stoddard solvent IA excavation area, which is closest to the penta and Stoddard source area (in the Myrtle Street ROW), excavation below the water table is proposed in order to remove elevated concentrations in saturated soil, which has become impacted as a result of a release to groundwater. The removal of impacted saturated soils is expected to remove residual source product that has migrated laterally on the water table in this area, which will ultimately improve groundwater quality over time. In this area only, if PID measurements below the water table are greater than 20 ppmv, then soil excavation will be extended deeper in 2-foot lifts until PID measurements are less than 20 ppmv, until a depth of 20 feet bgs is reached, or if excavation is unable to be extended without the use of additional engineering controls (i.e., shoring), whichever occurs first.

In the heavy oil excavation area, the presence of heavy oil has been observed in the field, as evidenced by dark staining on the soil. If staining is observed during excavation, the excavation will be extended beyond the proposed limits (vertically or horizontally) until staining is no longer observed. The results of soil compliance samples as described in Section 4.6.2, will be used to confirm field observations and to determine if additional excavation is necessary.

4.6.2 Compliance Soil Sample Collection

Compliance soil samples will be collected to document that the objectives of the IA are met; refer to Section 7.2 for the specific details of the compliance monitoring plan. If the result of a compliance soil sample is greater than the RL for a constituent, then the following actions will be completed:

- If a composite sample result is greater than the RL for a constituent in unsaturated soil, then the individual samples that the composite was composed of will be individually analyzed for the constituent(s) that was greater than the RL.
- Once the results of the discrete samples are reviewed, the excavation in the area that encompassed the soil sample(s) greater than the RL will be extended deeper in 2-foot lifts or to the top of the water table, whichever occurs first, depending on the final depth of the trench.
- If the excavation is terminated above the water table in areas outside the source area (including the Stoddard solvent IA excavation area), additional confirmation soil samples will be collected in accordance with Section 7.2 to document compliance with the IA. If the excavation is extended to the water table, additional soil samples will not be collected, as the results will be considered indicative of the groundwater plume, and remediation will be evaluated as part of the future RI/FS.
- For the heavy oil excavation, if the results of a confirmation sample are greater than the RL for heavy oil, the excavation will be extended in 2-foot lifts both vertically and horizontally until the RLs are met.

4.7 EXCAVATED SOIL MANAGEMENT

Excavated soil associated with the three interim actions described above will be managed in accordance with the following sections.

4.7.1 Stockpile Management

All stockpiles shall be placed at a designated location(s) within the limits of the construction project. The temporary stockpiles shall be placed upon either 10-milliliter-thick polyethylene sheeting or woven waterproof tarps provided by the contractor, with a straw bale, ecology block, or other approved containment berm secured beneath the sheet or tarp to prevent erosion. Alternately, if the volume of contaminated soil is expected to be small, a roll-off container may be utilized to store excess soil, which eliminates the need to reload stockpiled soil onto trucks. The soil stockpiles must be kept covered with sheeting or tarps when not in use until loaded for disposal or reuse. Soils within the heavy oil-range organics excavation area have been sufficiently characterized, as described in Section 4.7.2, and may also be direct loaded into trucks for disposal.

4.7.2 Waste Characterization

Soil designated for potential reuse will be sampled for Site COCs according to the stockpile sampling frequency presented in Section 7.2.3. For soils segregated as contaminated for off-site disposal, existing analytical results will be provided to the selected disposal facility, with supplemental samples collected if needed for further disposal characterization. Samples will be collected for analytes that are IA COCs at a frequency provided by the receiving disposal facility. Additional analytes may be tested as required from the receiving landfill to evaluate compliance with their operational permits.

4.7.3 Soil Transport and Disposal

Soil that presents obvious signs of contamination in the field or has concentrations greater than Site CULs must be transported off-site for disposal or beneficial reuse (i.e., daily cover) at a Subtitle D landfill or other permitted solid waste facility. Previous data collected within the trench and excavation areas may also be used for waste characterization, as appropriate. Soil drums, roll-offs, and/or stockpiled soil or other material will be loaded onto trucks for transport off-site to an appropriate Subtitle D landfill for disposal under an appropriate manifest or bill of lading. If necessary, drying agents may be used to allow materials to be transported to the receiving landfill without free liquid accumulation. Any soil spills in the stockpile loading area will be cleaned up immediately and placed in appropriate containers or a dump truck for disposal. Transporters should follow the collection and transportation standards included in WAC 173-350-300.

4.8 GROUNDWATER MANAGEMENT

The groundwater table was encountered between 9 and 11 feet bgs during the most recent investigation at the Site. The majority of the underground components of the stormwater system will be installed above the groundwater table. Some deeper components of the system, including the flow splitter/control structure, pre-treatment structure, and pump station manhole may require excavation approximately 1 to 2 feet below the water table. When excavation below the water table is required, or if water accumulates within the excavation area due to rain or other events, a limited amount of dewatering may be necessary during construction.

At a minimum, the contractor will provide shoring and temporary storage capacity for accumulated water within the excavation. Groundwater data will be fully evaluated in each of these areas to identify potential contaminants that may be present. It is expected that treatment will be required prior to discharge, with accumulated water batch sampled to select the necessary treatment to comply with discharge permit requirements for the intended method of discharge or disposal. The means and methods for dewatering, water treatment, and permitted discharge will be selected by the contractor and approved by Floyd|Snider or KPFF. A plan for shoring, dewatering, and water treatment will be prepared by the contractor; a copy of this plan will be provided to Ecology, if requested, prior to the start of construction.

4.9 INTERIM ACTION SITE CONTROLS

During stormwater system construction and supplemental excavation, the contractor shall employ the following site controls to prevent the release of contamination from the Site.

4.9.1 Well Protection

During construction, all monitoring wells will be protected. Existing well WT-MW-110, which is located within the heavy oil-range organics excavation area, will be decommissioned by a licensed driller prior to excavation and re-installed after stormwater system construction is completed. Existing well WT-MW-04 is located adjacent to the stormwater detention piping excavation; however, this well was not able to be located during the most recent groundwater sampling event and is presumed to be damaged at the ground surface. WT-MW-04 will be located by scraping the ground surface prior to excavation and, if found, abandoned by a licensed driller prior to construction. This well will be re-installed after construction has been completed, likely during RI field work. Alternatively, if the well is located and viable, and will not impede construction, it will be protected and the roadbox/surface completion will be re-established during construction.

4.9.2 Best Management Practices

Best management practices (BMPs) will be implemented during construction to ensure that environmental quality of the Property and surrounding area are maintained during construction.

In order to minimize track-out of soil during construction, construction access driveways will be stabilized with quarry spalls to remove excess soil from vehicle tires. The SIM facility also sweeps S. Myrtle Street daily and will continue to do so during construction. If sweeping and driveway stabilization are not sufficient to prevent track-out, additional BMPs including increased sweeping frequency and/or installation of temporary wheel washes at the access driveways may be implemented.

Soil loading and off-loading will be performed in a designated loading area. When loading confirmed or potentially contaminated soil for disposal, the ground surface of the loading area will be covered and any spilled soil picked up and placed into the appropriate container to prevent the spread of contamination. Loads will be securely covered prior to transport. Confirmed or potentially contaminated soils will be stockpiled on plastic sheeting, and all stockpiles will be surrounded with appropriate berming to prevent stormwater run-on/run-off and covered when not being actively worked.

Construction equipment will be kept in good working condition and inspected regularly for fuel leaks. Equipment fueling will be completed in a dedicated refueling area, with containment measures such as absorbent cloths deployed as necessary to prevent the release of dripping or spilled fuel to the ground surface. Basic spill containment materials, including absorbent cloths and booms, will be kept at the refueling area and re-stocked as needed. Any releases of fuel or other chemicals on the Site will be reported to SIM; additional notification requirements for larger spills, spills that enter the storm drain system or water bodies, or any releases from unanticipated USTs encountered during excavation are as follows:

Spills into waters of the State (including ponds, ditches, seasonally dry streams, and wetlands)
Immediately call all of the following: **The National Response Center (NRC) 1-800-424-8802** **Washington Department of Emergency Management 1-800-258-5990** **Ecology Northwest Regional Office 1-425-649-7000**
Spill to Soil (including encounters of pre-existing contamination not specified in work plan)
Report immediately if threatening to health or environment (i.e., explosive, flammable, toxic vapors, shallow groundwater, nearby creek), otherwise within 90 days **Ecology Northwest Regional Office 1-425-649-7000** Notify public utilities department if spill enters sanitary sewer, stormwater system, streets, ditches, streams, and/or wetlands. **Seattle Public Utilities 1-206-386-1800**
Unanticipated Underground Storage Tank
Report within 24 hours if unanticipated tank encountered with confirmed release of material **Ecology Northwest Regional Office 1-425-649-7000** **Washington Emergency Management Division 1-800-258-5990 or 1-800-OILS-911**

A spill notification form is provided in Appendix B.

Access to the property by the public is currently prevented by the existing perimeter fence; however, this fence will be removed as part of construction. When the perimeter fence is removed, temporary construction fencing will be used to prevent public access to the property. All property entrances will be secured at the end of each work day. Upon completion of the proposed construction, new fencing will be installed along S. Myrtle Street.

4.9.3 Stormwater Management

Temporary erosion and sedimentation controls will be established by the contractor around the construction perimeter to achieve sedimentation control. The contractor will be required to prepare a temporary erosion and sedimentation controls plan prior to construction to identify specific controls. This section details the minimum requirements.

A perimeter filter berm consisting of a 6-foot-wide, 12-inch-high triangular berm composed of ¾-inch to 3-inch washed, well-graded gravel with a 2-inch to 3-inch compost blanket has already been installed as a structural BMP to reduce sediment from being transported off-site. To supplement the filter berm, a sediment trap and two stormwater settling tanks have been placed upstream of the berm to allow sediment to settle prior to discharge. In addition, a Stormceptor® swirl concentrator will be installed in October 2016 to augment existing sediment removal.

Prior to construction, all storm drain inlets surrounding the property will be fitted with geotextile fabric inserts to prevent soil from entering the storm drain system.

During construction, BMPs will be installed around the perimeter of the property to eliminate runoff. The perimeter controls may be composed of compost socks, compost berms, silt fence, straw bales, straw wattles, or a combination of these elements. City catch basins near construction entrances and within adjacent streets will be fitted with catch basin filters.

Bare soil will be covered with compost blankets, straw, mulch, matting, or other approved equal to control runoff. Stockpiles will be bermed using a straw bale, ecology block, or other approved containment berm to control runoff, and stockpiles that will be un-worked for more than 24 hours will be also be covered.

The project will be performed under a CSGP. Regular weekly inspections of stormwater management BMPs, as well as any stormwater sampling required by the CSGP, will be performed by a Certified Erosion and Sediment Control Lead.

4.9.4 Decontamination

The excavation and water storage equipment used during construction (bucket, tools, holding tanks, etc.) will be cleaned to meet a visually clean debris surface standard using dry methods (broom, brush, etc.) if practicable. Trucks and excavation equipment will also be decontaminated prior to leaving the property. Decontamination shall include cleaning of any part of the truck or equipment that has come in contact with soil, including steel or rubber tracks and tire treads.

If water is necessary for cleaning, decontamination of large equipment will be completed within a bermed area and on a competent surface covered with plastic sheeting. Decontamination water will be containerized and managed along with any waters generated from dewatering or stormwater controls into the on-site aboveground storage tanks and batch tested prior to disposal. If necessary, water will be treated prior to discharge, with the treatment to be proposed by the contractor for Ecology approval. Small amounts of decontamination water (i.e., under 1 gallon) may be mixed with dry excavated soil and transported off-site for disposal.

5.0 Relationship of Interim Action to the Site Cleanup Action

Remedial actions that are implemented prior to completion of the RI/FS are considered IAs. In this case, the IA as described in Section 4.0 is being conducted to remove known and encountered contaminated soil during construction of the proposed stormwater conveyance system and subsequent paving of the Property, which is a more timely and cost-effective means of source removal. The IA will be implemented in accordance with WAC 173-340-430 and has been designed in a manner that will not preclude reasonable alternatives for any final cleanup action that may be required. The RLs used for this IA, as described in Section 3.2, are conservative values and are expected to be consistent with final cleanup goals for the Site. Appropriate CULs for the Site will be fully evaluated as part of the future RI and established in the final Cleanup Action Plan for the Site.

Completing the IA in conjunction with the stormwater system installation allows excavation to be completed when the contractor is mobilized and has necessary equipment to complete the work. Completion of excavation prior to placement of stormwater piping, structures, and final pavement will also allow access to contaminated soil in areas that will no longer be accessible after installation of these subsurface features and without disturbance of newly installed pavement. In addition, completion of source soil removal prior to paving will be protective of groundwater quality and will likely accelerate groundwater quality improvement prior to completion of RI/FS and final cleanup actions for the Site. It is anticipated that the IA soil remediation (source removal by excavation) completed in these areas will be sufficient for final cleanup for soil. A full evaluation of soil and groundwater cleanup alternatives will be completed as part of the future FS.

It is expected that future soil cleanup (likely source soil removal by excavation) will be necessary off-property and immediately south of the Stoddard solvent IA excavation as part of a future Cleanup Action Plan. As described in Section 4.4, an additional excavation buffer has been incorporated into the design of the IA to allow future excavation to overlap with the IA excavation, without compromising the detention piping associated with the stormwater system. In addition, it is expected that remedial action(s) will also be implemented for groundwater in the future, and the completion of the IA will not prevent the completion of groundwater cleanup actions in the future.

6.0 Health and Safety

Contractors must follow general health and safety procedures while performing subsurface construction activities at the Site. Additionally, the environmental oversight consultants and engineers, and construction contractor, will prepare their own Health and Safety Plans that address the health and safety protocols that are specific to their tasks to be performed. Workers will be required to wear the appropriate personal protective equipment, which is expected to be Level D and consists, at a minimum, of steel toe boots, safety vest, and protective gloves to limit exposure to contaminated media. The Site is located in an active industrial area and the contractor must therefore be aware of vehicular traffic and other potential hazards associated with active roadways and surrounding facility operations. In addition, the contractor should consider potential impacts from petroleum hydrocarbons and/or penta when performing any subsurface disturbance of material in the area defined on Figure 4.1. At a minimum, ambient air should be periodically monitored during trenching and excavation with a PID. Contractors must be aware of these hazards and take appropriate precautions while performing the work outlined in this IAWP.

All site personnel who have the potential to contact contaminated media must also comply with Occupational Safety and Health Administration (OSHA) and Department of Occupational Safety and Health (DOSH) health and safety training and medical monitoring requirements, including 40-hour Hazardous Waste Operations and Emergency Response certification. All certifications must be kept up-to-date according to the schedule set by OSHA/DOSH or the employer.

7.0 Sampling and Analysis Plan/Quality Assurance Project Plan

This section, the SAP/QAPP, presents the specific field protocols and field and laboratory QA/QC procedures associated with the IA soil sampling. Soil samples will be collected from the base and sidewalls of trenches and excavations to document materials left in-place, from stockpiled materials for disposal characterization, and from imported backfill materials. This SAP/QAPP was developed in accordance with Ecology's *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology 2004) and MTCA (Ecology 2007). Soil sampling procedures are presented in the Floyd|Snider Standard Guideline for soil sampling and Standard Guideline for Soil Logging, included as Appendix C.

7.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

The various QA field, laboratory, and management responsibilities of key project personnel are defined in this section.

7.1.1 Project Management Responsibilities

Lynn Grochala, Floyd|Snider, is the Project Manager and will have day-to-day responsibility for project implementation. As Project Manager, she will be responsible for maintaining QA on this project and ensuring that the IAWP objectives are met.

Allison Geiselbrecht is the Principal-in-Charge and Site Coordinator for the project and is responsible for communicating with Ecology and providing overall project implementation.

7.1.2 Quality Assurance Responsibilities

Floyd|Snider's data manager, Chell Black, will be responsible for the data validation of all sample results from the analytical laboratories with the exception of dioxin/furan results. Data validation responsibilities include reviewing laboratory reports, advising on data corrective action procedures, and performing QA/QC on analytical data reports. For dioxin/furan data, EcoChem, Inc. will perform a Level IV, Tier III Data Quality Review (Full Validation).

Additionally, Chell will enter all of the data into Floyd|Snider's proprietary database, Ecology's Environmental Information Management system, and perform data management and queries.

7.1.3 Laboratory Responsibilities

Freidman & Bruya, Inc., in Seattle, Washington, will perform analytical services in support of the IA activities and will be responsible for implementing specific requirements outlined in the project QAPP, included in Section 7.5.

7.1.4 Field Responsibilities

Kristin Anderson of Floyd|Snider is the field supervisor and will be responsible for managing all IA construction oversight and sample collection activities in the field. Specific responsibilities include tracking IA project activities and field construction schedule; coordinating and managing IA field work activity; monitoring soil excavation and material handling to ensure that the contractor is performing according to the IAWP; supervising contractor procedures for contaminated material handling (including stockpile maintenance as needed) and disposal to ensure consistency with the IAWP; documenting quantities of materials transported off-site for disposal; and managing the collection of compliance samples to ensure that the objectives of the IAWP have been met. The field supervisor will also prepare field reports and communicate progress updates to Floyd|Snider's Project Manager.

KPFF will be responsible for day-to-day construction oversight for the stormwater system installation, including contractor coordination. KPFF field personnel will ensure that the stormwater conveyance system is installed in accordance with the specifications outlined in the EDR to meet the requirements of the Water Quality Administrative Order.

7.2 COMPLIANCE MONITORING PLAN

Confirmation sampling will be performed to ensure that the remediation goals of IA soil excavation are met. Samples that will be collected to complete the IA will include composite soil sample collection beneath conveyance piping to document soil quality below the pipes, excavation confirmation soil samples, and characterization samples of excavated materials for disposal. The order of sample collection presented in the following sections may change based on the contractor's sequencing of the IA implementation. A summary of all samples to be collected is provided in Table 7.1. The following sections present field sampling protocols.

7.2.1 Composite Soil Sample Collection

During trenching, bottom samples will be collected approximately every 20 feet along the base of the trench, as shown on Figure 7.1, with the exception of the off-property trench A5 where samples will be collected approximately every 50 to 70 feet. Data from the off-property trench will be collected to document soil quality beneath the stormwater conveyance piping, but will not be used for construction decision making. Composite bottom samples will be prepared for each trench segment, with two composites prepared for the longest trenches (designated "trench A" and "trench E" on Figure 7.1). Samples will be analyzed for the IA COCs including Stoddard solvent, penta, and heavy oil-range organics. A composite sample from Trench A2 will also be analyzed for dioxins/furans. Sufficient volume of the discrete 20-foot sub-samples will also be held for potential future analysis to delineate contamination if any composite sample results exceed their respective RLs.

In those areas where previous soil boring data already exist, these data will be used in conjunction with additional trench bottom samples. Soil data from boring WT-GP-8 will be used to supplement data for trench segment A2; Stoddard solvent (quantified as gasoline-range organics) was non-detect at 5 feet bgs.

Composite samples will also be collected from the deeper subsurface structure excavation areas as follows:

- One three-point composite sample will be collected from beneath the detention piping area north of the Stoddard solvent excavation; the sample will be analyzed for Stoddard solvent, penta, and heavy oil organics.
- One three-point composite sample will be collected from the pre-treatment/pump station area west of the excavation; the sample will be analyzed for Stoddard solvent, penta, and heavy oil organics.

Additionally, existing samples will be used to document the soil conditions in the vicinity of the deeper structures. These include:

- Detention piping area: WT-SB-06 (non-detect for penta and Stoddard solvent at 10 feet bgs)
- Pre-treatment/pump station area: WT-SB-01 and WT-MW-108 (both non-detect for penta and Stoddard solvent at 10 feet bgs)

7.2.2 Post-Excavation Soil Compliance Sample Collection

Soil compliance monitoring will be conducted in two areas to demonstrate that RLs have been achieved during IA construction: (1) the supplemental Stoddard solvent buffer excavation, and (2) the heavy oil-range organics excavation area in the east central property. The sampling schemes for these two areas are described in this section.

Where appropriate, previous data collected during recent soil characterization sampling events in areas that can document excavation limits will be used as confirmation samples. The proposed additional confirmation samples and existing sample locations that will be used as confirmation samples are shown on Figure 7.1.

- In the Stoddard solvent buffer area, the existing sample collected from 12 to 13 feet bgs at WT-GP-3 will be used as the confirmation sample for the western sidewall of the excavation. This sample had a Stoddard solvent concentration of 109 mg/kg, less than the RL, and was collected from the depth interval that had the greatest field indications of contamination at this location. Additional sidewall samples to document compliance with the RL will be collected at approximately 12 feet bgs, or at the interval that has the greatest field indications of contamination, including one sample each from the northernmost and easternmost sidewalls where the excavation is intended to remove soil with Stoddard solvent exceeding the RL. Samples will not be collected from the south sidewall of the excavation, as the buffer is known to abut an area of Stoddard solvent and penta contamination that will be addressed in the RI/FS. The soil sample collected from WT-GP-4 at 12 to 13 feet bgs is located at the south-central extent of the excavation and can be used to document what will remain on the southern extent; this sample contained Stoddard solvent at a concentration of 3,950 mg/kg. Excavation bottom samples will also be collected to document compliance with the RL. Four evenly spaced bottom samples will be collected from 15 feet bgs, or the final bottom depth of the excavation. Samples will be analyzed for diesel-range organics (Stoddard solvent). Two of these discrete excavation bottom samples will also be analyzed for penta, and one of the discrete samples will also be analyzed for dioxins/furans.

In the heavy oil area, the existing samples collected from 4 to 5 feet bgs at WT-SB-14, WT-SB-15, and WT-SB-18 will be used for the northern, western, and southern sidewalls, respectively, of the excavation. These samples were all non-detect for heavy oil-range organics. One additional sample will be collected from the eastern sidewall of the excavation at approximately 4 to 5 feet bgs. The existing 6- to 7-foot bgs sample at WT-MW-110 and 5- to 6-foot bgs sample at WT-SB-20 were less than the heavy oil-range organics RL and will be used as excavation bottom samples; no other bottom samples will be necessary to document compliance with the RL in the heavy oil-range organics excavation. Samples will be analyzed for heavy oil-range organics. The method of sidewall and base sample collection will be determined in coordination with the contractor, and will be dependent on safe conditions for entry into the excavation by field sampling personnel or accessibility of the sidewall if trench boxes are used for shoring. Prior to sample collection, the excavation extents will be verified by the field personnel. Soil samples will be collected from a depth of 6 inches or less into the surface of the excavation limits. Sidewall samples will be collected from the depth intervals specified above, using an excavator bucket, shovel, or hand trowel to expose a fresh surface and then scrape the surface to obtain a sample.

Soil samples will be homogenized in a decontaminated stainless steel or disposable bowl after collection. The field technician will record a description of the sample including field observations of contamination, if present. Soil samples will be submitted to the laboratory under expedited (24-hour or 48-hour) turnaround time.

If results of the confirmation samples indicate that COCs remain at concentrations greater than the RLs, additional excavation in 2-foot lifts (for bottom exceedance) or 2-foot extensions (for sidewall exceedances) will be performed. If additional excavation is deemed necessary, samples will be re-collected using the same protocols described above following re-excavation of an area. If results still indicate contamination greater than the RLs, the excavation extension procedure will be repeated until target concentrations are achieved.

7.2.3 Stockpile Sampling for Material Reuse or Disposal

Material segregated as potentially contaminated (having low-level PID readings less than 10 ppmv but no other field indications of contamination) will be sampled for analysis of the Site COCs and geotechnical parameters to determine whether the soil may be reused on-site, or requires off-site disposal. Previous data collected may also be used for waste characterization. If obvious signs of contamination are observed, such as sheen or free product, then a sample must be collected to ensure compliance with the off-site landfill acceptance criteria.

Soil stockpiled for potential re-use must meet the CULs for the Site COCs presented in Section 3.1. Three-point composite samples will be collected from stockpiles at a frequency in accordance with Table 6.9 of Ecology's *Guidance for Remediation of Petroleum Contaminated Sites* (Ecology 2016), as follows:

Cubic Yards of Soil	Number of Samples
0–100	3
101–500	5
501–1,000	7
1,001–2,000	10
>2,000	10+1 for each additional 500 CY

Soil samples will be analyzed in accordance with the backfill testing requirements discussed in Section 7.2.4 to determine suitability for re-use as backfill. Additional analysis will be performed as required by the receiving landfill, specific testing requirements and frequency will be determined during construction.

7.2.4 Backfill Testing

When excavated material cannot be used for backfill because of CUL exceedances, or more suitable backfill material is needed for geotechnical purposes such as to support weight (traffic), imported backfill must meet one of the following criteria prior to being imported:

- Backfill must be naturally occurring soil or rock (i.e., virgin material) from an established quarry. This material will not require testing prior to use at the Site; however, the quarry must provide testing results for the fill material that are current (i.e., within 2 years).
- If another source of backfill is desired (i.e., not virgin material), then the backfill must be tested and approved by the project engineer prior to importing the material for use at the Site. Material must be tested for, at a minimum, common contaminants with MTCA Method A CULs for industrial properties (refer to Table 745-1 of MTCA). The test results must indicate that the soil meets the MTCA Method A CULs for an industrial property, in addition to MTCA Method A CULs for a residential property (unrestricted). This list of contaminants includes the following:
    - Metals: arsenic, lead, cadmium, chromium (total), and mercury (inorganic)
    - Benzene, toluene, ethylbenzene, and xylenes (BTEX) and naphthalene
    - cVOCs including tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane
    - TPH
    - PCBs

7.3 FIELD QUALITY CONTROL SAMPLES

Blind field duplicates are collected to evaluate the efficiency of field decontamination procedures, variability from sample handling, and sample heterogeneity. Field duplicate samples will be collected at a frequency of one blind duplicate per 20 samples. Because no performance criteria have been established for field duplicates, these results will be screened against a relative percent difference (RPD) of 75 percent between the parent and duplicate sample. However, no data will be qualified based solely on field duplicate precision.

The effectiveness of field decontamination protocols will be evaluated by collection of an equipment rinsate blank for all non-dedicated sampling equipment. The standard for rinsate blank samples is non-detect for all Site COCs; however, no data will be qualified based solely on the detection of Site COCs in the rinsate blank.

For samples collected for volatiles analysis with the laboratory methods NWTPH-Gx and USEPA 8260, trip blanks will be included in each cooler to identify possible sample contamination during transportation.

7.4 SAMPLE HANDLING AND CUSTODY DOCUMENTATION

This section describes the analytical program to be conducted for each sample selected for chemical analysis, and well as the field and laboratory QA objectives and QC procedures required to be met to achieve technically sound and useable data.

7.4.1 Sample Nomenclature

The sample naming format that will be used for the discrete samples within the trench segments is: Trench Segment-sample number-depth in feet. For example, the second sample from trench segment A1 at 5 feet bgs would be named "WT-A1-02-5'." The corresponding trench composite sample would be named "A1."

The sample naming format that will be used for excavation confirmation soil samples is: "IA Excavation Area-base or sidewall location and direction-depth of sample in feet bgs." For example, the first sidewall soil sample collected from the east side of the Stoddard solvent excavation, at a depth of 4 feet bgs would be labeled "SS- S1E-4'." The sidewall sample collected from the east side of the heavy oil-range organics excavation at 4 feet bgs would be labeled "HO-S1E-4'."

The sample naming formats that will be used for the stockpile and backfill soil samples are: "Whitehead Tyee-Stockpile-Stockpile number-sample number" and "Whitehead Tyee-Backfill-sample number." For example, the first stockpile soil sample collected from stockpile 1 would be labeled WT-SP1-01. The stockpile numbers used for sampling purposes will be tracked by the field technician.

Field duplicates will be given fictitious identifications for the purposes of laboratory analysis, with the parent sample identifications tracked by the field technician. Other QA/QC samples including trip blanks and rinsate blanks will be labeled with their purpose (i.e., "TB" or "RB") and the date collected.

7.4.2 Sample Handling

Established preservation and storage measures will be taken in order to control the integrity of the samples during transit to the laboratory and during holding prior to analysis. The field technician will check all container labels, chain-of-custody form entries, and logbook entries for completeness and accuracy at the end of each sampling day.

Sample containers will be labeled at the time of sampling, clearly identifying the project name, project number, sampling location, sampler's initials, sample number, date and time of collection, and analysis to be performed.

7.4.3 Sampling Chain-of-Custody

The field technician will be responsible for all sample tracking and custody procedures in the field, and chain-of-custody procedures will be strictly followed. The field technician will be responsible for final sample inventory and will maintain sample custody documentation. At the end of each day, and prior to transfer, Chain-of-Custody Form entries will be made for all samples. Adequate sample custody will be achieved by means of approved field and analytical documentation. Such documentation includes the chain-of-custody record, which is initially completed by the sampler and is thereafter signed by those individuals who accept custody of the sample. A sample will be considered to be in custody if one of the following is maintained:

- The samples are in someone's physical possession.
- The samples are in someone's view.
- The samples are locked up or secured in a locked container or vehicle or otherwise sealed so that any tampering would be evident.
- The samples are kept in a secured area, restricted to authorized personnel only.

Each shipment of sample coolers will be accompanied by Chain-of-Custody Forms; the forms will be signed at each point of transfer and will include sample numbers. All Chain-of-Custody Forms will be completed in indelible ink. Copies of all forms will be retained as appropriate and included as appendices to QA/QC reports to management. Any time possession of the samples is transferred, the individuals relinquishing and receiving the samples will respectively sign, date, and note the time of transfer on the Chain-of-Custody Form. This form documents the transfer of custody of samples from the sampler to the laboratory.

7.4.4 Sample Transport

Table 7.2 summarizes sample size requirements, container type, preservation method (if applicable), and holding times for soil analytes. Prior to transport, sample containers will be wrapped and securely packed inside the cooler with ice packs or crushed ice by the field technician. Samples will be delivered to the laboratory under chain-of-custody following completion of sampling activities on the day of sample collection or the following day depending on the field sampling duration.

7.4.5 Sample Receipt

The designated sample custodian at the laboratory will accept custody of the samples and verify that the Chain-of-Custody Form matches the samples received. The Laboratory Project Manager will ensure that the custody forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the Chain-of-Custody Forms. The laboratory will contact the Floyd|Snider project manager immediately if discrepancies are discovered between the Chain-of-Custody forms and the sample shipment upon receipt. The laboratory project manager, or designee, will specifically note any coolers that do not contain ice packs or are not sufficiently cold upon receipt.

7.5 QUALITY ASSURANCE PROJECT PLAN

This section describes the analytical program to be conducted for each sample selected for chemical analysis, as well as the laboratory QA objectives and QC procedures required to be met to achieve technically sound and useable data. Samples will be transported to Friedman & Bruya, Inc., located in Seattle, Washington for chemical analysis using the analytical methods provided in Table 7.2. Laboratory data quality objectives, including detection limits and reporting limits for the selected analytical methods, are presented in Table 7.3 and are described in the following sections.

7.5.1 Data Quality Objectives

The data collection proposed herein is intended to ensure that the full extent of soil exceeding the Site CULs or RLs is removed and that all contaminated media removed during the IA are directed to the proper disposal facilities. These objectives have been used to define the following data quality objectives:

- The data must be representative of the media and relevant to the objective listed; this data quality objective is addressed by the design of this IAWP.
- The data must be sufficiently complete so as not to introduce unacceptable uncertainty. This was addressed by multiple rounds of sampling to characterize soil prior to construction. Additional data will be collected during construction to provide confirmation in areas where there was some uncertainty regarding final extents.
- The data analysis must be both sensitive and selective. Standard USEPA methods are used for the analysis of penta; these methods have reporting limits that are less than their most stringent MTCA CUL for industrial properties and have been found to be without measureable analytical interference at the Site. Standard Ecology methods have been used for Stoddard solvent and heavy oil-range organics analysis and were adjusted to use the appropriate standards for quantitation. Again the practical quantitation limits for the NWTPH methods were less than the most stringent MTCA CULs.

- The analytical methods used to make the measurements must be selected to allow the data to be used in meeting the objectives. This data quality objective is addressed by using standardized USEPA methods that have been performing at the Site for years without known matrix problems or interferences. These methods are listed in Table 7.2.
- The analytical methods used to make measurements must be sufficiently sensitive to allow the objectives to be met. Specifically, the reporting limits in combination with the requirements for precision and accuracy shown in Table 7.4 will allow the results to be distinguished from decision criteria (i.e., the CULs or RLs). The decision criteria listed are the smallest of the various criteria listed herein for making decisions for a specific analyte in a specific medium.
- Data validation will be completed and data will be reviewed to determine if the data are acceptable for their intended use based on project-specific decision criteria.

7.5.2 Laboratory Analyses

Soil samples collected will be analyzed for the applicable Site COCs, and additional contaminants necessary to determine soil quality for potential backfill, by the following methods:

- Gasoline-range organics by NWTPH-Gx
- Diesel (i.e., Stoddard Solvent)- and heavy oil-range organics by NWTPH-Dx
- Penta and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA Method 8270D SIM
- Heavy metals by USEPA Method 6020/1631E
- VOCs including cVOCs, BTEX compounds, and naphthalene by USEPA Method 8260C
- PCBs by USEPA Method 8082

7.5.3 Reporting Limits

The analytical methods identified above result in method detection limits and reporting limits (or practical quantitation limits) that are less than the relevant CULs or RLs. Table 7.3 presents the target reporting limits for each analytical method. These reporting limits are goals only, insofar as instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achieving the desired reporting limit and associated QA/QC criteria. In such instances, the laboratory will report the reason for any deviation from these reporting limits.

7.5.4 Laboratory Quality Assurance/Quality Control Objectives

Laboratory QA/QC objectives include obtaining data that are technically sound and properly documented, having been evaluated against established criteria for the principal data quality indicators (i.e., precision, accuracy, representativeness, completeness, and comparability) as defined in Ecology and USEPA guidance (Ecology 2004 and USEPA 2002) and of sufficient quality and quantity for their intended purpose. Laboratory results will be evaluated against data quality objectives and project-specific decision criteria by reviewing results for analysis of method blanks, matrix spike (MS), duplicate samples, laboratory control samples (LCS), calibrations, performance evaluation samples, and interference checks as specified by the specific analytical methods.

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, precision is a quantitative measure of the variability of a group of measurements compared to their average values. Precision, defined as the RPD between results, will be evaluated for both laboratory MS/matrix spike duplicate (MSD) and field duplicate samples. Duplicate samples will be collected at a minimum frequency of 1 per laboratory analysis group and 1 per 20 field samples. Performance criteria have not been established for field duplicates. Field duplicate precision will, therefore, be screened against a RPD of 75 percent for all samples. However, no data will be qualified based solely on field duplicate precision. As shown in Table 7.4, data that meet the detection limit, accuracy, and precision requirements listed will be useable for decision-making.

Accuracy is an expression of the degree to which a measured or computed value represents the true value. Analytical accuracy may be assessed by analyzing “spiked” samples with known concentrations (surrogates, LCS, and/or MS) and measuring the percent recovery. Accuracy measurements on MS samples will be carried out at a minimum frequency of one per laboratory analysis group per matrix analyzed.

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care has been taken in the design of the sampling program to ensure sample locations are properly selected, sufficient numbers of samples are collected to accurately reflect conditions at the location(s), and samples are representative of the sampling location(s). A sufficient volume of samples will be collected at each sampling location to minimize bias or errors associated with sample particle size and heterogeneity.

Completeness, defined as the number of acceptable data points relative to the total number of data points, will be assessed for all samples within a given media (i.e., soil). The QA/QC objective for completeness for all components of this project is 95 percent. Data that were qualified as estimated because the QA/QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as estimated will be further reviewed for usability. For this project, the primary use of the data is to compare to standards for making decisions regarding waste disposal and compliance with soil CULs. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness. If a sample medium has an unacceptable completeness percentage after comparison to the individual data quality objectives described above, original samples will be re-analyzed if sufficient sample volume is available, archived samples will be analyzed if appropriate, or additional samples will be obtained during construction (if feasible).

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. In order to ensure results are comparable, samples will be analyzed using standard USEPA or Ecology methods and protocols. Calibration and reference standards will be traceable to certified standards, and standard data reporting formats will be employed. Data will also be reviewed to verify that precision and accuracy criteria were achieved and, if not, that data were appropriately qualified.

7.5.5 Laboratory and Field Quality Assurance/Quality Control Procedures

The quality of analytical data generated is assessed by both the implementation of field QC procedures, and by the frequency and type of internal laboratory QA/QC checks developed for analysis type and method. Field QC is evaluated through the analysis of blind field duplicates. Blind field duplicates will be collected at a rate of 1 per 20 samples and are used to evaluate the efficiency of field decontamination procedures, variability from sample handling, and sample heterogeneity. Laboratory results will be evaluated by reviewing analytical results of method blanks, MS/MSD, field duplicate samples, LCS, calibrations, performance evaluation samples, and interference checks as specified by the specific analytical methods.

7.6 DATA REDUCTION, VALIDATION, AND LABORATORY REPORTING

Initial data reduction, evaluation, and reporting at the laboratory will be carried out as described in the appropriate analytical protocols and the laboratory QA/QA Manuals. QA/QC data resulting from methods and procedures described in this document will also be reported.

7.6.1 Data Reduction and Reporting

The laboratory will be responsible for internal checks on data reporting and will correct errors identified during the QA review. Close contact will be maintained with the laboratory to resolve any QA/QC problems in a timely manner. The analytical laboratory will be required, where applicable, to report the following:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to, QA/QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered (actual or perceived) and their resolutions will be documented in as much detail as necessary.
- **Sample Identification Codes.** Records will be produced that clearly match all blind duplicate QA/QC samples with laboratory sample identification codes.
- **Chain-of-Custody Records.** Legible copies of the Chain-of-Custody Forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.

- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code:
    - Sample matrix.
    - Date of sample extraction.
    - Date and time of analysis.
    - Weight and/or volume used for analysis.
    - Final dilution volumes or concentration factor for the sample.
    - Percent moisture in solid samples.
    - Identification of the instrument used for analysis.
    - Method reporting and quantitation limits.
  - Analytical results reported with reporting units identified.
  - All data qualifiers and their definitions.
  - Electronic data deliverables.
- **QA/QC Summaries.** This section will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (refer to above). No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested.
  - **Method Blank Analysis.** The method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
  - **Surrogate Spike Recovery.** All surrogate spike recovery data for organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed.
  - **MS Recovery.** All MS recovery data for metals and organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed. The RPD for all duplicate analyses will be reported.
  - **Matrix Duplicate.** The RPD for all matrix duplicate analyses will be reported.
  - **LCS and LCS Duplicates.** All LCS/LCS duplicates for metals and organic compounds will be reported. The RPD for all duplicate analyses shall be reported.
  - **Blind Duplicates.** Blind duplicates will be reported in the same format as any other sample. RPDs will be calculated for duplicate samples and evaluated as part of the data quality review.

7.6.2 Data Validation

Floyd|Snider will conduct a Level I Compliance Screening on all the analytical data. EcoChem, Inc. will perform a Level IV, Tier III Data Quality Review (Full Validation) for dioxin/furan analysis.

All chemical data will be reviewed with regard to the following:

- Chain-of-custody/documentation
- Sample preservation and holding times
- Method blanks
- Reporting limits
- Surrogate recoveries
- MS/MSD recoveries
- LCS recoveries
- Laboratory and field duplicate RPDs

Data validation will be based on the QA/QC criteria as recommended in the methods identified in this SAP/QAPP and in the *National Functional Guidelines for Organic and/or Inorganic Methods Data Review* (USEPA 2014a and 2014b).

Data usability, conformance with the QA/QC objectives, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the laboratory in consultation with the Floyd|Snider project manager and may include qualification or rejection of the data.

8.0 Project Schedule

The schedule presented below provides anticipated submittal dates for major deliverables associated with the IA. In addition to the milestones in the schedule, all analytical data will be submitted to Ecology in both printed and electronic formats in accordance with Section VII of the AO (Work to be Performed), Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal.

Deliverable/Milestone	**Date**
Progress Reports	Monthly on the 15th of the month following the reporting period
Public Review Period for draft IAWP and SEPA Checklist	30 calendar days after submittal of this Public Review draft IAWP
Implement IAWP	No Later than July 1, 2017
Agency Review Draft IA Construction Completion Report	90 calendar days after the IA construction is complete, or by January 1, 2018 (whichever date is earliest)
Final IA Construction Completion Report	30 calendar days after receipt of Ecology’s comments on the Agency Review IA Report

9.0 References

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Whitehead Tyee Site

Interim Action Work Plan

Tables

Table 3.1
Summary of Non-Detect Contaminants in On-Property Soil

Analyte	Unit	Number of Results (All Non-Detect)	Minimum Reporting Limit	Maximum Reporting Limit
Total Petroleum Hydrocarbons (TPH)				
Gasoline-range organics	mg/kg	19	2.00	7.21
Metals				
Mercury	mg/kg	15	0.224	0.391
Polychlorinated Biphenyls (PCBs)				
PCB Aroclor 1016	mg/kg	4	0.0990	0.117
PCB Aroclor 1221	mg/kg	4	0.0990	0.117
PCB Aroclor 1232	mg/kg	4	0.0990	0.117
PCB Aroclor 1242	mg/kg	4	0.0990	0.117
PCB Aroclor 1248	mg/kg	4	0.0990	0.117
PCB Aroclor 1254	mg/kg	4	0.0990	0.117
PCB Aroclor 1260	mg/kg	4	0.0990	0.117
PCB Aroclor 1262	mg/kg	4	0.0990	0.117
PCB Aroclor 1268	mg/kg	4	0.0990	0.117
PCBs (Total, Aroclors)	mg/kg	4	0.0990	0.117
Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	mg/kg	5	0.0814	0.430
Acenaphthylene	mg/kg	5	0.0814	0.430
Dibenzo(a,h)anthracene	mg/kg	5	0.0814	0.430
Semivolatile Organic Compounds (SVOCs)				
1-Methylnaphthalene	mg/kg	4	0.0814	0.0951
2,4,5-Trichlorophenol	mg/kg	16	0.193	1.00
2,4,6-Trichlorophenol	mg/kg	16	0.193	0.430
2,4-Dichlorophenol	mg/kg	5	0.203	0.430
2,4-Dimethylphenol	mg/kg	5	0.102	0.430
2,4-Dinitrophenol	mg/kg	5	0.203	1.00
2-Chloronaphthalene	mg/kg	5	0.102	0.430
2-Chlorophenol	mg/kg	5	0.102	0.430
2-Methylphenol	mg/kg	16	0.0964	0.430
2-Nitrophenol	mg/kg	5	0.203	0.430
4,6-Dinitro-o-cresol	mg/kg	5	0.203	1.00
4-Chloro-3-methylphenol	mg/kg	5	0.430	0.594
4-Methylphenol	mg/kg	16	0.0964	0.430
4-Nitrophenol	mg/kg	5	0.509	1.00
Benzyl alcohol	mg/kg	4	0.102	0.119
bis(2-chloroethoxy)methane	mg/kg	5	0.102	0.430
bis-chloroisopropyl ether	mg/kg	1	0.430	0.430
Di(2-ethylhexyl)adipate	mg/kg	4	0.102	0.119
Diethylphthalate	mg/kg	5	0.102	0.430
Dimethyl phthalate	mg/kg	5	0.102	0.430
Di-n-butyl phthalate	mg/kg	5	0.102	0.430

Table 3.1
Summary of Non-Detect Contaminants in On-Property Soil

Analyte	Unit	Number of Results (All Non-Detect)	Minimum Reporting Limit	Maximum Reporting Limit
Semivolatile Organic Compounds (SVOCs) (Cont.)				
Di-n-octyl phthalate	mg/kg	5	0.102	0.430
Hexachlorobutadiene	mg/kg	16	0.0964	0.430
Hexachlorocyclopentadiene	mg/kg	5	0.102	0.430
Isophorone	mg/kg	5	0.102	0.430
m-cresol	mg/kg	11	0.0964	0.115
N-Nitroso-di-n-propylamine	mg/kg	5	0.102	0.430
N-Nitrosodiphenylamine	mg/kg	1	0.430	0.430
Phenol	mg/kg	5	0.203	0.430
Volatile Organic Compounds (VOCs)				
1,1-Dichloroethene	mg/kg	11	0.0558	0.0721
1,2,4-Trichlorobenzene	mg/kg	5	0.102	0.430
1,2-Dichlorobenzene	mg/kg	5	0.102	0.430
1,2-Dichloroethane	mg/kg	11	0.0335	0.0433
1,3-Dichlorobenzene	mg/kg	5	0.102	0.430
1,4-Dichlorobenzene	mg/kg	16	0.0964	0.430
2,4-Dinitrotoluene	mg/kg	16	0.0964	0.430
2,6-Dinitrotoluene	mg/kg	5	0.102	0.430
2-Nitroaniline	mg/kg	5	0.509	1.00
3,3'-Dichlorobenzidine	mg/kg	1	0.430	0.430
3-Nitroaniline	mg/kg	1	1.00	1.00
4-Bromophenyl phenyl ether	mg/kg	5	0.102	0.430
4-Chloroaniline	mg/kg	5	0.430	0.594
4-Chlorophenyl phenyl ether	mg/kg	5	0.102	0.430
4-Nitroaniline	mg/kg	1	1.00	1.00
Benzene	mg/kg	19	0.0200	0.0289
bis(2-chloroethyl)ether	mg/kg	5	0.203	0.430
Carbon tetrachloride	mg/kg	11	0.0223	0.0289
Chlorobenzene	mg/kg	11	0.0223	0.0289
Chloroform	mg/kg	11	0.0223	0.0289
Ethylbenzene	mg/kg	8	0.02	0.0200
Hexachlorobenzene	mg/kg	16	0.0964	0.430
Hexachloroethane	mg/kg	16	0.0964	0.430
Methyl ethyl ketone	mg/kg	11	0.0698	0.0902
Nitrobenzene	mg/kg	16	0.193	0.430
Pyridine	mg/kg	11	0.193	0.230
Toluene	mg/kg	8	0.020	0.0200
Trichloroethene	mg/kg	11	0.0335	0.0433
Vinyl chloride	mg/kg	12	0.00223	0.500
Xylene (total)	mg/kg	8	0.060	0.060

Abbreviation:
mg/kg Milligrams per kilogram

Table 3.2
Summary of Detected Contaminants in On-Property Soil

Information on COPC		Information About Detected Results								Information About Exceedances: MTCA Method A, Unrestricted and Industrial				Information About Exceedances: MTCA Method C, Cancer				Information About Exceedances: MTCA Method C, Noncancer				Information About Exceedances: Remediation Level (RL)			
Analyte	Units	Number of Results	Number of Detected Results	Percent of Detected Results	Minium Detected Value	Maximum Detected Value	Location of Maximum Detect	Date of Maximum Detect	Depth of Maximum Detect	MTCA Method A, Unrestricted and Industrial	Number of Detected Results that Exceed MTCA Method A, Unrestricted and Industrial	Percent of Detected Results that Exceed MTCA Method A, Unrestricted and Industrial	EF[1]	MTCA Method C, Cancer	Number of Detected Results that Exceed MTCA Method C, Cancer	Percent of Detected Results that Exceed MTCA Method C, Cancer	EF[1]	MTCA Method C, Noncancer	Number of Detected Results that Exceed MTCA Method C, Noncancer	Percent of Detected Results that Exceed MTCA Method C, Noncancer	EF[1]	RL	Number of Detected Results that Exceed RL	Percent of Detected Results that Exceed RL	EF[1]
Total Petroleum Hydrocarbons (TPH)																									
Diesel-range organics	mg/kg	53	4	7.5%	120	307	WT-GP-4	3/26/2013	10–13	2,000				--				--				--			
Heavy oil-range organics	mg/kg	50	15	30%	80.2	22,900	WT-MW-110	12/7/2015	4–5	2,000	3	6.0%	11	--				--				2,000	3	6.0%	11
Stoddard solvent	mg/kg	35	6	17%	109	5,290	WT-GP-2	3/26/2013	12–13	100	6	17%	53	--				--				1,000	3	8.6%	5.29
Semivolatile Organic Compounds (SVOCs)																									
Pentachlorophenol	mg/kg	33	8	24%	0.13	9.76	WT-GP-4	3/26/2013	10–13	--				0.328	6	18%	30	18.0				2.5	5	15%	3.9
bis(2-ethylhexyl)phthalate	mg/kg	5	3	60%	0.12	2.6	WT-MW-110	12/7/2015	0–2	--				9,400				70,000				--			
Butyl benzyl phthalate	mg/kg	5	1	20%	0.859	0.859	WT-MW-110	12/7/2015	0–2	--				--				--				--			
Carbazole	mg/kg	5	1	20%	0.08	0.08	B-49	7/6/1993	15	--				--				--				--			
Dibenzofuran	mg/kg	5	1	20%	0.14	0.14	B-49	7/6/1993	15	--				--				3,500				--			
Volatile Organic Compounds (VOCs)																									
Tetrachloroethene	mg/kg	11	3	27%	0.133	0.16	WT-GP-7	3/26/2013	3	0.05	3	27%	3.2	63,000				21,000				--			
Metals																									
Arsenic	mg/kg	15	15	100%	1.53	8.06	WT-MW-110	12/7/2015	0–2	20				88.000				1,100				--			
Barium	mg/kg	15	15	100%	12.1	57.0	WT-GP-11	3/26/2013	0–5	--				--				700,000				--			
Cadmium	mg/kg	15	3	20%	0.179	0.389	WT-MW-110	12/7/2015	0–2	2				--				--				--			
Chromium	mg/kg	15	15	100%	10.4	24.0	WT-MW-110	12/7/2015	0–2	19	2	13%	1.3	--				--				--			
Lead	mg/kg	15	15	100%	0.979	35.9	WT-MW-110	12/7/2015	0–2	250				--				--				--			
Selenium	mg/kg	15	15	100%	0.818	1.35	WT-SB-01	12/7/2015	0–2	--				--				18,000				--			
Silver	mg/kg	15	1	6.7%	0.128	0.128	WT-GP-2	3/26/2013	0–10	--				--				18,000				--			
Polycyclic Aromatic Hydrocarbons (PAHs)																									
cPAHs (MTCA TEQ-HalfND)	mg/kg	4	1	25%	0.844	0.844	WT-MW-110	12/7/2015	0–2	--				18				--				--			
2-Methylnaphthalene	mg/kg	5	1	20%	0.150	0.150	B-49	7/6/1993	15	--				--				14,000				--			
Anthracene	mg/kg	5	1	20%	0.170	0.170	B-49	7/6/1993	15	--				--				1,050,000				--			
Benzo(g,h,i)perylene	mg/kg	5	1	20%	0.296	0.296	WT-MW-110	12/7/2015	0–2	--				--				--				--			
Fluoranthene	mg/kg	5	2	40%	0.690	0.967	WT-MW-110	12/7/2015	0–2	--				--				140,000				--			
Fluorene	mg/kg	5	1	20%	0.230	0.230	B-49	7/6/1993	15	--				--				140,000				--			
Naphthalene	mg/kg	5	1	20%	0.600	0.600	B-49	7/6/1993	15	5				--				--				--			
Phenanthrene	mg/kg	5	2	40%	0.382	1.10	B-49	7/6/1993	15	--				--				--				--			
Pyrene	mg/kg	5	2	40%	0.810	0.830	WT-MW-110	12/7/2015	0–2	--				--				105,000				--			

Notes:

Blank cells are intentional.

-- Not available.

1 The EF is the maximum concentration divided by the criterion, expressed as a fraction; values greater than 1 occur when there is an exceedance. EFs are rounded to two significant digits.

Abbreviations:

COPC Contaminant of potential concern
cPAH Carcinogenic polycyclic aromatic hydrocarbon
EF Exceedance factor
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
ND Non-detect
TEQ Toxic equivalent

Table 3.3
Surface Soil Analytical Data

Analyte	Units	MTCA Method A Industrial Cleanup Level	MTCA Method A Unrestricted Cleanup Level	MTCA Method C Cleanup Level, Cancer	MTCA Method C Cleanup Level, Noncancer	RL	Applicable Criterion	WT-GP-2	WT-GP-3	WT-GP-4	WT-GP-5	WT-GP-7	WT-GP-8	WT-GP-10	WT-GP-11	WT-SB-01	WT-SB-02	WT-SB-08	WT-MW-110
							Sample ID	GP-2 (0-10)	GP-3 (0-10)	GP-4 (0-10)	GP-5 (0-5)	GP-7 (0-5)	GP-8 (0-5)	GP-10 (0-5)	GP-11 (0-5)	SB-01-0-2	SB-02-0-2	SB-08-0-2	SB-11-0-2
							Sample Date	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	12/07/2015	12/07/2015	12/07/2015	12/07/2015
							Depth (ft bgs)	0–10	0–10	0–10	0–5	0–5	0–5	0–5	0–5	0–2	0–2	0–2	0–2
Total Petroleum Hydrocarbons (TPH)																			
Gasoline-range organics	mg/kg	100[1]	100[1]	--	--	--	100[1]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-range organics	mg/kg	2,000	2,000	--	--	--	2,000	22.5 U	22.8 U	23.0 U	23.0 U	22.5 U	20.2 U	21.7 U	21.1 U	23.3 U	21.3 U	NA	22.4 UJ
Heavy oil-range organics	mg/kg	2,000	2,000	--	--	2,000	2,000	145	57.00 U	57.6 U	57.6 U	56.3 U	376	**7,850**	52.7 U	1,060	445	NA	295 J
Stoddard solvent[4]	mg/kg	100[1]	100[1]	--	--	1,000[2]	1,000[2]	NA	NA	NA	NA	NA	NA	NA	NA	23.3 UJ	21.3 UJ	NA	22.4 UJ
Semivolatile Organic Compounds																			
Pentachlorophenol	mg/kg	--	--	328	17,500	2.5[3]	2.5[3]	0.109 U	0.112 U	0.114 U	0.114 U	0.109 U	0.101 U	0.189	0.0964 U	0.130	0.0217 U	0.102 U	0.112 U
1,2,4-Trichlorobenzene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
1,2-Dichlorobenzene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
1,3-Dichlorobenzene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
1,4-Dichlorobenzene	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
1-Methylnaphthalene	mg/kg	--	--	4,500	--	--	4,500	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
2,4,5-Trichlorophenol	mg/kg	--	--	--	--	--	--	0.218 U	0.224 U	0.229 U	0.218 U	0.23 U	0.202 U	0.202 U	0.193 U	0.238 U	NA	0.203 U	0.225 U
2,4,6-Trichlorophenol	mg/kg	--	--	12,000	3,500	--	3,500	0.218 U	0.224 U	0.229 U	0.218 U	0.23 U	0.202 U	0.202 U	0.193 U	0.238 U	NA	0.203 U	0.225 U
2,4-Dichlorophenol	mg/kg	--	--	--	10,500	--	10,500	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
2,4-Dimethylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
2,4-Dinitrophenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
2,4-Dinitrotoluene	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
2,6-Dinitrotoluene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
2-Chloronaphthalene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
2-Chlorophenol	mg/kg	--	--	--	17,500	--	17,500	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
2-Methylnaphthalene	mg/kg	--	--	--	14,000	--	14,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
2-Methylphenol	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
2-Nitroaniline	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.594 U	NA	0.509 U	0.562 U
2-Nitrophenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
4,6-Dinitro-o-cresol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
4-Bromophenyl phenyl ether	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
4-Chloro-3-methylphenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.594 U	NA	0.509 U	0.562 U
4-Chloroaniline	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.594 U	NA	0.509 U	0.562 U
4-Chlorophenyl phenyl ether	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
4-Methylphenol	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
4-Nitrophenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.594 U	NA	0.509 U	0.562 U
Acenaphthene	mg/kg	--	--	--	210,000	--	210,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Acenaphthylene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Anthracene	mg/kg	--	--	--	1,050,000	--	1,050,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Benzo(a)anthracene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.463
Benzo(a)pyrene	mg/kg	0.1	0.1	18	--	--	0.1	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	**0.635**
Benzo(b)fluoranthene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.819
Benzo(g,h,i)perylene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.296
Benzo(k)fluoranthene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.298
Benzyl alcohol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
bis(2-chloroethoxy)methane	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
bis(2-chloroethyl)ether	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
bis(2-ethylhexyl)phthalate	mg/kg	--	--	9,400	70,000	--	9,400	NA	NA	NA	NA	NA	NA	NA	NA	0.142	NA	0.102 U	2.60
Butyl benzyl phthalate	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.859
Carbazole	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.594 U	NA	0.509 U	0.562 U
Chrysene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.415
Di(2-ethylhexyl)adipate	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U

Table 3.3
Surface Soil Analytical Data

Analyte	Units	MTCA Method A Industrial Cleanup Level	MTCA Method A Unrestricted Cleanup Level	MTCA Method C Cleanup Level, Cancer	MTCA Method C Cleanup Level, Noncancer	RL	Applicable Criterion	WT-GP-2	WT-GP-3	WT-GP-4	WT-GP-5	WT-GP-7	WT-GP-8	WT-GP-10	WT-GP-11	WT-SB-01	WT-SB-02	WT-SB-08	WT-MW-110
							Sample ID	GP-2 (0-10)	GP-3 (0-10)	GP-4 (0-10)	GP-5 (0-5)	GP-7 (0-5)	GP-8 (0-5)	GP-10 (0-5)	GP-11 (0-5)	SB-01-0-2	SB-02-0-2	SB-08-0-2	SB-11-0-2
							Sample Date	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	12/07/2015	12/07/2015	12/07/2015	12/07/2015
							Depth (ft bgs)	0–10	0–10	0–10	0–5	0–5	0–5	0–5	0–5	0–2	0–2	0–2	0–2
Semivolatile Organic Compounds (continued)																			
Dibenzo(a,h)anthracene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Dibenzofuran	mg/kg	--	--	--	3,500	--	3,500	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Diethylphthalate	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Dimethyl phthalate	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Di-n-butyl phthalate	mg/kg	--	--	--	350,000	--	350,000	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Di-n-octyl phthalate	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Fluoranthene	mg/kg	--	--	--	140,000	--	140,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.967
Fluorene	mg/kg	--	--	--	140,000	--	140,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Hexachlorobenzene	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
Hexachlorobutadiene	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
Hexachlorocyclopentadiene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Hexachloroethane	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	0.119 U	NA	0.102 U	0.112 U
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.426
Isophorone	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
m-cresol	mg/kg	--	--	--	--	--	--	0.109 U	0.112 U	0.114 U	0.109 U	0.115 U	0.101 U	0.101 U	0.0964 U	NA	NA	NA	NA
Naphthalene	mg/kg	5	5	--	--	--	5	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.0899 U
Nitrobenzene	mg/kg	--	--	--	--	--	--	0.218 U	0.224 U	0.229 U	0.218 U	0.23 U	0.202 U	0.202 U	0.193 U	0.238 U	NA	0.203 U	0.225 U
N-Nitroso-di-n-propylamine	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.119 U	NA	0.102 U	0.112 U
Phenanthrene	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.382
Phenol	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.238 U	NA	0.203 U	0.225 U
Pyrene	mg/kg	--	--	--	105,000	--	105,000	NA	NA	NA	NA	NA	NA	NA	NA	0.0951 U	NA	0.0814 U	0.830
Pyridine	mg/kg	--	--	--	--	--	--	0.218 U	0.224 U	0.229 U	0.218 U	0.23 U	0.202 U	0.202 U	0.193 U	NA	NA	NA	NA
Metals																			
Arsenic	mg/kg	20.0	20.0	88	1,100	--	20.0	3.08	3.37	3.47	3.24	4.88	3.21	3.33	3.60	5.00	NA	2.87	8.06
Barium	mg/kg	--	--	--	700,000	--	700,000	26.0	42.1	26.1	22.7	30.6	28.7	33.6	57.0	41.5	NA	20.0	55.7
Cadmium	mg/kg	2.00	2.00	--	--	--	2.00	0.199 U	0.201 U	0.183 U	0.175 U	0.208 U	0.166 U	0.179	0.175 U	0.293	NA	0.160 U	0.389
Chromium[5]	mg/kg	19.0	19.0	--	11,000	--	19.0	12.1	13.8	12.9	13.1	15.5	17.8	11.1	15.1	**20.4**	NA	10.6	**24.0**
Lead	mg/kg	250	250	--	--	--	250	6.06	10.5	2.72	4.01	3.28	10.0	5.64	15.6	29.9 J	NA	11.5	35.9
Mercury	mg/kg	2.00	2.00	--	--	--	2.00	0.314 U	0.345 U	0.309 U	0.312 U	0.391 U	0.297 U	0.263 U	0.224 U	0.262 U	NA	0.248 U	0.26 U
Selenium	mg/kg	--	--	--	18,000	--	18,000	1.05	0.917	1.25	0.852	1.13	0.995	0.896	0.91	1.35	NA	0.855	0.844
Silver	mg/kg	--	--	--	18,000	--	18,000	0.128	0.1 U	0.0913 U	0.0875 U	0.104 U	0.083 U	0.0843 U	0.0874 U	0.0952 U	NA	0.0799 U	0.0852 U
Polychlorinated Biphenyls (PCBs)																			
PCB Aroclor 1016	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1221	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1232	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1242	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1248	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1254	mg/kg	--	--	66.0	70.0	--	66.0	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1260	mg/kg	--	--	66.0	--	--	66.0	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1262	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCB Aroclor 1268	mg/kg	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U
PCBs (Total, Aroclors)	mg/kg	1.00	1.00	66.0	--	--	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0.117 U	NA	0.110 U	0.100 U

Notes:
- -- Not applicable.
- **BOLD** Exceeds one or more cleanup level.
- 1 The MTCA Method A gasoline with no detectable benzene criterion was used as a surrogate for Stoddard solvent.
- 2 The interim action remediation level for Stoddard solvent is the residual saturation screening level for weathered gasoline.
- 3 The interim action remediation level for pentachlorophenol is the MTCA Method B cancer direct contact cleanup level.
- 4 Stoddard solvent was quantified using the NWTPH-Dx Method instead of the NWTPH-Gx Method. An estimated value for Stoddard solvent was quantified based on a 3-point calibration performed after the initial analysis under NWTPH-Dx.
- 5 Cleanup levels are for chromium (VI).

Abbreviations:
- bgs Below ground surface
- ft Feet
- mg/kg Milligrams per kilogram
- MTCA Model Toxcis Control Act
- NA Not analyzed
- RL Remediation Level

Qualifiers:
- J Analyte was detected, concentration is considered an estimate.
- U Analyte was not detected, concentration given is reporting limit.
- UJ Analyte was not detected, concentration given is reporting limit, which is considered an estimate.

Table 3.4
Summary of Detected Contaminants in On-Property Groundwater

Information on COPC		Information About Detected Results							Information About Exceedances: MTCA Method A, Groundwater				Information About Exceedances: MTCA Method C, Cancer				Information About Exceedances: MTCA Method C, Noncancer			
Analyte	Units	Number of Results	Number of Detected Results	Percent of Detected Results	Minium Detected Value	Maximum Detected Value	Location of Maximum Detect	Date of Maximum Detect	MTCA Method A, Groundwater	Number of Detected Results that Exceed MTCA Method A, Groundwater	Percent of Detected Results that Exceed MTCA Method A, Groundwater	EF[1]	MTCA Method C, Cancer	Number of Detected Results that Exceed MTCA Method C, Cancer	Percent of Detected Results that Exceed MTCA Method C, Cancer	EF[1]	MTCA Method C, Noncancer	Number of Detected Results that Exceed MTCA Method C, Noncancer	Percent of Detected Results that Exceed MTCA Method C, Noncancer	EF[1]
Total Petroleum Hydrocarbons (TPH)																				
Gasoline-range organics	µg/L	4	3	75%	170	9,700	WT-MW-02	04/15/2014	800	2	50%	12	--	NA	NA	NA	--	NA	NA	NA
Diesel-range organics	µg/L	17	10	59%	55.6	7,800	WT-MW-02	04/15/2014	500	7	41%	16	--	NA	NA	NA	--	NA	NA	NA
Heavy oil-range organics	µg/L	17	3	18%	171	712	MW-09	12/21/2015	500	2	12%	1.4	--	NA	NA	NA	--	NA	NA	NA
Stoddard Solvent	µg/L	17	8	47%	310	7,100	WT-MW-02	04/15/2014	500	7	41%	14	--	NA	NA	NA	--	NA	NA	NA
Semivolatile Organic Compounds (SVOCs)																				
Pentachlorophenol	µg/L	17	14	82%	0.720	729	WT-MW-01	12/17/2015	--	NA	NA	NA	2.20	10	59%	330	175	3	18%	4.2
Dioxins/Furans																				
Dioxin/Furan TEQ with One-Half of the Detection Limit	pg/L	2	2	100%	1.32	91.3	WT-MW-01	01/07/2016	--	NA	NA	NA	6.73	1	50%	14	24.5	1	50%	3.7
Volatile Organic Compounds (VOCs)																				
Benzene	µg/L	11	5	45%	1.47	8.71	MW-09	05/14/2014	5.00	3	27%	1.7	8.00	1	9%	1.1	--	NA	NA	NA
Toluene	µg/L	11	8	73%	1.05	12.4	MW-09	05/15/2015	1,000	None	None	None	--	NA	NA	NA	1,400	None	None	None
Ethylbenzene	µg/L	11	3	27%	2.12	3.70	WT-MW-01	04/15/2014	700	None	None	None	--	NA	NA	NA	1,750	None	None	None
Xylene (total)	µg/L	4	3	75%	5.20	74.0	WT-MW-01	04/15/2014	1,000	None	None	None	--	NA	NA	NA	3,500	None	None	None
1,1-Dichloroethene	µg/L	11	6	55%	1.16	2.54	MW-09	05/14/2014	--	NA	NA	NA	--	NA	NA	NA	875	None	None	None
cis-1,2-Dichloroethene	µg/L	12	10	83%	3.70	1,170	B-49	10/23/2014	--	NA	NA	NA	--	NA	NA	NA	35.00	9	75%	33
Tetrachloroethene	µg/L	12	12	100%	2.00	130	MW-09	09/30/2015	5.00	9	75%	26	210	None	None	None	105	3	251%	1.2
trans-1,2-Dichloroethene	µg/L	11	8	73%	2.33	20.2	MW-09	05/14/2014	--	NA	NA	NA	--	NA	NA	NA	--	NA	NA	NA
Trichloroethene	µg/L	12	9	75%	8.32	162	MW-09	05/14/2014	5.00	9	75%	32	9.40	8	67%	17	8.80	8	67%	18
Vinyl chloride	µg/L	12	10	83%	0.290	460	B-49	05/13/2015	0.200	10	83%	2,300	0.290	9	75%	1,600	52.5	3	25%	8.8

Notes:

-- Not available.

1 The EF is the maximum concentration divided by the criterion, expressed as a fraction; values greater than 1 occur when there is an exceedance. EFs are rounded to two significant digits.

Abbreviations:

COPC Contaminant of potential concern
EF Exceedance Factor
µg/L Micrograms per liter
MTCA Model Toxics Contol Act
NA Not applicable
pg/L Picograms per liter
TEQ Toxic equivalent

Table 4.1
Soil Analytical Data in Stormwater System Construction Areas

								Location	Trench	Pre-treatment/Pump Station		Detention Pipes
								Location	WT-GP-8	WT-SB-01	WT-MW-108	WT-SB-06
								Sample ID	GP-8 (4-5)	SB-01-10	SB-03-10-11	SB-06-10-11
								Sample Date	03/26/2013	12/07/2015	12/07/2015	12/07/2015
								Depth (ft bgs)	4–5	10	10–11	10–11
Analyte	Units	MTCA Method A Cleanup Level	MTCA Method B Cleanup Level, Cancer	MTCA Method B Cleanup Level, Noncancer	MTCA Method C Cleanup Level, Cancer	MTCA Method C Cleanup Level, Noncancer	RL	Applicable Criterion				
Total Petroleum Hydrocarbons (TPH)												
Gasoline-range organics	mg/kg	100[1]			--	--	--	100	6.08 U	NA	NA	NA
Diesel-range organics	mg/kg	2,000			--	--	--	2,000	NA	19.2 U	23.5 U	22.3 U
Heavy oil-range organics	mg/kg	2,000			--	--	2,000	2,000	NA	48.0 U	58.9 U	55.7 U
Stoddard solvent[2]	mg/kg	100[1]			--	--	1,000[3]	1,000	NA	19.2 UJ	23.5 UJ	22.3 UJ
Semivolatile Organic Compounds												
Pentachlorophenol	mg/kg	--			328	17,500	2.5[4]	2.5	NA	0.104 U	0.0220 U	0.0229 U

Notes:

-- Not applicable.

1 The MTCA Method A gasoline with no detectable benzene criterion was used as a surrogate for Stoddard solvent.

2 Stoddard solvent was quantified using the NWTPH-Dx Method instead of the NWTPH-Gx Method. An estimated value for Stoddard solvent was quantified based on a 3-point calibration performed after the initial analysis under NWTPH-Dx.

3 The interim action remediation level for Stoddard solvent is the residual saturation screening level for weathered gasoline.

4 The interim action remediation level for pentachlorophenol is the MTCA Method B cancer direct contact cleanup level.

Abbreviations:

ft bgs Feet below ground surface
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
NA Not analyzed
RL Remediation Level

Qualifiers:

U Analyte was not detected, concentration given is reporting limit.
UJ Analyte was not detected, concentration given is reporting limit, which is considered an estimate.

Table 4.2
Soil Analytical Data in Stoddard Solvent Excavation Area

						Location	WT-GP-2			WT-GP-3			WT-GP-4			WT-GP-8
						Sample ID	GP-2 (7-8)	GP-2 (10-13)	GP-2 (12-13)	GP-3 (8-9)	GP-3 (10-13)	GP-3 (12-13)	GP-4 (4-5)	GP-4 (10-13)	GP-4 (12-13)	GP-8 (0-5)
						Sample Date	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013	03/26/2013
						Depth (ft bgs)	7–8	10–13	12–13	8–9	10–13	12–13	4–5	10–13	12–13	0–5
Analyte	Units	MTCA Method A Cleanup Level	MTCA Method C Cleanup Level, Cancer	MTCA Method C Cleanup Level, Noncancer	RL	Applicable Criterion										
Total Petroleum Hydrocarbons (TPH)																
Gasoline-range organics	mg/kg	100[1]	--	--	--	100	7.01 U	NA	6.31 U	5.58 U	NA	5.82 U	6.67 U	NA	6.31 U	NA
Diesel-range organics	mg/kg	2,000	--	--	--	2,000	NA	304 JM	NA	NA	129 JM	NA	NA	307 JM	NA	20.2 U
Heavy oil-range organics	mg/kg	2,000	--	--	2,000	2,000	NA	88.3	NA	NA	56.9 U	NA	NA	190	NA	376
Stoddard solvent[2,3]	mg/kg	100[1]	--	--	1,000[4]	1,000	NA	NA	**5,290**	NA	NA	109	NA	NA	**3,950**	NA
Semivolatile Organic Compounds																
Pentachlorophenol	mg/kg	--	328	17,500	2.5[5]	2.5	NA	**8.95**	NA	NA	**7.11**	NA	NA	**9.76**	NA	0.101 U

Notes:

-- Not applicable.

BOLD Exceeds the applicable Site cleanup level or remediation level.

1 The MTCA Method A gasoline with no detectable benzene criterion was used as a surrogate for Stoddard solvent.

2 Stoddard solvent was quantified using the NWTPH-Dx Method instead of the NWTPH-Gx Method. An estimated value for Stoddard solvent was quantified based on a 3-point calibration performed after the initial analysis under NWTPH-Dx.

3 Stoddard solvent may be quanitified by either the NWTPH-Gx or NWTPH-Dx Methd. Therefore, samples non-detect results for both gasoline-range organics diesel-range organics are presumed to be non-detect for Stoddard solvent.

4 The interim action remediation level for Stoddard solvent is the residual saturation screening level for weathered gasoline.

5 The interim action remediation level for pentachlorophenol is the MTCA Method B cancer direct contact cleanup level.

Abbreviations:

ft bgs Feet below ground surface
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
NA Not analyzed
RL Remediation Level

Qualifiers:

J Analyte was detected, concentration is considered an estimate.
JM Analyte was detected, concentration is considered an estimate due to poor chromatographic match to standard.
U Analyte was not detected, concentration given is reporting limit.
UJ Analyte was not detected, concentration given is reporting limit, which is considered an estimate.

Table 4.2
Soil Analytical Data in Stoddard Solvent Excavation Area

						Location	WT-MW-01			WT-MW-02			WT-MW-04		WT-SB-06	WT-SB-09
						Sample ID	B01-10	B01-12	B01-15	B02-05	B02-10	B02-15	B04-05	B04-10	SB-06-10-11	SB-09-13-14
						Sample Date	12/27/2013	12/27/2013	12/27/2013	12/27/2013	12/27/2013	12/27/2013	12/27/2013	12/27/2013	12/07/2015	12/07/2015
						Depth (ft bgs)	10	12	15	5	10	15	5	10	10–11	13–14
Analyte	**Units**	**MTCA Method A Cleanup Level**	**MTCA Method C Cleanup Level, Cancer**	**MTCA Method C Cleanup Level, Noncancer**	**RL**	**Applicable Criterion**										
Total Petroleum Hydrocarbons (TPH)																
Gasoline-range organics	mg/kg	100[1]	--	--	--	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-range organics	mg/kg	2,000	--	--	--	2,000	50 U	120	50 U	50 U	50 U	50 U	50 U	50 U	22.3 U	23.8 U
Heavy oil-range organics	mg/kg	2,000	--	--	--	2,000	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	55.7 U	59.5 U
Stoddard solvent[2,3]	mg/kg	100[1]	--	--	1,000[4]	1,000	50 U	140	50 U	50 U	50 U	50 U	50 U	50 U	22.3 UJ	**2,970** J
Semivolatile Organic Compounds																
Pentachlorophenol	mg/kg	--	328	17,500	2.5[5]	2.5	0.05 U	0.45	0.05 U	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U	0.0229 U	**2.53**

Notes:
-- Not applicable.
BOLD Exceeds the applicable Site cleanup level or remediation level.
1 The MTCA Method A gasoline with no detectable benzene criterion was used as a surrogate for Stoddard solvent.
2 Stoddard solvent was quantified using the NWTPH-Dx Method instead of the NWTPH-Gx Method. An estimated value for Stoddard solvent was quantified based on a 3-point calibration performed after the initial analysis under NWTPH-Dx.
3 Stoddard solvent may be quanitified by either the NWTPH-Gx or NWTPH-Dx Methd. Therefore, samples non-detect results for both gasoline-range organics diesel-range organics are presumed to be non-detect for Stoddard solvent.
4 The interim action remediation level for Stoddard solvent is the MTCA Method B residual saturation screening level for weathered gasoline.
5 The interim action remediation level for pentachlorophenol is the MTCA B cancer direct contact cleanup level.

Abbreviations:
ft bgs Feet below ground surface
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
NA Not analyzed
RL Remediation Level

Qualifiers:
J Analyte was detected, concentration is considered an estimate.
JM Analyte was detected, concentration is considered an estimate due to poor chromatographic match to standard.
U Analyte was not detected, concentration given is reporting limit.
UJ Analyte was not detected, concentration given is reporting limit, which is considered an estimate.

Table 4.3
Soil Analytical Data in Heavy Oil-Range Organics Excavation Area

						Location	WT-GP-10	WT-MW-110				WT-SB-14	WT-SB-15		WT-SB-18	WT-SB-20	
						Sample ID	GP-10 (0-5)	SB-11-0-2	SB-11-4-5	SB-11-6-7	SB-11-10-11	SB-14-4-5	SB-15-4-5	SB-15-4-5-D	SB-18-4-5	SB-20-4-5	SB-20-5-6
						Sample Date	03/26/2013	12/07/2015	12/07/2015	12/07/2015	12/07/2015	03/29/2016	03/29/2016	03/29/2016	03/29/2016	03/29/2016	03/29/2016
						Depth (ft bgs)	0-5	0–2	4–5	6–7	10–11	4–5	4–5	4–5	4–5	4–5	5–6
Analyte	**Units**	**MTCA Method A Cleanup Level**	**MTCA Method C Cleanup Level, Cancer**	**MTCA Method C Cleanup Level, Noncancer**	**RL**	**Applicable Criterion**											
Total Petroleum Hydrocarbons (TPH)																	
Gasoline-range organics	mg/kg	100[1]	--	--	--	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-range organics	mg/kg	2,000	--	--	--	2,000	21.7 U	22.4 UJ	23.5 U	20.9 UJ	21.7 U	24.0 U	26.3 U	23.9 U	26.9 U	23.1 U	21.8 U
Heavy oil-range organics	mg/kg	2,000	--	--	2,000	2,000	**7,850**	295 J	**22,900**	80 J	342	60 U	66 U	60 U	67 U	**2,960**	540 J
Stoddard solvent[2]	mg/kg	100[1]	--	--	1,000[3]	1,000	NA	22.4 UJ	23.5 UJ	20.9 UJ	21.7 UJ	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds																	
Pentachlorophenol	mg/kg	--	328	17,500	2.5[4]	2.5	NA	0.112 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-- Not applicable.
BOLD Exceeds the applicable Site cleanup level or remediation level.
1 The MTCA Method A gasoline with no detectable benzene criterion was used as a surrogate for Stoddard solvent.
2 Stoddard solvent was quantified using the NWTPH-Dx Method instead of the NWTPH-Gx Method. An estimated value for Stoddard solvent was quantified based on a 3-point calibration performed after the initial analysis under NWTPH-Dx.
3 The interim action remediation level for Stoddard solvent is the residual saturation screening level for weathered gasoline.
4 The interim action remediation level for pentachlorophenol is the MTCA Method B cancer direct contact cleanup level.

Abbreviations:
ft bgs Feet below ground surface
mg/kg Milligrams per kilogram
MTCA Model Toxics Control Act
NA Not analyzed
RL Remediation Level

Qualifiers:
J Analyte was detected, concentration is considered an estimate.
U Analyte was not detected, concentration given is reporting limit.
UJ Analyte was not detected, concentration given is reporting limit, which is considered an estimate.

Table 7.1
Proposed Soil Sample Collection

Composite Name	Composite Location	Number of Discrete Samples[1]	Discrete Sample Frequency/ Depth[2]	Laboratory Analyses
Composite Soil Samples				
A1	On-property trench bottom	5	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
A2	On-property trench bottom	6	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics Dioxins/furans
A3	Detention piping area excavation bottom	3	Evenly spaced in excavation area/ 12 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
A4	Pre-treatment/ pump station area excavation bottom	3	Evenly spaced in excavation area/ 13 to 16 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
A5	Off-property trench bottom	3	Every 50 to 70 feet/ 6 to 8 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
B	On-property trench bottom	3	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
C	On-property trench bottom	4	Every 20 feet/5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
D	On-property trench bottom	4	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
E1	On-property trench bottom	4	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics
E2	On-property trench bottom	5	Every 20 feet/ 5 to 7 feet bgs	Stoddard solvent Pentachlorophenol Heavy oil-range organics

Table 7.1
Proposed Soil Sample Collection

Location	Sample Type	Number of Samples[3]	Sample Locations/ Depth[4]	Laboratory Analyses
Post-Excavation Soil Compliance Samples				
Stoddard solvent buffer area	Excavation sidewall	2	At northern and eastern excavation extents/ 12 feet bgs	Stoddard solvent (all)
Stoddard solvent buffer area	Excavation bottom	4	Evenly spaced in excavation area/ 15 feet bgs	Stoddard solvent (all) Pentachlorophenol (2 samples) Dioxins/furans (1 sample)
Heavy oil area	Excavation sidewall	1	At eastern excavation extent/ 4 to 5 feet bgs	Heavy oil-range organics

Notes:
1 Field duplicate samples for data quality assurance will be collected at a frequency of 1 duplicate per 20 field samples. A total of one composite sample field duplicate and two discrete sample field duplicates will be collected during trenching and excavation for stormwater system installation.
2 Sample depths vary dependent on the slope of the trenches and depths of individual stormwater system components.
3 Field duplicate samples for data quality assurance will be collected at a frequency of 1 duplicate per 20 samples. One field duplicate will be collected during soil compliance sampling.
4 Sample depths may be adjusted with the interim action excavation depth, or to target intervals with the greatest field indications of contamination.

Abbreviation:
bgs Below ground surface

Table 7.2
Analytical Requirements, Methods, Preservation, Bottle Type, and Holding Times

Parameter	Method	Bottle Type	Preservative	Holding Time
Soil Compliance Monitoring and Stockpile Analyses				
Total Petroleum Hydrocarbons—Diesel- (i.e., Stoddard Solvent) and Heavy Oil-Range	NWTPH-Dx	One 4-oz WMG	None, cool to <4 °C	14 days to extract, then 40 days to analyze
Pentachlorophenol and cPAHs	USEPA Method 8270D SIM	One 4-oz WMG	None, cool to <4 °C	14 days to extract, then 40 days to analyze
Additional Analyses for Backfill Testing				
Total Petroleum Hydrocarbons—Gasoline-Range	NWTPH-Gx	Four tared glass 40-mL VOA vials	None, cool to <4 °C for up to 48 hours, freeze to <-7 °C	2 days to freeze, 14 days to analyze
Benzene, Toluene, Ethylbenzene, and Xylenes	USEPA Method 8260C			
Volatile Organic Compounds – PCE, TCE, 1,1,1-TCA, and Naphthalene				
Heavy Metals (Arsenic, Lead, Cadmium, Chromium [total], and Mercury)	USEPA Method 6020/1631E	One 4-oz WMG	None, cool to <4 °C	Metals: 6 months Mercury: 28 days
Polychlorinated Biphenyls	USEPA Method 8082	One 4-oz WMG	None, cool to <4 °C	None

Abbreviations:
cPAHs Carcinogenic polycyclic aromatic hydrocarbons
°C Degrees Celsius
mL Milliliter
oz Ounces
PCE Tetrachloroethylene
TCA Trichloroethane
TCE Trichloroethylene
VOA Volatile organic analysis
WMG Wide-mouth glass jar

Table 7.3
Analytical Methods, Detection Limits, and Reporting Limits

Parameter	Analysis Method	Method Detection Limit	Reporting Limit[1] (PQL or LOQ)
Soil Compliance Monitoring and Stockpile Analyses			
Total Petroleum Hydrocarbons—Diesel- (i.e., Stoddard Solvent) and Heavy Oil-Range	NWTPH-Dx	Stoddard: 3.20 mg/kg Diesel: 3.80 mg/kg Heavy Oil: 6.90 mg/kg	Stoddard: 50.0 mg/kg Diesel: 50.0 mg/kg Heavy Oil: 250 mg/kg
Pentachlorophenol and cPAHs	USEPA Method 8270D SIM	Penta: 0.00800 mg/kg Other SVOCs: 0.0003 to 0.00120 mg/kg	Penta: 0.0500 mg/kg cPAHs: 0.0100 mg/kg
Additional Analyses for Backfill Testing			
Total Petroleum Hydrocarbons—Gasoline-Range	NWTPH-Gx	0.0400 mg/kg	2.00 mg/kg
Benzene, Toluene, Ethylbenzene, and Xylenes Volatile Organic Compounds – PCE, TCE, 1,1,1-TCA, and Naphthalene	USEPA Method 8260C	Benzene: 0.00560 mg/kg Toluene: 0.00610 mg/kg Ethylbenzene: 0.00560 mg/kg m,p xylene: 0.0120 mg/kg o xylene: 0.00770 mg/kg PCE: 0.0110 mg/kg TCE: 0.0110 mg/kg 1,1,1 TCA: 0.00630 mg/kg Naphthalene: 0.0150 mg/kg	0.0250 to 1.50 mg/kg
Heavy Metals (Arsenic, Lead, Cadmium, Chromium [total], and Mercury)	USEPA Method 6020/1631E	Arsenic: 0.140 mg/kg Lead: 0.0410 mg/kg Cadmium: 0.0510 mg/kg Chromium: 0.120 mg/kg Mercury (6020): 0.0430 mg/kg Mercury (1631E): 0.00450 mg/kg	0.100 to 1.000 mg/kg
Polychlorinated Biphenyls	USEPA Method 8082	0.00210 mg/kg	0.0200 mg/kg

Note:

1 All reporting limits shown are method PQLs or LOQs from Friedman & Bruya, Inc, located in Seattle, Washington.

Abbreviations:

cPAHs Carcinogenic polycyclic aromatic hydrocarbons
LOQ Limit of Quantitation
mg/kg Milligrams per kilogram
PCE Tetrachloroethene
penta Pentachlorophenol
PQL Practical quantitation limit
TCE Trichloroethene

Table 7.4
Data Quality Assurance and Quality Control Criteria

Parameter	Units	Reporting Limit[1]	Precision	Accuracy	Completeness	Reference
Soil Compliance Monitoring and Stockpile Analyses						
Total Petroleum Hydrocarbons—Diesel- (i.e., Stoddard Solvent) and Heavy Oil-Range	mg/kg	Stoddard: 50.0 Diesel: 50.0 Heavy Oil: 250	± 20%	± 30%	95%	NWTPH-Dx
Pentachlorophenol and cPAHs	mg/kg	Penta: 0.050 Other SVOCs: 0.0100	± 20%	± 30%	95%	USEPA Method 8270D SIM
Additional Analyses for Backfill Testing						
Total Petroleum Hydrocarbons—Gasoline-Range	mg/kg	2.00	± 20%	± 30%	95%	NWTPH-Gx
Volatile Organic Compounds – PCE, TCE, 1,1,1-TCA, and Naphthalene	mg/kg	0.0250 to 1.50	± 20%	± 30%	95%	USEPA 8260C
Benzene, Toluene, Ethylbenzene, and Xylenes						
Heavy Metals (Arsenic, Lead, Cadmium, Chromium [total], and Mercury)	mg/kg	1.00 to 5.00	± 20%	± 30%	95%	USEPA Method 6020/1631E
Polychlorinated Biphenyls	mg/kg	0.0200	± 30%	± 50%	95%	USEPA Method 8082

Note:

1 All reporting limits shown are method PQLs or LOQs from Friedman & Bruya, Inc., located in Seattle, Washington.

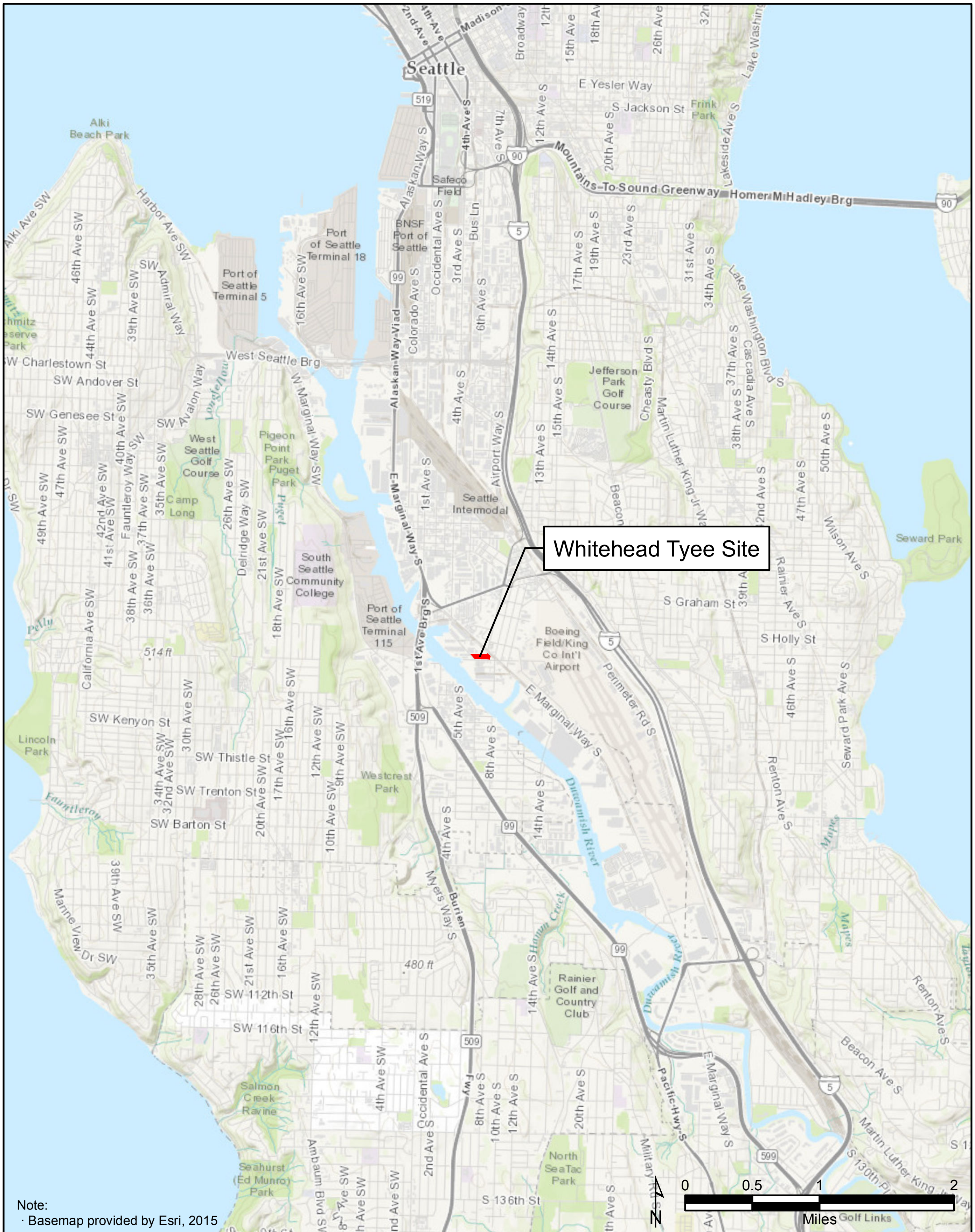
Abbreviations:

cPAHs Carcinogenic polycyclic aromatic hydrocarbons
LOQ Limit of Quantitation
mg/kg Milligrams per kilogram
PCE Tetrachloroethene
penta Pentachlorophenol
PQL Practical quantitation limit
TCA Trichloroethane
TCE Trichloroethene

Whitehead Tyee Site

Interim Action Work Plan

Figures



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Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 1.1
Vicinity Map

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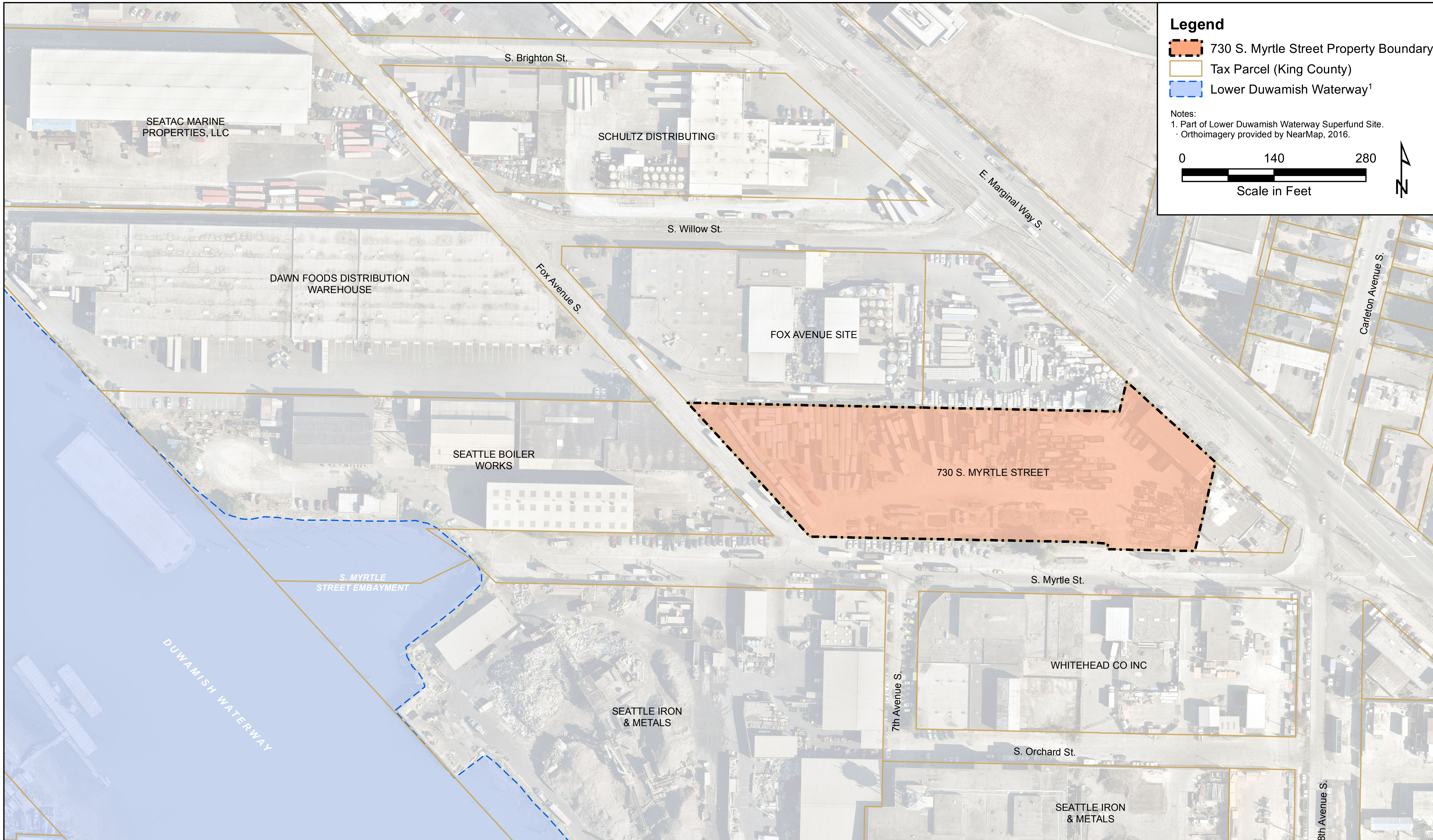
4/5/2017



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Whitehead Tyee Site
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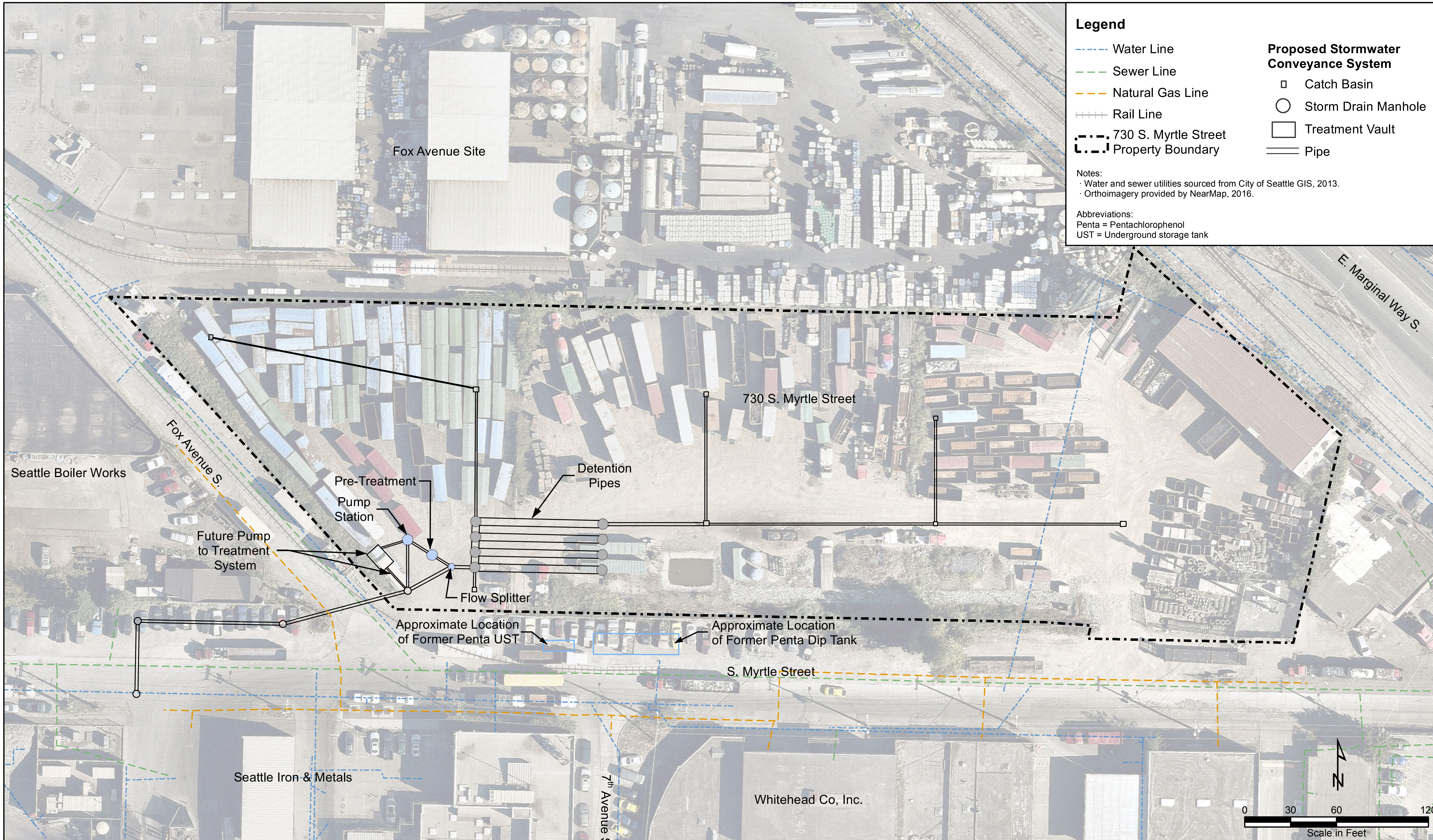
Figure 1.2
Site Vicinity Map

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 1.2 Site Vicinity Map.mxd
4/5/2017



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Whitehead Tyee Site
Seattle, Washington

Figure 1.3
Proposed Stormwater Conveyance System

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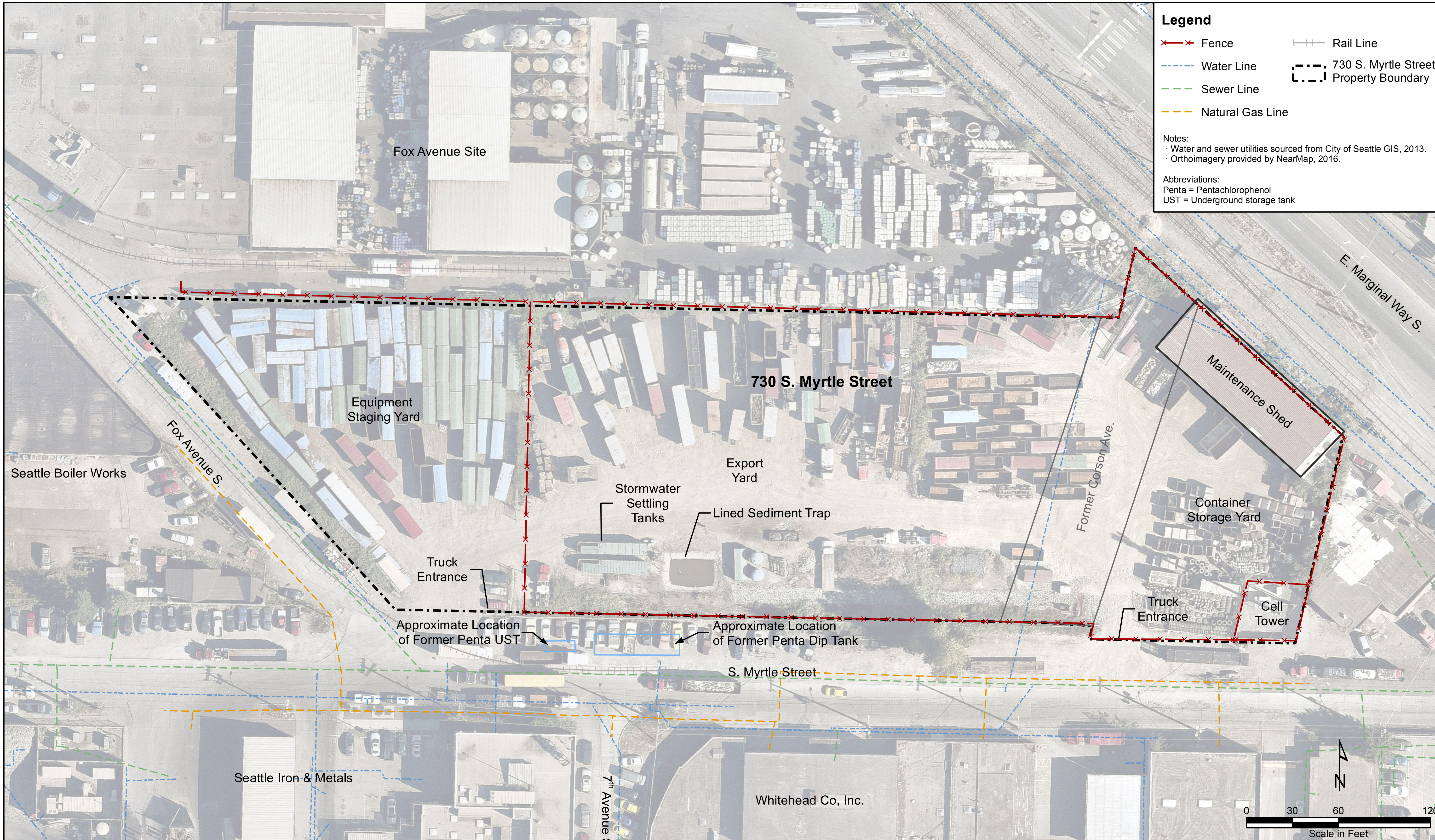
4/5/2017



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Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 2.1
Pertinent Site Features

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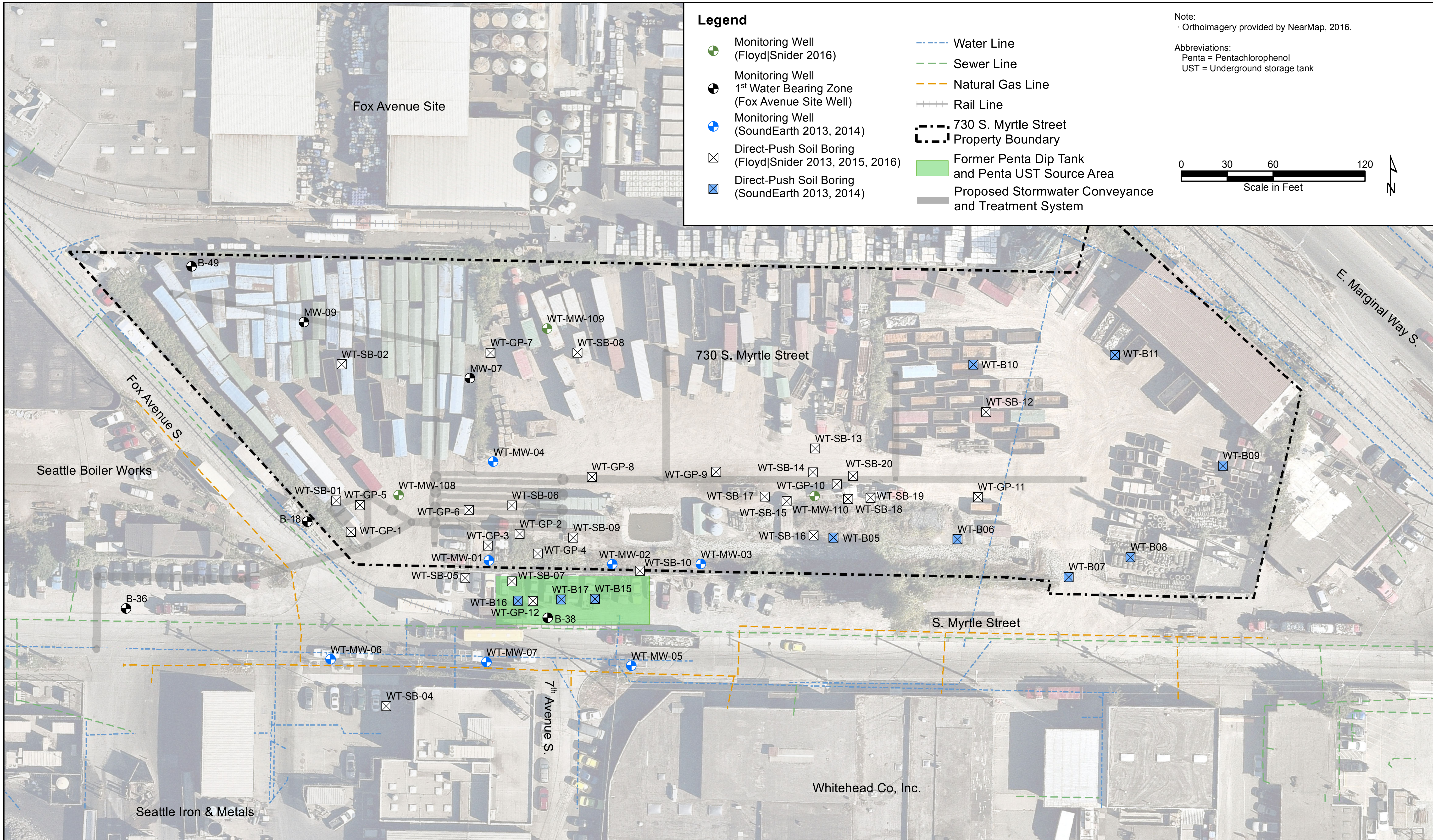
4/5/2017



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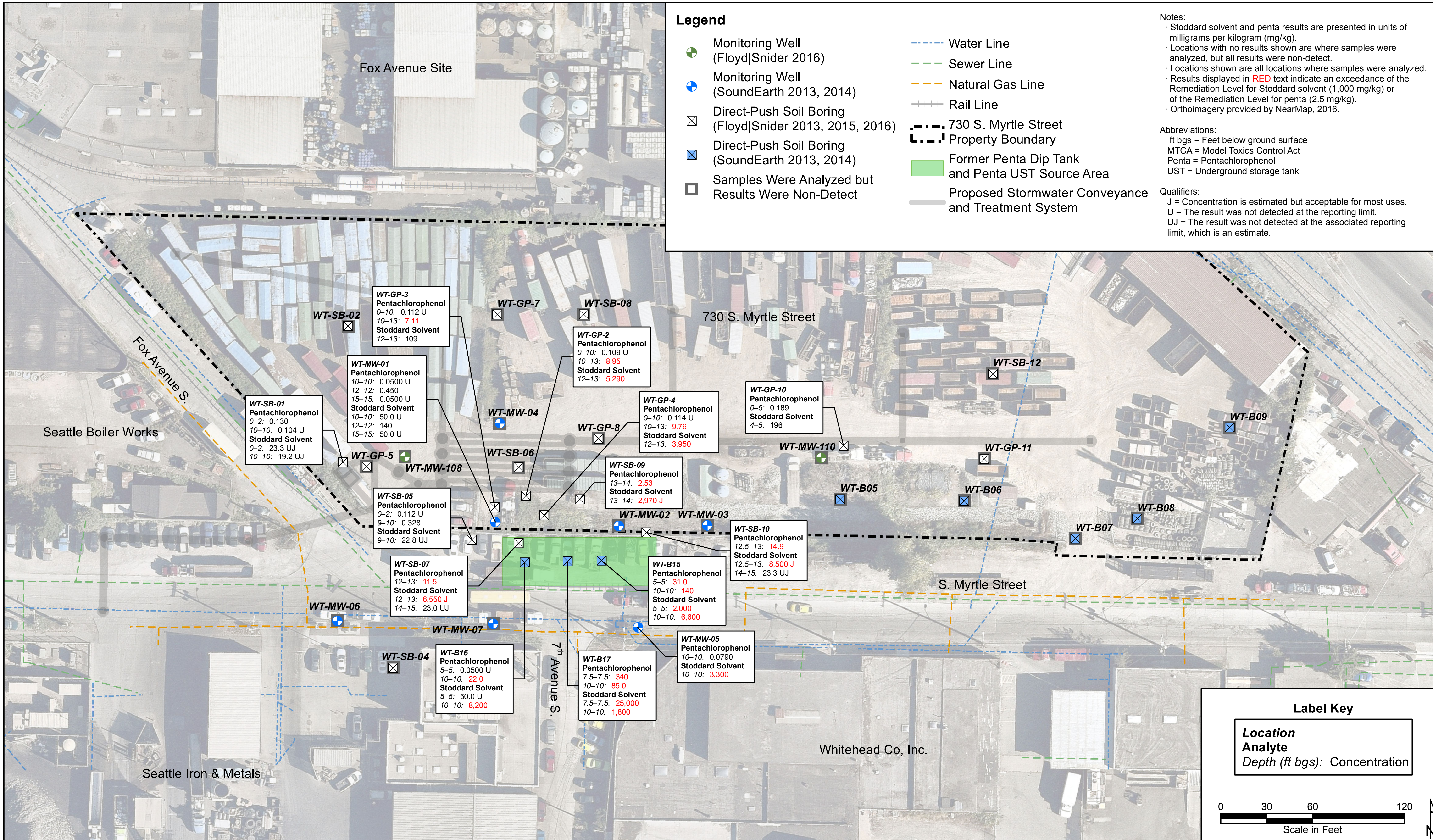
Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 3.1
Soil Boring and Monitoring Well Locations

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 3.1 Soil Boring and Monitoring Well Locations.mxd
4/5/2017



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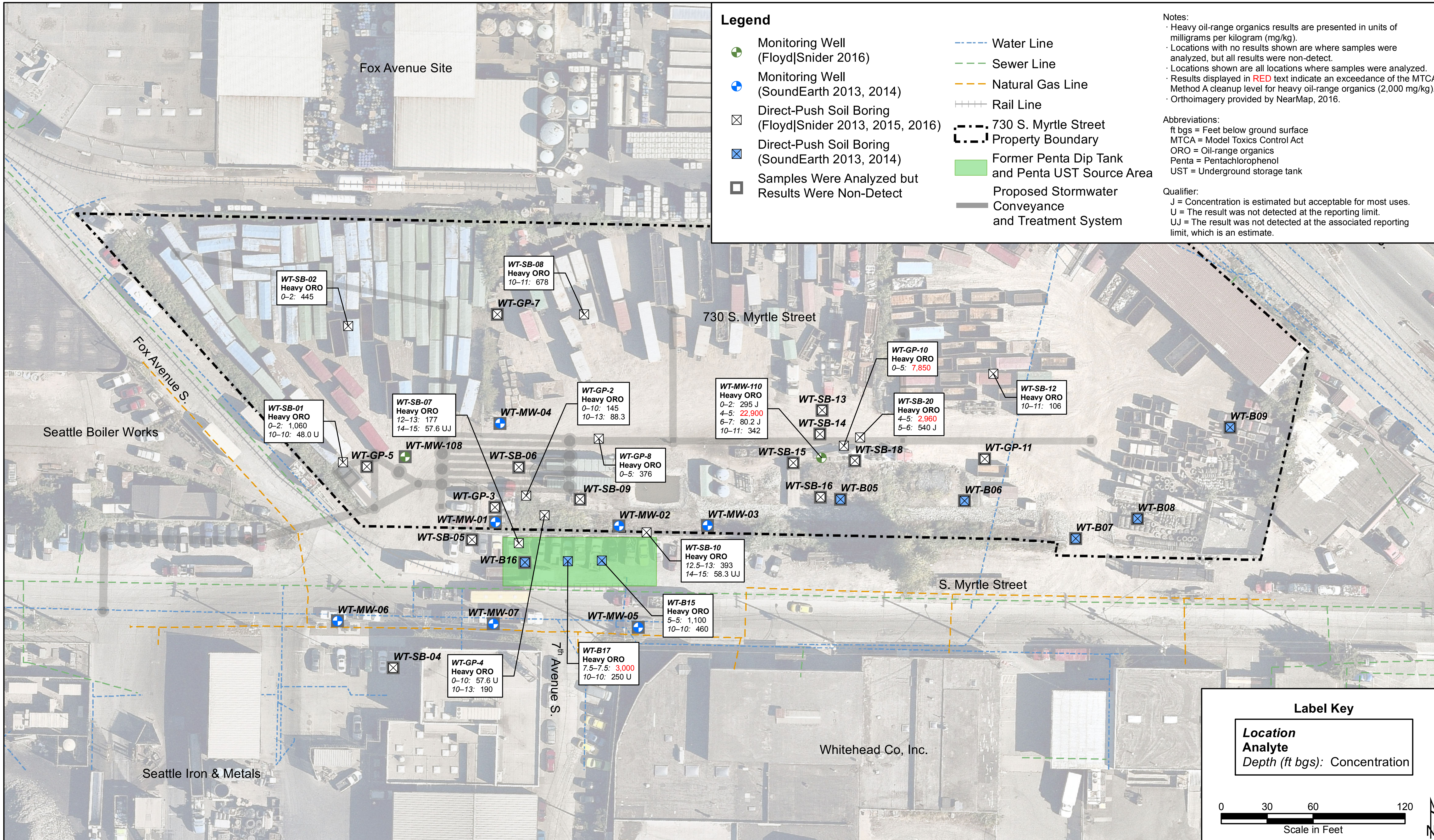
Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 3.2
Soil Analytical Results for Pentachlorophenol and Stoddard Solvent

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 3.2 Soil Analytical Results for Pentachlorophenol and Stoddard Solvent.mxd
4/5/2017



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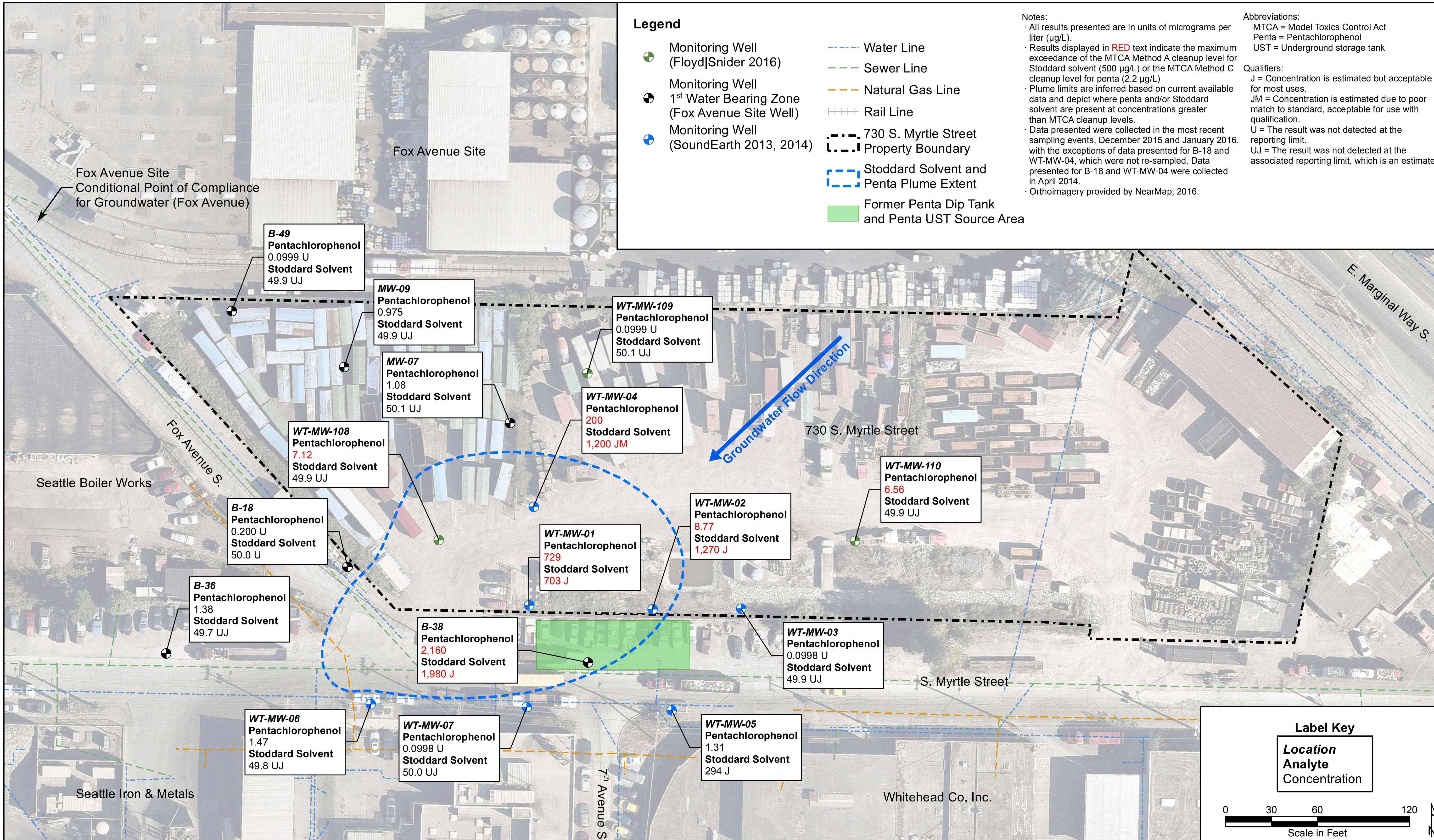
Seattle, Washington

Figure 3.3
Soil Analytical Results for Heavy Oil-Range Organics

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 3.3 Soil Analytical Results for Heavy Oil-Range Organics.mxd
4/5/2017



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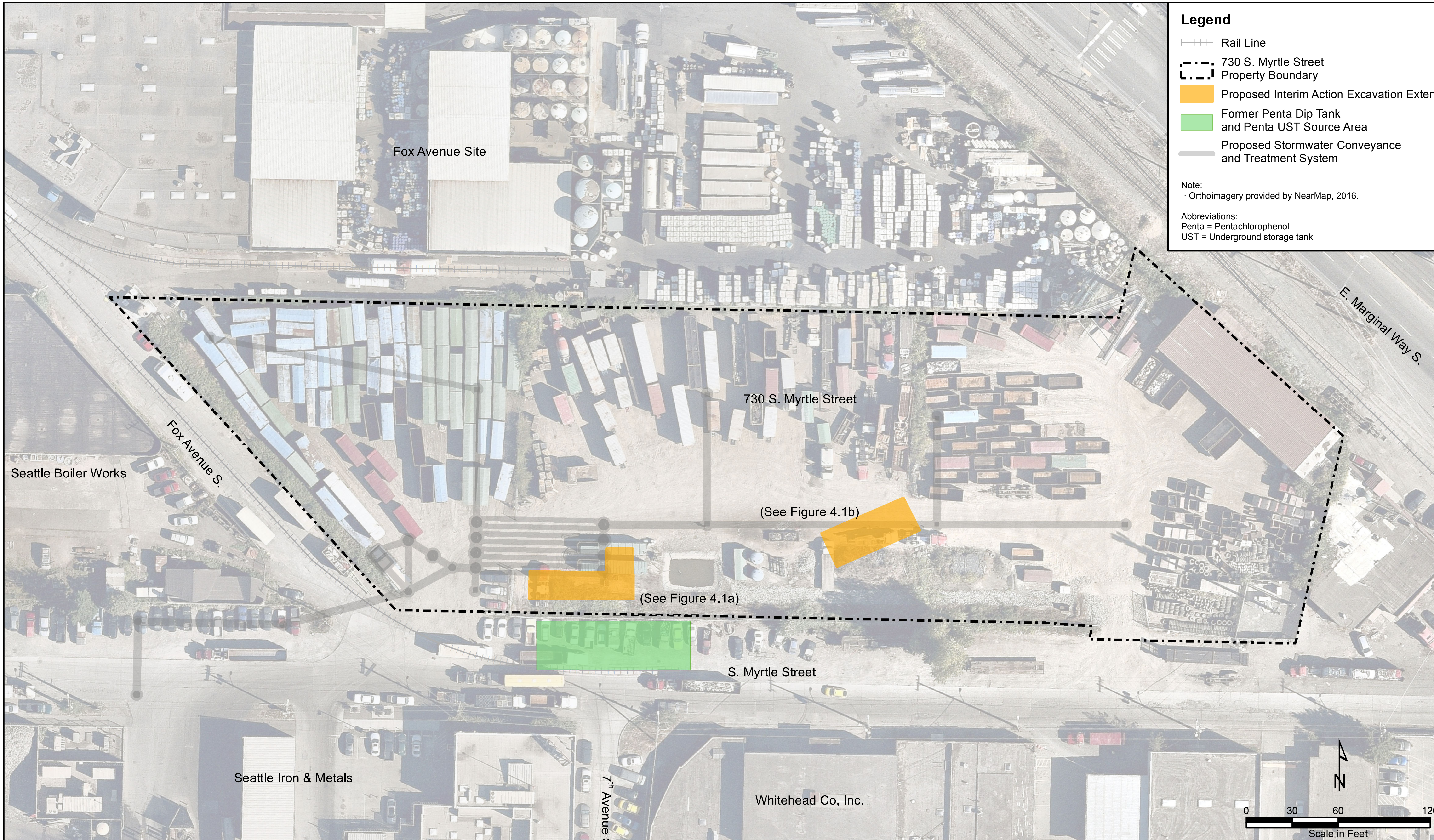
Seattle, Washington

Figure 3.4
Groundwater Analytical Results for Stoddard Solvent and Pentachlorophenol

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 3.4 Groundwater Analytical Results for Stoddard Solvent and Pentachlorophenol.mxd
4/5/2017



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Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 4.1
Proposed Interim Action

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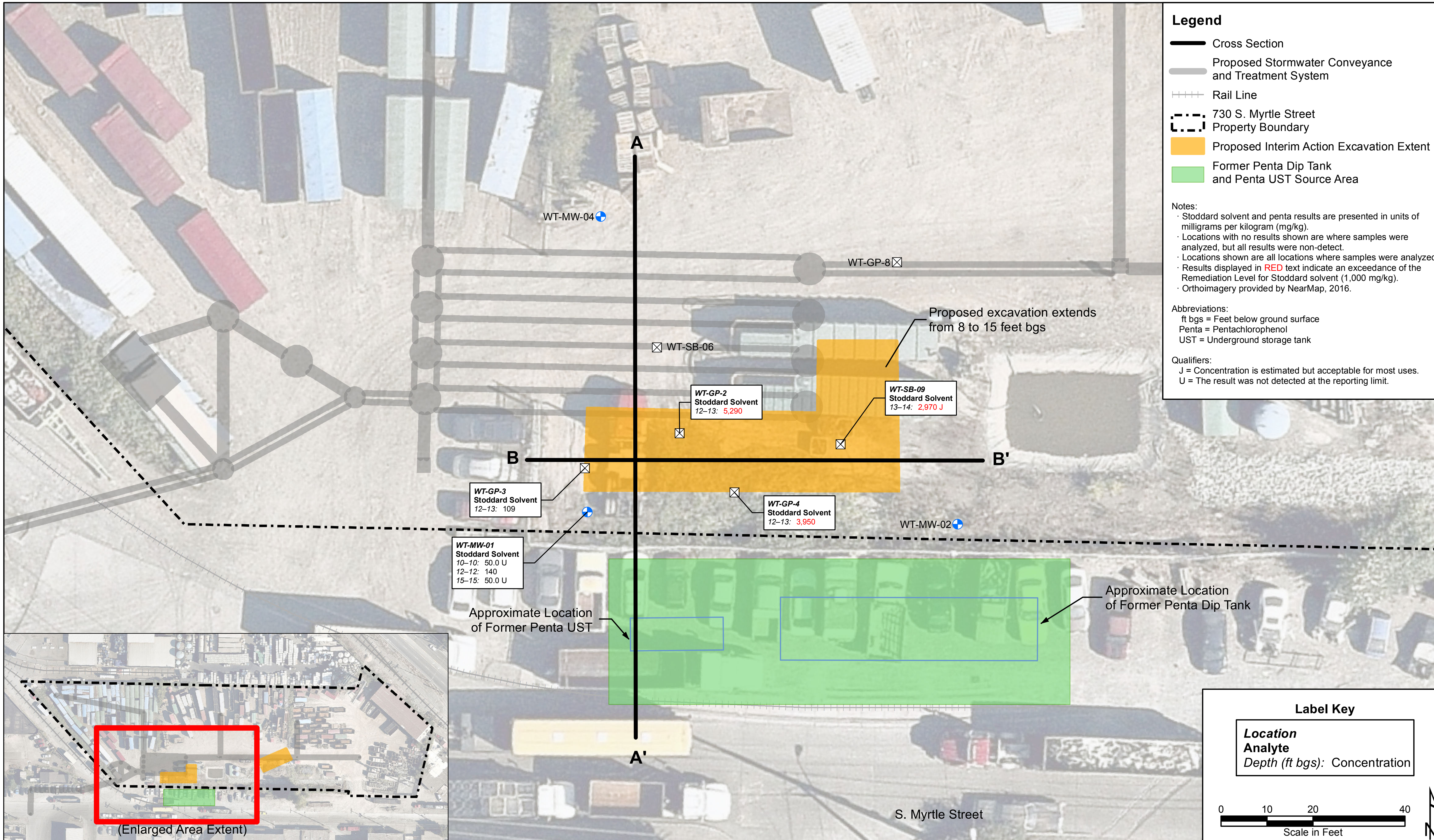
4/5/2017



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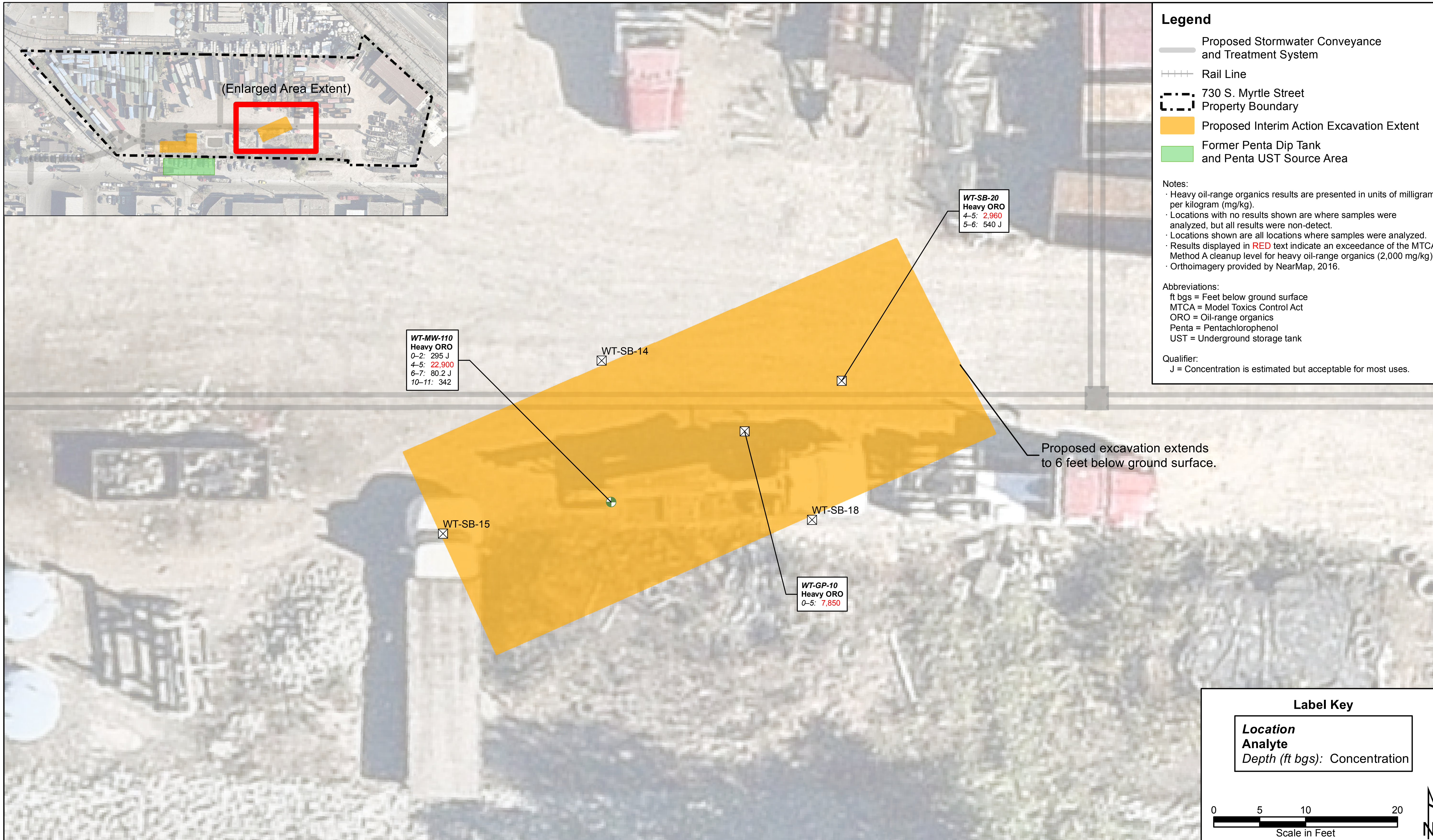
Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 4.1a
Interim Action: Stoddard Solvent Excavation

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 4.1a Interim Action Stoddard Solvent Excavation.mxd
4/5/2017



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Whitehead Tyee Site
Seattle, Washington

Figure 4.1b
Interim Action: Heavy Oil-Range Organics Excavation

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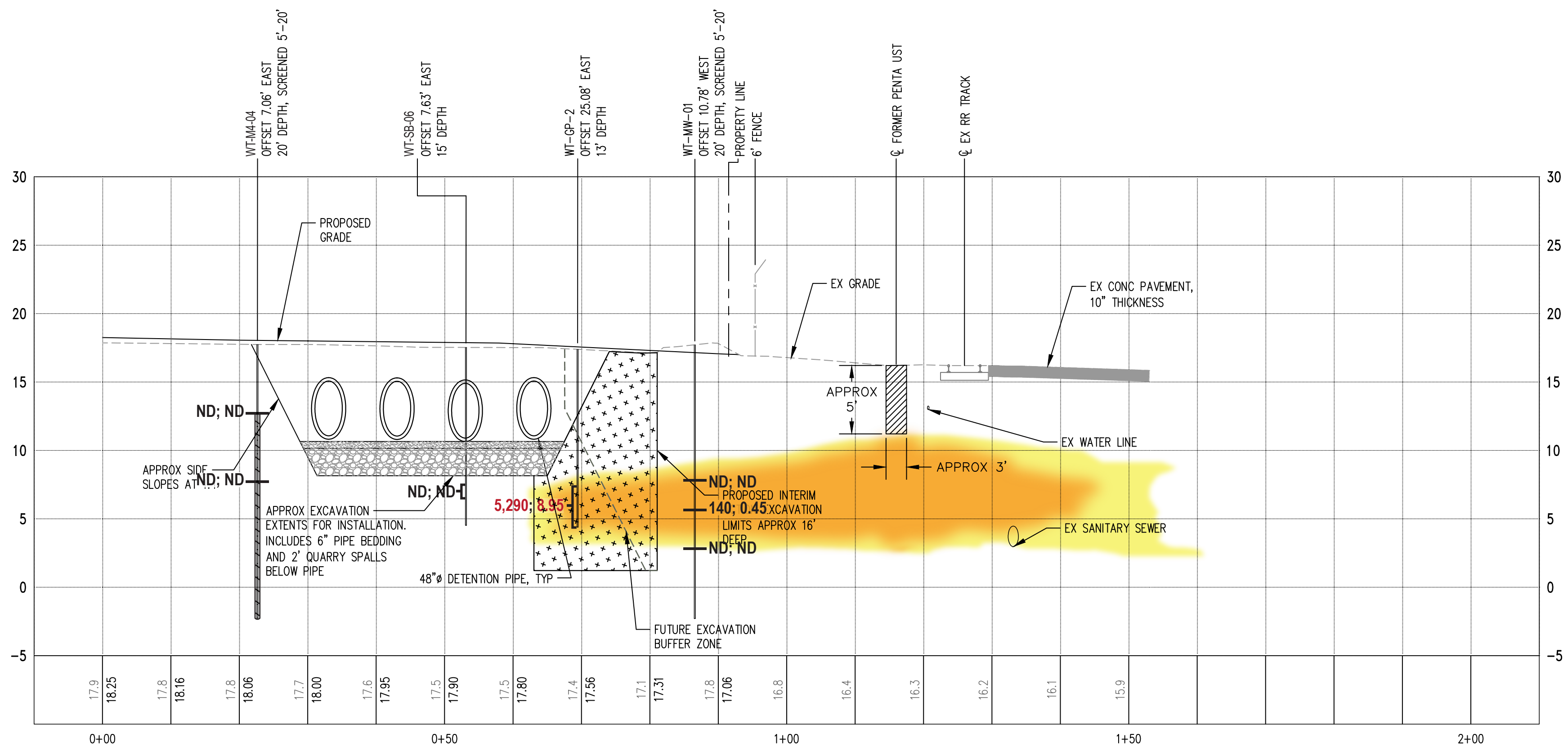
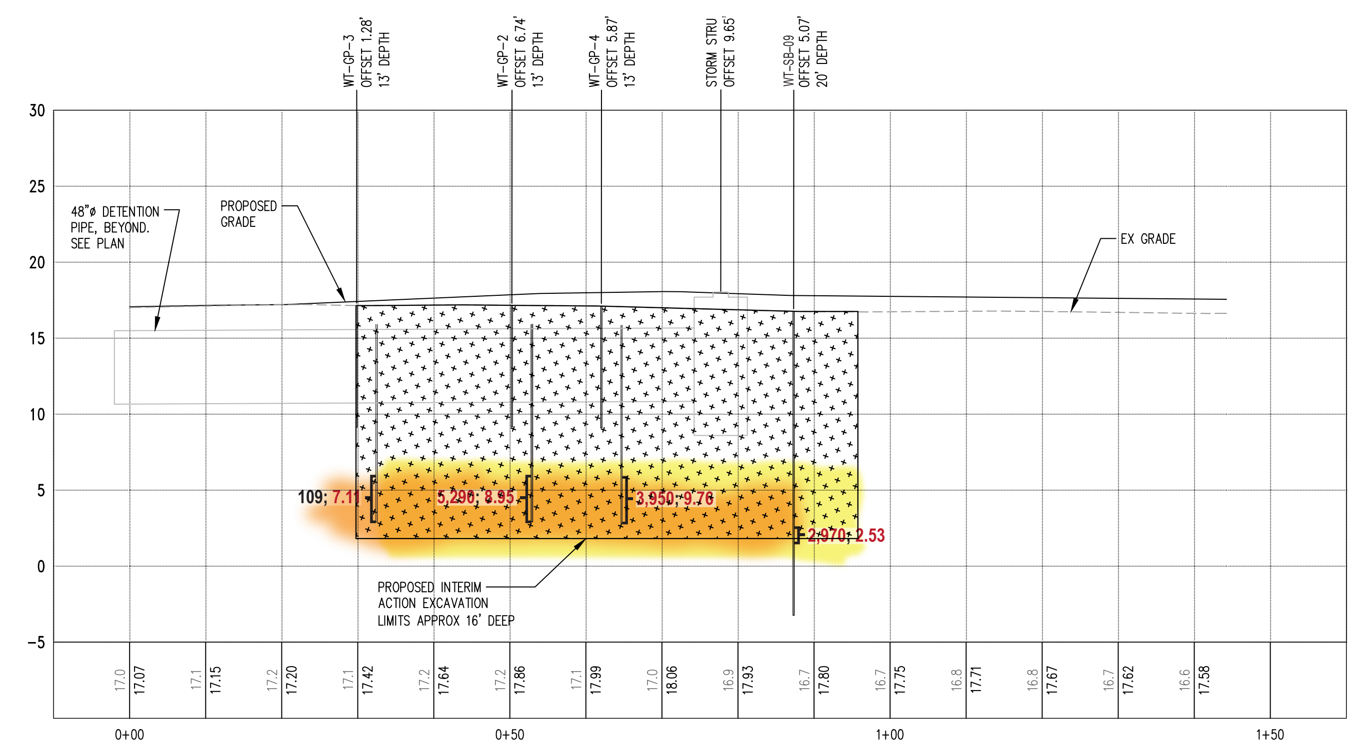
4/5/2017



STORM DRAIN EXCAVATION SECTION A/1



STORM DRAIN EXCAVATION SECTION B/1

LEGEND

BORING ID

Stoddard solvent; Penta (concentrations in mg/kg)

Red indicates a concentration that exceeds the applicable Site Remediation Level

Approximate extent of Stoddard solvent in soil > Site Remediation Level (1,000 mg/kg)

Approximate extent of penta in soil > Site Remediation Level (2.5 mg/kg)

Abbreviations:
mg/kg = Milligrams per kilogram
MTCA = Model Toxics Control Act
NA = Not analyzed
ND = Non-detect
Penta = Pentachlorophenol

CITY OF SEATTLE DATUM

GRAPHIC SCALE (IN FEET) HORIZONTAL

GRAPHIC SCALE (IN FEET) VERTICAL

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Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

Figure 4.2
Stoddard Solvent Excavation Cross Sections

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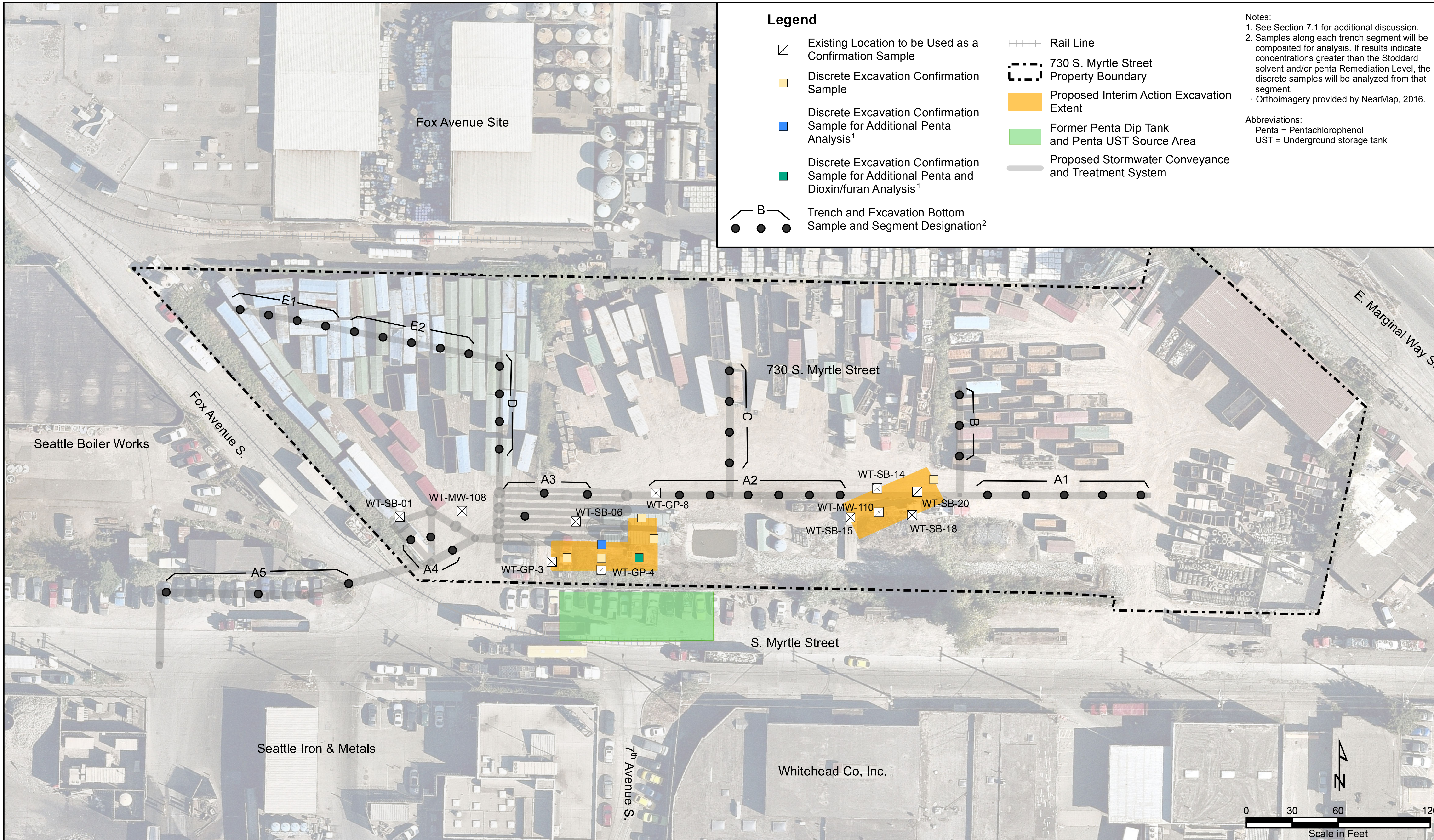
12/21/2016



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Interim Action Work Plan
Whitehead Tyee Site
Seattle, Washington

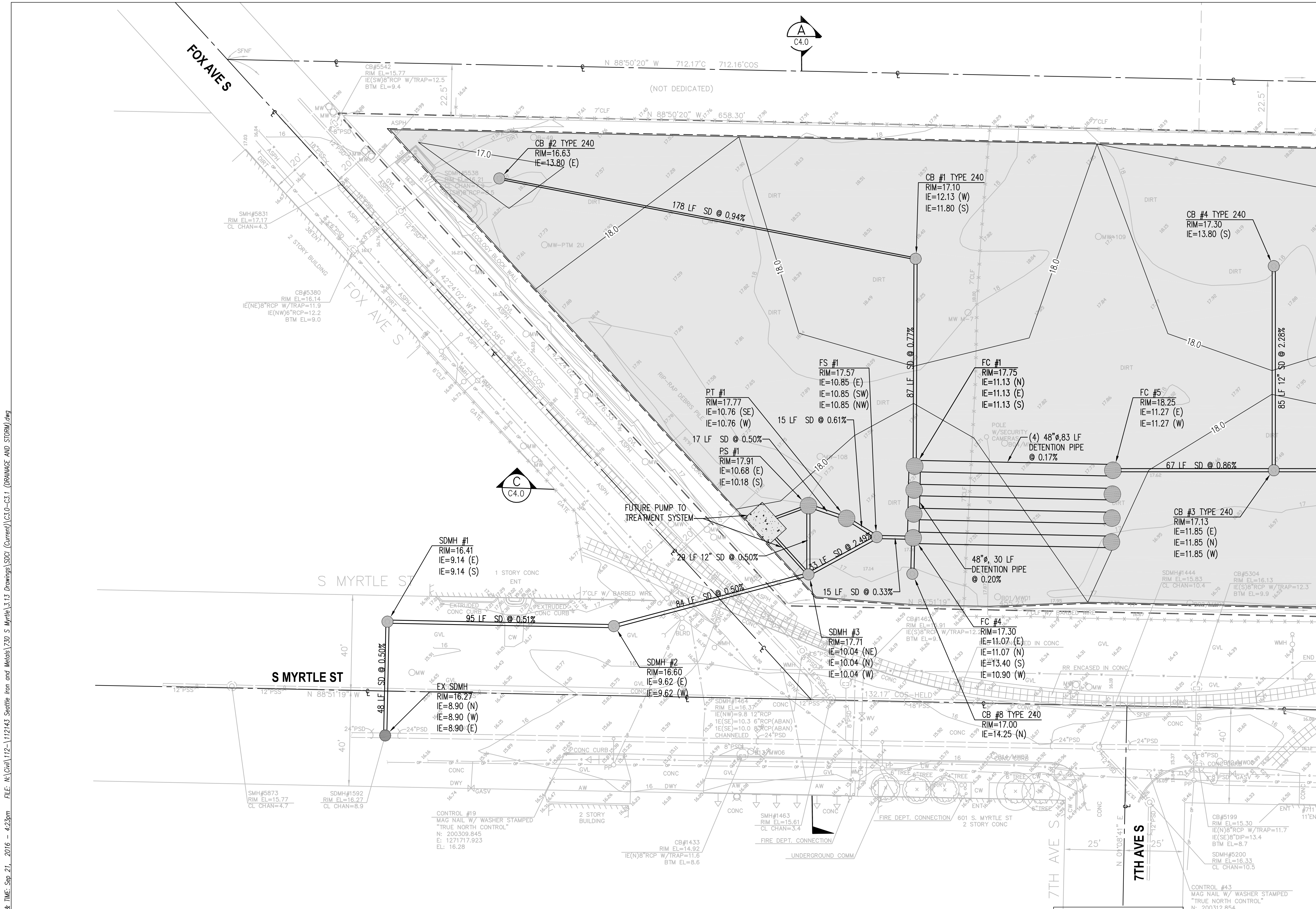
Figure 7.1
Proposed Soil Sample Collection

I:\GIS\Projects\SIM-730EDR\MXD\Interim Action Work Plan\Figure 7.1 Proposed Soil Sample Collection.mxd
4/5/2017

Whitehead Tyee Site

Interim Action Work Plan

Appendix A
Stormwater System Plan Drawings



NOTES:

1. WORK WITHIN S MYRTLE STREET TO BE PERFORMED UNDER A STREET IMPROVEMENT PERMIT.
2. ADJUST EXISTING MONITORING WELL TO GRADE.

SDCL SUBMITTAL

NO.	DATE	BY	CHD.	APPR.	REVISION

DATE: - | SCALE: -
DESIGNED: - | CHECKED: WMA
DRAWN: RGC | PROJECT NAME
JOB NO: 112143

kpff
2407 North 31st Street, Suite 100
Tacoma, Washington 98407
(253) 396-0150 Fax (253) 396-0162

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555

SEATTLE IRON & METALS
730 SOUTH MYRTLE STREET, SEATTLE, WA

DRAINAGE PAVING AND UTILITY PLAN

SHEET C3.0

SHEET 13 OF 18

PLOTTED BY: ssteiner DATE & TIME: Sep 21, 2016 - 4:23pm FILE: N:\Civil\112-\112143 Seattle Iron and Metals\730 S Myrtle\3.13 Drawings\SDCI (Current)\C3.0-C3.1 (DRAINAGE AND STORM).dwg

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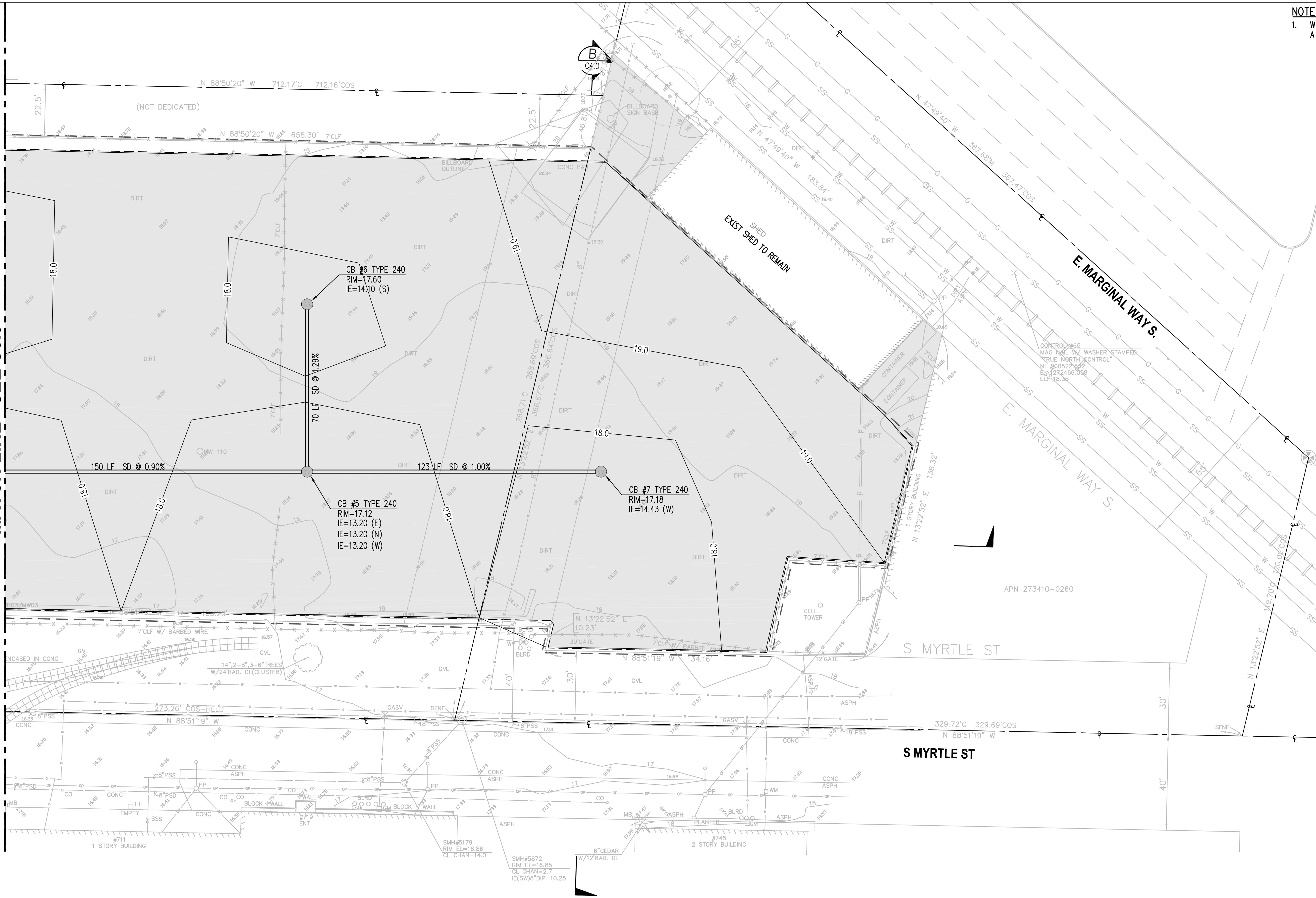

CITY OF SEATTLE DATUM

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)

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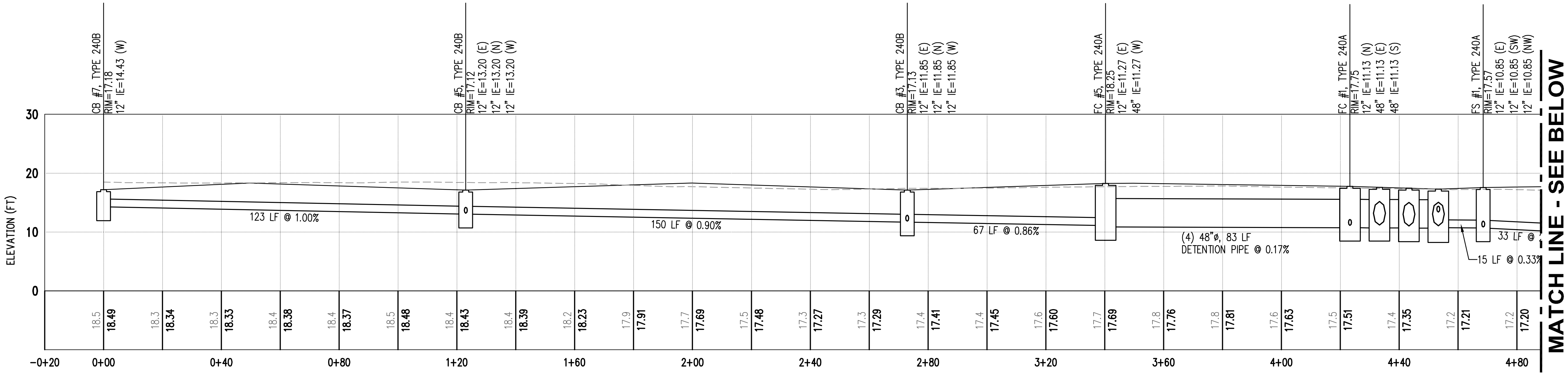
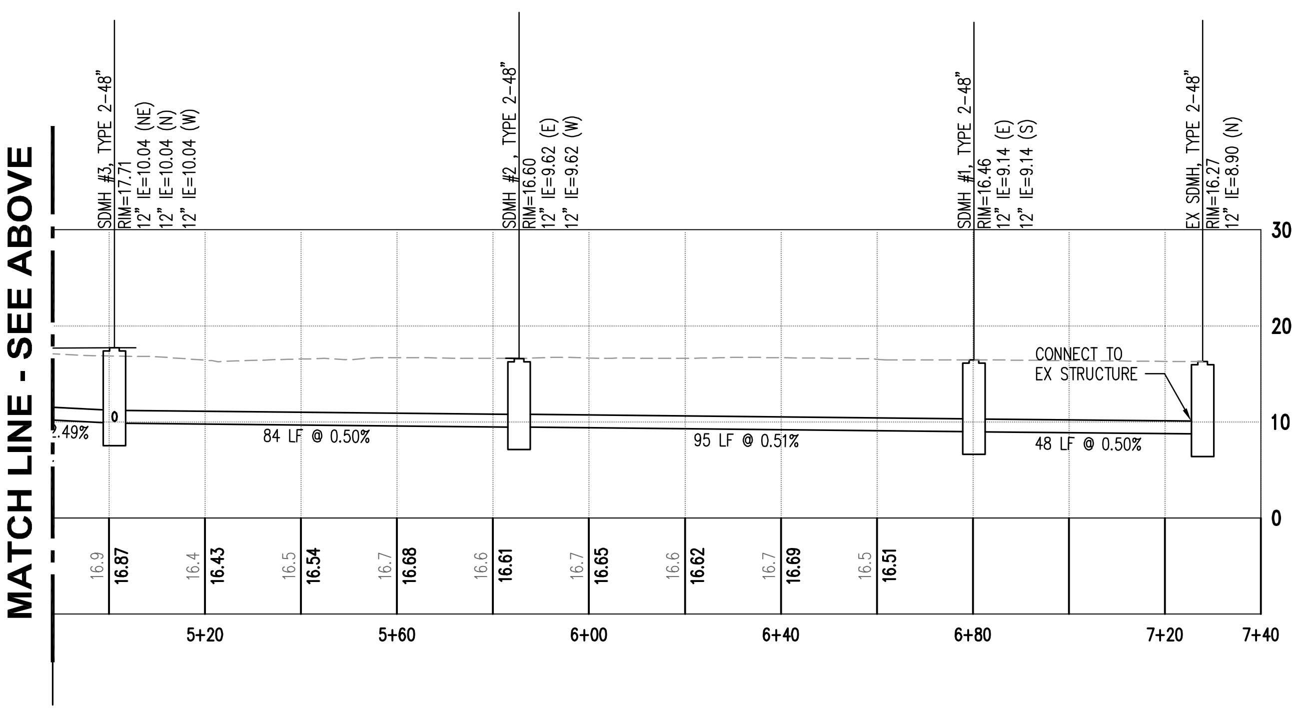
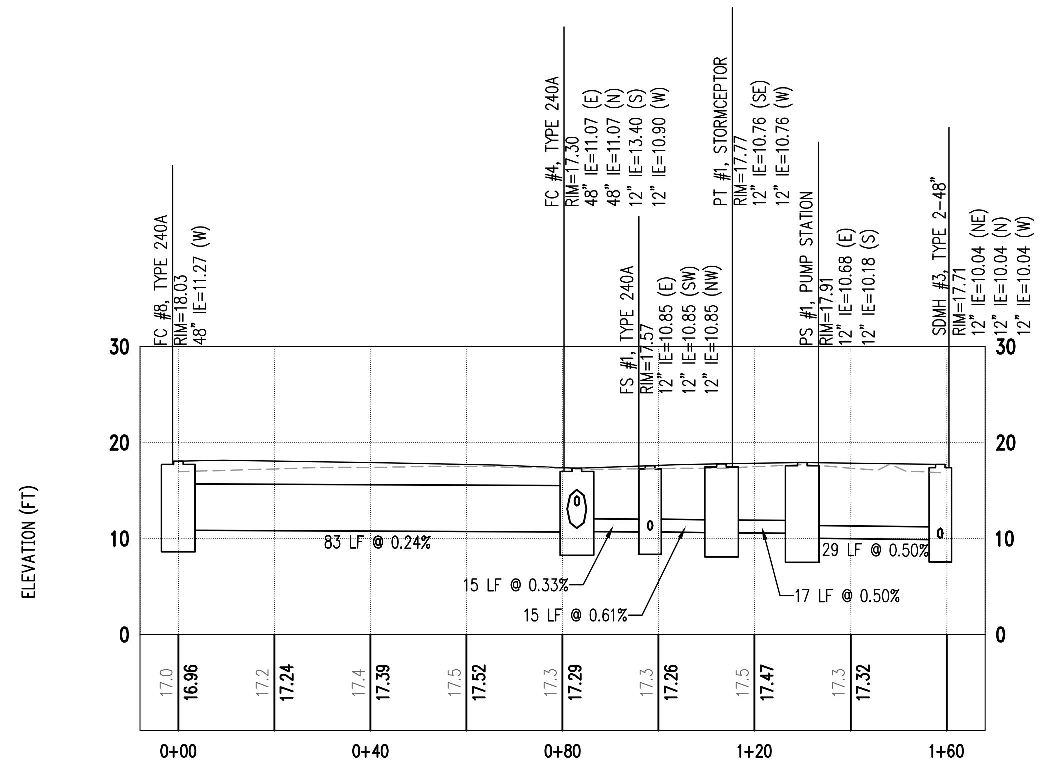
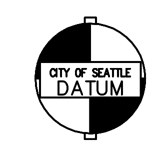
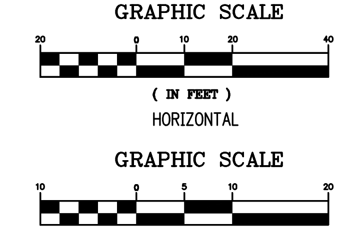
2. ADJUST EXISTING MONITORING WELL TO GRADE.











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SEATTLE IRON & METALS
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DRAINAGE PROFILES

SHEET C3.2

SHEET 13 OF 18

PLOTTED BY: ssteiner DATE & TIME: Sep 21, 2016 - 4:13pm FILE: N:\Civil\112-\112143 Seattle Iron and Metals\730 S Myrtle\3.13 Drawings\SDCI (Current)\C3.2 (DRAINAGE AND STORM).dwg

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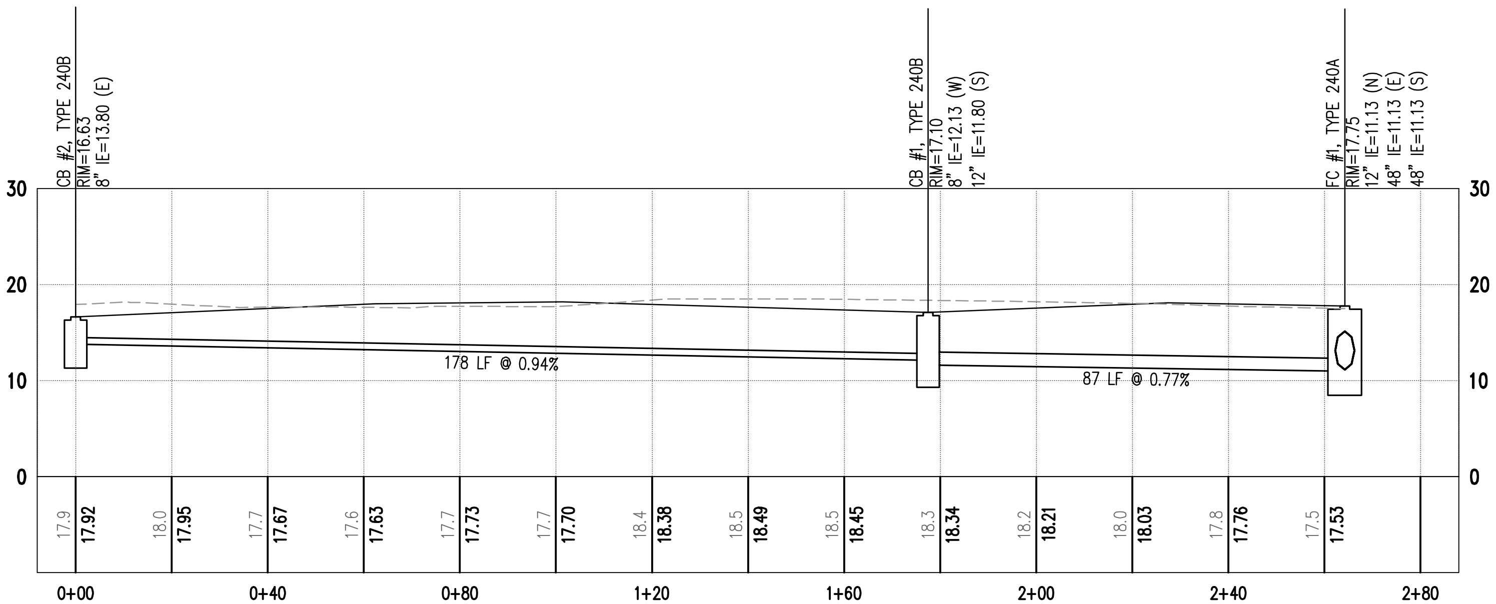

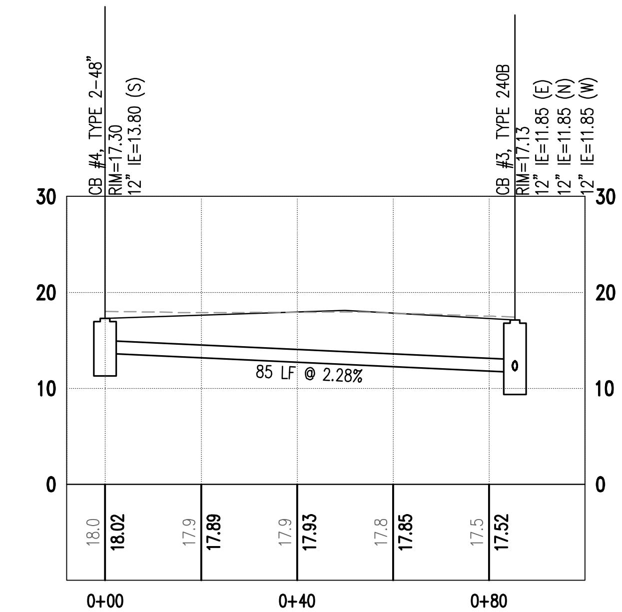

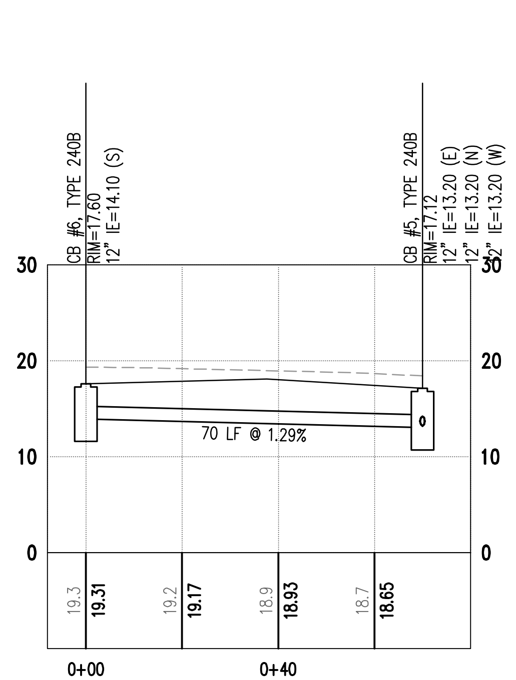

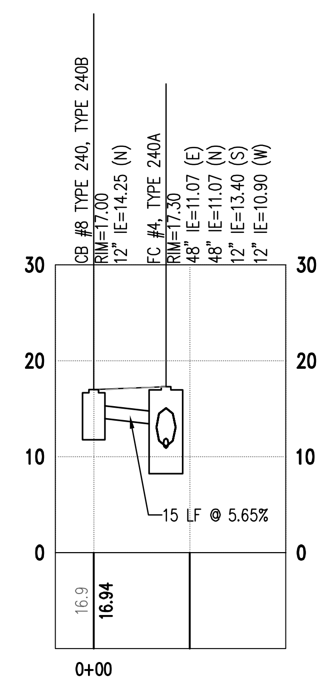

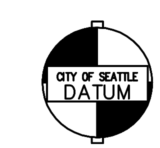

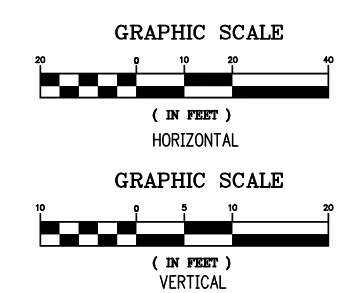

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Tacoma, Washington 98407
(253) 396-0150 Fax (253) 396-0162

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SEATTLE IRON & METALS
730 SOUTH MYRTLE STREET, SEATTLE, WA

DRAINAGE PROFILES

SHEET C3.3

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Whitehead Tyee Site

Interim Action Work Plan

Appendix B
Notification Form for Spills

SPILL NOTIFICATION FORM

<table>
<tr><th colspan="2">Part A: Basic Spill Data</th></tr>
<tr><td>Type of Spilled Substance:</td><td>Notification Person</td></tr>
<tr><td>Quantity Released:</td><td>Spill Date and Time:</td></tr>
<tr><td rowspan="2">Location of Spill:</td><td>Discovery Date and Time:</td></tr>
<tr><td>Spill Duration:</td></tr>
<tr><td>Facility Name and Location:</td><td>Release to:
[ ] Outdoor Pavement
[ ] Stormwater Catch Basin
[ ] Soil
[ ] Containment
[ ] Other: _________________</td></tr>
<tr><td colspan="2">Nature of spill and any environmental or health effects:
[ ] Injuries [ ] Fatalities</td></tr>
</table>

<table>
<tr><th colspan="3">Part B: Notification Checklist</th></tr>
<tr><td>Spill Type:</td><td>Notification Date and Time:</td><td>Name of Person that Received Call:</td></tr>
<tr><td colspan="3">For this project: All measurable spills shall be reported</td></tr>
<tr><td>Ecology:</td><td></td><td></td></tr>
<tr><td colspan="3">Spill enters the sanitary sewer or stormwater drainage system</td></tr>
<tr><td>City of Seattle Public Works</td><td></td><td></td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>National Response Center
1-800-424-8802</td><td></td><td></td></tr>
</table>

Whitehead Tyee Site

Interim Action Work Plan

Appendix C
Floyd|Snider Standard Field Guidelines

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE

Soil Logging

DATE/LAST UPDATE: May 2015

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and should review and understand these procedures prior to going in the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

These soil logging standard guidelines should be used by the field staff performing subsurface investigations, such as a direct push or roto-sonic soil boring, installation of a monitoring well via hollow stem auger, or roto-sonic or mud rotary drilling. While many projects will not necessarily have a Licensed Geologist (LG) or Hydrogeologist (LHG) who reviews and stamps every boring log, it is important that the field staff discusses the soil logging needs for a particular investigation with the project geologist, the project manager, or whoever will ultimately be responsible for interpreting the findings of the field investigation. This discussion is in addition to field training and general knowledge about soil logging, and should happen prior to entering the field, with additional follow-up before drafting a final set of electronic logs, after the investigation is complete.

2.0 Equipment and Supplies

Logging Equipment and Tools:

- 100-foot tape measure or measuring wheel
- Handheld Global Positioning System (GPS; optional)
- Unified Soil Classification System (USCS) Soil Classification Field Guide

- Soil logging kit containing:
    - Stainless steel spoons
    - Paint scraper or trowel
    - Small Ziploc bags
    - Small stainless steel bowls or black mining pans for sheen testing
    - Spray bottle filled with water
    - Paper towels (preferably white)
    - Engineers tape
    - Note cards
    - Optional items include:
        - Empty VOA vials or small glass jars
        - Munsell color chart
        - Sieves
        - White and grayscale color cards for photographs
- Plastic sheeting and duct tape or clamps to cover the sampling table
- Camera
- Trash bags
- Coolers
- Jars
- Labels
- Ice

Paperwork:

- Work Plan and/or Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP)
- Health and Safety Plan (HASP)
- Copies of figures showing previous boring locations and boring logs from previous investigations, if available
- Boring log forms appropriate for drilling method, printed in Rite in the Rain paper and/or bound field notebook
- Permanent markers and pencils

Personal Equipment:

- Steel-toed boots
- Hard hat

- Safety vest
- Safety glasses
- Nitrile gloves
- Ear plugs
- Rain gear
- Work gloves

3.0 Standard Procedures

3.1 OFFICE PREPARATION

First, meet with the project manager or field manager to identify the key information and goals of the soil boring investigation. These may include fill history, known or suspected sources of contamination and potential field indications of these contaminants, identification of specific units, or important geotechnical measurements. If possible, select a boring log template that is appropriate for the project needs.

Next, review the work plan and all available existing materials such as cross-sections or boring logs from previous investigations to familiarize yourself with the site geology. In addition (or alternatively if other information is not available), you may also review a geologic map of the area from a reputable source such as United States Geological Survey (USGS).

Finally, check the area of the site where drilling will occur for underground objects. At minimum, a OneCall locate request should be made at least one week in advance of drilling in order to give public utility locators time to mark known buried utility lines. All planned boring locations should be marked on the ground with white spray paint prior to making a locate request. In almost all cases, a private utility locator should also clear the area of drilling any underground objects using electromagnetic techniques. If drilling is to occur in close proximity to buried utilities, the work plan may specify use of an air knife or vacuum to clear the borehole to a depth below the utility lines.

3.2 COLLECTING SOIL SAMPLES FOR CLASSIFICATION

1. Before beginning drilling, record the following information on each log:
   a. Operator's name and company, equipment make/model, equipment measurements (i.e., sampler length and diameter, hammer weight and stroke if using hollow stem auger, boring diameter)
   b. Your name, date, project, boring name and approximate descriptive location (i.e., where is the soil boring relative to known site features). Include a description of the ground surface and whether or not coring was necessary, if coring was necessary, include core diameter, concrete thickness, and subcontractor information.

c. A small hand drawn map showing your location with measurements to a stationary reference point, or GPS coordinates (ideally, both). This is also a good place to note if you have had to move a boring location because of underground utilities, access issues, etc. It is important to note the reason for relocation and the direction and distance moved (i.e., moved 10 feet to the north due to presence of subsurface water line).

2. If you are using a hollow stem auger drilling method, it is important to communicate to the driller how often you would like a split spoon sample collected. Typically this would be continuous or every 5 feet but may be different depending on the project needs.

3. Note any feedback from the driller about the drilling conditions. This may include difficult drilling or rig chatter (usually caused by hard materials), heaving sands (usually caused by hydrostatic pressure on the borehole), caving, or hole instability.

4. For split spoon samples, record the number of hammer blows (blow counts) necessary to drive the sampler each 6-inch increment, as reported by the driller. If more than 50 blows are needed, record the distance that the sampler was driven in 50 blows (i.e., 2-inches in 50 blows). This is referred to as the standard penetration test.

5. Cover the sampling table with plastic sheeting. Lay an engineer's tape lengthwise across the sampling table. Once a sample has been collected, orient it on the table so that the top is aligned with the 0-foot mark on the tape.

6. Split open the sampler, core barrel liner, or sample collection bag. Record the depth interval that the sampler was driven and the depth interval of soil that was recovered. For split spoons or single-cased core barrels, such as Geoprobe direct-push rods, determine whether any loose 'slough' soil has been dislodged by the drilling equipment and deposited at the top of your core (AMS direct push rods are double cased and do not create slough). Do not include slough in the measurement of the soil recovered. Often the core will be filled with an uninterrupted column of soil that is shorter in length than the total drive interval. In such cases, record the recovery interval as it is situated in the core unless you are able to determine the actual depth where the soil sample originated.

7. Before further disturbing the soil, take volatile organic compound (VOC) measurements with a photoionization detector (PID), if using. Take measurements by making crevices in the soil with a spoon or scraper and inserting the PID probe into these openings. Alternatively, collect small spoonfuls of soil into Ziploc bag(s), seal the bag(s), gently shake the bag(s), and insert the PID probe through the top of the bag(s) and into the headspace once the soil vapor has been allowed to equilibrate with the surrounding air (headspace method). The bag headspace screening method is typically more accurate and is useful at sites with low concentrations of VOCs, whereas the in-situ method is a faster and more qualitative method, best used at sites with higher VOC concentrations. If sampling for VOCs by the U.S. Environmental Protection Agency (USEPA) Method 5035, these soil samples should also be collected

prior to disturbing the core. Soil sampling procedures using USEPA Method 5035 are described in detail in the Soil Sample Collection Standard Guideline.

8. Use a straight edge to scrape the soil level and expose the center of the core. Photograph the core alongside the measuring tape and an index card displaying the soil boring location/ID and depth interval.

3.3 SOIL CLASSIFICATION

Soils are described using the following characteristics: Moisture content, color, consistency, MAJOR CONSTITUENT, minor constituent, geotechnical properties, other observations (e.g. visual or olfactory indications of contamination). The USCS field guide is included in this guidance for reference. The steps below should help guide the logger in classifying soils according to the USCS.

1. Note the moisture content of the soil, using “dry,” “moist,” “wet,” or “saturated.” Mark the water table at the time of drilling on the log at the depth where saturated soil is first observed
2. Record the color of the soil. A descriptive color (i.e., light brown) or a color identified using the Munsell color chart are both valid.
3. Determine whether organic matter influences the properties of the material. If so, record as an organic soil.
4. If the soil is predominantly inorganic, identify whether the major constituent is coarse- or fine-grained. Coarse-grained soils include sands and gravels; fine-grained soils include silts and clays.
    a. For coarse grained soils, determine:
        i. Grain size(s) present including fine, medium, or coarse, and grain size distribution including well-graded (a mixture of fine to coarse grains) or poorly-graded (uniform in size). The USCS guide is helpful for determining grain sizes. If the major constituent is gravel, note its angularity using “rounded,” “sub-angular” or “angular.”
        ii. Minor constituent(s). If a minor constituent represents less than approximately 15% of the sample, note this as “with [minor constituent]” and optionally, whether it is “trace” (<5%) or “few” (5-15%). If a minor constituent represents more than 15% of the sample, use “[minor constituent]-y.” For example, a sand with 5% silt would be classified as a “SAND with trace silt” and sand with 30% silt would be classified as a “SILTY SAND.” For coarse-grained soils with fines between 5% and 15%, the USCS includes several dashed classifications, such as SW-SM. It is often helpful to record an estimated percentage for soil constituents to aid in classification according to the USCS.

b. For fine-grained soils, determine:

   i. Major constituent. To determine whether a material is silt or clay, a simple settling test may be performed in a glass vial or gloved hand by spraying a small amount of the sample with water. Silt particles will settle out of suspension in water within a few minutes, whereas clay particles will remain suspended for a longer period of time.

   ii. Minor constituent(s). As described above, determine the approximate percentage and record as "with [minor constituent]" or "[minor constituent]-y" as appropriate. It is often helpful to record an estimated percentage to aid in classification according to the USCS.

   iii. Geotechnical properties. Depending on project data needs, geotechnical properties may be optional but often provide helpful information. Geotechnical properties include plasticity (ranging from "non-plastic" to "highly plastic" as determined by a thread test) and consistency (ranging from "loose" to "very dense" for coarse-grained soils and "soft" to "hard" for fine-grained soils). When using split spoon samplers, blow counts recorded during the standard penetration test (also referred to as N-values) are used to determine consistency; when using direct-push or sonic drilling, consistency is described qualitatively.

5. Using the USCS guide and the description of the soil, determine the appropriate USCS symbol and record it on the log. If it is difficult to distinguish the major constituent of a soil, a borderline "/" symbol may be used to denote the two potential major constituents present. This is not the same as the USCS classifications that utilize a dash, such as SW-SM.

6. Determine whether contacts between stratigraphic units are abrupt, or gradational. Note abrupt contacts using a solid line and gradational contacts using a dotted line. If the contact between units is not visible and was missed between sample depths, a dashed line is used.

7. If the site or area geology is known, and you are confident in your identification of a specific stratum, note the geologic unit. At a site where the geology is uncertain, you may make some more general notes about the depositional environment, such as identifying probable estuarine deposits, colluvium, glacial till, etc.

3.4 OTHER OBSERVATIONS

1. Record other materials observed in the sample. These may include minor amounts of rootlets or other plant matter, evidence of organisms such as shell fragments, and/or anthropogenic debris such as brick fragments, plastic, or metal debris.

2. Record potential indications of contamination. These may include odors, colored or black staining on soils, colored crystals, hydrocarbon sheens, or non-aqueous phase liquid (NAPL) product.
   a. To test for hydrocarbon sheen, put a small amount of soil in a bowl, saturate with water and swirl, noting whether a rainbow sheen appears on the surface of the water. Alternatively, place a small amount of water in the bottom of the bowl and a small amount of soil along the side, then tilt the bowl so that the water slowly touches the soil. If observed, note the color of the sheen and describe as slight (discontinuous on the water surface), moderate (continuous but spreading slowly) or high (rainbow sheen covering entire surface water).
   b. To test for the presence of NAPL, use a clean paper towel to blot the surface of the core and note the proportion of the towel that is saturated with oil (be sure to allow the towel to dry when blotting moist to wet soils to distinguish between saturation due to NAPL and due to water).
3. Note the final depth of the boring and any reasons for early termination of the boring (i.e., refusal).
4. If monitoring wells will be installed, follow the Standard Guidelines for monitoring well construction and well development.

4.0 Decontamination

All reusable equipment that comes into contact with soil should be decontaminated as follows prior to moving to the next sampling location.

Split spoons, stainless steel bowls and spoons, and any other tools used for soil classification must be decontaminated between boring locations. If collecting soil samples for chemical analysis, split spoons and any tools used for sample processing must be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an alconox (or similar)/clean water solution and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils and other drilling materials generated during soil boring activities will be contained, transported, disposed of in accordance with applicable laws, and stored in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For investigation-derived waste (IDW) that is contained, such as waste soils, 55-gallon drums approved by the Washington State Department of Transportation (WSDOT) will be supplied by the driller and used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “soil cuttings”), the dates on which the wastes were placed in the container, the owner's name, contact information for the field person who generated the waste, and the site name.

Whenever possible, IDW contained within drums will be characterized relative to applicable waste criteria using data from the sampling locations. Material that is designated for off-site disposal will be transported to an off-site facility that is permitted to accept the waste. Manifests will be used as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster).

6.0 Field Documentation

All observations should be recorded on a soil boring form appropriate for the drilling method or in a bound field notebook. Field staff should make an effort to record as much detail as possible in the field log. After the field work is complete, a set of final logs (usually electronic) that serve as the record for the project will be completed in consultation with the project manager or field manager.

Enclosure: USCS Soil Classification Field Guide

FIELD GUIDE FOR SOIL AND STRATIGRAPHIC ANALYSIS v.2

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START HERE

DENSITY OR CONSISTENCY

COARSE GRAINED DEPOSITS N-VALUE		FINE GRAINED DEPOSITS N-VALUE	q_u (tsf)	
0-4	► VERY LOOSE	0-2	<0.25	► VERY SOFT
5-10	► LOOSE	3-4	0.25-0.50	► SOFT
11-29	► MEDIUM DENSE	5-8	0.50-1.0	► MEDIUM
30-49	► DENSE	9-15	1.0-2.0	► STIFF
>50	► VERY DENSE	16-30	2.0-4.0	► VERY STIFF
		>30	>4.0	► HARD

COLOR
Use Standard Munsell Color Notation

IS THE COLOR A MATRIX COLOR?
- YES → **MATRIX COLOR** List in sequence, dominant first
- NO → IS THE COLOR FROM A COATING OR CONCENTRATION?
  - YES → **COATING or CONCENTRATION** Note frequency, color, and size
  - NO → **MOTTLE** Note contrast, color, and size

CLASSIFICATION
Unified Soil Classification System - adopted ASTM D2488

STEP 1: IS SEDIMENT COARSE GRAINED OR FINE GRAINED?

COARSE-GRAINED DEPOSITS (>50% coarse-grained sediments, <50% fines)

STEP 2: DETERMINE SAND VS. GRAVEL RATIO

INCREASING GRAIN SIZE

SAND			GRAVEL	
FINE	MEDIUM	COARSE	SMALL	LARGE

STEP 3: CONTINUE WITH SAND OR GRAVEL ON FLOW CHART (REVERSE)

FINE-GRAINED DEPOSITS (organic and inorganic) (>50% fines, <50% coarse-grained sediments)

STEP 2: DETERMINE PLASTICITY AND ASSIGN USCS GROUP SYMBOL

INCREASING PLASTICITY

NON PLASTIC	LOW PLASTICITY	MEDIUM PLASTICITY	HIGH PLASTICITY
ML		CL	CH

STEP 3: CONTINUE WITH GROUP SYMBOL ON FLOW CHART (REVERSE)

MOISTURE

- MOISTURE ABSENT ► DRY
- DAMP ► MOIST
- VISIBLE WATER ► WET

FOR NON-PLASTIC FINES:
- WATER RISES TO SURFACE SLOWLY ► SLOW DILATENCY
- WATER RISES TO SURFACE QUICKLY ► RAPID DILATENCY

PLASTICITY
(Use with CLASSIFICATION)

- WILL NOT SUPPORT 6mm DIAMETER ROLL IF HELD ON END ► NON-PLASTIC
- 6mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF, 4mm DIA. ROLL DOES NOT ► LOW PLASTICITY
- 4mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF, 2mm DIA. ROLL DOES NOT ► MEDIUM PLASTICITY
- 2mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF ► HIGH PLASTICITY

(6mm) (4) (2)

COHESIVENESS

- 6mm DIAMETER ROLL CANNOT BE FORMED ► NONCOHESIVE
- 6mm DIAMETER ROLL CAN BE FORMED ► COHESIVE

SEDIMENTARY STRUCTURE

- UNIFORM ► MASSIVE
- BEDS >30cm ► THICKLY BEDDED
- BEDS 3cm to 30cm ► BEDDED
- BEDS 0.5cm to 3cm ► THINLY BEDDED
- BEDS <0.5cm ► LAMINATED

SECONDARY SOIL STRUCTURE (IN SOLUM ONLY)
- Spheroidal peds or granules usually packed loosely ► GRANULAR
- Irregular, roughly cubelike peds with planar faces (angular or subangular) ► BLOCKY
- Flat and horizontal peds ► PLATY
- Vertical, pillarlike peds with flat tops ► PRISMATIC
- Vertical, pillarlike peds with curved tops (which are commonly "bleached") ► COLUMNAR

WEATHERING ZONE ABBREVIATION

MODIFIER SYMBOL (if present)		1st SYMBOL		2nd SYMBOL		LAST SYMBOL (if present)	
MOTTLED	► M	OXIDIZED	► O	LEACHED	► L	SECONDARY CARBONATE	► 2
JOINTED	► J	REDUCED	► R	UNLEACHED	► U		
		UNOXIDIZED	► U				

EXAMPLE: solum, OJL, MOJL, MOJL2, MOJU — MRJU, RJU, RU, UU

SECONDARY GRAIN SIZE INFORMATION

- < 5% ► TRACE
- 6% to 15% ► LITTLE
- 16% to 30% ► FEW
- 31% to 49% ► SOME

- ► UNIFORM (poorly graded)
- ► NON-UNIFORM (well graded)

- ► FINE SAND
- ► MEDIUM-GRAINED SAND
- ► COARSE-GRAINED SAND
- ► FINE GRAVEL
- ► COARSE GRAVEL

FOR GLACIAL DIAMICTONS ► CLAST FRACTION ► CLAST LITHOLOGY

DEPOSITIONAL ENVIRONMENT

VARIOUS DEPOSITIONAL ENVIRONMENTS (interpretation)
- ► EOLIAN (LOESS)
- ► FLUVIAL
- ► ALLUVIAL
- ► LACUSTRINE
- ► COASTAL
- ► RESEDIMENTED

GLACIAL DEPOSITIONAL PROCESSES
- ► SUBGLACIAL
- ► GLACIOFLUVIAL
- ► GLACIOLACUSTRINE
- ► RESEDIMENTED

GENERALIZED RESEDIMENTATION PROCESSES
- ► MASS SLUMP
- ► SEDIMENT FLOW
- ► COLLUVIUM

STRATIGRAPHIC NAME

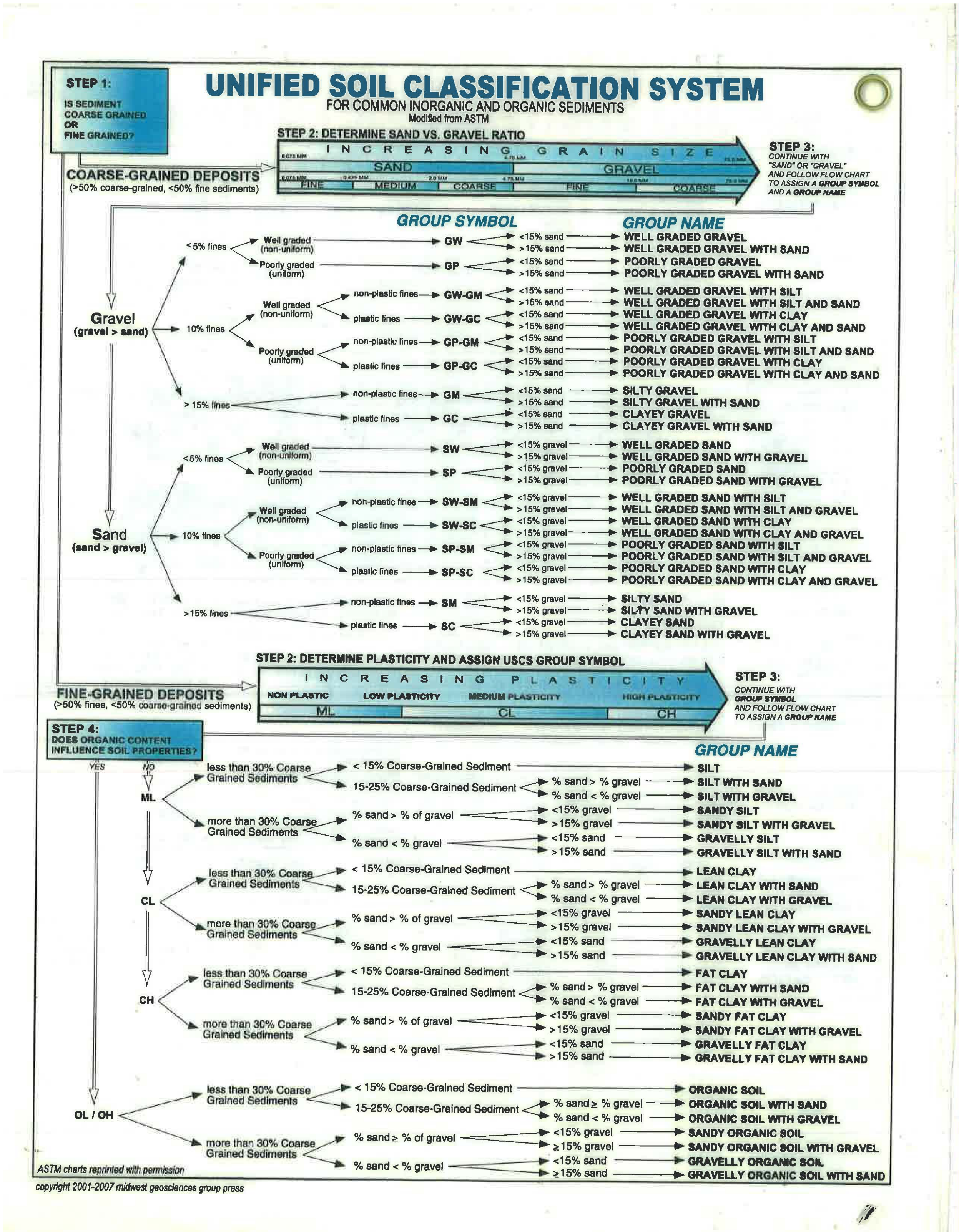
USE FORMAL STATE GEOLOGICAL SURVEY NOMENCLATURE WHEN POSSIBLE;
IF NOT POSSIBLE, ASSIGN SITE-SPECIFIC UNIT NAME ACCORDING TO DEPOSITIONAL ENVIRONMENT / FACIES ASSEMBLAGE

STRATIGRAPHIC CONTACT

010106

- < 10 cm ► SHARP (or ABRUPT for pedogenic alternation)
- > 10 cm (Note transition interval) ► GRADATIONAL (or TRANSITIONAL for weathering zone change)

USCS SOIL CLASSIFICATION FIELD GUIDE



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F|S STANDARD GUIDELINE

Soil Sample Collection

DATE/LAST UPDATE: May 2015

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline presents commonly used procedures for collection of soil samples for characterization and laboratory analysis. The methods presented in this guideline apply to the collection of soil samples during the following characterization activities: soil borings via drilling, manual collection of shallow soil samples, test pit excavation, excavation confirmation, and stockpile characterization. Specific details regarding the collection of discrete and composite samples, and special sampling techniques for volatile organic compounds (VOCs) are also included. The guideline is intended to be used by staff who collect soil samples in the field.

It is important that the field staff completing the soil sample collection discusses the specific needs for a particular investigation with the project geologist, the project manager, or whoever will ultimately be responsible for interpreting the findings of the field investigation. This discussion is in addition to field training and general knowledge about soil sampling, and should happen prior to entering the field, with additional follow-up before finalizing the field forms, after the investigation is complete.

2.0 Equipment and Supplies

Soil Sampling Equipment and Tools:

- Tape measure or measuring wheel
- Stainless steel bowls and spoons
- Graduated plunger and collection tubes for VOC samples (if needed)
- Trash bags
- Decontamination tools including:
  - Paper towels
  - Spray bottles of alconox (or similar) solution
  - Deionized or distilled water
- Adhesive drum labels, or paint or grease pen
- Washington State Department of Transportation- (WSDOT) approved drums for investigation-derived waste (IDW) disposal, if needed (if drilling, to be provided by driller)
- Camera
- Hand-held global position system (GPS; optional)
- Coolers, sample jars, labels, ice

Paperwork:

- Work Plan and/or Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP)
- Health and Safety Plan (HASP)
- Sample collection forms printed in Rite in the Rain paper, or Rite in the Rain field notebook

Personal Equipment:

- Steel-toed boots
- Safety vest
- Safety glasses
- Nitrile gloves
- Rain gear
- Work gloves

3.0 Standard Procedures

3.1 OFFICE PREPARATION

Prior to going into the field, review the SAP/QAPP tables to become familiar with the desired sample intervals, nomenclature, field Quality Assurance (QA) samples, analytes, sample containers, and holding times for each analytical method.

At least one week prior to sampling, coordinate with the laboratory specified in the SAP/QAPP to get coolers and appropriate sample containers. Familiarize yourself with the volume requirements and container types, preservation methods, and holding times for each class of analytes.

3.2 GENERAL SOIL SAMPLE COLLECTION PROCEDURES

1. Locate the desired sample location and depth interval using a handheld GPS or by taking field measurements from known site features. Note the soil type and any other observations or indications of contamination on a soil boring log, soil sample collection form or field notebook, as described in the Soil Logging Standard Guideline. Note the location and depth of the sample and take a photograph, if possible.
2. Refer to subsections 3.2.1 through 3.2.4 for the appropriate soil collection procedures for drilling, shallow soil, test pit excavation, excavation confirmation, and stockpiles. If collecting samples for VOC analysis by the U.S. Environmental Protection Agency (USEPA) Method 5035, refer to Section 3.3 for specific sample collection procedures for this method. If composite soil sampling is recommended, refer to Section 3.4 for details.
3. Once soil has been collected from the desired depth or interval, mix thoroughly until the sample is homogenous in color, texture, and moisture.
4. Fill the required laboratory-provided jars, taking care not to overfill. If large gravels (diameter greater than ~ 1 inch) are encountered, these should be discarded to ensure that an adequate soil volume is collected for analysis. If necessary, use a clean paper towel to remove soil particles from the threaded mouth of the jar before securing lids to ensure a good seal.
5. Label each jar with the sample name, date, time, field staff initials and required analyses. If collecting a field duplicate, use the sample nomenclature specified in the work plan and note the field duplicate name and sample time in the sample log. If extra volume for matrix spike/matrix spike duplicate (MS/MSD) analysis is being collected, use the same name on all jars. Soil samples should be protected from moisture by placing the filled sample jars into separate sealed Ziploc bags before placing them into a cooler.

6. Complete a chain-of-custody form for all samples, including sample names, date and time of collection, number of containers, and required analyses and methods. Keep samples on ice to maintain temperatures of 4-6 degrees Celsius (°C) and transport to the laboratory under chain-of-custody procedures.

3.2.1 Soil Sample Collection via Drilling

These procedures should be used for drilling via direct-push, hollow stem auger, or roto-sonic methods where a pre-designated sample interval (i.e. 0 to 5 feet below ground surface [bgs]) is retrieved from the subsurface using a split spoon sampling device, lined core, or bag sampler.

1. Ensure that reusable sampling equipment has been thoroughly decontaminated prior to sampling.
2. Use a stainless steel spoon or trowel, or disposable scoop to remove an equal volume of soil across the targeted depth interval from the sampler.
    a. If using a split spoon sampler or other reusable sampler, avoid collecting the soil that is touching the sides of the sampler to the extent practical.
    b. If the soil touching a reusable sampler must be collected to obtain adequate volume for analysis, notify the PM and record in the field logbook.

3.2.2 Manual Collection of Shallow Soil Samples

These procedures should be used for shallow soil sampling via scoop, trowel, shovel, or hand auger.

1. Dig or auger to the bottom depth of the shallowest sample to be collected, using a tool that has been cleaned and decontaminated. Verify that the target depth has been reached using a measuring tape.
2. If using a scoop or trowel, collect the soil directly into a decontaminated stainless steel bowl.
3. If using a shovel, the soil may either be collected in bowls or set as aside on plastic sheeting in favor of collecting the sample from the sidewall of the hole. If sampling the sidewall, use a decontaminated or disposable scoop or trowel to collect soil from the target depth, or scrape along the sidewall to collect soil across a target depth interval. Transfer soil to a decontaminated stainless steel bowl, repeating until a sufficient volume has been collected.
4. If using a hand auger, empty the cylinder of the auger directly into a decontaminated stainless steel bowl. It may be necessary to empty the hand auger onto plastic sheeting or into a bowl in order to reach the target depth without overflowing the sampler.
5. Any soil from depth intervals that are not targeted for sampling should be set aside on plastic sheeting and returned to the hole after sampling.

3.2.3 Sample Collection from Test Pits or Limited Soil Excavations

These procedures should be used for collecting samples from test pit explorations excavated using a back hoe or excavator. These same general procedures should also be followed for post-excavation soil samples used to confirm that an excavation has removed contaminated material or to document post-excavation conditions after target excavation limits have been reached.

1. Measure the length, width, and depth of the test pit or excavation area to verify that the target extents have been reached. The lateral spacing of the test pit or excavation confirmation samples, or exact location of samples should be specified in the work plan and typically depend on the size of the excavation area but can vary significantly from project to project.
2. If not specified in the work plan, sidewall samples may be collected either midway between the ground surface and base of the excavation, or incrementally along the entire height of the sidewall. Both sidewall and base (bottom) samples should penetrate a minimum of 6 inches beyond the excavated surface.
3. If the test pit or excavation is less than 4 feet deep, or has been benched to accommodate safe entry, a sample may be collected directly from the sidewall(s). To collect soil from a sidewall, use a decontaminated or disposable scoop, trowel, or shovel to obtain soil from the desired depth or depth interval directly into a decontaminated stainless steel bowl.
4. If a test pit or excavation cannot be safely entered, instruct the excavator operator to scoop sidewall material from the target depth or depth interval. Collect the soil sample from the excavator bucket using a decontaminated stainless steel spoon, trowel, or disposal scoop, avoiding material that has come into contact with the teeth or sides of the bucket. Place an adequate volume of soil into a decontaminated stainless steel bowl. If necessary, follow the compositing procedures in Section 3.4.

3.2.4 Stockpile Sampling

These procedures should be used for classifying stockpiled soil, including excavated soil and imported backfill material.

1. Where potentially contaminated soils have been previously excavated and stockpiled on site, Washington State Department of Ecology (Ecology) guidance recommends using a decontaminated or disposable scoop or trowel, penetrating 6 to 12 inches beneath the surface of the pile at several locations until sufficient volume for analysis is achieved. A decontaminated shovel may also be used to facilitate collection of soil from large piles. The locations for soil collection should be where contamination is most likely to be present based on field screening (i.e. staining, odor, sheen, or elevated photoionization detector [PID] readings). If there are not field indications of contamination, the locations should be distributed evenly around the stockpile.

2. The stockpile may need to be broken up into sections for sample collection depending on the size of the pile (i.e., segregate the pile in half or quarters). If this is necessary, it is important to document where each set of samples were collected from (i.e., north quadrant) and create a field sketch of the pile for reference.
3. If a sampling frequency is not specified in the work plan, the general rule of thumb for contaminated soil stockpile profiling is to collect and submit 3 analytical samples (these samples can be multi-point composites or grabs) for stockpiles less than 100 cubic yards (CY), 5 samples for stockpiles between 100 and 500 CY, 7 samples for stockpiles 500 to 1,000 CY, 10 samples for stockpiles 1,000 to 2,000 CY, and 10 samples for stockpiles larger than 2,000 CY with an additional sample collected for every 500 CY of material. This rule of thumb is consistent with Ecology guidance for site remediation.
4. Samples for characterization of stockpiles of imported backfill or other presumed clean material should also be collected as described above. If not described in the work plan, the typical sample frequency for imported or clean material characterization is one sample per 500 CY.

3.3 SOIL SAMPLE COLLECTION FOR VOC ANALYSIS

If collecting soil samples for VOC analysis by USEPA Method 5035, collect these samples first before disturbing the soil. This method uses a soil volume gauge fitted with a disposable soil sampling plunger tube to collect a soil plug that can be discharged directly to a VOA vial, limiting the loss of volatiles during sampling. The collection of VOC samples using the 5035 method specifies use of an airtight VOA vial with a septum lid. Ecology's interpretation of the USEPA 5035 method allows for field preservation of the sample with methanol or sodium bisulfate, or laboratory preservation (i.e. field collection into an un-preserved vial). It is important to note that if laboratory preservation is the selected method, samples must be received at the laboratory within 48-hours of sample collection. The method of sample preservation for the 5035 method will vary for each site and is dependent on site-specific conditions. Preservation method selection should be coordinated with the laboratory and specified in the sampling plan.

1. Note the volume of soil needed for analysis as specified by the laboratory (commonly 5 or 10 grams). Raise the handle of the soil volume gauge to the slot in the gauge body corresponding to the desired volume and turn clockwise until the tabs in the handle lock into the slot.
2. Insert a sample tube at the open end of the gauge body and turn clockwise until the tabs on the tube lock into the "0 gram" slot. Remove the cap from the sample tube and press directly (where possible) into the shallow soil, soil core/sampler, excavation base or sidewall, or stockpile.
3. Continue pressing the sample tube until the plunger is stopped by the sample volume gauge. If a depth interval (for example 9 to10 feet) is targeted for VOC sampling, collect small volumes of soil across this interval until the sample tube is filled

4. Twist counterclockwise to disengage the sample tube, then depress the plunger to eject the soil plug directly into a laboratory-provided VOA vial. If multiple vials per sample are required, the same plunger may be re-used to fill the remaining vials.

3.4 COMPOSITE SAMPLE COLLECTION

For this guideline, composites are considered to be samples that are collected across more than one location, or multiple depth intervals at a single location. Samples collected over continuous depth intervals within a sampling device (i.e. split spoon) are addressed for each sampling method in Section 3.2 above.

Compositing of sample material may be performed in the field, or by the analytical laboratory. To collect a field composite sample, identify the locations and depth(s) that will comprise the composite. Collect soil from the first target sub-sample depth or depth interval and hold in a decontaminated stainless steel bowl, covered with aluminum foil to prevent cross contamination and label with the location and depth. Continue to collect and hold individual sub-samples until all components of the composite have been collected, then transfer an equal amount of each sub-sample to a clean bowl and homogenize. Fill necessary sample jars from homogenized composite. In some cases, project plans may require that each individual sample that comprised the composite be collected in jars and submitted to the laboratory in the event that individual sample analysis is desired, or if laboratory compositing is requested in addition to field compositing as a field quality control measure. In this case, label each individual jar, but indicate HOLD on the chain-of-custody, and note that the sample is part of composite XYZ.

To collect a laboratory composite sample, collect, and label each sub-sample using the procedures described above in Section 3.2. Record each sub-sample on the chain-of-custody form, and indicate on this form which samples should be composited by the laboratory and the desired name of the composite sample. It is important to communicate to the laboratory if discrete samples will also require analysis (in some cases) or only the composite sample.

4.0 Decontamination

All reusable equipment that comes into contact with soil should be decontaminated prior to moving to the next sampling location.

Stainless steel bowls and spoons, and any tools used for sample processing will be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an alconox (or other soap)/clean water solution and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils will be contained, transported, disposed of in accordance with applicable laws, and stored in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For IDW that is containerized, such as waste soils, 55-gallon drums approved by WSDOT will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., "soil"), the dates on which the wastes were placed in the container, the owner's name and contact information for the field person who generated the waste, and the site name.

IDW that is placed into drums for temporary storage will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate for disposal.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site Dumpster).

6.0 Field Documentation

All observations including sample collection locations, soil descriptions, sample depths, collection times, analyses, and field QC samples should be recorded on a boring log, soil sample collection form, or bound field notebook. Information recorded should additionally include personnel present (including subcontractors), purpose of field event, weather conditions, sample collection date and times, sample analytes, and any deviations from the SAP.