FARALLON
consulting

975 5th Avenue Northwest, Issaquah, Washington 98027
Tel: (425) 295-0800 Fax: (425) 295-0850
www.faralloncconsulting.com

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT

WOODWORTH & COMPANY, INC.
LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON 98499
TOXICS CLEANUP PROGRAM VCP NO. SW 1012

Submitted by:
Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027

Farallon PN: 188-001

For:
Woodworth & Company, Inc.
1200 East D Street
Tacoma, Washington 98421

August 19, 2009

Prepared by:

Brani Jurista
Associate Geologist

Shane C. Broesder, P.E.
Associate Engineer

Reviewed by:

Peter Jewett, L.G., L.E.G.
Principal

State of Washington
Engineering Geologist
908
Licensed Geologist
Peter Day Jewett

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

Addendum	*Addendum to Remedial Investigation Work Plan, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499* dated January 30, 2009, prepared by Farallon Consulting, L.L.C.
AOC	Area of Concern
AS	air sparging
bgs	below ground surface
COCs	constituents of concern
COPCs	constituents of potential concern
DRO	total petroleum hydrocarbons as diesel-range organics
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources, Inc.
EPA	U.S. Environmental Protection Agency
Farallon	Farallon Consulting, L.L.C.
FS	Feasibility Study
FSP	Field Sampling Plan
GRO	total petroleum hydrocarbons as gasoline-range organics
HVOCs	halogenated volatile organic compounds
Lakeview Facility	Woodworth & Company, Inc. Lakeview Facility located at 2800 104th Street South in Lakewood, Washington (herein referred to as the Site)
mg/kg	milligrams per kilogram
µg/l	micrograms per liter
mg/l	milligrams per liter
MNA	monitored natural attenuation
msl	mean sea level
MTCA	Washington State Model Toxics Control Act Cleanup Regulation
ORC	Oxygen Release Compound
ORO	total petroleum hydrocarbons as oil-range organics
PCBs	polychlorinated biphenyls
PQL	practical quantitation limit

Property	Woodworth & Company, Inc. Lakeview Facility located at 2800 104th Street South in Lakewood, Washington
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RI Work Plan	*Remedial Investigation Work Plan, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499* dated January 26, 2009, prepared by Farallon Consulting, L.L.C.
Site	AOC 1 through AOC 5
Spectra	Spectra Laboratories, Inc.
SVE	soil vapor extraction
TCE	trichloroethene
TEE	Terrestrial Ecological Evaluation
TPCHD	Tacoma-Pierce County Health Department
TPH	total petroleum hydrocarbons
TPST	TPST Soil Recyclers of Washington
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code
Woodworth	Woodworth & Company, Inc.
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Remedial Investigation/Feasibility Study (RI/FS) Report on behalf of Woodworth & Company, Inc. (Woodworth) to present the results of the Remedial Investigation (RI) and to develop and evaluate technically feasible cleanup alternatives for the Lakeview Facility located at 2800 104th Street South in Lakewood, Washington (herein referred to as the Property) (Figure 1). The RI/FS Report has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA), as established in Chapter 173-340 of the Washington Administrative Code (WAC 173-340) as an independent remedial action under the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP). The scope for work for the RI was completed in accordance with the Remedial Investigation Work Plan (RI Work Plan) and the Addendum to Remedial Investigation Work Plan (Addendum) dated January 26 and 30, 2009, respectively, both prepared by Farallon (2009a and 2009b). The RI Work Plan and Addendum were submitted to Ecology prior to commencement of RI field activities.

1.1 PURPOSE

The scope of work for the RI was developed to address the data gaps in the preliminary conceptual site model that were identified in the RI Work Plan in order to develop and evaluate technically feasible cleanup action alternatives. As defined in WAC 173-340-350, the purpose of the RI/FS is to collect, develop, and evaluate sufficient information to select a cleanup action under WAC 173-340-360 through 173-340-390.

The RI provides sufficient data to refine the conceptual site model to identify the suspected sources of contamination and evaluate the nature and extent of the constituents of potential concern (COPCs), potential exposure pathways and receptors, and contaminant fate and transport characteristics. The Feasibility Study (FS) summarizes the results of the preliminary screening of potentially feasible cleanup alternatives in accordance with WAC 173-340-350(8) and presents the cleanup action alternative selected.

This RI/FS Report is intended to provide sufficient information to enable Ecology and Woodworth to reach concurrence under the VCP on the selection of a final cleanup action.

1.2 REPORT ORGANIZATION

The format of this RI/FS Report and supporting documents meets the requirements of WAC 173-340-350(7) and 173-340-350(8). The Report has been organized into the following sections:

- **Section 2—Project Background.** This section describes the Property location, use, and history; adjacent properties; the Site definition and areas of concern; the Property environmental setting, including geography, geology, and hydrogeology; and previous investigations conducted at the Property.

- **Section 3—Remedial Investigation.** This section describes the objectives of the RI to address data gaps remaining from previous investigations, the RI scope of work designed to address the data gaps, the RI field program conducted at the Property in early 2009, and the RI results.
- **Section 4—Conceptual Site Model.** This section summarizes the conceptual site model developed from the results of the subsurface investigations conducted at the Property. Included is a discussion of the constituents of concern (COCs) and the media of concern, COC source areas, the nature and extent of COCs, and the preliminary exposure risk assessment. This section also addresses the Terrestrial Ecological Evaluation (TEE) requirement under MTCA.
- **Section 5—Feasibility Study.** This section describes the evaluation of feasible remediation technologies, cleanup action objectives, the evaluation of cleanup alternatives, and the soil and groundwater cleanup alternatives recommended for implementation at the Site.
- **Section 6—Bibliography.** This section lists the source materials used in preparing the RI/FS Report.

Figures 1 and 2 depict the Property location and general features, respectively. Groundwater elevation contours are shown on Figures 3 and 4. Figures 5 and 6 summarize the soil analytical results. Figures 7 through 9 include cross-sections of the site. Groundwater analytical results are depicted on Figures 10 through 13. Figure 14 depicts the areas where cleanup may be required to meet the MTCA requirements for a No further Action determination from Ecology. Monitoring well elevation data and soil and groundwater laboratory analytical results are summarized in Tables 1 through 8. Table 9 summarizes and compares the technically feasible cleanup alternatives.

Boring and well construction logs from investigations conducted at the Property are included in Appendix A. Appendix B contains laboratory analytical reports for the soil and groundwater samples collected at the Property by Farallon subsequent to the submission of the RI Work Plan (Farallon 2009a) and Addendum to the RI Work Plan (Farallon 2009b). The RI Work Plan and Addendum to the RI Work Plan should be referenced in conjunction with the entire RI/FS Report.

2.0 PROJECT BACKGROUND

This section presents background information, including a description of the Property, historical use information, surrounding land use information, a definition of the Site, details pertaining to the environmental setting of the Site, and a summary of previous environmental investigations.

2.1 PROPERTY DESCRIPTION

The Property is located north of Washington State Route 512, east of Interstate 5, and west of Sales Road South in Section 6, Township 19 North, Range 3 East in Lakewood, Pierce County, Washington (Figures 1 and 2). The Property consists of Tacoma–Pierce County Parcel Nos. 0319061135, 0319061136, 0319062075, and 0319062076, together totaling approximately 60 acres. All four parcels are used by Woodworth for the recycling of imported asphalt and concrete debris and for hot- and cold-mix asphalt production.

The southern one-third of the Property is almost entirely asphalt-paved and contains an asphalt-processing plant, a truck maintenance shop building, a covered carport used for equipment storage, a Quonset-shaped building used for the shredding and recycling of asphalt shingles, and several small sheds and trailer homes used for storage, office space, or warehouse for the service well (Figure 2). The southwestern portion of the Property is used for parking Woodworth fleet trucks. Employee parking areas and a stormwater collection retention pond with associated biofiltration swale are located at the western end of the Property. The southeastern end of the Property was occupied by a thermodesorption plant used for treatment and recycling of petroleum-contaminated soil. An elevated gravel parking lot that is being leased to a neighboring business and used for parking is located along 104th Street South.

The central portion of the Property is used for asphalt and concrete recycling and for stockpiling raw and crushed material. Crushing equipment, radial stackers, and various stockpiles of sorted debris are located on this portion of the Property.

The northern one-third of the Property is used as a storage area for unused debris and material. A two-cell wet pond and associated infiltration trench are located at the far northern end of the Property. A water-supply well near the center portion of the Property provides water for steam-cleaning of equipment and roofing shingles (Figure 2). The water-supply well-head is located in a well-house.

2.2 HISTORICAL USE

The Property was first developed between 1946 and 1969 for surface sand and gravel mining operations (Farallon 2009a). Hot-mix asphalt production reportedly commenced on the Property in 1971 (Farallon 2009a). Sand and gravel mining operations continued until the late 1980s, at which time the raw materials for asphalt production were imported from off-Property locations.

At some time between the 1980s and early 1990s, the Washington State Department of Transportation (WSDOT) operated a mobile laboratory on the Property for the testing of asphalt mix, which included use of trichloroethene (TCE) in the asphalt-testing process. WSDOT personnel reportedly disposed of spent TCE by pouring the substance directly into the soil on the Property. Although the exact location of the former WSDOT mobile laboratory is unknown, Farallon learned from interviews with on-site personnel that its likely location was the area between the asphalt plant and the roofing shredder building (Figure 2).

The Property was used from approximately 1981 to 1992 to landfill various inert waste materials such as clean dirt and rock, waste concrete and asphalt, waste concrete roof tiles, and Atlas Foundry cast steel waste material consisting of refuse sand, refractory materials, reclaim dust, and slag. The Atlas Foundry waste material reportedly consisted of silica and chromite sands, bentonite clay, sodium silicate, burned dolomite brick, high alumina brick, calcium aluminate cement and mortar, ladle linings, and silica dust and flour (Tacoma-Pierce County Health Department [TPCHD] 2003).

Treatment of petroleum-contaminated soil was conducted on the Property from 1991 to 2005 under a Conditional Solid Waste Permit from TPCHD. In 1994, Woodworth sold the soil treatment facility to TPST Soil Recyclers of Washington (TPST), but remained an owner of the Property. Operations by TPST ended in approximately 2005, at which time the majority of the buildings and equipment used by TPST were demolished or decommissioned.

2.3 SURROUNDING FACILITIES

This subsection provides a brief description of the facilities located adjacent to the Property. A detailed discussion of these adjacent facilities and their potential as source areas to the Woodworth Lakewood Facility is provided in the RI Work Plan (Farallon 2009a).

The McChord Air Force Base is located directly hydrologically up-gradient and south of the Property. Historical research revealed releases of hazardous substances to subsurface soil and groundwater at various locations at the McChord Air Force Base. Concentrations of halogenated volatile organic compounds (HVOCs), total petroleum hydrocarbons (TPH) as gasoline-range organics (GRO) and diesel-range organics (DRO), and metals have been detected in groundwater, with concentrations of TCE, vinyl chloride, GRO, and DRO detected above cleanup levels.

The former Cascade Demolition Landfill and Cascade Asphalt Paving Company were located south and up-gradient of the Property. Research of historical documents and interviews with Woodworth personnel indicated that the Cascade Demolition Landfill may have accepted jet fuel, and also extracted rock and produced asphalt (TPCHD 2003). Cascade Asphalt Paving Company reportedly operated an asphalt-testing laboratory that may have used TCE in the testing process (TPCHD 2003).

Several facilities of potential concern were identified, including a facility containing leaking underground storage tanks with a confirmed release of petroleum hydrocarbons to soil, and a material-recovery facility.

2.4 SITE DEFINITION

The Site is defined as portions of the Property located at 2800 104th Street South in Lakewood, Washington that are known or have been found to contain contiguous concentrations of hazardous substances that exceed the applicable cleanup levels. The physical boundaries of the Site are defined by the observed extent of contamination based on the results of the RI and previous environmental investigations, and are depicted on Figure 2. The Site has been apportioned into five Areas of Concern (herein referred to as AOCs):

- AOC 1: Equipment Storage Carport Area;
- AOC 2: Equipment Parking Area;
- AOC 3: Former Recycled Stockpile Area;
- AOC 4: Asphalt-Testing Laboratory Area; and
- AOC 5: Atlas Foundry Waste Area.

AOC 1 is located on the southern portion of the Property. The physical features currently located in AOC 1 include a carport structure that is used to store various equipment used for maintenance of the Woodworth truck fleet and operations of the asphalt plant. The results of the RI detected concentrations of DRO and oil-range organics (ORO) in shallow subsurface soil and groundwater exceeding MTCA Method A cleanup levels.

AOC 2 is located directly north of the truck maintenance shop and currently is used by Woodworth for parking various trailer-mounted equipment and machinery. The results of the RI detected concentrations of ORO in soil exceeding the MTCA Method A cleanup level.

AOC 3 is located in the western portion of the Property in an area that formerly was used for stockpiling recycled asphaltic concrete and currently is used for structural testing of asphalt. The results of the RI detected concentrations of DRO in shallow subsurface soils exceeding the MTCA Method A cleanup level.

AOC 4 is located near the central portion of the Property immediately west to northwest of the roofing shredder building in the reported vicinity of the former WSDOT testing laboratory. Concentrations of TCE have been detected in groundwater exceeding the MTCA Method A cleanup level.

AOC 5 is in the area of reported landfilling of Atlas Foundry waste material in the northeastern portion of the Property. The results of the RI detected concentrations of total and dissolved arsenic and lead in groundwater exceeding MTCA Method A cleanup levels.

2.5 ENVIRONMENTAL SETTING

This section describes the physical and environmental setting of the Property and vicinity, including a summary of the regional geography, geology, and hydrogeology.

2.5.1 Geography and Geology

The Property is located in Lakewood, Washington in the Puget Sound Lowlands between the surface waters of Puget Sound on the west and the Cascade Mountains on the east. The nonuniform topography of the Property vicinity can be attributed to glacial carving and deposition. The topography of the Property slopes slightly to the northwest, but has been significantly altered by mining activities.

The Property vicinity is underlain by a complex 1,300- to 2,000-foot-thick sequence of alternating glacial and nonglacial Quaternary sediments deposited during multiple advances of the Cordilleran ice sheet into the Puget Sound Lowlands during the Pleistocene era (Borden and Troost 2001). The uppermost lithology of the area has been attributed to Pleistocene glacial deposits of the Vashon Stade of the Fraser glaciation (Armstrong et al. 1965), consisting mainly of Steilacoom Gravel as defined by Walters and Kimmel (1968) (Troost In Review). The origin of the gravel is attributed to multiple outburst floods from subsequently lower elevations of Glacial Lake Puyallup (Troost In Review).

The soil encountered at the Property during the field activities for the RI is consistent with previously observed and documented subsurface conditions. Poorly graded sands and gravels are the predominant lithology encountered at the Property and are separated into a shallow and a deep unit by a layer of silt and silty gravel.

The geology and soil types that underlie the Property are described in detail in Section 3.3.1, Soil, and are shown on Figures 7 through 9.

2.5.2 Hydrogeology

The RI Work Plan described three water-bearing zones observed at the Property. However, the subsurface data collected during the RI indicate that Water-Bearing Zone 1 and Water-Bearing Zone 2 likely are a single water-bearing zone that contains discontinuous lenses of non-water-bearing silt and silty gravel. This water-bearing zone will be referred to herein as the Shallow Water-Bearing Zone.

Two groundwater-bearing zones were identified during the RI. The Shallow Water-Bearing Zone ranges in thickness from 8 to 20 feet, appears to be discontinuous and largely unconfined, and was encountered at depths ranging from 5 to 36 feet below ground surface (bgs). A Deep Water-Bearing Zone encountered across the Property transitions from confined conditions in the east to unconfined conditions in the central portion of the Property and was encountered at depths ranging from 28 to 72 feet bgs. The Deep Water-Bearing Zone ranges in thickness from 46 to 60 feet. The Shallow Water-Bearing Zone is separated from the Deep Water-Bearing Zone by a discontinuous layer of silt and silty gravel that is up to 30 feet thick in some portions of the Property.

The static groundwater levels in the monitoring wells screened in the Shallow Water-Bearing Zone ranged from 5 to 36 feet below the top of the well casing during the field activities for the RI (Table 1). The groundwater flow direction in the Shallow Water-Bearing Zone was observed to be generally to the north-northwest (Figure 3).

The static groundwater levels in the monitoring wells screened in the Deep Water-Bearing Zone ranged from 17 to 69 feet below the top of the well casings during the field activities for the RI (Table 1). The groundwater flow direction in the Deep Water-Bearing Zone was observed to be generally to the east-northeast (Figure 4).

An aquitard consisting of silt and silty gravel sediments was encountered at the base of the Deep Water-Bearing Zone in a number of monitoring wells at the Property. This aquitard separates the Deep Water-Bearing Zone from a regional aquifer that provides water for the water-supply well that is located just north of AOC 4 (Figure 2). The water-supply well is the only well on the Property that is screened in the regional aquifer. According to the well log (Appendix A), the water-supply well was installed in 1969 to a total depth of 187 feet bgs and originally was screened from 167 to 187 feet bgs, but later was perforated from 107 to 129 feet bgs. The groundwater flow direction of the regional aquifer at the Property has not been determined. Groundwater extracted from the water-supply well is used for industrial process water and is not used as a drinking water source.

2.6 PREVIOUS INVESTIGATIONS

Previous environmental investigations conducted at the Property by others are described in detail in the RI Work Plan (Farallon 2009a). Tables summarizing the laboratory analytical results of previous environmental investigations, as documented in the reports prepared by others, are provided in Appendix E of the RI Work Plan (Farallon 2009a). The investigations were conducted between 1983 and 2008 by Robinson & Noble, Inc. (1991a and 1991b); ATEC Associates, Inc. (1991); PAC-TECH Engineering, Inc. (1993); Saltbrush Environmental Service, Inc. (1994); and Spectra Laboratories, Inc. (Spectra) (1995 through 2008). The results of the investigations conducted at the Property by others have detected concentrations of TCE, DRO, metals, and ORO in groundwater exceeding applicable MTCA cleanup levels.

Farallon conducted additional investigation at the Property between August and October 2008 that included advancement of soil borings, installation of monitoring wells, and collection and laboratory analysis of soil, groundwater, and surface water samples. The scope of work and investigation results are presented in detail in the RI Work Plan (Farallon 2009a) and Addendum to the RI Work Plan (Farallon 2009b).

The results of the additional investigation detected concentrations of DRO and ORO in soil exceeding MTCA Method A cleanup levels. Concentrations of TCE and arsenic were detected in groundwater exceeding MTCA Method A cleanup levels. Constituents detected at concentrations below MTCA cleanup levels included metals in soil and HVOCs in groundwater. Concentrations of arsenic and ORO were detected in surface water samples collected from retention ponds at the Property.

The results of the previous investigation conducted by others and the additional investigation activities conducted at the Property by Farallon were used to develop a preliminary conceptual site model and to identify gaps for the RI (Farallon 2009a; Farallon 2009b).

3.0 REMEDIAL INVESTIGATION

The RI was conducted to collect sufficient information to address the data gaps in the conceptual site model to meet the requirements of MTCA and to enable evaluation and selection of technically feasible cleanup alternatives. A detailed description of the scope of work for the RI is provided in the RI Work Plan (Farallon 2009a) and Addendum to the Work Plan (Farallon 2009b). A detailed description of the sampling methodologies and quality assurance procedures implemented during the RI is provided in the Sampling and Analysis Plan, Appendix A of the RI Work Plan (Farallon 2009a), which contains a Field Sampling Plan (FSP) and a Quality Assurance Project Plan. A summary of the RI objectives and scope of work completed for the RI is provided below.

3.1 OBJECTIVES

The objectives of the RI were developed to address the data gaps in the preliminary conceptual site model. The objectives of the RI were to:

- Define the lateral and vertical extent of concentrations of HVOCs exceeding the cleanup levels in groundwater;
- Refine the groundwater flow direction and gradient in the Shallow and Deep Water-Bearing Zones;
- Investigate the nature and extent of foundry fill material potentially located on the eastern portion of the Property; and
- Evaluate the potential for natural attenuation processes to effectively mitigate threats to human health and the environment posed by releases from the Site.

3.2 SCOPE OF WORK

The scope of work for the RI included:

- Advancing eight soil borings for collection of soil samples and installation of monitoring wells MW-9B, MW-10B, MW-11B, MW-12B, MW-14C, MW-17A, MW-18, and MW-19 (Figure 2);
- Conducting groundwater monitoring and collecting groundwater samples from 24 existing and newly installed monitoring wells and 1 water-supply well;
- Excavating 10 test pits and collecting soil samples; and
- Conducting laboratory analysis of soil and groundwater samples.

The following sections present a summary of the field activities conducted for each element of the RI.

3.2.1 Soil Sampling and Reconnaissance Groundwater Sampling

Soil samples were collected from borings MW-11B, MW-12B, and MW-19 in January 2009 in accordance with the procedures described in the FSP (Farallon 2009a). The soil sample collected from boring MW-11B at 3 feet bgs was submitted for analysis for GRO, DRO, ORO, benzene, toluene, ethylbenzene, and xylenes, and the soil sample collected at 8 feet bgs was submitted for analysis for DRO and ORO to assess soil conditions in AOC 1 (Figure 5). The soil sample collected from boring MW-19 at 20 feet bgs was submitted for analysis for HVOCs to assess the potential presence of HVOCs near AOC 2. The soil sample collected from boring MW-12B at 33 feet bgs to assess for the presence of metals in soil at AOC 5 was submitted for laboratory analysis for arsenic, cadmium, chromium, lead, and mercury by U.S. Environmental Protection Agency (EPA) Method 6020/7471A.

Reconnaissance groundwater samples were collected from borings MW-9B and MW-12B in accordance with the procedures and equipment described in the FSP (Farallon 2009a). The reconnaissance groundwater sample collected from boring MW-9B in the Shallow Water-Bearing Zone at a depth of 30 feet bgs was submitted for laboratory analysis for HVOCs to assess groundwater quality along the eastern Property boundary. Reconnaissance groundwater samples were collected from boring MW-9B in the Deep Water-Bearing Zone at a depth of 70 feet bgs and from boring MW-12B at depths of 89 and 121 feet bgs to evaluate the extent of HVOCs in groundwater. Soil and reconnaissance groundwater samples collected from select borings were submitted to OnSite Environmental Inc. of Redmond, Washington for laboratory analyses in accordance with the scope of work described in the FSP (Farallon 2009a).

3.2.2 Monitoring Well Installation and Development

A total of eight monitoring wells were installed and developed at the Site between January 21 and January 28, 2009, including monitoring well MW-17A constructed in the Shallow Water-Bearing Zone and monitoring wells MW-9B, MW-10B, MW-11B, MW-12B, MW-14C, MW-18, and MW-19 constructed in the Deep Water-Bearing Zone (Figure 2; Table 2). Monitoring well MW-17A was constructed in the Shallow Water-Bearing Zone at a total depth of 35 feet bgs. The total depths of the monitoring wells constructed in the Deep Water-Bearing Zone ranged from 56 to 127 feet bgs. All of the monitoring wells were constructed with 10 feet of screen set at the total depth of the boring. The monitoring wells were constructed in accordance with the sample locations, equipment, and procedures described in the FSP (Farallon 2009a). The boring well construction logs for the eight monitoring wells are provided in Appendix A and construction details are summarized in Table 1.

Following installation of the monitoring wells, Robinson Engineers, L.L.C. (2009) of Fife, Washington surveyed the north side of the casing and monument rim at the new monitoring wells. The horizontal coordinates for the eight new monitoring wells were referenced to the State Plane Coordinate System (Washington South Zone 5626) and the vertical survey to mean sea level (msl) (NGVD 29) using the global positioning system (Table 1). The existing monitoring wells had been surveyed by Robinson Engineers, L.L.C. (2008) to the same depth.

3.2.3 Groundwater Monitoring and Sampling

Groundwater monitoring and sampling was conducted between February 2 and February 12, 2009, including measuring groundwater levels and collecting groundwater samples from all 24 monitoring wells located on the Property, with the exceptions of monitoring well MW-8, which was inaccessible during this monitoring event, and the water-supply well. The procedures and laboratory analysis for groundwater samples collected during the February 2009 monitoring and sampling event were described in detail in the FSP (Farallon 2009a).

3.2.4 Test Pit Explorations

Ten test pits were excavated in the area where foundry fill material reportedly was stockpiled and buried along the eastern Property boundary (Figure 2). The test pits were excavated to a maximum depth of approximately 20 feet bgs using a backhoe provided by Woodworth. Soil samples were collected at various depths in accordance with ASTM International and EPA standard protocols and were classified under the Unified Soil Classification System. Ten soil samples were submitted for laboratory analysis for arsenic, cadmium, chromium, lead, and mercury by EPA Method 6020/7471A.

3.2.5 Management of Investigation-Derived Waste

Soil cuttings, decontamination water, purge water, and other wastewater generated by the RI field program were temporarily stored on the Property in labeled 55-gallon steel drums. The analytical results for the soil and groundwater samples will be used to develop a waste profile for disposal at an approved transport, storage, and disposal facility. A licensed hazardous waste transporter will manage off-Property transportation and disposal of investigation-derived waste.

3.3 REMEDIAL INVESTIGATION RESULTS

This section presents a summary of the results of the RI, including a description of soil and groundwater conditions, and summaries of groundwater monitoring and soil and groundwater analytical data.

3.3.1 Soil

This section presents a summary of the soil conditions observed and the analytical results for the soil samples collected during the RI. The soil sample locations, including borings and test pits, are depicted on Figure 2. The laboratory analytical results for the soil samples collected during the RI, as well as the soil samples collected during previous phases of investigation conducted at the Property by Farallon, are summarized in Tables 2 and 3. Figures 5 and 6 depict the analytical results for the soil samples collected on the Property. Boring logs are provided in Appendix A and laboratory analytical reports are provided in Appendix B.

3.3.1.1 Soil Conditions

The shallow sand and gravel unit is predominantly composed of poorly graded sands and gravels containing various amounts of silt from the ground surface to a depth of approximately 48 feet bgs. In some areas, the sand and gravel layer is replaced by fill material, which is largely reworked native material or imported material consisting of construction debris (Figure 9). The construction debris was observed to comprise chunks of concrete, asphalt, or brick. In addition, chalk-like debris was observed in boring MW-12B at approximately 22 feet bgs. Farallon believes that the chalk-like debris is remnants of construction drywall. Farallon relied on visual evidence during drilling and test pit explorations to identify and potentially delineate Atlas Foundry fill material. No evidence of foundry slag or metallic debris was found at the Property. Several discontinuous layers or lenses of silt and silty gravel have been encountered at depths ranging from 5 feet bgs in the southern portion of the Property to 30 feet bgs in the western portion of the Property (Figures 7, 8, and 9). The silt and silty gravel layers appear to be an aquitard at the base of the Shallow Water-Bearing Zone, but are absent from the central portion of the Property.

The deep sand and gravel layer consists of fine to coarse sand and gravel with very little fines at depths ranging from approximately 20 feet bgs in the central portion to over 120 feet bgs in the southern and northwestern portions of the Property. The deep sand and gravel unit is underlain by a silt and silty gravel layer encountered at depths ranging from approximately 77 feet bgs in boring MW-14C to 127 feet bgs in boring MW-10B (Figures 2, 7, 8, and 9). This deep silt and silty gravel unit, considered to be the base of the Deep Water-Bearing Zone, was encountered in borings MW-9B, MW-10B, MW-12, MW-14C and the water-supply well located in the central and western portions of the Property (Figure 2). The top of the deep silt and silty gravel unit dips in a westerly direction from approximately 77 feet bgs (corresponding to 203 feet above msl in monitoring well MW-14C) to 119 feet bgs (corresponding to 183 feet above msl in monitoring well MW-9B) (Figure 8).

3.3.1.2 Soil Analytical Results

Two soil samples collected from boring MW-11B were submitted for laboratory analysis for DRO and ORO by Northwest Method NWTPH-Dx. The laboratory analytical results detected concentrations of ORO exceeding the MTCA Method A cleanup level in both soil samples, which were collected at depths of 3 and 8 feet bgs (Table 2). Concentrations of DRO below the MTCA Method A cleanup level were detected in the soil samples (Table 2).

The soil sample collected from boring MW-19 at a depth of 20 feet bgs was submitted for laboratory analysis for HVOCs by EPA Method 8260B. The laboratory analytical results did not detect concentrations of HVOCs above the laboratory practical quantitation limits (PQLs) (Table 2).

One soil sample collected from boring MW-12B at a depth of 33 feet bgs and one soil sample collected from each test pit at depths ranging from 3 to 14 feet bgs were submitted for laboratory analysis for arsenic, cadmium, chromium, lead, and mercury by EPA Methods 6020/7471A. Concentrations of arsenic, chromium, and lead were detected in one or more of the soil samples above the laboratory PQLs but below the applicable MTCA cleanup level (Table 3). The laboratory analytical results did not detect concentrations of cadmium or mercury in soil above the laboratory PQLs (Table 3).

3.3.2 Groundwater

Groundwater sample locations are depicted on Figure 2. Table 1 presents a summary of groundwater level measurements and calculated groundwater elevations. The laboratory analytical results for the groundwater samples collected during the RI are summarized in Tables 4 through 7. The groundwater geochemical results are summarized in Table 8. Figures 2 and 3 depict the groundwater elevation and flow direction in the Shallow Water-Bearing Zone and Deep Water-Bearing Zone, respectively. The laboratory analytical results for groundwater are depicted on Figures 10 through 13. The laboratory analytical reports are attached in Appendix B.

3.3.2.1 Groundwater Conditions

The groundwater elevations calculated for the February 2009 monitoring event ranged from 266.78 feet above msl at monitoring well MW-9 to 280.50 feet above msl at monitoring well MW-11 in the Shallow Water-Bearing Zone (Table 1). Groundwater elevations were contoured for the Shallow Water-Bearing Zone using the February 2, 2009 water level measurements collected by Farallon (Figure 2; Table 1). The groundwater elevations for the top of the Shallow Water-Bearing Zone indicate a surface depression or low near the central portion of the Property (Figure 2). As a result, the approximate groundwater flow direction ranges from the northeast in the southwestern portion of the Property, transitioning to the north-northwest in the southern portion, eventually shifting to the west in the eastern portion of the Property (Figure 2). The general groundwater flow direction beyond the groundwater surface depression is to the north-northwest. Slight mounding in the area northwest of the roofing shredder building (Figure 2) may be attributable to the contribution of water from steam-cleaning operations conducted in that area. The approximate horizontal hydraulic gradient of the Shallow Water-Bearing Zone ranged from 0.02 to 0.04 foot per foot.

Groundwater elevations calculated for the February 2009 monitoring event ranged from 244.59 feet above msl at monitoring well MW-12B to 260.83 feet above msl at monitoring well MW-7 in the Deep Water-Bearing Zone (Table 1). The groundwater flow elevations indicate that the groundwater flow direction in the Deep Water-Bearing Zone ranges from the north in the southern portion to the east in the northern portion of the Property, eventually converging to the northeast in the eastern portion (Figure 3). The average hydraulic gradient for the Deep Water-Bearing Zone ranges from 0.01 to 0.04 foot per foot. Steeper gradients are identified in the southeastern and northeastern portions, with shallower gradients in the eastern portions of the Property.

A comparison of groundwater levels measured in monitoring wells constructed in the Shallow Water-Bearing Zone and adjacent monitoring wells located in the Deep Water-Bearing Zone provides information pertaining to the vertical gradient of groundwater. The calculated groundwater surface deviations for the February 2009 monitoring event indicate a vertical separation of 19 to 34 feet from the top of the

Shallow Water-Bearing Zone to the top of the Deep Water-Bearing Zone, indicating a downward vertical gradient. The groundwater level elevations for the monitoring wells screened in the middle and bottom of the Deep Water-Bearing Zone indicate a downward vertical gradient of 0.43 feet.

3.3.2.2 Groundwater Analytical Results

The laboratory analytical results for the groundwater samples collected during the RI detected concentrations of DRO, methylene chloride, TCE, arsenic, and lead exceeding the MTCA Method A cleanup levels. The laboratory analytical results are summarized below:

- A concentration of DRO exceeding the MTCA Method A cleanup level of 500 micrograms per liter (μg/l) was detected in the groundwater sample collected from Shallow Water-Bearing Zone monitoring well MW-11 (Table 4).
- A concentration of methylene chloride exceeding the MTCA Method A cleanup level was detected in the reconnaissance groundwater sample collected from boring MW-9B (Table 5). However, methylene chloride was flagged in the laboratory report as a common laboratory solvent and likely was introduced during sample preparation (Appendix B).
- Concentrations of TCE exceeding the MTCA Method A cleanup level of 5 μg/l were detected in the groundwater samples collected from Deep Water-Bearing Zone monitoring wells MW-2 and MW-14 (Table 6).
- Concentrations of total and dissolved arsenic and total lead were detected exceeding the MTCA Method A cleanup levels in the groundwater sample collected from Shallow Water-Bearing Zone monitoring well MW-12.
- Total arsenic was detected at a concentration exceeding the MTCA Method A cleanup level in the groundwater sample collected from Shallow Water-Bearing Zone well MW-17A. However, the detected concentration of dissolved arsenic in the same sample is below the MTCA Method A cleanup level.

The laboratory analytical results detected concentrations of 1,1,1-trichloroethane, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, and chloroform below applicable MTCA cleanup levels in groundwater samples collected from monitoring wells in both of the water-bearing zones (Table 6). Concentrations of TCE below the MTCA Method A cleanup level were detected in groundwater samples collected from monitoring wells screened in the Shallow Water-Bearing Zone (Table 6).

Concentrations of tetrachloroethene, (cis)1,2-dichloroethene, and/or chloroform below MTCA Method A cleanup levels were detected in reconnaissance groundwater samples collected from boring MW-9B at 30 and 70 feet bgs.

Concentrations of metals detected in unfiltered groundwater samples submitted for analysis for total metals were higher than the concentrations of metals detected in filtered samples submitted for analysis for dissolved metals. The laboratory analytical results indicate that the reported concentrations of total metals in the groundwater samples likely are biased high due to the turbidity of the samples.

3.3.2.3 Groundwater Geochemistry

Groundwater geochemical data were collected during the RI to evaluate the potential for natural attenuation by biodegradation to reduce concentrations of dissolved-phase HVOCs in groundwater in the Deep Water-Bearing Zone. The groundwater geochemistry was evaluated by collecting field measurements for temperature, specific conductance, pH, dissolved oxygen, ferrous iron, and oxidation-reduction potential. The groundwater samples collected from Deep Water-Bearing Zone monitoring wells were submitted for laboratory analysis for nitrate, sulfate, nitrite, methane, ethane, and ethene. The groundwater geochemical measurements and analytical results are summarized in Table 8.

The groundwater samples collected from Deep Water-Bearing Zone monitoring wells MW-9B, MW-14, MW-18, and MW-19 were submitted for laboratory analysis for geochemical parameters. The laboratory analytical results detected concentrations of nitrate ranging from 0.067 to 1.2 milligrams per liter (mg/l). Concentrations of sulfate were detected in groundwater ranging from 11 to 39 mg/l (Table 8). The laboratory analytical results detected nitrite in the groundwater samples collected from monitoring wells MW-14 and MW-19 at concentrations of 0.051 and 0.11 mg/l, respectively. Concentrations of methane were detected in the groundwater samples collected from monitoring wells MW-14, MW-18, and MW-19; and ethane and ethene from monitoring well MW-19 (Table 8).

The temperature of groundwater ranged from 7.51 to 13.83 degrees Celsius in the Shallow Water-Bearing Zone and 8.01 to 13.04 degrees Celsius in the Deep Water-Bearing Zone (Table 8). The measured specific conductance of groundwater ranged from 0.300 to 0.859 milliSiemens per centimeter in the Shallow Water-Bearing Zone and from 0.238 to 0.473 milliSiemens per centimeter in the Deep Water-Bearing Zone (Table 8). The dissolved-oxygen measurements ranged from 0.35 to 5.01 mg/l in the Shallow Water-Bearing Zone and 0.50 to 9.51 mg/l in the Deep Water-Bearing Zone (Table 8). The pH measurements of groundwater ranged from 6.42 to 9.15 in the Shallow Water-Bearing Zone and 6.49 to 7.86 in the Deep Water-Bearing Zone. The oxidation-reduction potential measurements of groundwater ranged from –99.5 to 190.4 millivolts in the Shallow Water-Bearing Zone and from –256.4 to 162.7 millivolts in the Deep Water-Bearing Zone.

Although a comparison of geochemical parameters for the groundwater samples collected from the Shallow and Deep Water-Bearing Zones indicates that the two water-bearing zones are geochemically similar, the results of the natural attenuation assessment indicate that monitoring well MW-19 appears to be in groundwater of different geochemical characteristics than the groundwater where the other three sampled monitoring wells are located. This difference may be explained by the presence of a mixing zone and interconnection between the Shallow and Deep Water-Bearing Zones in the area of

MW-14, affecting the geochemistry of groundwater in monitoring wells MW-14 and MW-18, and possibly monitoring well MW-9B. For this reason, monitoring well MW-19 groundwater quality parameters will not be used for comparison of background subsurface conditions. Because of the distance of monitoring well MW-9B from the leading edge of the HVOC plume in the Deep Water-Bearing Zone, natural attenuation parameters for the groundwater samples collected from monitoring well MW-9B will be used for comparison of background conditions. The natural attenuation parameters and geochemical indicators are summarized in Table 8.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model has been developed to identify potential or suspected sources of hazardous substances, the nature and extent of hazardous substances, contaminated media, and potential exposure pathways and scenarios in accordance with WAC 173-340-200. A preliminary conceptual site model was prepared prior to the RI to assist in the identification of data gaps in the Site characterization and to develop the scope of work for the RI. The preliminary conceptual site model was provided in the RI Work Plan (Farallon 2009a) and has been refined based on the results of the RI. The conceptual site model has been developed to meet the requirements for completion of an RI in accordance with WAC 173-340-350 and is the basis for developing technically feasible cleanup alternatives and selecting a final cleanup action.

4.1 CONSTITUENTS OF CONCERN

The Property has been used for surface sand and gravel mining and hot-mix asphalt production since its development in the mid-1940s. A mobile asphalt-testing laboratory was operated on the Property by WSDOT at some time during the 1980s or 1990s. As noted, WSDOT disposed of spent TCE on the Property. The Property also has been used to landfill various inert solid waste materials and as a treatment and recycling facility for petroleum-contaminated soil. The COPCs identified in the RI Work Plan were based on the historical uses of the Property and the results of previous environmental investigations.

The COCs specific to the AOCs on the Property are defined by the results of the RI and previous investigations conducted at the Property. The COCs are defined as the chemicals that have been detected at concentrations exceeding the cleanup levels defined in the RI.

4.1.1 Soil

The COCs exceeding the MTCA cleanup levels that have been detected in soil include DRO and ORO.

4.1.2 Groundwater

The COCs exceeding the MTCA cleanup levels that have been detected in groundwater include DRO, TCE, arsenic, and lead.

The RI Work Plan identified cadmium, chromium, mercury, and polychlorinated biphenyls (PCBs) as COPCs for the RI. Because the results of the RI did not detect concentrations of cadmium, chromium, mercury, or PCBs above regulatory cleanup levels that pose a risk to human health or the environment, these are not retained as COCs for future action. With the exception of a single groundwater sample collected in 2003 that detected concentrations of cadmium equivalent to the MTCA Method A cleanup level, historical monitoring reports indicate that concentrations of cadmium have been below the MTCA cleanup level or laboratory PQLs since 1994 (Farallon 2009a). Concentrations of chromium above MTCA Method A cleanup levels have not been detected in groundwater samples since 1999 (Farallon 2009a).

Due to the reported landfilling of foundry waste material, mercury and PCBs initially were identified in the RI Work Plan as potential COPCs (Farallon 2009a). Based on historical and previous investigation results, Farallon collected and analyzed groundwater samples from monitoring wells proximate to the foundry fill. The laboratory analytical results did not detect concentrations of mercury or PCBs above the laboratory PQLs. In accordance with the RI Work Plan, because field evidence of petroleum hydrocarbons in soil was not indicated in the test pit explorations, soil samples were not submitted for laboratory analysis for PCBs. Cadmium, chromium, mercury, and PCBs are not COCs for the Property.

4.2 SOURCES OF CONSTITUENTS OF CONCERN

The concentrations of DRO and ORO detected in soil and/or groundwater in AOC 1, AOC 2, and AOC 3 exceeding MTCA Method A cleanup levels likely are attributable to fugitive spills, leaks, and drips associated with the storage and distribution of petroleum products from aboveground and underground storage tanks, piping, and fuel dispensers; and equipment and vehicle maintenance and storage.

The concentrations of TCE detected in groundwater in AOC 4 exceeding the MTCA Method A cleanup level in groundwater likely are attributable to the operation and practices of the former WSDOT testing laboratory that used TCE for the testing of asphalt and disposed of spent TCE on the Property. The exact location of the mobile trailer-mounted former WSDOT testing laboratory is not well documented, but the unit is reported to have operated at the western end of the roofing shredder building (Figure 2). The aerial photograph from 1985 shows several structures in that area, one of which could be the former WSDOT testing laboratory (EDR 2008b). The year 1985 falls within the time frame when the WSDOT testing laboratory was present on the Property. Aerial photographs taken before and after the 1985 photograph do not show a structure that resembles a mobile laboratory in that area. In addition, the highest concentration of TCE was detected in the groundwater sample collected from monitoring well MW-14, which is located in the reported area of the former WSDOT testing laboratory (Figure 9). The distribution of TCE in groundwater detected in monitoring wells in the Shallow Water-Bearing Zone may indicate multiple locations for the former WSDOT testing laboratory. As noted, WSDOT personnel discarded spent TCE, a common solvent used in testing laboratories for asphalt batch plants, to the ground surface. The data indicate that the discarded TCE has migrated to groundwater.

The concentrations of arsenic and lead detected in groundwater in AOC 5 exceeding MTCA Method A cleanup levels likely are attributable to natural background concentrations and/or migration of groundwater from off-Property source areas and do not appear to be associated with the reported use of Atlas Foundry waste as fill material.

4.3 NATURE AND EXTENT OF CONSTITUENTS OF CONCERN

The nature and extent of hazardous substances in soil and/or groundwater was presented in the preliminary conceptual site model (Farallon 2009a). The nature and extent of COCs in each AOC has been defined by the results of the RI and previous environmental investigations, the suspected and/or confirmed source areas, and the physical conditions of the Property. The following sections summarize the physical conditions of the Property and describe the nature and extent of COCs in soil and/or groundwater in each of the AOCs.

4.3.1 Physical Conditions

Geologic and hydrogeologic information and soil and groundwater analytical data were compiled on cross-sections prepared to illustrate the conceptual model of site conditions. As shown on Cross Sections A-A', B-B', and C-C' (Figures 7, 8, and 9 respectively), the lithologic units are divided into shallow and deep sand and gravel units separated by a layer of silt and silty gravel. Below the deep sand and gravel unit is a layer of silt and silty gravel that separates the upper units from a regional aquifer.

The shallow sand and gravel unit spans from near the ground surface to a maximum depth of approximately 48 feet bgs, of which the lower portion containing groundwater has been designated herein as the Shallow Water-Bearing Zone. This shallow sand and gravel unit is underlain by a discontinuous layer of silt and silty gravel of up to 30 feet in thickness. Below this layer is the deep sand and gravel unit encountered at depths ranging from approximately 20 feet bgs in the central portion to over 120 feet bgs in the southern and northwestern portions of the Property. The deep sand and gravel unit is saturated with groundwater and has been designated herein as the Deep Water-Bearing Zone. This unit is underlain by a silt and silty gravel layer encountered at depths ranging from approximately 77 feet bgs in boring MW-14C to 127 feet bgs in boring MW-10B. This deep silt and silty gravel unit appears to be continuous across the Property and is considered to be the base of the Deep Water-Bearing Zone.

The Shallow Water-Bearing Zone is an unconfined to confined 8- to 20-foot-thick water-bearing zone, the top of which is approximately 9 to 40 feet bgs. The Shallow Water-Bearing Zone is underlain by a discontinuous aquitard (shallow silt and silty gravel), below which is the Deep Water-Bearing Zone. The Deep Water-Bearing Zone is a largely confined aquifer approximately 50 to 70 feet thick, the top of which is approximately 28 bgs in the central portion to 70 feet bgs in the northwestern portion of the Property. Recent drilling at the location of the former WSDOT testing laboratory source area indicates that the Shallow Water-Bearing Zone and the silt and silty gravel aquitard unit are absent from this location, suggesting a hydraulic connection between the two water-bearing zones. The interconnection between the two water-bearing zones is further supported by a depression or low of the piezometric surface for the Shallow Water-Bearing Zone in this area (Figure 5).

4.3.2 AOC 1: Equipment Storage Carport Area

The AOC 1 Equipment Storage Carport Area is delineated by the concentrations of ORO in soil and DRO in groundwater exceeding MTCA Method A cleanup levels (Figure 2). The laboratory analytical results for soil samples collected from boring MW-11B detected concentrations of ORO exceeding the MTCA Method A cleanup level in soil at depths of 3 and 8 feet bgs (Figure 5). The lateral extent of ORO in soil in the AOC 1 Equipment Storage Carport Area is defined to the north and west by the laboratory analytical results of soil samples collected from borings SS-11 and SS-10, respectively (Figure 5).

The depth to groundwater in the Shallow Water-Bearing Zone in the AOC 1 Equipment Storage Carport Area ranges from 6 to 11 feet bgs, indicating that soil with concentrations of ORO may be affecting groundwater quality in the Shallow Water-Bearing Zone. Concentrations of DRO exceeding the MTCA Method A cleanup level were detected in the groundwater sample collected from monitoring well MW-11 in February 2009. Monitoring well MW-11 is constructed with a screened interval in the Shallow Water-Bearing Zone (Figure 7).

The suspected source of TPH to soil and groundwater in the AOC 1 Equipment Storage Carport Area appears to be surface releases associated with spills, leaks, and drips from the storage and distribution of petroleum products from storage tanks and/or the maintenance of equipment that have infiltrated to groundwater.

4.3.3 AOC 2: Equipment Parking Area

The AOC 2 Equipment Parking Area is delineated by concentrations of ORO in soil exceeding the MTCA Method A cleanup level (Figure 2). Laboratory analytical results for soil samples collected from boring SS-6 detected concentrations of ORO exceeding the MTCA Method A cleanup level in soil at a depth of 2.5 feet bgs (Figure 5). The lateral extent of ORO in soil in the AOC 2 Equipment Parking Area is defined to the south by the laboratory analytical results of a soil sample collected from boring SS-11 (Figure 5).

Monitoring well MW-13 is located adjacent to boring SS-6 and screened from approximately 14 to 24 feet bgs within the Shallow Water-Bearing Zone. The laboratory analytical results for a groundwater sample collected from monitoring well MW-13 in October 2008 did not detect concentrations of TPH above the laboratory PQLs, indicating that soil with concentrations of ORO has not affected groundwater quality in the AOC 2 Equipment Parking Area (Figure 7).

The suspected source of TPH to soil in the AOC 2 Equipment Parking Area appears to be surface releases associated with the storage or maintenance of equipment.

4.3.4 AOC 3: Former Recycled Stockpile Area

The AOC 3 Former Recycled Stockpile Area is delineated by concentrations of DRO in soil exceeding the MTCA Method A cleanup level (Figure 2). The laboratory analytical results for soil samples collected from boring SS-12 detected concentrations of DRO exceeding the MTCA Method A cleanup level in soil at a depth of 4 feet bgs (Figure 5). The vertical extent of DRO in soil in the AOC 3 Former Recycled Stockpile Area is defined by the laboratory analytical results for the soil samples collected from boring SS-12 at 8 and 16 feet bgs (Figure 5).

The laboratory analytical results for soil samples collected from boring SS-12 at depths of 8 and 16 feet bgs did not detect concentrations of TPH above the laboratory PQLs, indicating that soil with concentrations of DRO likely is not affecting groundwater quality in the AOC 3 Former Recycled Stockpile Area.

The suspected source of TPH to soil in the AOC 3 Former Recycled Stockpile Area appears to be surface releases associated with the storage or maintenance of equipment used in the asphalt recycling process.

4.3.5 AOC 4: Asphalt-Testing Laboratory Area

The AOC 4 Asphalt-Testing Laboratory Area is delineated by detected concentrations of TCE in groundwater exceeding the MTCA Method A cleanup level (Figure 2). A plume of dissolved-phase TCE in groundwater has been detected in the Shallow Water-Bearing Zone as defined by the laboratory analytical results for groundwater samples collected from monitoring wells MW-1, MW-3, MW-4, and MW-9 and in the Deep Water-Bearing Zone as defined by the laboratory analytical results for groundwater samples collected from monitoring wells MW-2, MW-14, and MW-15 (Figure 9; Table 6). The laboratory analytical results for groundwater samples collected from the Shallow Water-Bearing Zone have detected concentrations of TCE ranging from 0.32 to 4.3 μg/l, all of which are below the MTCA Method A cleanup level of 5 μg/l (Figure 8; Table 6). Concentrations of TCE were detected in groundwater samples collected from the Deep Water-Bearing Zone ranging from 2.8 to 24 μg/l, and were detected in groundwater samples collected from monitoring wells MW-2 and MW-14 exceeding the MTCA Method A cleanup level (Figure 12).

The suspected source of TCE to groundwater is releases to the ground surface associated with the use of TCE at the former WSDOT testing laboratory, with vertical migration via gravity and infiltration of precipitation to groundwater.

The laboratory analytical results for soil samples collected from borings SS-4 and SS-5 at depths of 5 and 2 feet bgs, respectively, did not detect concentrations of TCE exceeding the laboratory PQLs (Figure 5; Table 2). Borings SS-4 and SS-5 were completed in the approximate reported location of the former WSDOT testing laboratory (Figure 2). However, based on the unknown exact location of the former WSDOT testing laboratory, the detected concentrations and the distribution of the dissolved-phase plume of TCE in groundwater and the thickness of the vadose zone in AOC 4, it is likely that concentrations of TCE exceeding the MTCA Method A cleanup level are present in soil.

Groundwater was encountered at the time of drilling in monitoring wells MW-14 and MW-14C at depths of approximately 20 and 27 feet bgs, respectively. Groundwater levels measured in monitoring wells MW-14 and MW-14C ranged from 27 to 32 feet bgs (Table 1). These data indicate that the vadose zone in AOC 4 likely is 20 to 30 feet thick and that two water-bearing zones that are discrete in other areas of the Property may be mixing and becoming one groundwater unit in AOC 4.

Monitoring wells MW-14 and MW-14C are located in the reported location of the former WSDOT testing laboratory and were constructed with screened intervals corresponding to the Deep Water-Bearing Zone. Monitoring well MW-14 is screened from approximately 50 to 55 feet bgs and monitoring well MW-14C is screened from approximately 67 to 77 feet bgs (Table 1). The vertical extent of concentrations of TCE in groundwater in AOC 4 is defined by the laboratory analytical results of the groundwater sample collected from monitoring well MW-14C (Figure 12). The vertical extent of concentrations of TCE in groundwater exceeding the MTCA Method A cleanup level can be defined from the top of the water-bearing zone, estimated at 27 feet bgs, to approximately 67 feet bgs, indicating an affected vertical zone of 40 feet.

The down-gradient extent of the dissolved-phase plume of TCE in groundwater exceeding the MTCA Method A cleanup level is defined by the laboratory analytical result for the groundwater sample collected from monitoring well MW-18. Monitoring well MW-18 is located down-gradient of monitoring well MW-14, is screened across the same water-bearing portion of the Deep Water-Bearing Zone as is monitoring well MW-14, and did not contain concentrations of TCE in groundwater above the laboratory PQLs (Figure 6; Table 12). The laboratory analytical results for groundwater samples collected from the Deep Water-Bearing Zone in monitoring wells MW-9B, MW-12B, and MW-17, located farther down-gradient, did not detect concentrations of TCE above the laboratory PQLs, confirming the limited extent of the dissolved-phase plume of TCE in the vicinity of monitoring wells MW-2 and MW-14 (Figure 12).

Historical laboratory results indicate that concentrations of TCE in groundwater samples collected from monitoring well MW-2 have decreased from 31 μg/l in 1994 (Saltbrush Environmental Service, Inc. 1994) to 14 μg/l in 2008 and 2009 (Farallon 2009a; 2009c). Similarly, concentrations of TCE in groundwater samples collected from monitoring well MW-3 have decreased from 11 μg/l in 1998 (Spectra 1995 through 2008) to 3.4 μg/l in February 2009 (Table 6). This trend of decreasing concentrations of TCE in groundwater at the Property likely is attributable to adsorption, dilution, and dispersion rather than the process of biodegradation by reductive dechlorination, as indicated by the minimal presence to lack of TCE degradation products such as dichloroethene (DCE) isomers or vinyl chloride.

4.3.6 AOC 5: Atlas Foundry Waste Area

The AOC5 Atlas Foundry Waste Area is delineated by concentrations of arsenic and lead in groundwater in the Shallow Water-Bearing Zone exceeding MTCA Method A cleanup levels (Figure 2). The laboratory analytical results for groundwater samples collected from monitoring well MW-12 detected concentrations of total and dissolved arsenic and lead exceeding MTCA Method A cleanup levels (Figure 13; Table 7). Analytical results for the groundwater samples from the Deep Water-Bearing Zone did not detect concentrations of arsenic or lead above the laboratory PQLs.

Concentrations of arsenic, chromium, copper, lead, nickel, and zinc were well below MTCA Method A or Method B cleanup levels in the soil samples collected from borings SS-7, SS-9, and MW-12B and test pits TP-1 through TP-10 at depths ranging from 3 to 33 feet bgs (Figure 6; Table 3). The analytical results for soil sampling for metals suggest that leaching of metals from the foundry waste material to groundwater is not a migration pathway. The lack of visual evidence of foundry waste fill in the area of monitoring wells MW-12 and MW-17A, supported by the laboratory analytical results for soil samples collected near these monitoring wells, suggests that concentrations of arsenic and/or lead detected in groundwater may have originated from sources off the Property or are naturally occurring. Farallon does not recommend further action to remediate low concentrations of arsenic or lead detected in groundwater in the Shallow Water-Bearing Zone.

4.4 PRELIMINARY EXPOSURE RISK ASSESSMENT

Two types of risk associated with exposure to COCs at the Site include terrestrial ecological risk and human health risk. As discussed in Section 4.5, Terrestrial Ecological Evaluation Results, the Site qualifies for a TEE exclusion based on WAC 173-340-7491. As a result, mitigating the potential human health risk associated with exposure to COCs in the affected media at the Site is the primary objective of the cleanup action. This section describes the assessment and conclusions pertaining to the exposure pathways at the Site. Identification of potential exposure scenarios has been used to evaluate technically feasible remediation technologies for the Site.

4.4.1 Soil Pathway

Direct contact via dermal contact with and/or ingestion of soil beneath the Site is the exposure pathway for shallow soil. Direct contact with soil would require excavation activities. At present, soil with concentrations of DRO and/or ORO exceeding the 2,000 milligrams per kilogram (mg/kg) level considered protective of the direct contact pathway for dermal contact and/or ingestion is covered with concrete, asphalt, and/or building structures, which makes the risk of direct contact negligible. Concentrations of HVOCs and metals above MTCA Method A cleanup levels have not been detected in soil at the Site or Property.

4.4.2 Groundwater Pathways

Potential exposure pathways for groundwater include the direct contact pathway, which comprises both the dermal contact and ingestion pathways. There are no groundwater supply wells at or in the vicinity of the Site that are used for potable water supply. The water-supply well located on the Property is used for industrial process water only and is not considered potable by the operators. Shallow Water-Bearing Zone groundwater is not used as a drinking water source and likely is a non-potable resource as defined in WAC 173-340-720(2)(b)(i) due to the nature of the subsurface lithology in the Shallow Water-Bearing Zone, which is predominantly silty sand, gravel, and silt. Deep Water-Bearing Zone groundwater underlying the Shallow Water-Bearing Zone may qualify as a potential future source of potable water. However, because of the availability of municipal water supply in the Property vicinity, there is a low probability that groundwater in the Deep Water-Bearing Zone at the Property or adjacent properties would be used as a potable water source. Because: 1) there is no practical use for the Shallow Water-Bearing Zone groundwater in the Site vicinity; 2) Shallow Water-Bearing Zone groundwater is located approximately 8 feet bgs; and 3) the ground surface is capped with concrete, asphalt, or building structures, direct contact with groundwater would require excavation activities for groundwater to become a potential risk to human health. Future redevelopment activities at the Site affecting the Shallow Water-Bearing Zone could result in exposure to contaminated groundwater.

Farallon has conducted a survey of potential receptors within a 0.5-mile radius of the Site. Data sources included a well log search on the Ecology (2003) Web site and a third-party search of government databases (EDR 2008a). Three potential receptors were initially identified 0.25 mile north to northeast of the Property, in the general direction of groundwater flow in the Deep Water-Bearing Zone. The potential receptors included a water-supply well in a mobile home park, an unidentified "single well other than collector or Ranney type" (EDR 2008a), and

Charlton Lake (U.S. Geological Survey [USGS] 1991). Further evaluation of these potential receptors revealed that the mobile home park is serviced by municipal water. No additional information was located for the unidentified well other than its depth of 29 feet bgs and installation date of April 1940. The USGS (1991) topographic map of Tacoma, Washington depicts the surface elevation of Charlton Lake as 270 feet above msl. The top of the Deep Water-Bearing Zone at the eastern Property boundary is approximately 245 feet above msl (Figure 4). If the gradient of the piezometric surface of the Deep Water-Bearing Zone at the Property is extrapolated to Charlton Lake 0.25 mile away, the top of the Deep Water-Bearing Zone is expected to be approximately 233 feet above msl, more than 35 feet deeper than the Charlton Lake level. Recent aerial photographs (Google Maps 2009) indicate that Charlton Lake is a wetland with ponding water and is overgrown with aquatic vegetation, indicative of a shallow water body. In addition, the results of the RI indicate that concentrations of HVOCs above the MTCA Method A cleanup level in groundwater in the Shallow and Deep Water-Bearing Zones have not migrated beyond Property boundaries. Therefore, both the survey and the evaluation of potential receptors indicate that the likelihood of an HVOC groundwater plume emanating at the Site and reaching these potential receptors is minimal.

4.4.3 Vapor Pathway

The presence of DRO and/or ORO in soil has the potential to result in vapor intrusion to indoor and outdoor air. Potential exposure would occur through the inhalation pathway. Because this area of the Site currently contains no structures in which vapors might accumulate, vapors would be dispersed into the atmosphere, where dilution and degradation would occur. The exposure risk posed by the vapor pathway in this area of the Site is minimal, as is the probability that outdoor air concentrations of DRO or ORO would exceed the MTCA Method A cleanup level.

Relatively low concentrations of TCE above MTCA Method A cleanup levels exist at depths below 28 feet bgs. Because this area of the Site currently contains no structures in which vapors might accumulate, the exposure risk posed by the vapor pathway is minimal.

4.5 TERRESTRIAL ECOLOGICAL EVALUATION RESULTS

A TEE is required by WAC 173-340-7490 where a hazardous substance has been released to soil. The regulation requires that one of the following actions be taken:

- Documenting of a TEE exclusion using the criteria presented in WAC 173-340-7491;
- Conducting of a simplified TEE in accordance with WAC 173-340-7492; or
- Conducting of a site-specific TEE in accordance with WAC 173-340-7493.

The Property, an active industrial facility used for asphalt production, has been significantly altered by mining. The site inspection and a survey of recent aerial photographs revealed no undeveloped land on or within 500 feet of the Property, qualifying the Property for a TEE exclusion based on WAC 173-340-7491. The results of the ranking for a simplified TEE under Table 749-1 of MTCA yielded a score of 12, which qualifies the Property to end the TEE under the criteria set forth in WAC 173-340-7491 (Appendix C). Therefore, no further consideration of ecological impacts is required under MTCA.

4.6 CONCEPTUAL SITE MODEL SUMMARY

The Property is underlain by coarse-grained soil units separated by a fine-grained soil aquitard unit underlain by another fine-grained soil unit. The coarse-grained units are groundwater-bearing and have been designated as the Shallow and Deep Water-Bearing Zones. The Shallow Water-Bearing Zone and the underlying fine-grained aquitard are discontinuous and appear to be absent in the central portion of the Property.

Concentrations of COCs detected in soil and/or groundwater exceeding the applicable MTCA cleanup levels include DRO, ORO, TCE, arsenic, and lead. The results of the RI indicate that the COPCs historically or suspected to be present and defined in the preliminary conceptual site model, including cadmium, chromium, mercury, and PCBs, have not been detected at concentrations that require remedial action to protect human health and the environment.

Likely sources of COCs to soil and groundwater at the Site include spills, leaks, and drips associated with the storage and distribution of petroleum products, equipment and vehicle maintenance, and operations associated with the former WSDOT testing laboratory.

The physical conditions of the Property and the results of the RI were considered in the identification of five AOCs on the Property in which concentrations of one or more of the COCs have been detected exceeding MTCA cleanup levels. Soil and groundwater have been impacted by releases of DRO and ORO in AOC 1. Surface releases of petroleum products have resulted in concentrations of ORO at AOC 2 and DRO at AOC 3 in soil that exceed MTCA cleanup levels. Concentrations of TCE exceeding the MTCA Method A cleanup level have been detected in groundwater and may be present in soil in AOC 4. AOC 5 consists of concentrations of arsenic and lead in groundwater exceeding MTCA Method A cleanup levels. Concentrations of COCs above the MTCA Method A cleanup levels do not migrate off the Property.

Groundwater analytical data confirm that dissolved-phase concentrations of HVOCs and the associated degradation compounds are below MTCA Method A cleanup levels in the Shallow Water-Bearing Zone. Analytical results for the groundwater samples collected from monitoring wells screened in the Deep Water-Bearing Zone detected concentrations of TCE that exceed the MTCA Method A cleanup level in AOC 4.

Vertical migration of HVOCs from the source area beneath the former WSDOT testing laboratory is evidenced by the TCE concentrations detected in groundwater samples collected from the Deep Water-Bearing Zone in monitoring wells in AOC 4. Concentrations of TCE appear to be the highest in the approximate middle of the Deep Water-Bearing Zone, and below laboratory PQLs near the base of the Deep Water-Bearing Zone. The lateral and vertical extent of TCE concentrations exceeding the MTCA Method A cleanup level in groundwater in the Deep Water-Bearing Zone has been sufficiently characterized by the existing monitoring well network.

Concentrations of arsenic and lead have been detected in groundwater samples collected from Shallow Water-Bearing Zone monitoring well MW-12 in AOC 5, located in the northeastern portion of the Property in the area of reported foundry waste material landfilling. Visual observation and analytical results for soil samples collected from test pits excavated in that area did not detect concentrations of arsenic or lead above MTCA cleanup levels. The lack of visual evidence of foundry fill in the area of monitoring wells MW-12 and MW-17A, supported by the analytical testing of soil near these monitoring wells, suggests that the arsenic and lead in groundwater may have originated from off-Property sources or are naturally occurring.

Preliminary exposure risk assessment and TEE have been conducted for the Site. There are no completed exposure pathways for the Site COCs, and the Site qualifies for a TEE exclusion based on WAC 173-340-7491. Because soil and groundwater represent the highest probable risk to human health and the environment based on the exposure pathway analysis performed, these media will be the target media for the cleanup action.

5.0 FEASIBILITY STUDY

The FS presents the evaluation of technically feasible cleanup action alternatives to facilitate selection of a final cleanup action for the Site in accordance with WAC 173-340-350(8). The Site is defined as areas where concentrations of one or more COCs exceed MTCA Method A cleanup levels in soil and/or groundwater and includes sub-areas AOC 1 through AOC 5 (Figure 2). The results of the RI provide sufficient information to select a final cleanup action for the Site that will be documented in a Cleanup Action Plan (WAC 173-340-380) and an Engineering Design Report (WAC 173-340-400).

This section identifies the cleanup action alternatives applicable to the Site that were evaluated in accordance with the MTCA requirements. The cleanup action alternatives were evaluated using the following MTCA threshold requirements:

- Protect human health and the environment;
- Comply with cleanup standards;
- Comply with applicable state and federal laws and regulations;
- Provide for compliance monitoring;
- Use permanent solutions to the maximum extent practicable; and
- Provide for a reasonable restoration time frame.

The following sections present the technically feasible cleanup alternatives evaluated for the Site and describe the screening of the alternatives.

5.1 CLEANUP ACTION OBJECTIVES

Cleanup action objectives have been established for the Site to support the identification and screening of technically feasible cleanup action alternatives that will meet the MTCA threshold requirements (WAC 173-340-360[2]). Technically feasible cleanup action alternatives that will meet the cleanup action objectives were evaluated according to the media of concern, the COCs, the cleanup standards, and other relevant considerations, including current and reasonably likely future use of the Property. The cleanup levels used for the evaluation of the cleanup action alternatives are defined as the MTCA cleanup levels for unrestricted land uses. The cleanup action objectives for the Site include:

- Protecting human health and the environment by eliminating the risks posed by the concentrations of TPH above the MTCA soil cleanup level of 2,000 mg/kg detected in soil and TPH above the MTCA groundwater cleanup level of 500 μg/l detected in groundwater;
- Protecting human health and the environment by eliminating the risks posed by the concentrations of VOCs above the MTCA Method A or B cleanup level in groundwater;

- Meeting the MTCA cleanup levels for TPH and VOCs established for soil and groundwater at the points of compliance, initially defined for soil as all soil on the Property; and for groundwater throughout the Site from the top to the bottom of the saturated zone; and
- Providing for compliance monitoring.

5.2 TECHNICALLY FEASIBLE CLEANUP ALTERNATIVES

The cleanup alternatives include remediation technologies that are combined to meet cleanup objectives at the Site. The following broad categories of cleanup alternatives were evaluated for the Site:

- Institutional controls and monitoring;
- Removal and disposal;
- Ex-situ treatment; and
- In-situ treatment.

The technically feasible cleanup action alternatives for the Site were evaluated based on the nature and extent of contamination, practicability, and specific Site conditions to meet the cleanup action objectives.

5.3 CLEANUP ACTION ALTERNATIVE SCREENING

A comprehensive list of cleanup action alternatives were developed and screened to develop the technically feasible cleanup action alternatives applicable to the Site. The evaluation criteria used to qualitatively evaluate and compare applicable cleanup action alternatives are defined in WAC 173-340-360(3)(f) and include:

- Protectiveness: The overall protectiveness of human health and the environment, including: 1) the degree to which existing risks are reduced; 2) the time required to reduce risk at the Site and attain cleanup standards; 3) on-Site risks resulting from implementing the alternative; and 4) improvement of overall environmental quality.
- Permanence: The degree to which the alternative permanently reduces the toxicity, mobility, or volume of hazardous substances, including: 1) the adequacy of the alternative in destroying the hazardous substances; 2) the reduction or elimination of hazardous substance releases and sources of releases; 3) the degree of irreversibility of waste treatment process; and 4) the characteristics and quantity of treatment residuals generated.
- Cost: The cost to implement the alternative, including the cost of construction, the net present value of any long-term costs, and Ecology oversight costs recoverable under the VCP. Long-term costs include operation and maintenance costs, monitoring costs, and reporting costs.

- Long-Term Effectiveness: The degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time that hazardous substances are expected to remain on-Site at concentrations exceeding cleanup levels, and the magnitude of residual risk with the alternative in place. The following types of cleanup action components, in descending order of effectiveness may be used as a guide to assess the relative degree of long-term effectiveness: 1) reuse or recycling; 2) destruction or detoxification; 3) immobilization or solidification; 4) on- or off-Site disposal in an engineered, lined, and monitored facility; 5) on-Site isolation or containment with attendant engineering controls; and 6) institutional controls and monitoring.
- Management of short-term risks: The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of the measures that will be taken to manage such risks. This criterion includes risks to workers implementing the cleanup alternative.
- Technical and administrative implementability: The ability of the alternative to be implemented, including consideration of whether the alternative is technically feasible, administrative and regulatory requirements, permitting, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing operations at the Site.
- Consideration of public concerns: Whether the community has concerns regarding the alternative, and if so, the extent to which the alternative addresses those concerns.

An initial screening of applicable remediation technologies for cleanup of soils with concentrations of TPH above the MTCA cleanup levels and groundwater with concentrations of TPH and VOCs above the MTCA cleanup levels was conducted to eliminate technologies that did not meet the above criteria. A number of remediation technologies were eliminated during the initial screening process conducted in accordance with WAC 173-340-350(8)(b). These technologies included, but were not limited to, soil flushing (co-solvents) and extraction; steam flushing and extraction; and thermal resistive heating. Although Farallon initially considered "no action," this alternative did not meet the cleanup action objectives, the protectiveness criteria, and/or permanence minimum requirements. Therefore, the "no action" alternative was eliminated.

Cleanup action alternatives that did not meet the initial screening criteria were considered not acceptable and were removed from further consideration. The technically feasible cleanup alternatives retained for consideration are summarized in Table 9 and discussed below.

5.3.1 Cleanup Action Alternatives for TPH in Soil

The technically feasible cleanup action alternatives evaluated for soil with concentrations of TPH above the MTCA cleanup levels at the Site in areas AOC 1, AOC 2, and AOC 3 (Figure 2), and included:

- Institutional controls and monitoring;
- In-situ treatment by soil vapor extraction (SVE); and

- Removal by excavation and disposal or recycling.

A description of each of the technically feasible cleanup action alternatives for cleanup of TPH in soil and the screening results for each are provided below.

5.3.1.1 Institutional Controls and Monitoring

Institutional controls and monitoring would protect human health and the environment from concentrations of TPH above the MTCA cleanup levels in soil using environment management and restrictions placed on the Property use and development. Long-term maintenance and monitoring would be required to ensure continued effectiveness of this cleanup action alternative. Institutional controls may include installation or maintenance of an impermeable cap, application of engineering controls, and establishment of deed restrictions to prevent exposure to TPH. Periodic site inspections, maintenance of the cap, and other physical components of the institutional controls would be involved.

This cleanup action alternative would protect human health and the environment, but would not comply with cleanup standards or applicable state and federal laws because soil with concentrations of TPH above MTCA Method A cleanup levels would remain on the Site. Although concentrations of TPH in groundwater would be minimally reduced due to dilution and dispersion, concentrations of TPH in groundwater would not be actively cleaned up. This cleanup action alternative does not support potential future uses of the Property, which may include commercial or residential development. Therefore, this cleanup alternative was not retained for further consideration.

5.3.1.2 In-Situ Treatment by Soil Vapor Extraction

SVE is a method of in-situ soil treatment that involves application of a vacuum to horizontal and/or vertical vapor extraction wells to induce air flow through the contaminated vadose zone soil. Contaminants sorbed onto soil particles or dissolved in soil moisture desorb to the vapor phase and are drawn to the extraction points. The vapors may then be treated, if necessary, and discharged to the atmosphere. SVE is most effective with homogeneous, high-permeability soil and volatile COCs. SVE is not as effective in reducing non-volatile COC concentrations in soil, such as DRO and ORO, which are the COCs in soil at the Site.

Because of the limited effectiveness of SVE on DRO and ORO, this cleanup action alternative would not protect human health or the environment, comply with cleanup standards, or comply with applicable laws because soil with concentrations of DRO and ORO above MTCA Method A cleanup levels would remain on the Site. Therefore, this cleanup action alternative was not retained for further evaluation.

5.3.1.3 Removal by Excavation and Disposal or Recycling

This cleanup action alternative includes excavation of soil with concentrations of TPH above the MTCA Method A cleanup levels within practicable excavation limits and disposal off the Property or recycling by incorporating the soil into asphalt produced at the Property or at an off-Property facility. This cleanup action alternative would protect human health and the environment by removing the soil with concentrations of TPH that present a risk to human health or the environment. Disposal or recycling of soil would permanently eliminate the contamination from the Site, comply with applicable state and federal laws, provide for compliance monitoring, and support potential future uses of the Property. This alternative provides a permanent remedy within the limits of practicability that meets the threshold requirements. Therefore, this alternative has been retained for further evaluation.

5.3.2 Description of Cleanup Action Alternatives for Groundwater

The technically feasible cleanup action alternatives evaluated for groundwater with concentrations of TPH or VOCs above the MTCA cleanup levels include:

- In-situ physical treatment by air sparging/soil vapor extraction (AS/SVE);
- In-situ chemical treatment;
- Ex-situ physical/chemical treatment (assuming groundwater extraction);
- Enhanced anaerobic bioremediation of VOCs;
- Enhanced aerobic bioremediation of TPH; and
- Monitored natural attenuation (MNA).

Each of these alternatives and the screening results are described below.

5.3.2.1 In-Situ Physical Treatment by AS/SVE

Air sparging (AS) is a method of in-situ physical groundwater treatment that involves injecting pressurized air into the saturated zone below groundwater with concentrations of VOCs above the MTCA Method A cleanup levels. As the injected air rises through the saturated zone, VOCs such as TCE in soil and/or groundwater volatilize into the injected air. The AS is coupled with SVE, which removes the soil vapor with VOCs for discharge to the atmosphere. This technology is evaluated for treatment of groundwater with concentrations of VOCs.

In-situ physical treatment of groundwater by AS/SVE can be enhanced by concurrent injection of ozone gas into the water-bearing zone with the AS treatment system. Ozone is a strong oxidant capable of destroying a wide range of VOCs, including TCE. Augmentation of AS/SVE technologies with ozone injection likely would accelerate the overall cleanup process and shorten the time frame of the cleanup action.

A potential disadvantage of AS/SVE for cleanup of VOCs in groundwater includes implementability challenges due to the large lateral and deep vertical extent of the treatment area and the discontinuous nature of the subsurface conditions. A disadvantage of using ozone in conjunction with AS/SVE technologies is the higher costs that are associated with construction of the treatment system due to increased system complexity, the required use of corrosion-resistant construction materials due to the corrosive nature of ozone, and the potential increase in operation and maintenance costs.

This cleanup action alternative would protect human health and the environment, comply with cleanup standards, and comply with applicable laws by reducing concentrations of VOCs in groundwater at the Site. Based on a conceptual system design that does not include ozone augmentation, it is estimated that eight AS wells installed approximately 70 feet bgs and eight SVE wells screened within the vadose zone would be required to address VOC groundwater contamination. In addition to the AS and SVE wells, a treatment compound that includes a control array, compressors, blowers, and possibly vapor treatment would be required. A pilot test of the feasibility of implementing AS/SVE technologies at the Site is recommended to evaluate the effectiveness of the system and provide data for design of the remedial system. This cleanup action alternative has been retained for further consideration.

5.3.2.2 In-Situ Chemical Treatment

In-situ chemical treatment involves injection of a chemical oxidant such as hydrogen peroxide, potassium permanganate, or sodium permanganate into groundwater to treat VOCs in groundwater. This cleanup action alternative would protect human health and the environment and comply with cleanup standards by permanently reducing concentrations of VOCs in groundwater. However, successful chemical treatment is dependent on adequate contact between the oxidant and the VOCs, and injection of a sufficient amount of oxidant to oxidize naturally occurring organic compounds in soil as well as the VOCs.

The vertical and horizontal extent of concentrations of VOCs in groundwater exceeding the MTCA Method A cleanup level would require a large number of injection points at varying depths through the water-bearing zones to distribute oxidant and ensure contact between the oxidant and contaminants. The extent of low concentrations of VOCs in groundwater at the Site would require a large volume of oxidant to oxidize natural occurring organic compounds and VOCs to achieve cleanup goals. The injection wells used for in-situ chemical treatment would require registration in the Ecology Underground Injection Control Program. The types and concentrations of oxidants approved by Ecology for use for in-situ chemical treatment are limited. The cost and complexity of implementing such an approach would be excessive. Therefore, this cleanup action alternative has not been retained for future consideration.

5.3.2.3 Ex-Situ Physical/Chemical Treatment

Ex-situ physical/chemical treatment involves a combination of extraction, treatment, and post-treatment of groundwater to provide hydraulic containment and reduce concentrations of VOCs in groundwater. A groundwater extraction system would be used to remove groundwater from the water-bearing zone, followed by aboveground treatment, if required, and discharge. This cleanup action alternative would protect human health and the environment, comply with cleanup standards, and comply with applicable laws by reducing concentrations of VOCs in groundwater. However, the large volume of groundwater would require years to pump, treat, and dispose, precluding the ability to meet threshold requirements within a reasonable restoration time frame. Therefore, this cleanup action alternative was not retained for future consideration.

5.3.2.4 Enhanced Anaerobic Bioremediation of VOCs

Enhanced anaerobic bioremediation involves injecting a solution consisting of a slow-release carbon source and electron donor, non-ionic surfactants, nutrients, and a specific bacteria strain (*Delhaloccoides* sp.) into the water-bearing zone to stimulate reductive dechlorination through long-term anaerobic biodegradation of TCE and its degradation compounds dichloroethenes and vinyl chloride to nonhazardous by-products. The feasibility of enhanced anaerobic bioremediation as a cleanup action alternative is dependent on subsurface conditions and the biodegradation processes naturally occurring in groundwater at the Site.

The results of the RI indicate that groundwater conditions at the Site are predominantly aerobic. The lack of TCE degradation products detected in groundwater indicates that biodegradation processes likely are not prevalent. The reduction in TCE concentrations over time appears to be the result of dilution and dispersion rather than degradation. With no existing biodegradation occurring, the success of this treatment alternative is unlikely. Therefore, this cleanup action alternative was not retained for future consideration.

5.3.2.5 Enhanced Aerobic Bioremediation of TPH

Enhanced aerobic bioremediation technology involves introducing chemical compounds into groundwater that release oxygen as the TPH compounds degrade over time, such as the Regenesis product Oxygen Release Compound (ORC). The released oxygen is used by aerobic microorganisms to accelerate biodegradation of the TPH. ORC is a fine, powdery material consisting of phosphate-intercalated magnesium peroxide that can be applied by injection of a slurry mixture, use of filter socks for direct emplacement into monitoring wells, or direct application to excavated areas. This technology is evaluated for treatment of TPH-contaminated groundwater within AOC 1.

Enhanced aerobic bioremediation alone is unlikely to meet the threshold requirements within a reasonable time frame. However, enhanced aerobic bioremediation coupled with removal of the source of the contamination (soil) would provide an effective cleanup action alternative for addressing concentrations of TPH in groundwater in AOC 1. This cleanup action alternative would protect human health and the environment, comply with cleanup standards, and comply with applicable laws by resulting in permanent elimination of TPH in groundwater. Therefore, this alternative has been retained for further evaluation.

5.3.2.6 Monitored Natural Attenuation

MNA relies on natural processes, including natural biodegradation, dispersion, dilution, sorption, volatilization, chemical or biological stabilization, transformation, or destruction to achieve the cleanup levels for groundwater. Natural attenuation processes reduce the mass, toxicity, mobility, volume, and/or concentrations of contaminants in groundwater.

The evaluation of MNA as a feasible cleanup alternative for the Site was based on primary and secondary lines of evidence that include evaluation of plume geometry and stability, and geochemical indicators of naturally occurring biodegradation. The results of the analysis of natural attenuation conducted as part of the RI indicate that subsurface groundwater conditions are predominantly aerobic, with little or no prevalent reducing conditions that are necessary to support VOC degradation. These results indicate that naturally occurring biodegradation is not active at the Site; therefore, the primary natural attenuation processes prevalent are likely dilution and dispersion. Dilution and dispersion can be relied on as a cleanup action only if the incremental costs of active remedial measures over the costs of dilution and dispersion grossly exceed the incremental degree of benefits of active remedial measures over the benefits of dilution and dispersion (WAC 1732-340-360[2][(g]).

MNA may be a feasible remedial alternative for groundwater with concentrations of VOCs that relies on dilution and dispersion to meet cleanup action objectives. Further evaluation of MNA may be considered in the future if the costs to implement active remedial actions are disproportionate to the benefit achieved.

5.4 CLEANUP ACTION ALTERNATIVE SCREENING SUMMARY

This section presents a summary of the results of the screening process of the feasible remedial alternatives for the treatment of TPH in soil at areas AOC 1, AOC 2, and AOC 3, and for the groundwater treatment of TPH in AOC 1 and VOCs. A summary of the feasible remedial alternatives is presented in Table 9.

5.4.1 TPH in Soil

The results of the feasibility study analysis for institutional controls and monitoring as a cleanup action alternative for TPH in soil indicate cleanup standards would not be met in a reasonable timeframe due to the lack of an active treatment method. Therefore, institutional controls and monitoring is not considered a feasible alternative for the cleanup of TPH in soil for areas AOC 1, AOC 2, and AOC 3.

The results also indicate that the use of in-situ treatment by SVE would not meet remedial action objectives within a reasonable time frame for the cleanup of TPH in soil at AOC 1, AOC 2, and AOC 3. The presence of non-volatile organic compound components of ORO and DRO, which are not amenable to this technology, prevent in-situ treatment by SVE from being considered a feasible cleanup alternative for TPH in soil. Therefore, SVE is not considered a feasible alternative for cleanup of TPH in soils for areas AOC 1, AOC 2, and AOC 3.

The cleanup action alternative for soil retained for further evaluation consists of excavation and disposal or recycling of soil with concentrations of TPH exceeding MTCA Method A cleanup levels. The selected cleanup action alternative will meet the remedial action objectives, and will provide permanent elimination or reduction in the toxicity, mobility, and volume of hazardous substances in soil at AOC 1, AOC 2, and AOC 3.

5.4.2 VOCs and TPH in Groundwater

The results of the feasibility study analysis indicate that the use of in-situ chemical treatment as a cleanup action alternative for VOCs in groundwater would meet the cleanup action objectives in a reasonable time frame. However, it would not be economical to apply this technology due to large horizontal extent and increased vertical depth of contamination, and the volume of groundwater that requires treatment. Therefore, in-situ chemical treatment of VOCs in groundwater is no longer considered a feasible cleanup alternative.

The results indicate that the use of ex-situ physical or chemical treatment of groundwater with concentrations of VOCs would not meet threshold requirements within a reasonable time frame. The large volume of groundwater that requires treatment eliminates ex-situ physical or chemical treatment from consideration as feasible cleanup alternatives for VOCs in groundwater.

Feasibility study analysis indicated that the use of enhanced anaerobic bioremediation to reduce concentrations of VOCs in groundwater will not meet threshold requirements of MTCA. Enhanced anaerobic bioremediation is not economically feasible and will not likely meet cleanup action objectives within a reasonable time frame. Therefore, enhanced anaerobic bioremediation is no longer considered a feasible alternative for the cleanup of VOCs in groundwater.

Results of the RI and the FS analysis for MNA of VOCs in groundwater may meet cleanup action objectives although not in a reasonable time frame. Therefore, MNA will not be considered a feasible cleanup alternative for the treatment of groundwater with concentrations of VOCs in AOC 4 at this time. However, if future evaluations of the selected cleanup alternatives prove to be cost disproportionate to their benefit, MNA may be reconsidered.

The cleanup action for TPH in alternative for groundwater at AOC 1 retained for further evaluation involves the use of enhanced aerobic bioremediation to reduce concentrations of TPH. The enhanced aerobic bioremediation would be implemented following TPH source removal by soil excavation. When completed in conjunction with source removal, enhanced aerobic bioremediation would meet threshold requirements of MTCA and achieve cleanup action alternatives within a reasonable time frame and is economically feasible.

The cleanup action alternative for groundwater retained for further evaluation involves in-situ physical treatment of VOCs in groundwater by AS/SVE. AS/SVE would meet threshold requirements of MTCA and the cleanup action objectives in a reasonable timeframe and is economically feasible.

5.5 SELECTED CLEANUP ACTION ALTERNATIVES

The selected cleanup action alternatives consist of a combination of technologies to remediate TPH in soil and TPH and VOCs in groundwater. The selected cleanup actions include;

- TPH in soil: Removal by excavation and disposal or recycling of soil with concentrations of TPH above the MTCA Method A cleanup level;
- TPH in groundwater: Source removal by soil excavation and enhanced aerobic bioremediation by the application of an enhancing agent (ORC or similar) in AOC 1 to backfill soils at the base of the excavation; and
- VOCs in groundwater: In-situ physical treatment by AS/SVE for groundwater with concentrations of VOCs in groundwater above the MTCA Method A Cleanup Levels.

The cleanup action alternatives for groundwater will require performance and compliance monitoring until the analytical results of groundwater sampling demonstrate that concentrations of TPH and/or VOCs are below MTCA Method A cleanup levels for four consecutive quarters.

5.5.1 Protection of Human Health and the Environment

The selected cleanup action will protect human health and the environment by excavating soil with concentrations of TPH above MTCA cleanup levels within practicable excavation limits. The selected groundwater cleanup action alternative will protect human health and the environment through permanent removal and/or destruction of TPH and/or VOCs to below MTCA cleanup levels.

5.5.2 Compliance with Cleanup Standards

The selected cleanup action will comply with cleanup standards by meeting MTCA cleanup levels for TPH in soil and TPH and/or VOCs in groundwater at the points of compliance. Soil and groundwater are defined as preliminary points of compliance throughout the Site. The final points of compliance for soil and groundwater will be defined in the Cleanup Action Plan.

5.5.3 Compliance with Applicable State and Federal Laws

The selected cleanup action alternatives will comply with the requirements of MTCA and applicable federal laws. The cleanup action will be conducted as an independent cleanup action under the Ecology VCP in accordance with MTCA requirements.

5.5.4 Provision for Compliance Monitoring

The selected cleanup action alternatives for soil will provide for compliance monitoring during excavation activities through the collection of soil performance and confirmation samples. Compliance monitoring following completion of the excavation activities will consist of groundwater will include monitoring and sampling at the points of compliance. Compliance monitoring for groundwater monitoring and sampling at the points of compliance will be performed during and after operation of the remediation system.

5.5.5 Permanence

The selected cleanup action alternative for soil will result in immediate and permanent achievement of cleanup action objectives. It is anticipated that soil with concentrations of TPH exceeding the MTCA Method A cleanup levels within practicable excavation limits can be removed from the Site and disposed or recycled by the asphalt recycling facility located on the Property. Soil with concentrations of TPH above MTCA cleanup levels will not be left in-place at the Site to the extent practicable.

The cleanup action alternative for VOCs in groundwater includes active treatment over a time period estimated to range from 1.5 to 3 years. The cleanup action alternative for TPH in groundwater will include passive treatment after source removal (soil excavation), which is likely to meet cleanup levels within 3 years. The selected cleanup action alternatives will result in permanent achievement of cleanup action objectives for groundwater.

5.5.6 Reduction of Toxicity, Mobility, and Volume of Contaminants

The selected cleanup action alternative for soil will immediately and permanently eliminate the volume of TPH in soil at the Site, resulting in permanent elimination of contaminant toxicity and mobility. The selected cleanup action alternatives for groundwater will result in permanent removal of contaminant toxicity, mobility, and volume through destruction over time.

5.5.7 Short-Term Risks

The cleanup action alternatives involve short-term risks associated with the excavation, handling, and sampling of soil and/or groundwater with concentrations of TPH and/or VOCs above the MTCA cleanup levels. Potential short-term risks to human health from vapors, dust emissions, and truck traffic would be increased during cleanup activities. Dust control and air-monitoring programs would effectively minimize these short-term risks. There are no short-term risks associated with application of ORC or equivalent at the Site.

5.5.8 Implementability

The cleanup action alternatives can be readily implemented at the Site. Excavation and transportation of soil with concentrations of TPH is a common practice that has proven successful at other facilities. Current operations at the Site provide unrestricted access to soil with concentrations of TPH above the MTCA cleanup levels. Soil with concentrations of TPH above MTCA cleanup levels can be accessed and removed using standard excavating equipment.

Implementation of AS/SVE for groundwater will require shallow excavation or trenching for installation of underground piping, drilling for installation of AS/SVE wells, and construction activities to connect the AS/SVE wells to the mechanical system equipment through underground piping. Although current operations at the Site may be temporarily disrupted, the excavation, drilling, and construction activities likely could be completed in less than 1 month, and operations could return to normal after that time. Operation of the AS/SVE system will not interfere with current operations.

Implementation of enhanced aerobic bioremediation as part of the cleanup action alternative requires application of an enhancing agent (ORC or equivalent) and a performance groundwater monitoring program over time. Application of an enhancing agent consists of mixing the powdery product with excavation backfill. A limited number of monitoring points for collection of groundwater to monitor biodegradation over time will be used. The equipment and methods used to sample and analyze groundwater are easily available. Enhanced aerobic bioremediation of groundwater is readily implementable.

5.5.9 Restoration Time Frame

The selected cleanup action alternatives will meet threshold requirements and cleanup action objectives in a reasonable restoration time frame. Removal and off-Site disposal of soil with concentrations of TPH exceeding MTCA Method A cleanup levels will result in immediate achievement of cleanup action objectives in soil. The selected cleanup action alternatives for groundwater involve a longer-term solution to meeting cleanup action objectives; however, the estimated time frame to meet the cleanup action objectives for groundwater is reasonable.

5.6 FEASIBILITY STUDY SUMMARY

The information provided in this RI/FS Report is sufficient to identify and screen technically feasible cleanup action alternatives, and to select a final cleanup action for the Site that meets the MTCA threshold requirements. The technically feasible cleanup action alternatives screened were based on the nature and extent of contamination, practicability, and specific Site conditions. A comprehensive list of cleanup action alternatives were developed and screened to select technically feasible alternatives applicable to Site conditions. The criteria used to qualitatively evaluate potentially applicable cleanup action alternatives were derived from WAC 173-340-360(3)(f).

Farallon considered a number of remediation technologies for application to the Site conditions to clean up soil with concentrations of TPH above the MTCA Method A cleanup levels and groundwater with concentrations of TPH or VOC above the MTCA Method A cleanup levels. The technologies included a broad category of alternatives such as institutional controls and monitoring, removal and disposal, ex-situ treatment, and in-situ treatment. The technically feasible cleanup alternatives for TPH in soil that were considered and further evaluated included institutional controls and monitoring, in-situ treatment by SVE, and excavation and disposal or recycling. The technically feasible cleanup alternatives for cleanup of TPH or VOCs in groundwater that were considered and further evaluated included in-situ chemical treatment, removal and ex-situ physical/chemical treatment, enhanced anaerobic bioremediation of VOCs, enhanced aerobic bioremediation of TPH, and monitored natural attenuation.

The selected cleanup actions will meet the cleanup objectives for the Site at reasonable cost and within a reasonable time frame. The selected cleanup alternatives include:

- Removal and disposal or recycling of soil with concentrations of TPH exceeding the MTCA cleanup levels within practicable excavation limits in areas AOC 1, AOC 2, and AOC 3;

- Source removal with enhanced aerobic bioremediation for groundwater containing concentrations of TPH exceeding MTCA cleanup levels in AOC 1; and
- AS/SVE for groundwater containing concentrations of VOCs exceeding the MTCA cleanup levels.

The selected cleanup action alternatives will meet threshold requirements and provide a permanent reduction in the toxicity, mobility, and volume of hazardous substances in soil and groundwater at the Site to the maximum extent practicable. These alternatives are technically appropriate and implementable given the nature and extent of the contamination, soil and groundwater conditions, and current and likely future uses of the Property.

6.0 BIBLIOGRAPHY

Armstrong, J. E., D. R. Crandell, D. J. Easterbrook, and J. B. Noble. 1965. "Late Pleistocene Stratigraphy and Chronology in Southwestern British Columbia and Northwestern Washington." *Geological Society of America Bulletin* 76 (no. 3): 321-330.

ATEC Associates, Inc. 1991. *Hazardous Material Response Plan for Groundwater Contamination at the Planned Soil Recycling Facility at the Lakeview Gravel Pit.* Prepared for Woodworth & Company, Inc. April 29.

Borden, R. K., and K. G. Troost. 2001. *Late Pleistocene Stratigraphy in the South-Central Puget Lowland, Pierce County, Washington.* Washington Division of Geology and Earth Resources Report of Investigations 33. December.

Brooks, Cedric "Butch." 2008 Personal Communication. December.

Environmental Data Resources, Inc. (EDR). 2008a. *The EDR Radius Map Report with GeoCheck, Woodworth Lakeview Gravel Pit, 2800 104th St S, Lakewood, WA.* July 15.

———. 2008b. *Historical Aerial Photographs for Woodworth Lakeview Gravel Pit, 2800 104th St S, Lakewood, WA.* 1946, 1969, 1979, 1985, 1992, 1996, 2000, and 2003. July 15.

Farallon Consulting, Inc. (Farallon). 2009a. *Remedial Investigation Work Plan, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499.* Prepared for Woodworth & Company, Inc. January 26.

———. 2009b. *Addendum to Remedial Investigation Work Plan, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499.* Prepared for Woodworth & Company, Inc. January 30.

———. 2009c. *Remedial Investigation/Feasibility Study Report, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499.* Prepared for Woodworth & Company, Inc. In progress.

Google Maps. 2009. Aerial Photograph. Maps. <http://www.google.com/maps>. (May 2009.)

PAC-TECH Engineering, Inc. 1993. *Plan of Operation for Woodworth & Company, Inc. Lakeview Facility.* Prepared for Woodworth & Company, Inc. May.

Pierce County, Washington. 2008. *Public GIS, Parcel Viewer and Property Tax Information.* <http://matterhorn.co.pierce.wa.us/publicgis/>. (July through December 2008.)

Robinson & Noble, Inc. 1991a. *Monitoring Well Recommendations/Hydrogeologic Information for Proposed Soil Recycling Facility at the Lakeview Pit.* Prepared for Woodworth & Company, Inc. April 3.

———. 1991b. *Supplemental Data Submittal for Ecology Regarding Lakeview Recycling Facility in Response to Comments , which are Included with Letter.* Prepared for Woodworth & Company, Inc. April 30.

Robinson Engineers, L.L.C. 2008. Survey of Site Monitoring Wells. September and October.

———. 2009. Survey of Site Monitoring Wells. February.

Saltbrush Environmental Service, Inc. 1994. *Fourth Quarter GW Sampling Report.* Prepared for Woodworth & Company, Inc. December 2.

Spectra Laboratories, Inc (Spectra). 1995 through 2008. Quarterly Groundwater Sampling Reports. Prepared for Woodworth & Company, Inc. February 10, 1995 through January 30, 2008.

Tacoma-Pierce County Health Department (TPCHD). 2003. *Source Protection Programs/Site Hazard Assessment for Woodworth & Company, Inc. Lakeview Pit.* August 2003 Update.

Troost, K.G. In Review. *Geologic Map of the Tacoma South 7.5-Minute Quadrangle, Washington.* U.S. Geological Survey Miscellaneous Field Investigation.

U.S. Department of the Air Force. 1995. *Final CY 1994 Annual Report, Long Term Monitoring Program, McChord Air Force Base*. June.

U.S. Department of Commerce. 2007. *United States Census 2007.* U.S. Department of Commerce. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. October.

U.S. Geological Survey (USGS). 1991. *7.5-Minute Quadrangle Tacoma, Washington.*

Walters, K. L., and G. E. Kimmel. 1968. *Ground-Water Occurrence and Stratigraphy of Unconsolidated Deposits, Central Pierce County, Washington: Olympia, Wash.* Washington State Department of Water Resources Water Supply Bulletin 22.

Washington State Department of Ecology (Ecology). 1995. Letter Regarding Independent Remedial Action Report, Diesel Fuel Release, Post Trucking Facility, January 12, 1994 Performed by Summit Envirosolutions. May 17.

———. 2001a. *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies*. Publication No. 01-03-003. February.

———. 2001b. *Model Toxics Control Act Cleanup Levels & Risk Calculations Version 3.1.* Publication No. 94-145. Revised November.

———. Well Logs. February 12, 2003. <http://apps.ecy.wa.gov/welllog/MapSearch/viewer.htm?&FASTSTART=YES&SESSIONID=651490206>. (May 2009.)

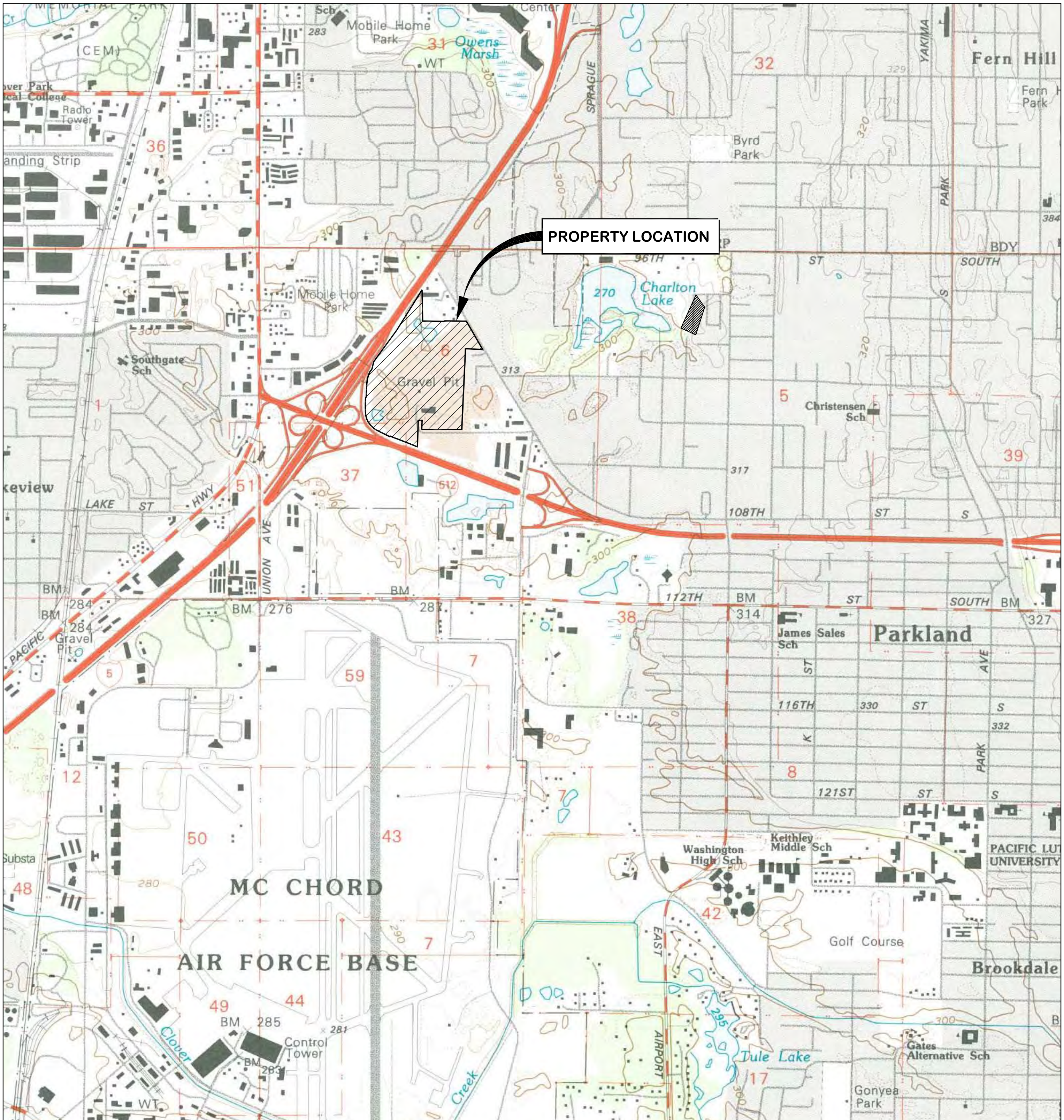
———. 2005. *Guidance on Remediation of Petroleum-Contaminated Ground Water by Natural Attenuation.* Toxics Cleanup Program. Publication No. 05-09-091, Version 1.0. July.

Western Regional Climate Center. *Seattle University of Washington (457478), Period of Record Monthly Climate Summary, 1971 to 2000 Monthly Climate Summary.* No date. <http://www.wrcc.dri.edu/CLIMATEDATA.html>. (December 2008.)

FIGURES

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001



REFERENCE: 7.5 MINUTE USGS QUADRANGLE TACOMA SOUTH, WASHINGTON. DATED 1991

WASHINGTON

N

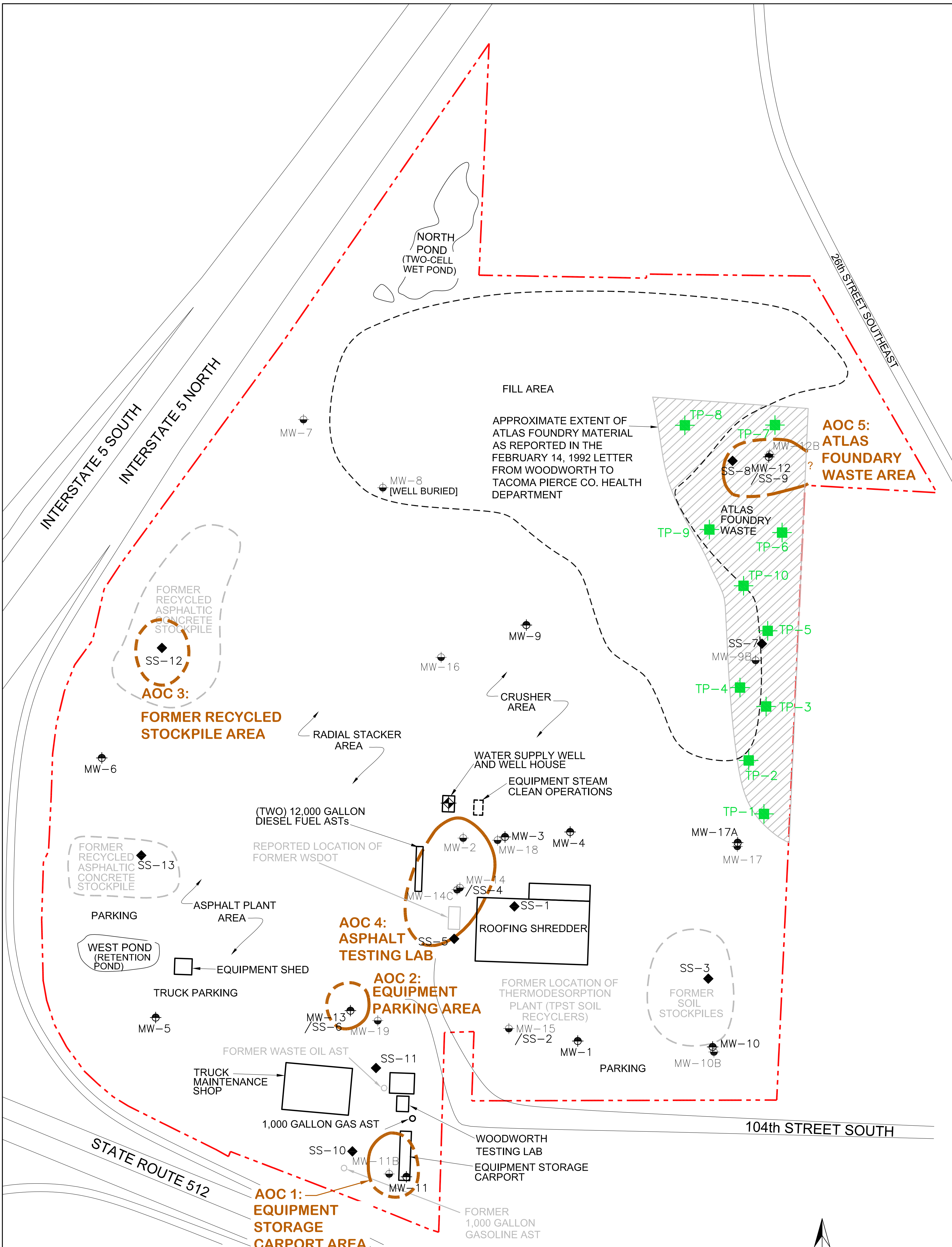
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 1

PROPERTY VICINITY MAP
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 8/20/09	Disk Reference: 188001



LEGEND

- PROPERTY BOUNDARY
- AREAS OF CONCERN (AOCS), COLLECTIVELY COMPRISE THE SITE
- FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.
- MW-11 MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- MW-15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- SS-10 SOIL SAMPLE
- TEST PIT

WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

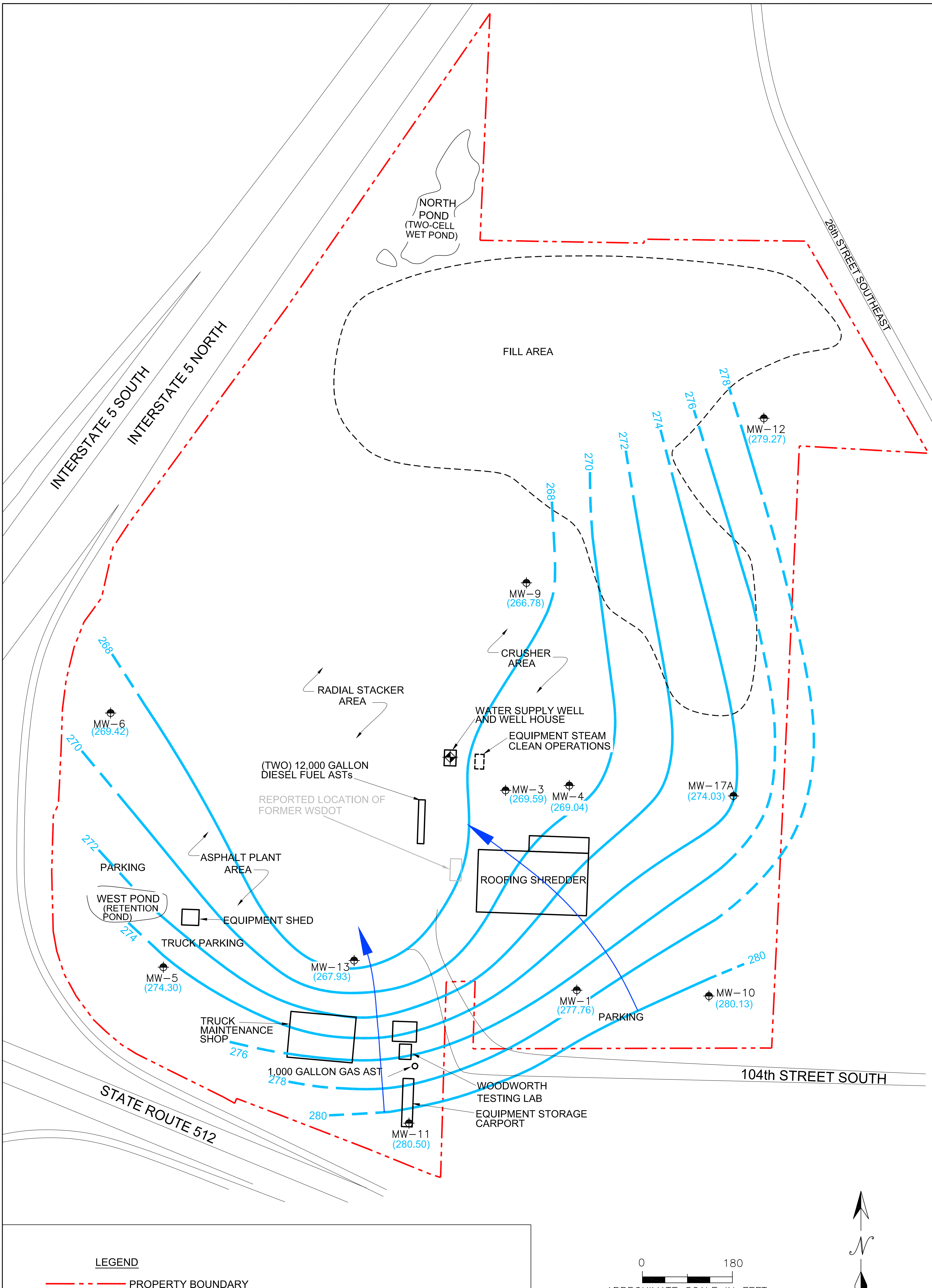
ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED.
MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 2
PROPERTY MAP
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 8/20/09	Disk Reference: 188001



LEGEND

PROPERTY BOUNDARY

MW-6 MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE

EXTRACTION WELL

(269.42) GROUNDWATER ELEVATION (FEBRUARY 2009)

270 GROUNDWATER ELEVATION CONTOUR, DASHED WHERE INFERRED

APPROXIMATE DIRECTION OF GROUNDWATER FLOW

WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

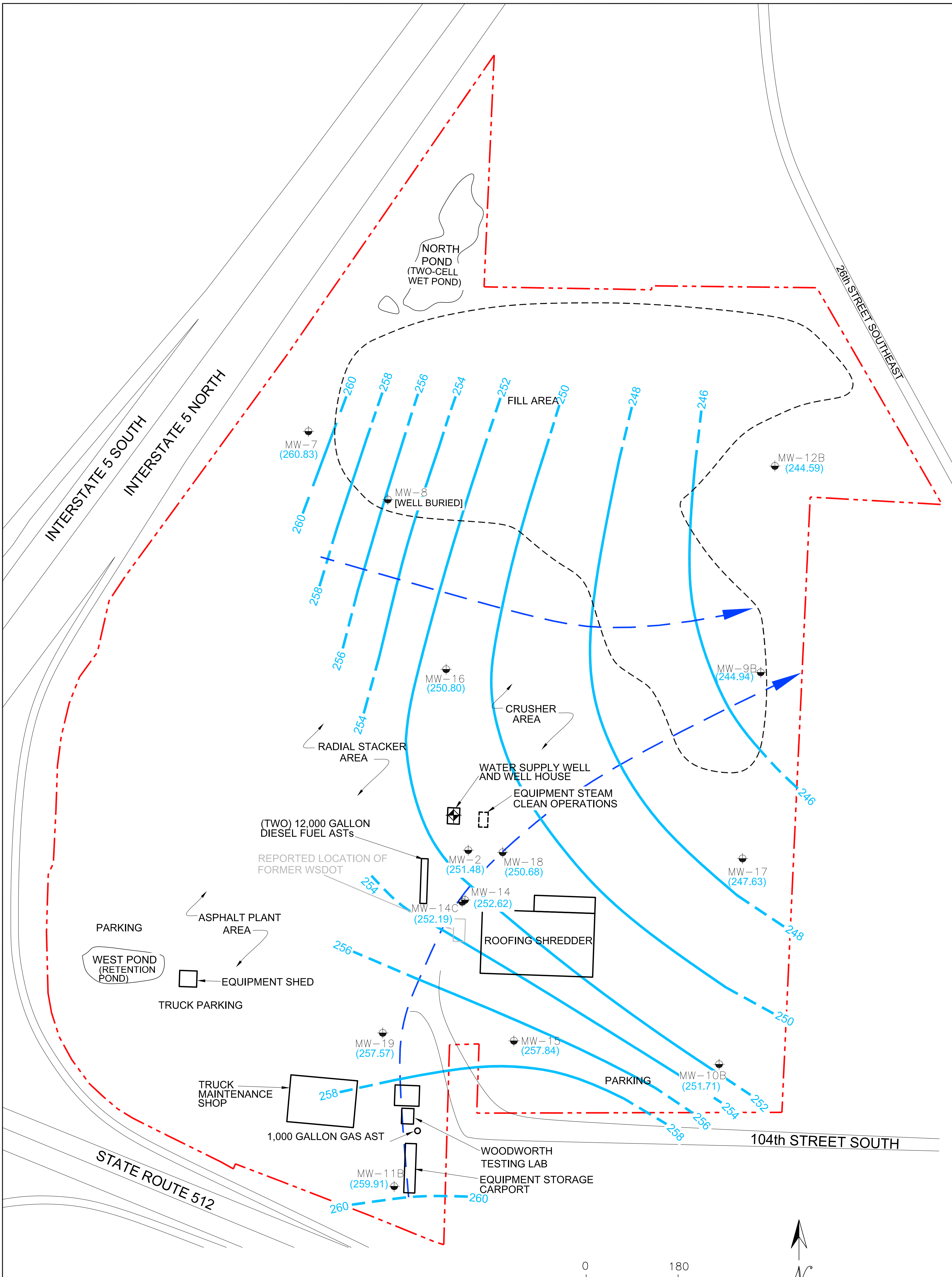
ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED.
MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 3

GROUNDWATER ELEVATION CONTOURS IN SHALLOW WATER-BEARING ZONE (FEBRUARY 2009)
WOODWORTH LAKEVIEW FACILITY
2800 104th ST S, LAKEWOOD, WASHINGTON
FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 8/20/09	Disk Reference: 188001



LEGEND

- PROPERTY BOUNDARY
- MW-15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- EXTRACTION WELL
- (257.84) GROUNDWATER ELEVATION (FEBRUARY 2009)
- 270 GROUNDWATER ELEVATION CONTOUR, DASHED WHERE INFERRED
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

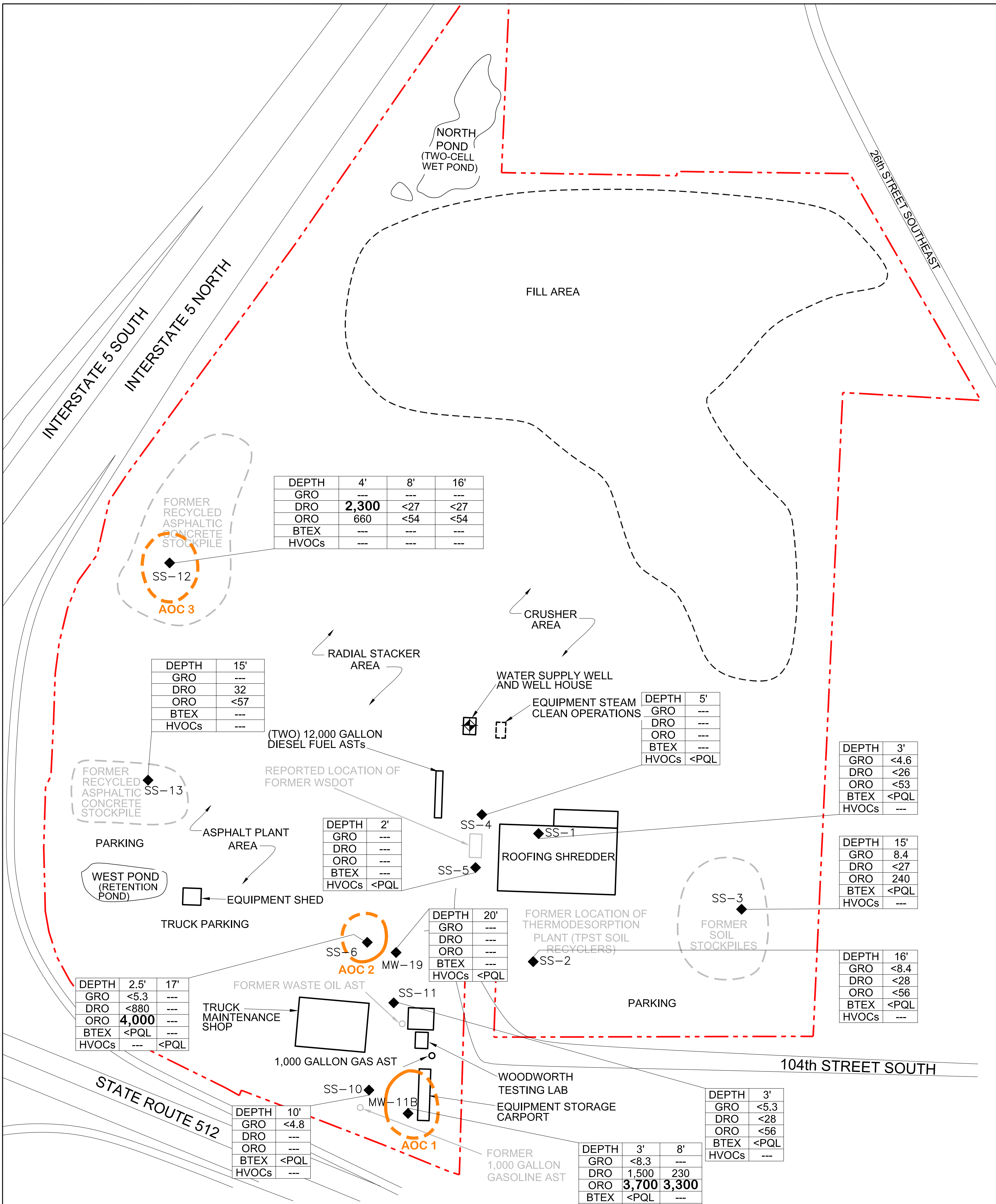
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 4

GROUNDWATER ELEVATION CONTOURS IN DEEP WATER-BEARING ZONE (FEBRUARY 2009)
WOODWORTH LAKEVIEW FACILITY
2800 104th ST S, LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date 8/20/09	Disk Reference: 188001



SS-12:

DEPTH	4'	8'	16'
GRO	---	---	---
DRO	**2,300**	<27	<27
ORO	660	<54	<54
BTEX	---	---	---
HVOCs	---	---	---

SS-13:

DEPTH	15'
GRO	---
DRO	32
ORO	<57
BTEX	---
HVOCs	---

SS-4:

DEPTH	5'
GRO	---
DRO	---
ORO	---
BTEX	---
HVOCs	<PQL

SS-1:

DEPTH	3'
GRO	<4.6
DRO	<26
ORO	<53
BTEX	<PQL
HVOCs	---

SS-5:

DEPTH	2'
GRO	---
DRO	---
ORO	---
BTEX	---
HVOCs	<PQL

SS-3:

DEPTH	15'
GRO	8.4
DRO	<27
ORO	240
BTEX	<PQL
HVOCs	---

MW-19:

DEPTH	20'
GRO	---
DRO	---
ORO	---
BTEX	---
HVOCs	<PQL

SS-2:

DEPTH	16'
GRO	<8.4
DRO	<28
ORO	<56
BTEX	<PQL
HVOCs	---

SS-6:

DEPTH	2.5'	17'
GRO	<5.3	---
DRO	<880	---
ORO	**4,000**	---
BTEX	<PQL	---
HVOCs	---	<PQL

SS-11:

DEPTH	3'
GRO	<5.3
DRO	<28
ORO	<56
BTEX	<PQL
HVOCs	---

SS-10:

DEPTH	10'
GRO	<4.8
DRO	---
ORO	---
BTEX	<PQL
HVOCs	---

MW-11B:

DEPTH	3'	8'
GRO	<8.3	---
DRO	1,500	230
ORO	**3,700**	**3,300**
BTEX	<PQL	---
HVOCs	---	---

LEGEND

PROPERTY BOUNDARY

FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.

AREAS OF CONCERN (AOCS) WHERE DRO/ORO CONCENTRATIONS IN SOIL ARE ABOVE MTCA METHOD A CLEANUP LEVELS

SS-10 ◆ SOIL SAMPLE

WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM

DEPTH IN FEET BELOW GROUND SURFACE

GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS

DRO = TPH AS DIESEL-RANGE ORGANICS

ORO = TPH AS OIL-RANGE ORGANICS

HVOCs = HALOGENATED VOLATILE ORGANIC COMPOUNDS

B = BENZENE T = TOLUENE E = ETHYLBENZENE X = TOTAL XYLENES

BOLD = INDICATES CONCENTRATIONS EXCEED WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION METHOD A CLEANUP LEVELS

< = INDICATES CONCENTRATIONS NOT DETECTED ABOVE THE STATED LABORATORY PRACTICAL QUANTITATION LIMIT (PQL)

--- = NOT ANALYZED

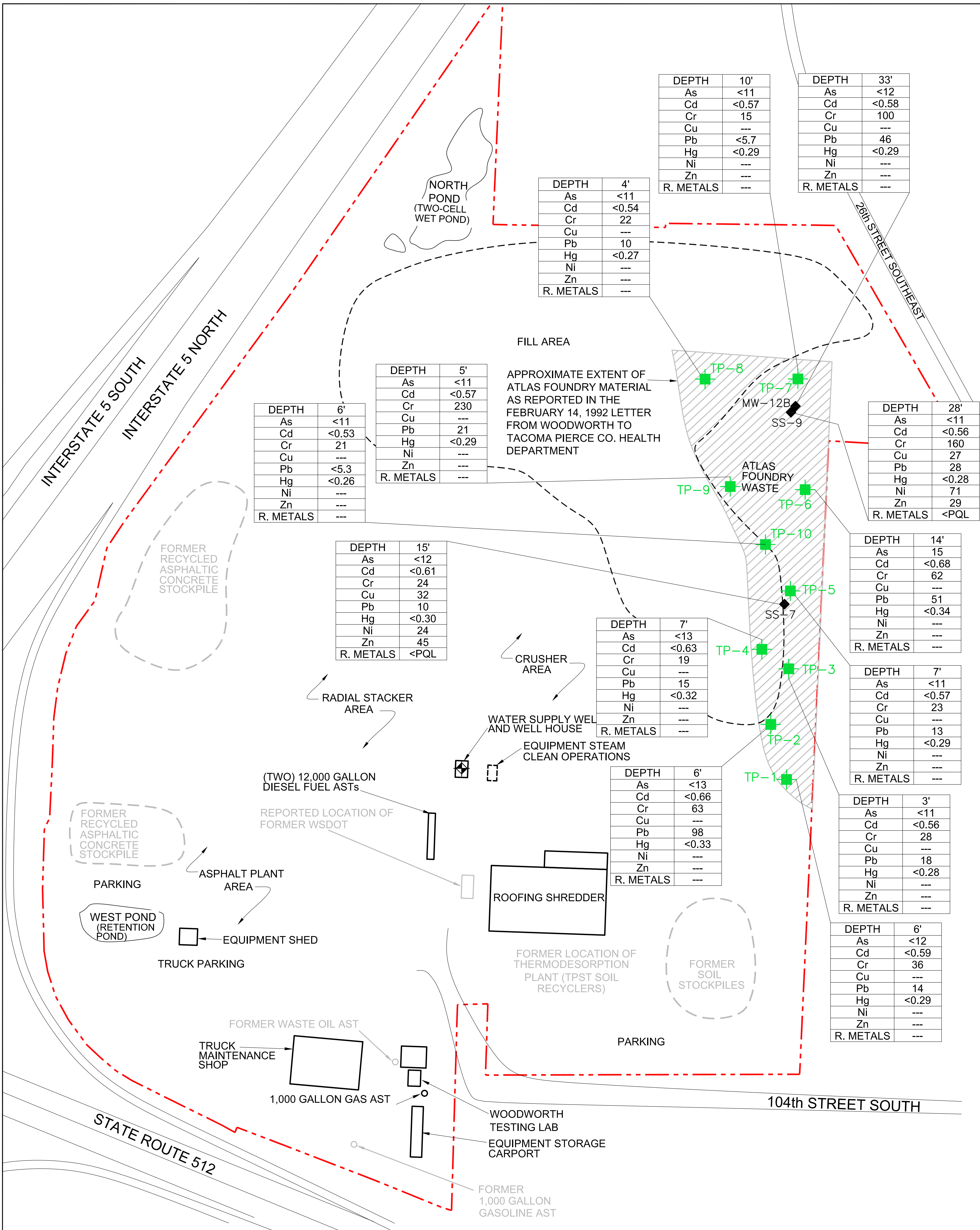
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 5

TPH / BTEX AND HVOCs DISTRIBUTION IN SOIL
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date 8/20/09	Disk Reference: 188001



DEPTH	10'
As	<11
Cd	<0.57
Cr	15
Cu	---
Pb	<5.7
Hg	<0.29
Ni	---
Zn	---
R. METALS	---

DEPTH	33'
As	<12
Cd	<0.58
Cr	100
Cu	---
Pb	46
Hg	<0.29
Ni	---
Zn	---
R. METALS	---

DEPTH	4'
As	<11
Cd	<0.54
Cr	22
Cu	---
Pb	10
Hg	<0.27
Ni	---
Zn	---
R. METALS	---

DEPTH	5'
As	<11
Cd	<0.57
Cr	230
Cu	---
Pb	21
Hg	<0.29
Ni	---
Zn	---
R. METALS	---

DEPTH	6'
As	<11
Cd	<0.53
Cr	21
Cu	---
Pb	<5.3
Hg	<0.26
Ni	---
Zn	---
R. METALS	---

DEPTH	28'
As	<11
Cd	<0.56
Cr	160
Cu	27
Pb	28
Hg	<0.28
Ni	71
Zn	29
R. METALS	<PQL

DEPTH	15'
As	<12
Cd	<0.61
Cr	24
Cu	32
Pb	10
Hg	<0.30
Ni	24
Zn	45
R. METALS	<PQL

DEPTH	14'
As	15
Cd	<0.68
Cr	62
Cu	---
Pb	51
Hg	<0.34
Ni	---
Zn	---
R. METALS	---

DEPTH	7'
As	<13
Cd	<0.63
Cr	19
Cu	---
Pb	15
Hg	<0.32
Ni	---
Zn	---
R. METALS	---

DEPTH	7'
As	<11
Cd	<0.57
Cr	23
Cu	---
Pb	13
Hg	<0.29
Ni	---
Zn	---
R. METALS	---

DEPTH	6'
As	<13
Cd	<0.66
Cr	63
Cu	---
Pb	98
Hg	<0.33
Ni	---
Zn	---
R. METALS	---

DEPTH	3'
As	<11
Cd	<0.56
Cr	28
Cu	---
Pb	18
Hg	<0.28
Ni	---
Zn	---
R. METALS	---

DEPTH	6'
As	<12
Cd	<0.59
Cr	36
Cu	---
Pb	14
Hg	<0.29
Ni	---
Zn	---
R. METALS	---

LEGEND

PROPERTY BOUNDARY

FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.

SS-10 SOIL SAMPLE

TEST PIT

WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM

DEPTH IN FEET BELOW GROUND SURFACE

As = ARSENIC
Cd = CADMIUM
Cr = CHROMIUM
Cu = COPPER
Pb = LEAD
Hg = MERCURY
Ni = NICKEL
Zn = ZINC
R METALS = REMAINING METALS; ANTIMONY, BERYLLIUM, SELENIUM, SILVER, AND THALLIUM
< = INDICATES CONCENTRATIONS NOT DETECTED ABOVE THE STATED LABORATORY PRACTICAL QUANTITATION LIMIT (PQL)
--- = NOT ANALYZED

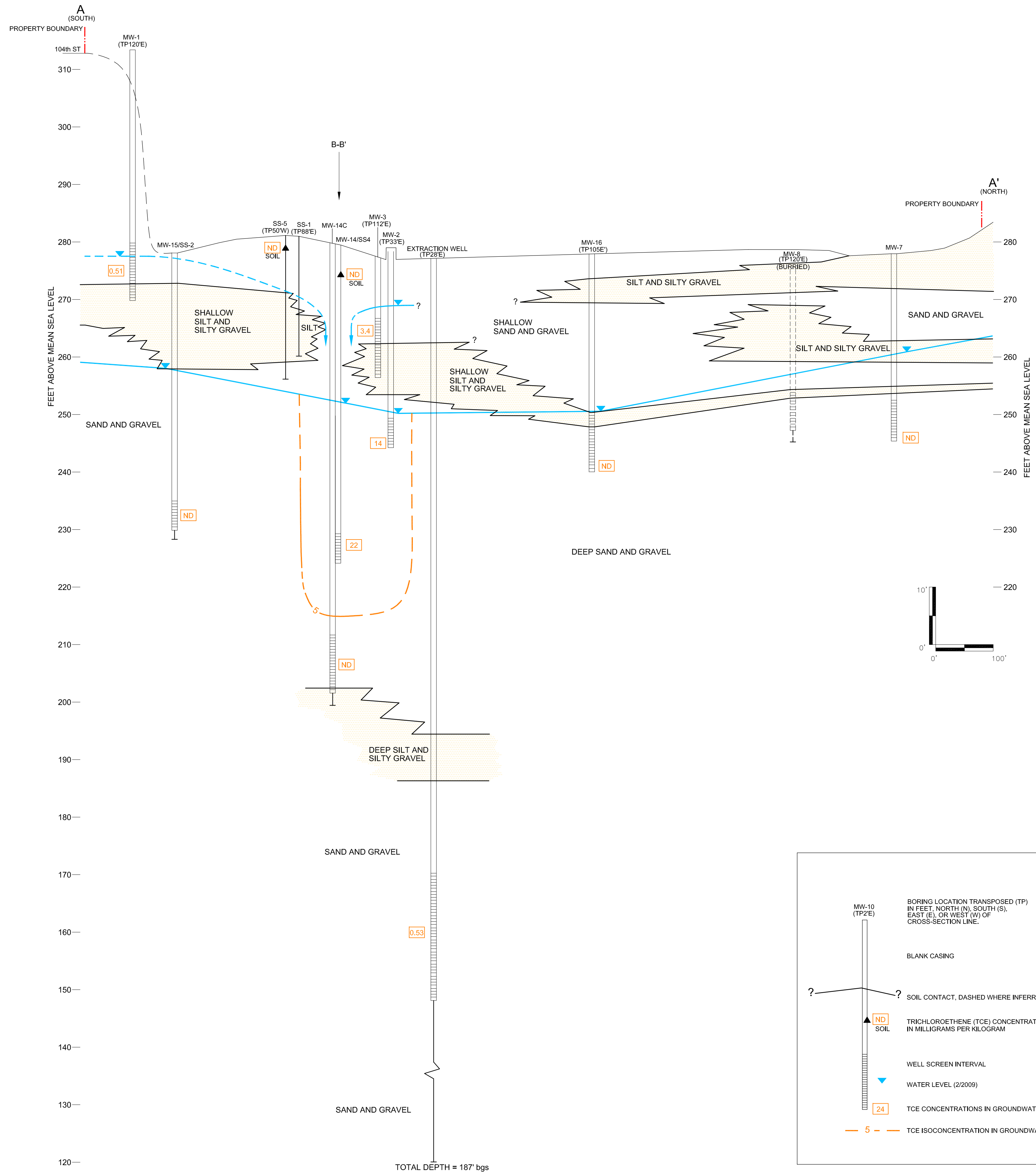
FIGURE 6

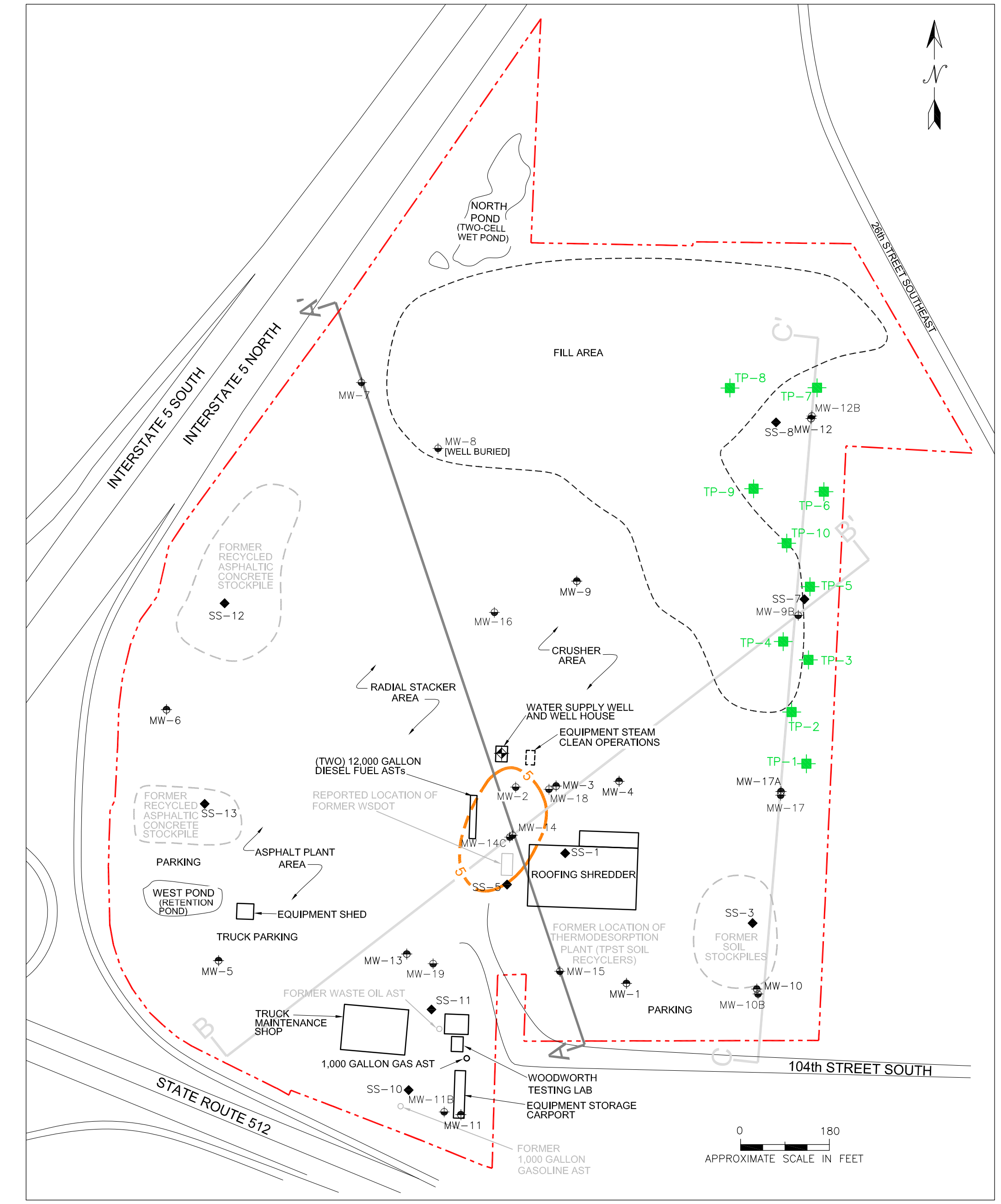
METALS DISTRIBUTION IN SOIL
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FARALLON PN: 188-001

Drawn By: DEW | Checked By: BJ | Date: 8/20/09 | Disk Reference: 188001





LEGEND

- MW-10 (TP2'E) — BORING LOCATION TRANSPOSED (TP) IN FEET, NORTH (N), SOUTH (S), EAST (E), OR WEST (W) OF CROSS-SECTION LINE.
- BLANK CASING
- SOIL CONTACT, DASHED WHERE INFERRED
- ND SOIL — TRICHLOROETHENE (TCE) CONCENTRATIONS IN SOIL IN MILLIGRAMS PER KILOGRAM
- WELL SCREEN INTERVAL
- WATER LEVEL (2/2009)
- 24 — TCE CONCENTRATIONS IN GROUNDWATER IN MICROGRAMS PER LITER (ug/L)
- 5 — TCE ISOCONCENTRATION IN GROUNDWATER IN ug/L, DASHED WHERE INFERRED
- A — A' LINE OF CROSS-SECTION
- SITE BOUNDARY
- FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.
- MW-11 — MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- MW-15 — MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- EXTRACTION WELL
- SS-10 — SOIL SAMPLE
- TEST PIT
- WSDOT — WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

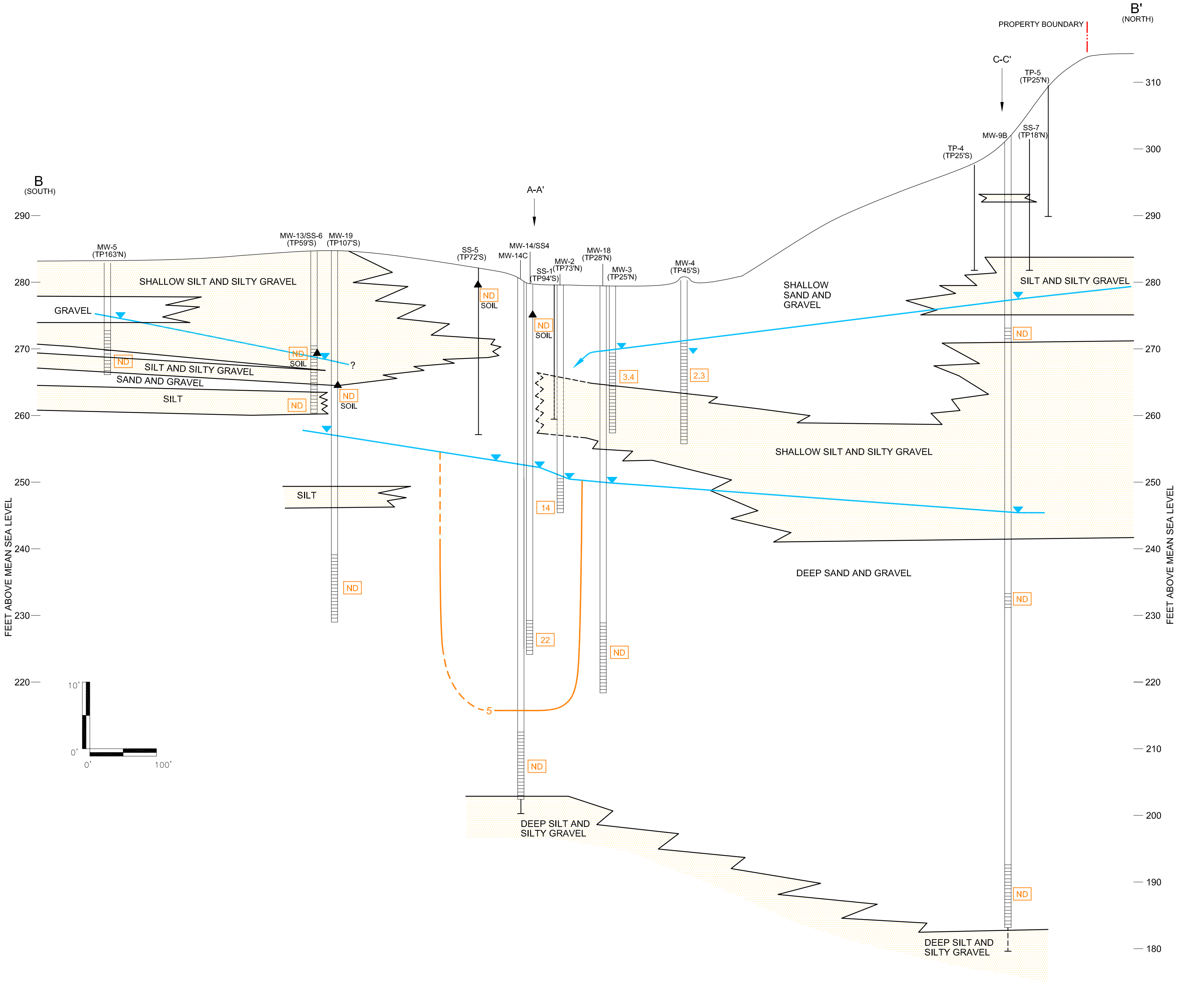
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

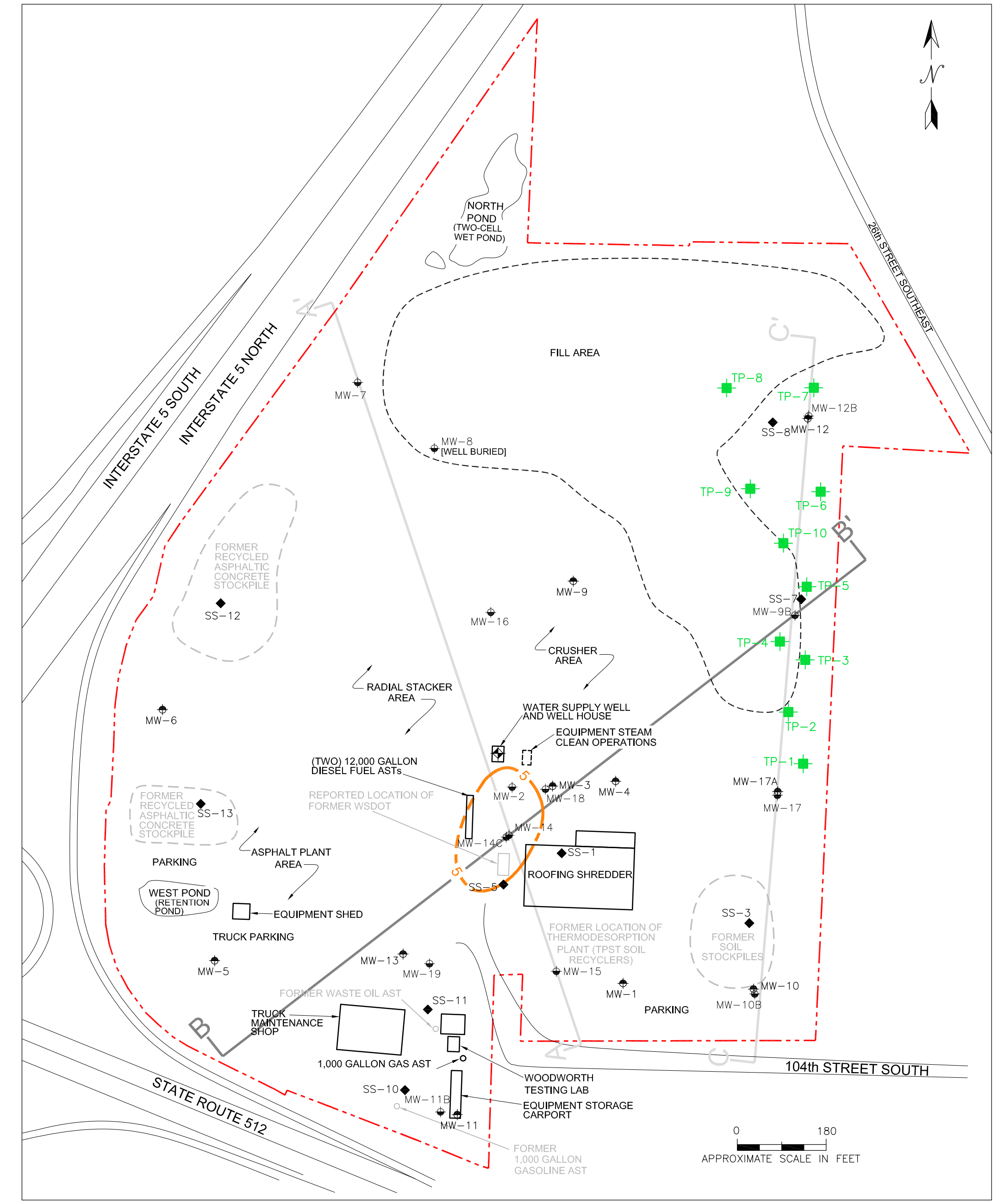
FIGURE 7

CROSS-SECTION A-A'
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW | Checked By: BJ | Date: 8/20/09 | Disk Reference: CROSECTIONS





LEGEND

MW-10 (TP2'E) — BORING LOCATION TRANSPOSED (TP) IN FEET, NORTH (N), SOUTH (S), EAST (E), OR WEST (W) OF CROSS-SECTION LINE.

BLANK CASING

SOIL CONTACT, DASHED WHERE INFERRED

ND SOIL — TRICHLOROETHENE (TCE) CONCENTRATIONS IN SOIL IN MILLIGRAMS PER KILOGRAM

WELL SCREEN INTERVAL

WATER LEVEL (2/2009)

24 — TCE CONCENTRATIONS IN GROUNDWATER IN MICROGRAMS PER LITER (ug/L)

B B' — LINE OF CROSS-SECTION

SITE BOUNDARY

FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.

MW-11 — MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE

MW-15 — MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE

EXTRACTION WELL

SS-10 — SOIL SAMPLE

TEST PIT

WSDOT — WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

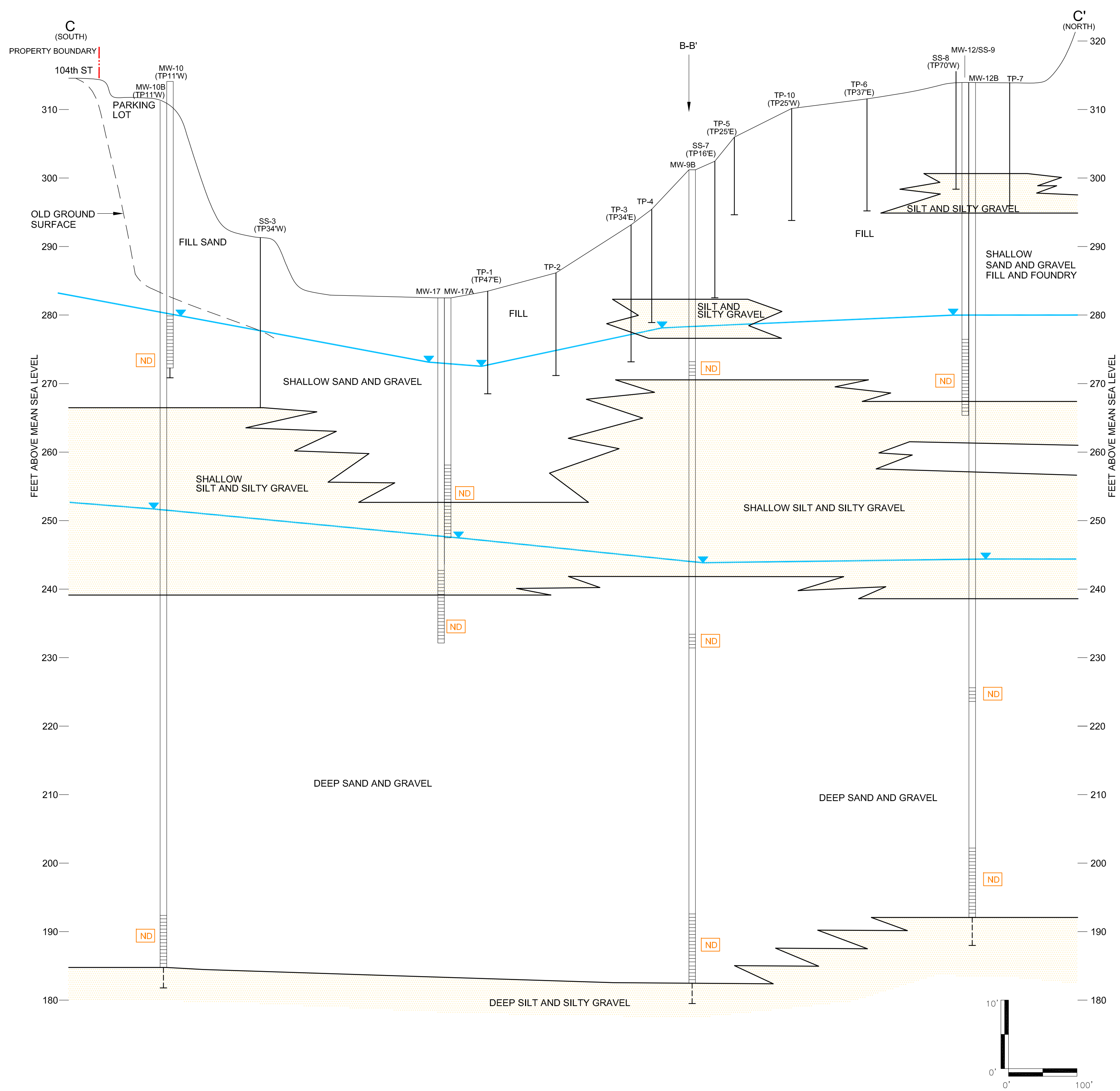
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

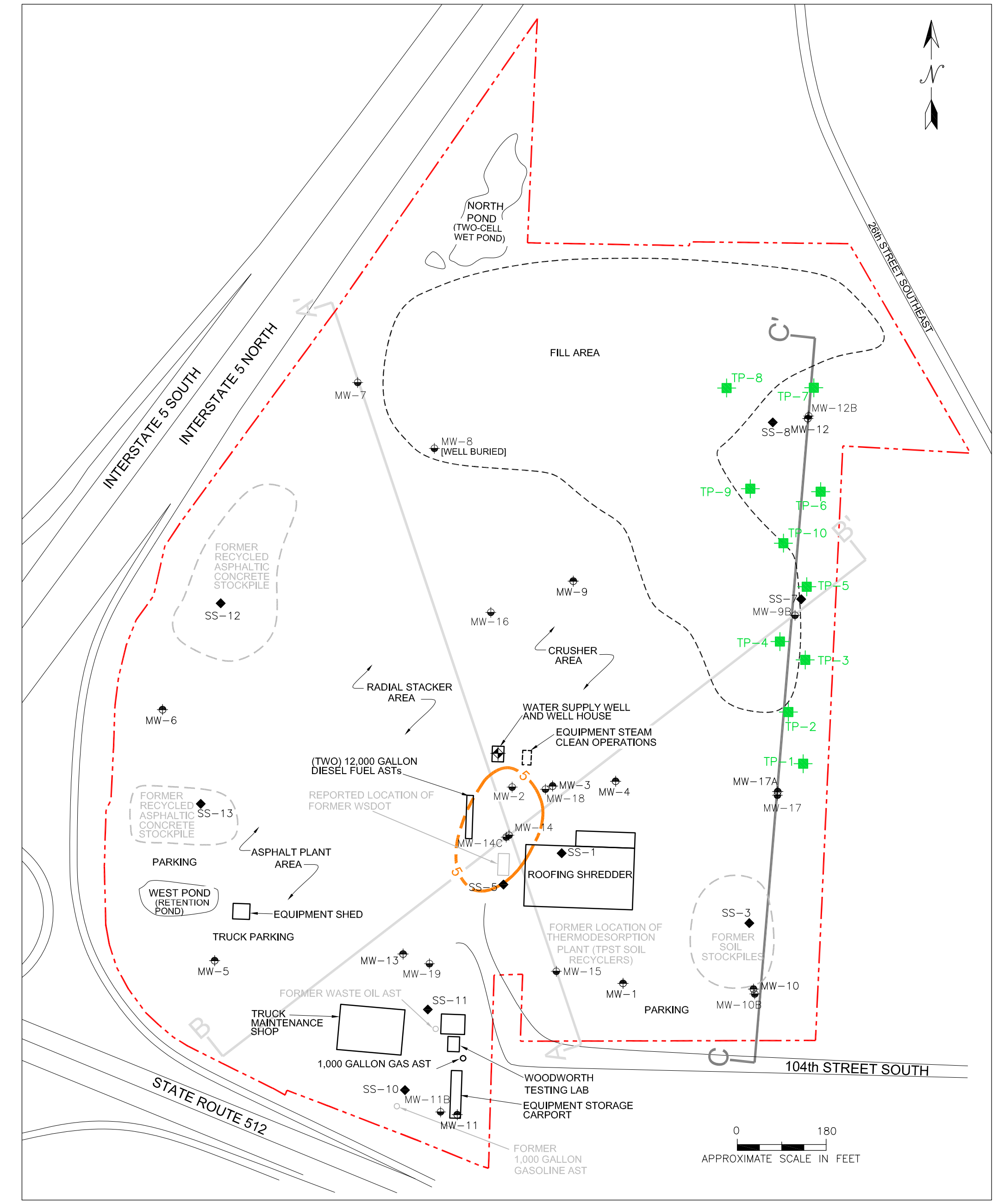
FIGURE 8

CROSS-SECTION B-B'
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 8/20/09	Disk Reference: CROSECTIONS





LEGEND

MW-10 (TP2'E) — BORING LOCATION TRANSPOSED (TP) IN FEET, NORTH (N), SOUTH (S), EAST (E), OR WEST (W) OF CROSS-SECTION LINE.

BLANK CASING

SOIL CONTACT, DASHED WHERE INFERRED

ND SOIL — TRICHLOROETHENE (TCE) CONCENTRATIONS IN SOIL IN MILLIGRAMS PER KILOGRAM

WELL SCREEN INTERVAL

WATER LEVEL (2/2009)

24 — TCE CONCENTRATIONS IN GROUNDWATER IN MICROGRAMS PER LITER (ug/L)

C C' — LINE OF CROSS-SECTION

SITE BOUNDARY

FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.

MW-11 — MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE

MW-15 — MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE

EXTRACTION WELL

SS-10 — SOIL SAMPLE

TEST PIT

WSDOT — WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

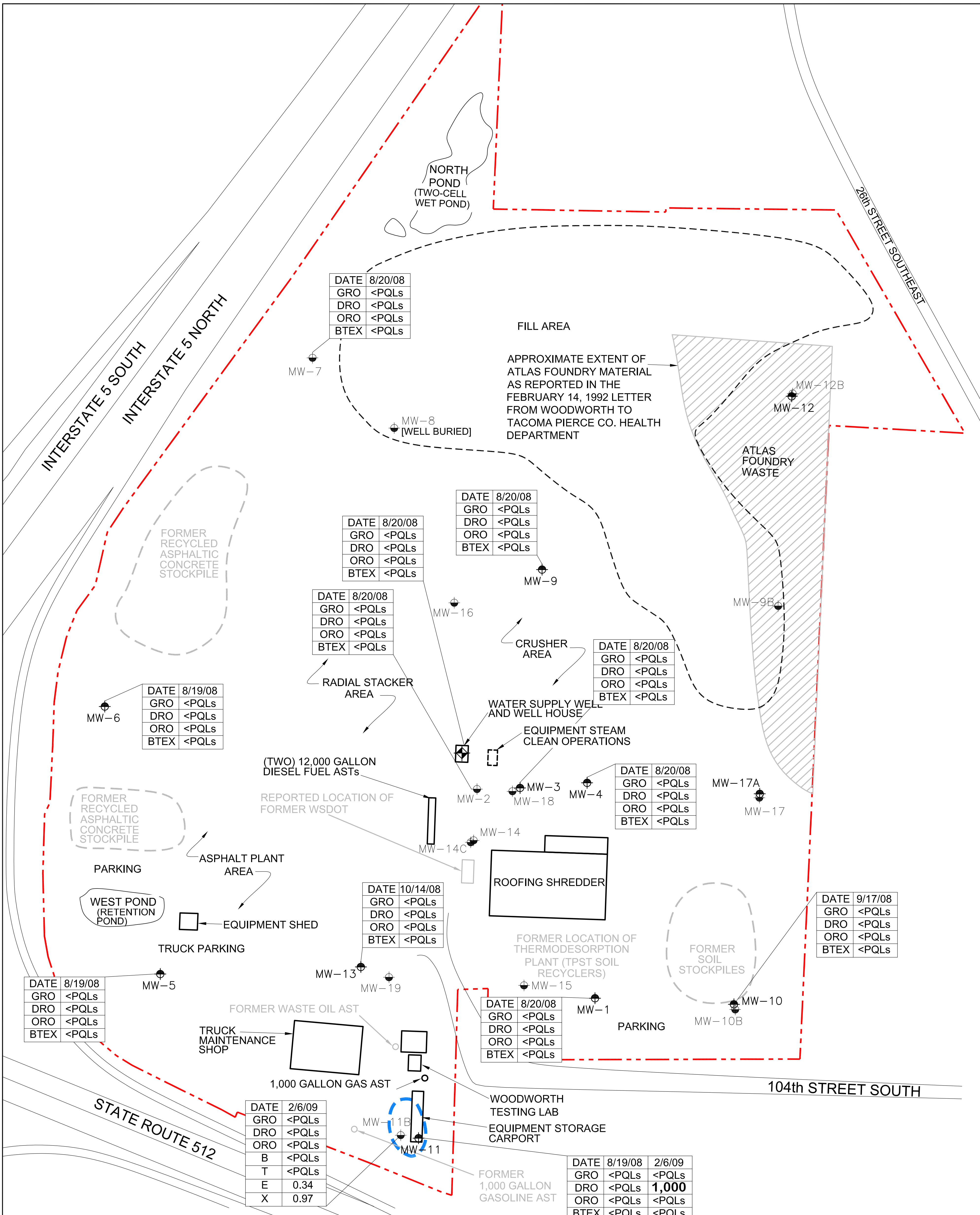
FIGURE 9

CROSS–SECTION C–C'
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Drawn By: DEW | Checked By: BJ | Date: 8/20/09 | Disk Reference: CROSECTIONS



DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/19/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	10/14/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	9/17/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/19/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	8/20/08
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
BTEX	<PQLs

DATE	2/6/09
GRO	<PQLs
DRO	<PQLs
ORO	<PQLs
B	<PQLs
T	<PQLs
E	0.34
X	0.97

DATE	8/19/08	2/6/09
GRO	<PQLs	<PQLs
DRO	<PQLs	**1,000**
ORO	<PQLs	<PQLs
BTEX	<PQLs	<PQLs

LEGEND

PROPERTY BOUNDARY

FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.

MW−11 MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE

MW−15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE

WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER

GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS

DRO = TPH AS DIESEL-RANGE ORGANICS

ORO = TPH AS OIL-RANGE ORGANICS

B = BENZENE T = TOLUENE E = ETHYLBENZENE X = TOTAL XYLENES

BOLD= INDICATES CONCENTRATIONS EXCEED WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION METHOD A CLEANUP LEVELS

< = INDICATES CONCENTRATIONS NOT DETECTED ABOVE THE STATED LABORATORY PRACTICAL QUANTITATION LIMIT (PQL)

APPROXIMATE EXTENT OF DRO CONCENTRATIONS IN GROUNDWATER ABOVE MTCA METHOD A CLEANUP LEVEL, DASHED WHERE INFERRED

0 180
APPROXIMATE SCALE IN FEET

N

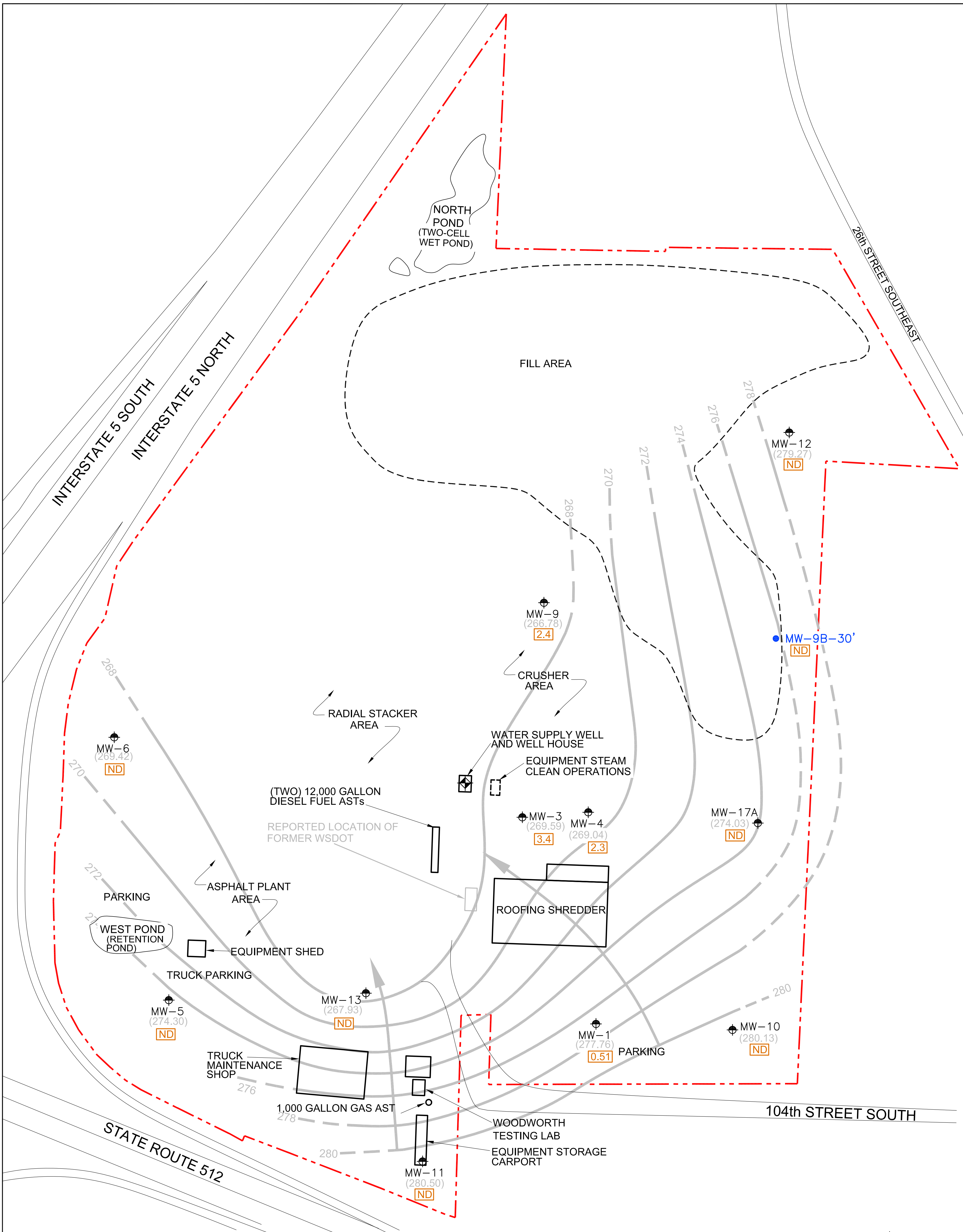
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 10

TPH/BTEX DISTRIBUTION IN GROUNDWATER
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188−001

Drawn By: DEW | Checked By: BJ | Date 8/20/09 | Disk Reference: 188001



LEGEND

- PROPERTY BOUNDARY
- MW−6 — MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- MW−9B−30' — RECONNAISSANCE GROUNDWATER SAMPLE
- EXTRACTION WELL
- (269.42) GROUNDWATER ELEVATION (FEBRUARY 2009)
- 270 GROUNDWATER ELEVATION CONTOUR, DASHED WHERE INFERRED
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- 3.4 TRICHLOROETHENE (TCE) CONCENTRATION IN GROUNDWATER IN MICROGRAMS PER LITER (FEBRUARY 2009)
- ND INDICATES CONCENTRATIONS OF TCE NOT DETECTED ABOVE LABORATORY QUANTITATION LIMITS
- WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

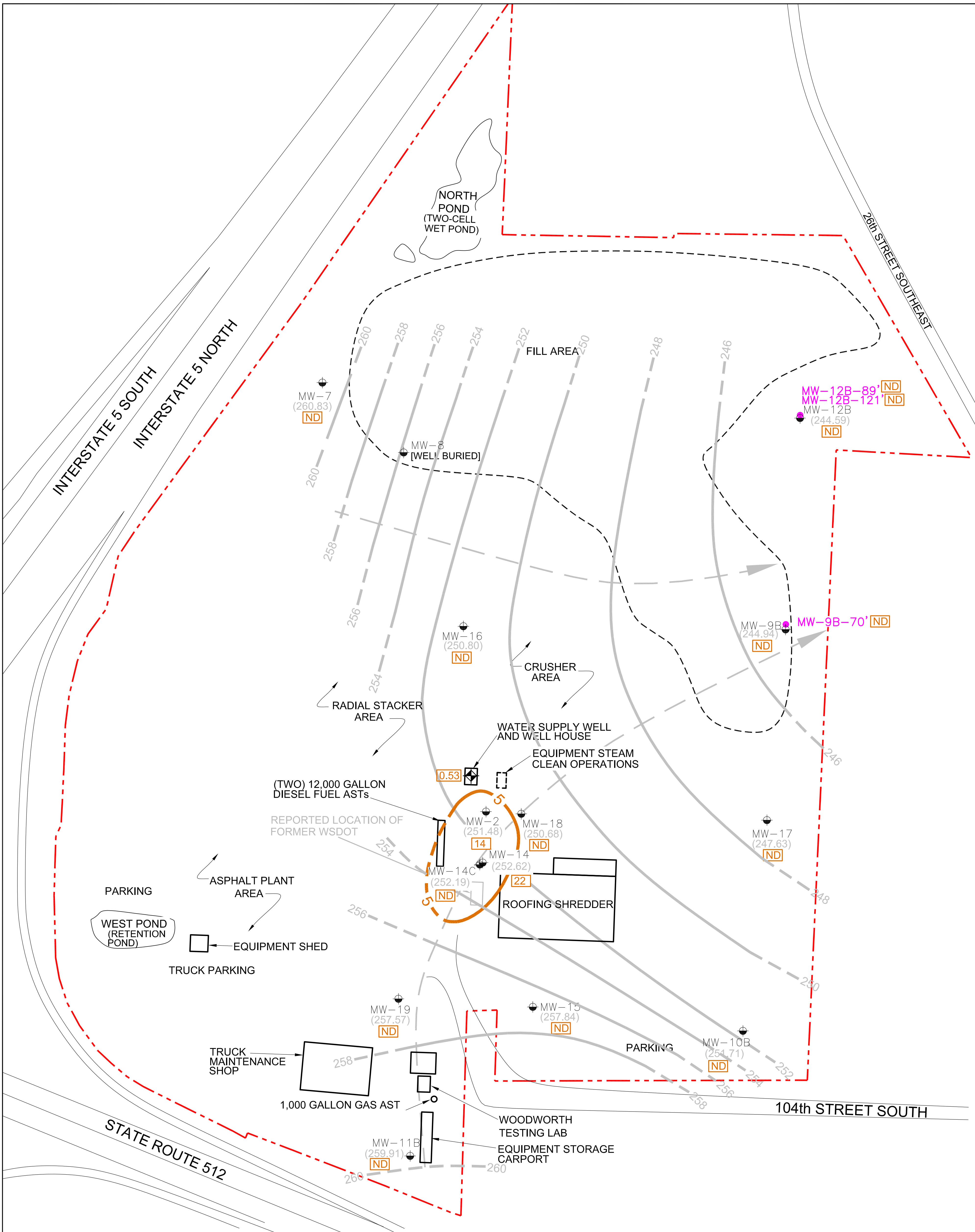
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 11

TCE DISTRIBUTION IN SHALLOW WATER−BEARING ZONE
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188−001

Drawn By: DEW | Checked By: BJ | Date: 8/20/09 | Disk Reference: 188001



LEGEND

- PROPERTY BOUNDARY
- MW-15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- MW-9B-70' RECONNAISSANCE GROUNDWATER SAMPLE
- EXTRACTION WELL
- (257.84) GROUNDWATER ELEVATION (FEBRUARY 2009)
- 270 GROUNDWATER ELEVATION CONTOUR, DASHED WHERE INFERRED
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- 5 TRICHLOROETHENE (TCE) ISOCONCENTRATION CONTOUR MICROGRAMS PER LITER (ug/L) (FEBRUARY 2009)
- 3.4 TCE CONCENTRATION IN GROUNDWATER IN ug/L (FEBRUARY 2009)
- ND INDICATES CONCENTRATIONS OF TCE NOT DETECTED ABOVE LABORATORY QUANTITATION LIMITS
- WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

0 180
APPROXIMATE SCALE IN FEET

N

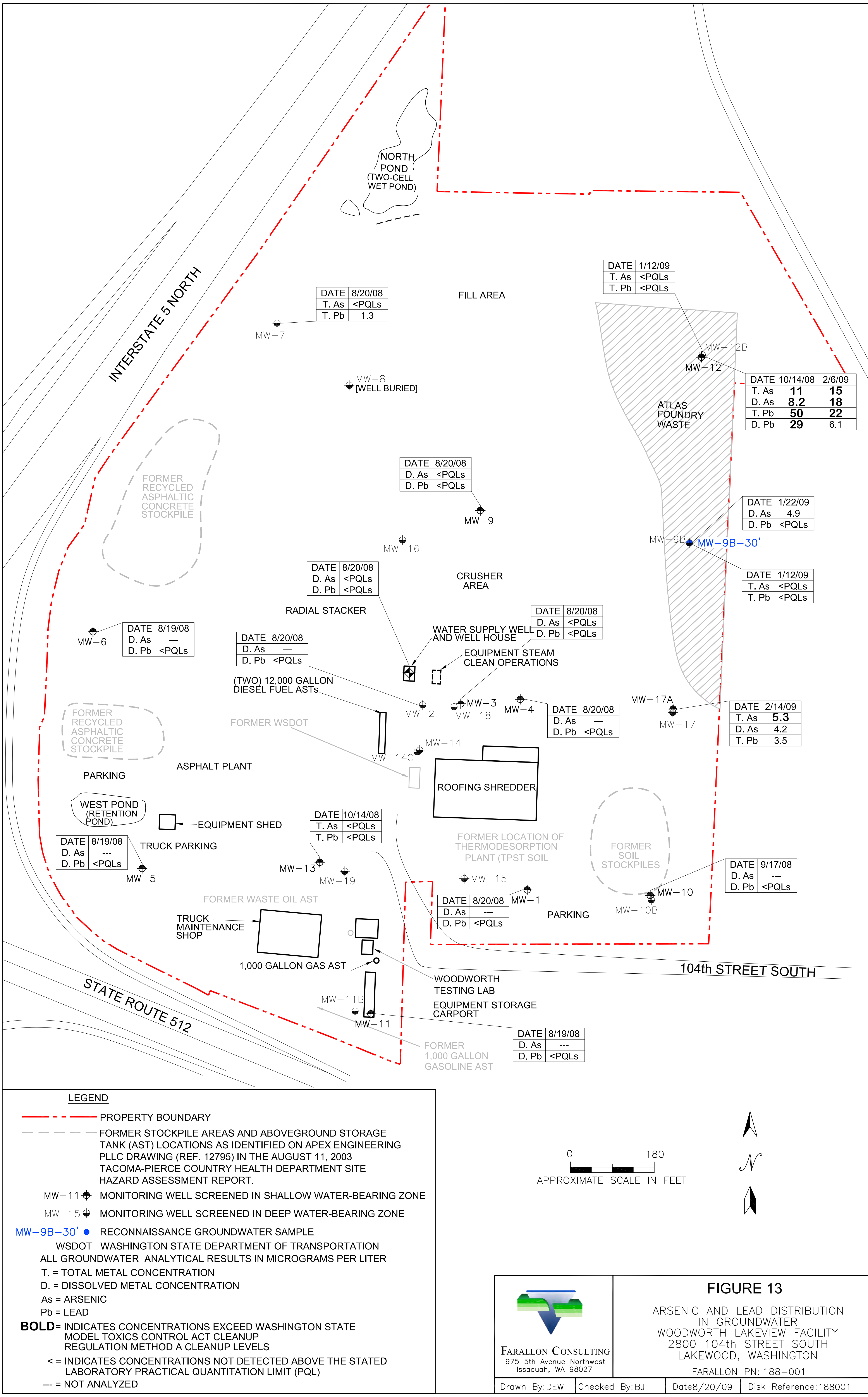
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

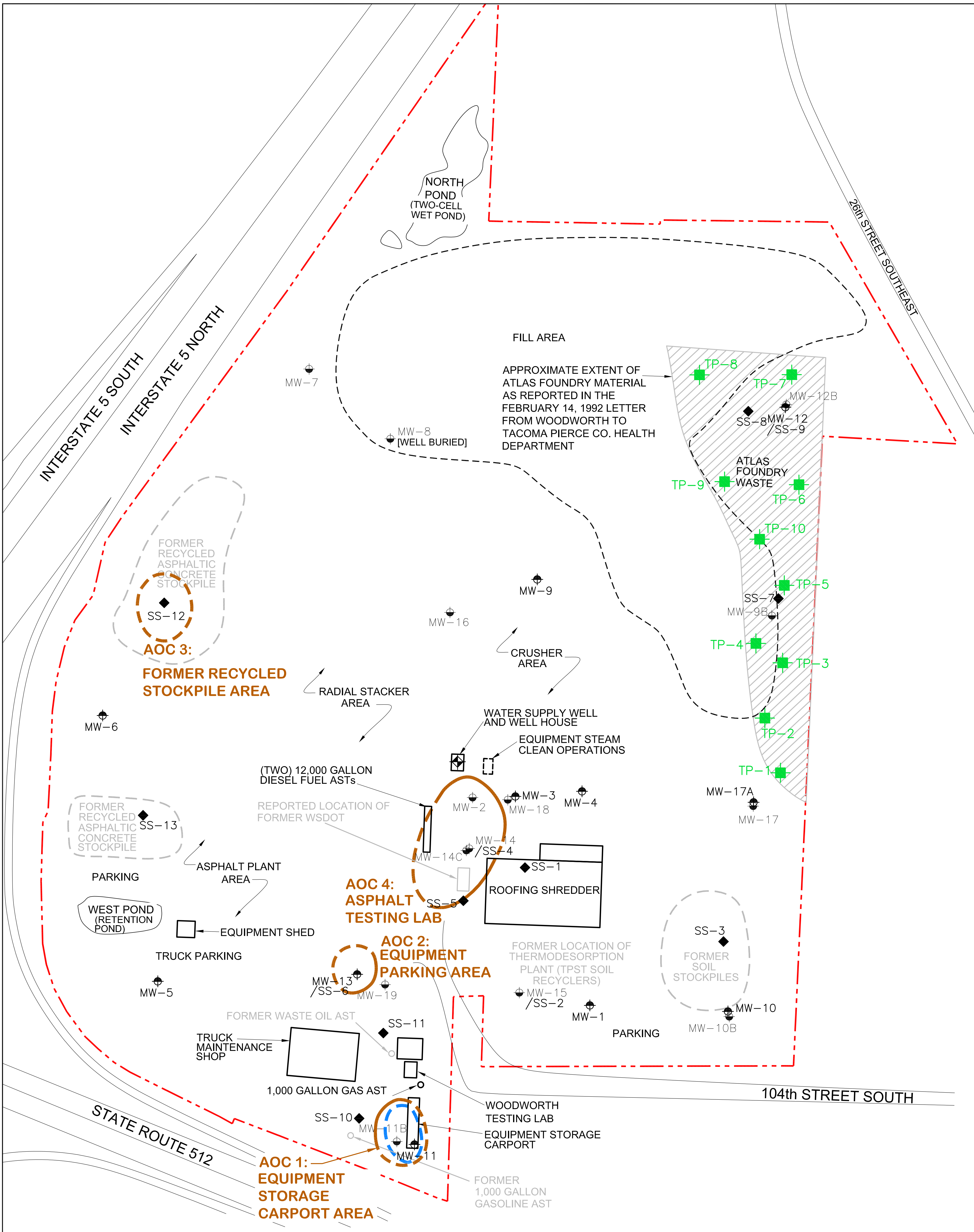
FIGURE 12

TCE DISTRIBUTION IN DEEP WATER-BEARING ZONE
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW | Checked By: BJ | Date: 8/20/09 | Disk Reference: 188001


INTERSTATE 5 NORTH
NORTH POND (TWO-CELL WET POND)
FILL AREA
DATE 1/12/09 T. As <PQLs T. Pb <PQLs
DATE 8/20/08 T. As <PQLs T. Pb 1.3
MW-7
MW-12B
MW-12
DATE 10/14/08 2/6/09 T. As 11 15 D. As 8.2 18 T. Pb 50 22 D. Pb 29 6.1
MW-8 [WELL BURIED]
ATLAS FOUNDRY WASTE
FORMER RECYCLED ASPHALTIC CONCRETE STOCKPILE
DATE 8/20/08 D. As <PQLs D. Pb <PQLs
MW-9
DATE 1/22/09 D. As 4.9 D. Pb <PQLs
MW-9B
MW-9B-30'
MW-16
DATE 8/20/08 D. As <PQLs D. Pb <PQLs
CRUSHER AREA
DATE 1/12/09 T. As <PQLs T. Pb <PQLs
RADIAL STACKER
DATE 8/20/08 D. As <PQLs D. Pb <PQLs
MW-6
DATE 8/19/08 D. As --- D. Pb <PQLs
DATE 8/20/08 D. As --- D. Pb <PQLs
WATER SUPPLY WELL AND WELL HOUSE
EQUIPMENT STEAM CLEAN OPERATIONS
(TWO) 12,000 GALLON DIESEL FUEL ASTs
MW-17A
MW-2
MW-3
MW-18
MW-4
DATE 8/20/08 D. As --- D. Pb <PQLs
MW-17
DATE 2/14/09 T. As 5.3 D. As 4.2 T. Pb 3.5
FORMER RECYCLED ASPHALTIC CONCRETE STOCKPILE
FORMER WSDOT
MW-14
MW-14C
ASPHALT PLANT
PARKING
ROOFING SHREDDER
WEST POND (RETENTION POND)
EQUIPMENT SHED
DATE 10/14/08 T. As <PQLs T. Pb <PQLs
DATE 8/19/08 D. As --- D. Pb <PQLs
TRUCK PARKING
FORMER LOCATION OF THERMODESORPTION PLANT (TPST SOIL
FORMER SOIL STOCKPILES
DATE 9/17/08 D. As --- D. Pb <PQLs
MW-5
MW-13
MW-19
MW-15
MW-1
MW-10
MW-10B
DATE 8/20/08 D. As --- D. Pb <PQLs
PARKING
FORMER WASTE OIL AST
TRUCK MAINTENANCE SHOP
1,000 GALLON GAS AST
104th STREET SOUTH
WOODWORTH TESTING LAB
STATE ROUTE 512
MW-11B
MW-11
EQUIPMENT STORAGE CARPORT
DATE 8/19/08 D. As --- D. Pb <PQLs
FORMER 1,000 GALLON GASOLINE AST
LEGEND
PROPERTY BOUNDARY
FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.
MW-11 MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
MW-15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
MW-9B-30' RECONNAISSANCE GROUNDWATER SAMPLE
WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER
T. = TOTAL METAL CONCENTRATION
D. = DISSOLVED METAL CONCENTRATION
As = ARSENIC
Pb = LEAD
BOLD= INDICATES CONCENTRATIONS EXCEED WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION METHOD A CLEANUP LEVELS
< = INDICATES CONCENTRATIONS NOT DETECTED ABOVE THE STATED LABORATORY PRACTICAL QUANTITATION LIMIT (PQL)
--- = NOT ANALYZED
0 180
APPROXIMATE SCALE IN FEET
N
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027
FIGURE 13
ARSENIC AND LEAD DISTRIBUTION IN GROUNDWATER
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON
FARALLON PN: 188-001
Drawn By: DEW
Checked By: BJ
Date 8/20/09
Disk Reference: 188001



LEGEND

- PROPERTY BOUNDARY
- FORMER STOCKPILE AREAS AND ABOVEGROUND STORAGE TANK (AST) LOCATIONS AS IDENTIFIED ON APEX ENGINEERING PLLC DRAWING (REF. 12795) IN THE AUGUST 11, 2003 TACOMA-PIERCE COUNTRY HEALTH DEPARTMENT SITE HAZARD ASSESSMENT REPORT.
- APPROXIMATE AREA OF GROUNDWATER CLEANUP ACTION
- APPROXIMATE AREA OF SOIL CLEANUP ACTION
- MW-11 MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- MW-15 MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- SS-10 SOIL SAMPLE
- TEST PIT
- WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ALL LOCATIONS OF SITE FEATURES ARE APPROXIMATE AND ASSEMBLED FROM 2008 AERIAL PHOTOGRAPH, UNLESS OTHERWISE NOTED. MONITORING WELL LOCATIONS WERE SURVEYED FOR HORIZONTAL AND VERTICAL COORDINATES BY A LICENSED SURVEYOR IN SEPTEMBER AND OCTOBER 2008, AND IN FEBRUARY 2009.

0 180
APPROXIMATE SCALE IN FEET

N

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 14

CLEANUP ACTION AREAS MAP
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By:DEW	Checked By:BJ	Date8/20/09	Disk Reference:188001

TABLES

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

Table 1
Monitoring Well and Groundwater Elevations
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Monitoring Well Identification	Northing[1] (feet)	Easting[1] (feet)	Measurement Date	Casing Elevation (feet msl)[2]	Monument Rim Elevation (feet msl)[2]	Ground Elevation (feet msl)[2]	Total Depth of Well (feet)	Screen Interval (feet below ground)	Screen Interval Elevation (msl)[2]	Depth to Groundwater (feet)[3]	Groundwater Elevation (feet msl)[2]
Shallow Water-Bearing Zone											
MW-1	673392.01	1149685.68	8/19/2008	313.65	NA	309.57	52.95	48.87 to 33.87	260.70 to 275.70	39.70	273.95
			9/17/2008							40.30	273.35
			10/17/2008							40.71	272.94
			2/2/2009							35.89	277.76
MW-3	673791.72	1149543.13	8/19/2008	279.31	279.78	278.20	22.00	20.89 to NA	257.31 to NA	11.54	267.77
			9/17/2008							12.37	266.94
			10/13/2008							12.26	267.05
			2/2/2009							9.72	269.59
MW-4	673801.40	1149670.70	8/19/2008	280.77	281.32	279.99	24.73	23.95 to NA	256.04 to NA	13.73	267.04
			9/17/2008							14.21	266.56
			10/13/2008							14.30	266.47
			2/2/2009							11.73	269.04
MW-5	673438.00	1148858.76	8/19/2008	282.99	283.26	283.26	16.68	16.95 to 9.95	266.31 to 273.31	11.40	271.59
			9/17/2008							11.23	271.76
			10/13/2008							11.24	271.75
			2/2/2009							8.69	274.30
MW-6	673946.46	1148753.22	8/19/2008	274.38	274.96	274.96	10.88	11.46 to 4.46	263.50 to 270.50	9.72	264.66
			9/17/2008							8.96	265.42
			10/13/2008							8.98	265.40
			2/2/2009							4.96	269.42
MW-9	674206.74	1149584.95	8/19/2008	278.15	278.67	277.17	25.00	24.02 to 17.02	253.15 to 260.15	14.48	263.67
			9/17/2008							14.94	263.21
			10/13/2008							14.79	263.36
			2/2/2009							11.37	266.78
MW-10	673380.41	1149949.88	8/19/2008	313.18	NA	311.18	41.81	39.81 to 32.81	271.37 to 278.37	36.99	276.19
			9/17/2008							39.42	273.76
			10/13/2008							38.56	274.62
			2/2/2009							33.05	280.13
MW-11	±673126[4]	±1149350[4]	8/19/2008	286.70	287.53	287.53	14.46	15.29 to 8.29	272.24 to 279.24	10.38	276.32
			9/17/2008							10.92	275.78
			10/13/2008							11.27	275.43
			2/2/2009							6.20	280.50
MW-12	674536.01	1150059.81	10/13/2008	313.32	313.88	313.88	48.15	47.59 to 37.59	265.17 to 275.17	37.20	276.12
			2/2/2009							34.05	279.27
MW-13	673451.43	1149240.32	10/13/2008	284.73	284.97	284.97	24.14	23.90 to 13.90	260.59 to 270.59	18.05	266.68
			2/2/2009							16.80	267.93
MW-17A	673780.51	1149998.98	2/2/2009	281.72	282.23	282.23	34.70	34.19 to 24.19	247.02 to 257.02	7.69	274.03

Table 1
Monitoring Well and Groundwater Elevations
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Monitoring Well Identification	Northing[1] (feet)	Easting[1] (feet)	Measurement Date	Casing Elevation (feet msl)[2]	Monument Rim Elevation (feet msl)[2]	Ground Elevation (feet msl)[2]	Total Depth of Well (feet)	Screen Interval (feet below ground)	Screen Interval Elevation (msl)[2]	Depth to Groundwater (feet)[3]	Groundwater Elevation (feet msl)[2]
Deep Water-Bearing Zone											
MW-2	673789.44	1149461.22	8/19/2008	278.90	279.15	279.15	34.30	34.55 to NA	244.60 to NA	32.50	246.40
			9/17/2008							32.74	246.16
			10/13/2008							32.50	246.40
			2/12/2009							27.42	251.48
MW-7	674609.12	1149148.38	8/19/2008	278.09	278.45	278.45	32.50	32.86 to 25.86	245.59 to 252.59	27.78	250.31
			9/17/2008							29.63	248.46
			10/13/2008							29.92	248.17
			2/2/2009							17.26	260.83
MW-8 (Inaccessible)	NA	NA	8/19/2008	±275.51	NA	NA	±28.0	NA	±247.51 to ±254.51	NA	NA
			9/17/2008								
			10/13/2008								
			2/2/2009								
MW-9B	674137.48	1150033.94	2/2/2009	301.23	301.55	301.55	119.00	118.68 to 108.68	182.23 to 192.23	56.29	244.94
MW-10B	673370.49	1149952.42	2/2/2009	310.91	311.27	311.27	127.00	126.64 to 116.64	183.91 to 193.91	59.20	251.71
MW-11B	673131.60	1149316.19	2/2/2009	287.31	287.53	287.53	58.67	58.45 to 48.45	228.64 to 238.64	27.40	259.91
MW-12B	674541.35	1150061.62	2/2/2009	313.53	313.74	313.74	121.00	120.79 to 110.79	192.53 to 202.53	68.94	244.59
MW-14	673691.98	1149454.83	10/13/2008	279.79	280.28	280.28	55.30	54.81 to 49.81	224.49 to 229.49	32.70	247.09
			2/2/2009							27.17	252.62
MW-14C	673688.28	1149449.26	2/2/2009	279.99	280.35	280.35	77.22	76.86 to 66.86	202.77 to 212.77	27.80	252.19
MW-15	673416.33	1149550.66	10/13/2008	278.37	278.66	278.66	48.24	47.95 to 42.95	230.13 to 235.13	24.75	253.62
			2/12/2009							20.53	257.84
MW-16	674143.56	1149417.99	10/13/2008	278.00	278.23	278.23	37.41	37.18 to 32.18	240.59 to 250.59	33.64	244.36
			2/2/2009							27.20	250.80
MW-17	673773.11	1149998.31	10/13/2008	281.78	281.96	281.96	50.03	49.85 to 39.85	231.75 to 241.75	39.80	241.98
			2/2/2009							34.15	247.63
MW-18	673785.23	1149528.63	2/2/2009	277.67	278.09	278.09	59.89	59.47 to 49.47	217.78 to 227.78	26.99	250.68
MW-19	673431.78	1149293.81	2/2/2009	284.46	284.71	284.71	55.78	55.53 to 45.53	228.68 to 238.68	26.89	257.57

NOTES:

[1]State Plane Coordinate System, Washington South Zone 5626.

[2]Feet above mean sea level (msl) surveyed by a licensed surveyor on September 17-18, October 28, 2008, and February 12, 2009; Vertical datum NGVD 29.

[3]In feet below top of well casing.

[4]Horizontal coordinates for monitoring well MW-11 were not surveyed due to global positioning system limitations when used inside the structure; its horizontal position was estimated by a Farallon Field Scientist.

NA = not available
msl = mean sea level

Table 2
Summary of Soil Analytical Results - TPH, BTEX, and HVOCs
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Sample Identification	Boring/Well Identification	Sample Date	Depth (feet bgs)[1]	Analytical Results (milligrams per kilogram)							
				GRO[2]	DRO[3]	ORO[3]	Benzene[4]	Toluene[4]	Ethylbenzene[4]	Total Xylenes[4]	HVOCs[4,5]
SS1-3-100608	SS-1	10/6/2008	3	<4.6	<26	<53	<0.020	<0.046	<0.046	<0.046	—
SS2-16-100208	SS-2	10/2/2008	16	<8.4	<28	<56	<0.020	<0.084	<0.084	<0.084	—
SS3-15-093008	SS-3	9/30/2008	15	8.4	<27	240	<0.020	<0.084	<0.084	<0.084	—
SS4-5-100308	SS-4	10/3/2008	5	—	—	—	—	—	—	—	<PQL
SS5-2-100608	SS-5	10/6/2008	2	—	—	—	—	—	—	—	<PQL
SS6-2.5-100708	SS-6	10/7/2008	2.5	<5.3	<880	**4,000**	<0.020	<0.053	<0.053	<0.053	—
SS6-17-100708		10/7/2008	17	—	—	—	—	—	—	—	<PQL
SS10-10-100708	SS-10	10/7/2008	10	<4.8	—	—	<0.020	<0.048	<0.048	<0.048	—
SS11-3-100708	SS-11	10/7/2008	3	<5.3	<28	<56	<0.020	<0.053	<0.053	<0.053	—
SS12-4-093008	SS-12	9/30/2008	4	—	**2,300**	660	—	—	—	—	—
SS12-8-093008		9/30/2008	8	—	<27	<54	—	—	—	—	—
SS12-16-093008		9/30/2008	16	—	<27	<54	—	—	—	—	—
SS13-15-093008	SS-13	9/30/2008	15	—	32	<57	—	—	—	—	—
MW11B-012809-3	MW-11B	1/28/2009	3	<8.3	1,500	**3,700**	<0.020	<0.083	<0.083	<0.083	—
MW11B-012809-8		1/28/2009	8	—	230	**3,300**	—	—	—	—	—
MW19-012609-20	MW-19	1/26/2009	20	—	—	—	—	—	—	—	<PQL
MTCA Method A Cleanup Levels[6]				**100**	**2,000**	**2,000**	**0.03**	**7**	**6**	**9**	**Varies**

NOTES:

Results in **bold** denote concentrations above applicable cleanup levels.

< denotes analyte not detected at or above the reporting limit listed.

— = denotes sample not analyzed

[1] Depth in feet below ground surface (bgs).

[2] Analyzed by Northwest Method NWTPH-Gx.

[3] Analyzed by Northwest Method NWTPH-Dx.

[4] Analyzed by U.S. Environmental Protection Agency (EPA) Method 8260B.

[5] All HVOC results were below the laboratory practical quantitation limits (PQL).

[6] Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

GRO = TPH as gasoline-range organics

ORO = TPH as oil-range organics

HVOCs = halogenated volatile organic compounds

Table 3
Summary of Soil Analytical Results - Metals
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood Washington
Farallon PN: 188-001

Sample Identification	Boring/ Well Identification	Sample Date	Depth (feet bgs)[1]	Analytical Results (milligrams per kilogram)												
				Antimony[2]	Arsenic[2]	Beryllium[2]	Cadmium[2]	Chromium[2]	Copper[2]	Lead[2]	Mercury[3]	Nickel[2]	Selenium[2]	Silver[2]	Thallium[2]	Zinc[2]
Soil Borings																
SS7-15-100108	SS-7	10/1/2008	15	<6.1	<12	<0.61	<0.61	24	32	10	<0.30	24	<12	<0.61	<6.1[6]	45
SS9-28-100208	SS-9	10/2/2008	28	<5.6	<11	<0.56	<0.56	160	27	28	<0.28	71	<11	<0.56	<5.6	29
MW12B-012109-33	MW-12B	1/21/2009	33	—	<12	—	<0.58	100	—	46	<0.29	—	—	—	—	—
Test Pits																
TP1-020309-6	TP-1	2/3/2009	6	—	<12	—	<0.59	36	—	14	<0.29	—	—	—	—	—
TP2-020309-6	TP-2	2/3/2009	6	—	<13	—	<0.66	63	—	98	<0.33	—	—	—	—	—
TP3-020309-3	TP-3	2/3/2009	3	—	<11	—	<0.56	28	—	18	<0.28	—	—	—	—	—
TP4-020309-7	TP-4	2/3/2009	7	—	<13	—	<0.63	19	—	15	<0.32	—	—	—	—	—
TP5-020309-7	TP-5	2/3/2009	7	—	<11	—	<0.57	23	—	13	<0.29	—	—	—	—	—
TP6-020309-14	TP-6	2/3/2009	14	—	15	—	<0.68	62	—	51	<0.34	—	—	—	—	—
TP7-020309-10	TP-7	2/3/2009	10	—	<11	—	<0.57	15	—	<5.7	<0.29	—	—	—	—	—
TP8-020309-4	TP-8	2/3/2009	4	—	<11	—	<0.54	22	—	10	<0.27	—	—	—	—	—
TP9-020309-5	TP-9	2/3/2009	5	—	<11	—	<0.57	230	—	21	<0.29	—	—	—	—	—
TP10-020309-6	TP-10	2/3/2009	6	—	<11	—	<0.53	21	—	<5.3	<0.26	—	—	—	—	—
MTCA Method A Cleanup Levels[4]				**NE**	**20**	**NE**	**2**	**2,000**	**NE**	**250**	**2**	**NE**	**NE**	**NE**	**NE**	**NE**
MTCA Method B Cleanup Levels[5]				**32**	**0.67**	**160**	**NE**	**NE**	**3,000**	**NE**	**24**	**1600**	**400**	**400**	**5.6**	**24,000**

NOTES:
< denotes analyte not detected at or above the reporting limit listed.
NE = not established
[1] Depth in feet below ground surface (bgs).
[2] Analyzed by U.S. Environmental Protection Agency (EPA) Method 6020.
[3] Analyzed by EPA Method 7471A.
[6] Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.
[5] Washington State Department of Ecology Cleanup Levels and Risk Calculations under MTCA, Version 3.1 Standard Method B Formula Values for Soil (Unrestricted Land Use) - Direct Contact (Ingestion Only) and Leaching Pathway, https://fortress.wa.gov/ecy/clarc/Reporting/ChemicalQuery.aspx
[6] Laboratory reporting limit exceeds cleanup level.

Table 4
Summary of Groundwater and Surface Water Analytical Results - TPH and BTEX
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Sample Identification	Well/Pond Identification	Sample Date	Analytical Results (micrograms per liter)						
			GRO[1]	DRO[2]	ORO[2]	Benzene[3]	Toluene[3]	Ethylbenzene[3]	Total Xylenes[3]
Shallow Water-Bearing Zone									
MW1-082008	MW-1	8/20/2008	<100	<260	<420	<0.2	<1.0	<0.2	<0.2
MW3-082008	MW-3	8/20/2008	<100	<240	<380	<0.2	<1.0	<0.2	<0.2
MW4-082008	MW-4	8/20/2008	<100	<270	<430	<0.2	<1.0	<0.2	<0.2
MW5-081908	MW-5	8/19/2008	<100	<230	<360	<0.2	<1.0	<0.2	<0.2
MW6-081908	MW-6	8/19/2008	<100	<260	<410	<0.2	<1.0	<0.2	<0.2
MW9-082008	MW-9	8/20/2008	<100	<220	<360	<0.2	<1.0	<0.2	<0.2
MW10-091708	MW-10	9/17/2008	<100	<250	<400	<0.20	<1.0	<0.20	<0.40
MW11-081908	MW-11	8/19/2008	<100	<230	<360	<0.2	<1.0	<0.2	<0.2
MW11-020609		2/6/2009	<100	**1,000**	<410	<1.0	<1.0	<1.0	<1.0
MW13-101408	MW-13	10/14/2008	<100	<250	<400	<1.0	<1.0	<1.0	<1.0
Deep Water-Bearing Zone									
MW2-082008	MW-2	8/20/2008	<100	<220	<360	<0.2	<1.0	<0.2	<0.2
MW7-082008	MW-7	8/20/2008	<100	<270	<440	<0.2	<1.0	<0.2	<0.2
MW11B-020609	MW-11B	2/6/2009	—	—	—	<0.2	<1.0	0.34	0.97
SW-082008	Water Supply Well	8/20/2008	<100	<220	<360	<0.2	<1.0	<0.2	<0.2
MTCA Method A Cleanup Levels[4]			**1,000 [5]**	**500**	**500**	**5**	**1,000**	**700**	**1,000**
Surface Water									
NP-082008	North Pond	8/20/2008	<100	360	1,700	<0.2	<1.0	<0.2	<0.2
WP-082008	West Pond	8/20/2008	<100	<240	<380	<0.2	<1.0	<0.2	<0.2

NOTES:

Results in **bold** denote concentrations above applicable cleanup levels.

< denotes analyte not detected at or above the reporting limit listed.

[1]Analyzed by Northwest Method NWTPH-Gx.

[2]Analyzed by Northwest Method NWTPH-Dx.

[3]Analyzed by U.S. Environmental Protection Agency (EPA) Method 8260B.

[4] Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.

[5]The cleanup level for GRO is without the presence of benzene.

BTEX = benzene, toluene, ethylbenzene, and total xylenes

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

GRO = TPH as gasoline-range organics

ORO = TPH as oil-range organics

Table 5
Summary of Reconnaissance Groundwater Analytical Results - HVOCs and Metals
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Sample Identification	Well/Pond Identification	Sample Depth (feet bgs)	Sample Date	Analytical Results (micrograms per liter)											
				Tetrachloroethene[1]	Trichloroethene[1]	(cis) 1,2-Dichloroethene[1]	1,1,1-Trichloroethane[1]	1,1-Dichloroethene[1]	1,1-Dichloroethane[1]	1,2-Dichloroethane[1]	Chloroform[1]	Methylene Chloride[1]	Remaining HVOCs[1]	Dissolved Arsenic[2]	Remaining Dissolved RCRA Metals[2,3]
Shallow Water-Bearing Zone															
MW9B-012209-30-GW	MW-9B	30	1/22/2009	2.1	<0.20	0.28	<0.20	<0.20	<0.20	<0.20	<0.20	**66**[4]	<PQL	4.9	<PQL
Deep Water-Bearing Zone															
MW9B-012209-70-GW	MW-9B	70	1/22/2009	0.48	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.24	<1.0	<PQL	—	—
MW12B-012109-89-GW	MW-12B	89	1/21/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—
MW12B-012209-121-GW		121	1/22/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—
MTCA Method A Cleanup Levels[5]				**5**	**5**	**NE**	**200**	**NE**	**NE**	**5**	**NE**	**5**	**NE**	**5**	**NE**
MTCA Method B Cleanup Levels[6]				**NE**	**0.11**	**80**	**7200**	**400**	**1600**	**0.48**	**7.2**	**5.8**	**Varies**	**0.0583**	**NE**

NOTES:

< denotes analyte not detected at or above the reporting limit listed.

— = denotes sample not analyzed

[1]Analyzed by U.S. Environmental Protection Agency Method 8260B.

[2]Analyzed by EPA Method 200.8/7470A.

[3]Resource Conservation and Recovery Act (RCRA) metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

[4] The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

[5] Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.

[6]MTCA Cleanup Levels and Risk Calculations, Version 3.1, Standard Method B Values for Groundwater, https://fortress.wa.gov/ecy/clarc/Reporting/ChemicalQuery.aspx

bgs = below ground surface

HVOCs = halogenated volatile organic compounds

NE = not established

Table 6
Summary of Groundwater and Surface Water Analytical Results - Volatile Organic Compounds
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

			Analytical Results (micrograms per liter)[1]													
Sample Identification	**Well/Pond Identification**	**Sample Date**	**Tetrachloroethene**	**Trichloroethene**	**(cis) 1,2-Dichloroethene**	**1,1,1-Trichloroethane**	**1,1-Dichloroethene**	**1,1-Dichloroethane**	**1,2-Dichloroethane**	**Chloroform**	**Methylene Chloride**	**Remaining HVOCs**	**Acetone**	**p-Isopropyltoluene**	**1,2,4-Trimethylbenzene**	**Remaining VOCs (full 8260B scan)**
Shallow Water-Bearing Zone																
MW1-082008	MW-1	8/20/2008	<0.20	0.32	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW1-020409		2/4/2009	<0.20	0.51	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW3-082008	MW-3	8/20/2008	<0.20	4.3	<0.20	0.66	<0.20	<0.20	<0.20	1.2	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW3-020609		2/6/2009	<0.20	3.4	<0.20	0.43	<0.20	<0.20	<0.20	0.71	<1.0	<PQL	—	—	—	—
Dup1-020609		2/6/2009	<0.20	3.4	<0.20	0.40	<0.20	<0.20	<0.20	0.69	<1.0	<PQL	—	—	—	—
MW4-082008	MW-4	8/20/2008	<0.20	2.0	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW4-020609		2/6/2009	<0.20	2.3	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW5-081908	MW-5	8/19/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW5-020309		2/3/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW6-081908	MW-6	8/19/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW6-020309		2/3/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW9-082008	MW-9	8/20/2008	<0.20	2.1	<0.20	0.30	<0.20	<0.20	<0.20	0.41	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW9-020309		2/3/2009	<0.20	2.4	<0.20	0.31	<0.20	<0.20	<0.20	0.45	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW10-091708	MW-10	9/17/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW10-020409		2/4/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW11-081908	MW-11	8/19/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW11-020609		2/6/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW12-020609	MW-12	2/6/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW13-101408	MW-13	10/14/2008	<0.20	<0.20	<0.20	0.58	0.26	0.73	0.41	<0.20	<1.0	<PQL	—	—	—	—
MW13-020609		2/6/2009	<0.20	<0.20	<0.20	0.68	<0.20	0.83	0.22	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW17A-020409	MW-17A	2/4/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MTCA Method A Cleanup Levels[2]			**5**	**5**	**NE**	**200**	**NE**	**NE**	**5**	**NE**	**5**	**NE**	**NE**	**NE**	**NE**	**NE**
MTCA Method B Cleanup Levels[3]			**NE**	**0.11**	**80**	**7200**	**400**	**1600**	**0.48**	**7.2**	**5.8**	**Varies**	**800**	**NE**	**400**	**Varies**

Table 6
Summary of Groundwater and Surface Water Analytical Results - Volatile Organic Compounds
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

Sample Identification	Well/Pond Identification	Sample Date	Analytical Results (micrograms per liter) [1]													
			Tetrachloroethene	Trichloroethene	(cis) 1,2-Dichloroethene	1,1,1-Trichloroethane	1,1-Dichloroethene	1,1-Dichloroethane	1,2-Dichloroethane	Chloroform	Methylene Chloride	Remaining HVOCs	Acetone	p-Isopropyltoluene	1,2,4-Trimethylbenzene	Remaining VOCs (full 8260B scan)
Deep Water-Bearing Zone																
MW2-082008	MW-2	8/20/2008	<0.20	**14**	<0.20	2.1	<0.20	<0.20	<0.20	2.2	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW2-021209	MW-2	2/12/2009	<0.20	**14**	<0.20	1.2	<0.20	<0.20	<0.20	2.0	<1.0	<PQL	—	—	—	—
Dup2-021209	MW-2	2/12/2009	<0.20	**14**	<0.20	1.2	<0.20	<0.20	<0.20	1.9	<1.0	<PQL	—	—	—	—
MW7-082008	MW-7	8/20/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW7-020309	MW-7	2/3/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW9B-021209	MW-9B	2/12/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.21	<1.0	<PQL	—	—	—	—
MW10B-020409	MW-10B	2/4/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
MW11B-020609	MW-11B	2/6/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	0.27	0.50	<PQL
MW12B-021209	MW-12B	2/12/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW-14-101308	MW-14	10/13/2008	<0.20	**24**	<0.20	11	3.5	0.43	<0.20	0.33	<1.0	<PQL	—	—	—	—
MW-14-021209	MW-14	2/12/2009	<0.20	**22**	<0.20	7.5	2.0	0.33	<0.20	0.29	<1.0	<PQL	—	—	—	—
MW-14C-020509	MW-14C	2/5/2009	<0.20	<0.20	<0.20	1.0	0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW15-101308	MW-15	10/13/2008	<0.20	2.8	0.45	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW15-020409	MW-15	2/4/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW16-101308	MW-16	10/13/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW16-020309	MW-16	2/3/2009	<0.20	<0.20	<0.20	0.26	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW17-101308	MW-17	10/13/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW17-020409	MW-17	2/4/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW18-020509	MW-18	2/5/2009	<0.20	<0.20	<0.20	9.9	2.6	0.63	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MW19-020509	MW-19	2/5/2009	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
SW-082008	Water Supply Well	8/20/2008	<0.20	0.3	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	<5.0	<0.20	<0.20	<PQL
Pumphouse-021209	Water Supply Well	2/12/2009	<0.20	0.53	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	—	—	—	—
MTCA Method A Cleanup Levels[2]			**5**	**5**	**NE**	**200**	**NE**	**NE**	**5**	**NE**	**5**	**NE**	**NE**	**NE**	**NE**	**NE**
MTCA Method B Cleanup Levels[3]			**NE**	**0.11**	**80**	**7200**	**400**	**1600**	**0.48**	**7.2**	**5.8**	**Varies**	**800**	**NE**	**400**	**Varies**
Surface Water																
NP-082008	North Pond	8/20/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	12	0.42	0.42	<PQL
WP-082008	West Pond	8/20/2008	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<1.0	<PQL	5.9	<0.20	<0.20	<PQL

NOTES:

< denotes analyte not detected at or above the reporting limit listed.

— = denotes sample not analyzed

[1]Analyzed by U.S. Environmental Protection Agency Method 8260B.

[2] Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.

[3]MTCA Cleanup Levels and Risk Calculations, Version 3.1, Standard Method B Values for Groundwater, https://fortress.wa.gov/ecy/clarc/Reporting/ChemicalQuery.aspx

[4] The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

HVOCs = halogenated volatile organic compounds

NE = not established

Table 7
Summary of Groundwater and Surface Water Analytical Results - Total and Dissolved Metals
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

			Analytical Results (micrograms per liter)												
			Arsenic[1]		Chromium[1]		Copper[1]		Lead[1]		Zinc[1]			Remaining Total Priority Pollutant	Remaining Dissolved Priority Pollutant
Sample Identification	Well/Pond Identification	Sample Date	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Remaining Total MTCA Metals[2,3]	Metals[2,5]	Metals[2,5]
Shallow Water-Bearing Zone															
MW1-082008	MW-1	8/20/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW3-082008	MW-3	8/20/2008	—	<3.0	—	<10	—	<10	—	<1.0	—	<25	—	—	<PQL
MW4-082008	MW-4	8/20/2008	—	—	—	—	—	—	<1.1	—	—	—	—	—	—
MW5-081908	MW-5	8/19/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW6-081908	MW-6	8/19/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW9-082008	MW-9	8/20/2008	—	<3.0	—	<11	—	<11	—	<1.0	—	<25	—	—	<PQL
MW10-091708	MW-10	9/17/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW11-081908	MW-11	8/19/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW12-101408	MW-12	10/14/2008	**11**	**8.2**	18	—	13	—	**50**	**29**	32	—	—	<PQL	—
MW12-020609		2/6/2009	**15**	**18**	18	—	—	—	**22**	6.1	—	—	<PQL		—
MW13-101408	MW-13	10/14/2008	<3.3	—	<11	—	<11	—	<1.1	—	<28	—	—	<PQL	—
MW17A-020409	MW-17A	2/4/2009	**5.3**	4.2	14	—	—	—	3.5	—	—	—	<PQL		—
Deep Water-Bearing Zone															
MW2-082008	MW-2	8/20/2008	—	—	—	—	—	—	—	<1.0	—	—	—	—	—
MW7-082008	MW-7	8/20/2008	—	—	—	—	—	—	1.3	—	—	—	—	—	—
MW9B-021209	MW-9B	1/12/2009	<3.3	—	<11	—	—	—	<1.1	—	—	—	<PQL	—	—
MW12B-021209	MW-12B	1/12/2009	<3.3	—	<11	—	—	—	<1.1	—	—	—	<PQL	—	—
SW-082008	Water Supply Well	8/20/2008	—	<3.0	—	<11	—	<11	—	<1.0	—	72	—	—	<PQL
MTCA Method A Cleanup Levels[6]			**5**		**50**		**NE**		**15**		**NE**		**NE**	**NE**	**NE**
MTCA Method B Cleanup Levels[7]			**0.0583**		**NE**		**590**		**NE**		**4800**		**NE**	**NE**	**NE**
Surface Water															
NP-082008	North Pond	8/20/2008	—	**5.6**	—	<11	—	<11	—	3.0	—	<25	—	—	<PQL
WP-082008	West Pond	8/20/2008	<3.3	—	<11	—	<11	—	<1.1	—	<28	—	—	<PQL	—

NOTES:
< denotes analyte not detected at or above the reporting limit listed.
— = denotes sample not analyzed
NE = not established
[1]Analyzed by U.S. Environmental Protection Agency (EPA) Method 200.8.
[2]Analyzed by EPA Method 200.8/7470A.
[3]Washington State Model Toxics Control Act Cleanup Regulation (MTCA) metals: arsenic, cadmium, chromium, lead, and mercury.
[4]Resource Conservation and Recovery Act (RCRA) metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.
[5]Priority pollutant metals: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.
[6]MTCA Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised November 2007.
[7]MTCA Cleanup Levels and Risk Calculations, Version 3.1, Standard Method B Values for Groundwater, https://fortress.wa.gov/ecy/clarc/Reporting/ChemicalQuery.aspx

Table 8
Summary of Groundwater Geochemical Data
Woodworth Lakeview Facility
Remedial Investigation/Feasibility Study
Lakewood, Washington
Farallon PN: 188-001

			Electron Receptors			Metabolic Byproducts					Water Quality Parameters[1]			
Sample Identification	Well Identification	Date Sampled	Dissolved Oxygen[1] (mg/L)	Nitrate[2] (mg/L)	Sulfate[3] (mg/L)	Nitrite[2] (mg/L)	Ferrous Iron[4] (mg/L)	Dissolved Methane[5] (µg/L)	Dissolved Ethane[5] (µg/L)	Dissolved Ethene[5] (µg/L)	pH[1]	Temperature[1] (Degrees Celsius)	Conductivity[1] (mS/cm)	ORP[1] (mV)
Shallow Water-Bearing Zone														
MW1-020409	MW-1	2/4/2009	2.05	—	—	—	—	—	—	—	6.43	9.91	0.809	190.4
MW3-020609	MW-3	2/6/2009	3.54	—	—	—	—	—	—	—	6.63	7.73	0.518	90.1
MW4-020609	MW-4	2/6/2009	2.23	—	—	—	—	—	—	—	6.72	8.80	0.859	100.5
MW5-020309	MW-5	2/3/2009	1.03	—	—	—	—	—	—	—	6.46	11.58	0.334	154.0
MW6-020309	MW-6	2/3/2009	1.26	—	—	—	—	—	—	—	6.97	9.85	0.360	134.1
MW9-020309	MW-9	2/3/2009	1.54	—	—	—	—	—	—	—	6.75	11.56	0.333	125.0
MW10-020409	MW-10	2/4/2009	1.10	—	—	—	—	—	—	—	6.48	10.36	0.300	183.3
MW11-020609	MW-11	2/6/2009	0.69	—	—	—	—	—	—	—	6.45	7.51	0.494	-48.8
MW12-020609	MW-12	2/6/2009	0.35	—	—	—	—	—	—	—	9.15	9.90	0.714	-99.5
MW13-020609	MW-13	2/6/2009	1.80	—	—	—	—	—	—	—	7.51	10.23	0.432	-29.1
MW17A-020409	MW-17A	2/4/2009	5.01	—	—	—	—	—	—	—	6.85	13.83	0.516	8.3
Deep Water-Bearing Zone														
MW2-021209	MW-2	2/12/2009	5.40	—	—	—	—	—	—	—	6.69	12.44	0.305	151.4
MW7-020309	MW-7	2/3/2009	2.17	—	—	—	—	—	—	—	7.19	12.84	0.302	81.9
MW9B-021209	MW-9B	2/12/2009	1.40	1.200	11	<0.050	0.0	<0.50	<0.50	<0.50	6.62	11.56	0.291	33.8
MW10B-020409	MW-10B	2/4/2009	1.83	—	—	—	—	—	—	—	6.49	12.09	0.275	5.9
MW11B-020609	MW-11B	2/6/2009	3.71	—	—	—	—	—	—	—	7.27	8.01	0.351	-36.8
MW12B-021209	MW-12B	2/12/2009	5.41	—	—	—	—	—	—	—	7.07	11.35	0.243	105.9
MW14-021209	MW-14	2/12/2009	4.07	0.190	22	0.051	0.0	3.3	<0.50	<0.50	7.03	11.69	0.367	162.7
MW14C-020509	MW-14C	2/5/2009	0.50	—	—	—	—	—	—	—	7.86	10.33	0.264	-95.6
MW15-020409	MW-15	2/4/2009	9.51	—	—	—	—	—	—	—	6.73	9.72	0.238	114.8
MW16-020309	MW-16	2/3/2009	0.92	—	—	—	—	—	—	—	6.73	12.96	0.450	103.1
MW17-020409	MW-17	2/4/2009	2.84	—	—	—	—	—	—	—	6.79	13.04	0.473	60.0
MW18-020509	MW-18	2/5/2009	6.80	0.080	26	<0.050	0.0	0.94	<0.50	<0.50	7.50	9.93	0.442	-91.1
MW19-020509	MW-19	2/5/2009	0.59	0.067	39	0.11	0.0	9.4	1.3	0.80	7.75	11.14	0.444	-256.4

NOTES:
[1]Collected using a YSI multimeter and flow-through cell.
[2]Analyzed by U.S. Environmental Protection Agency (EPA) Method 353.2.
[3]Analyzed by EPA Method 375.4.
[4]Collected and analyzed in field using a portable ferrous iron test kit
[5]Analyzed by EPA Method 8015M.

Electron receptors = Energy sources for biodegradation. A compound that gains electrons during biodegradation.
Metabolic byproducts = Compounds that result from biodegradation processes.
mg/L = milligrams per liter
µg/L = micrograms per liter
mS/cm = milliSiemens per centimeter specific conductance units
mV = millivolt units for measurement of oxidation-reduction potential (ORP)

Table 9
Comparison of Technically Feasible Cleanup Alternatives
Woodworth Lakeview Facility
Lakewood, Washington
Farallon PN: 188-001

Total Petroleum Hydrocarbons in Soil Cleanup Alternatives						
	Range of Cost		Time Frame Range			
Alternatives	Low	High	Short	Long	Advantages	Disadvantages
Institutional Controls and Monitoring	$120,000	$150,000	10 years	20 years	Low annual cost.	Does not meet cleanup criteria within a reasonable time frame.
In-Situ Treatment by Soil Vapor Extraction (SVE)	$200,000	$400,000	4 years	6 years	Active treatment system, requiring no off-site soil disposal.	High cost, extended time frame, poor performance on heavy TPH compounds, may not remediate the soil completely. No effect on saturated soils (below the groundwater table) such as in AOC 1.
Removal by Excavation and Off-Property Disposal or On-Property Recycling	$80,000	$125,000	3 months	6 months	Effective for soils near surface with source identified.	Disruption of operations during excavation. Unknown volume of soil to be removed.

Groundwater Cleanup Alternatives						
	Range of Cost		Time Frame Range			
Alternatives	Low	High	Short	Long	Advantages	Disadvantages
In-Situ Physical Treatment by Air Sparging (AS)/SVE	$550,000	$800,000	1.5 years	3 years	Will actively remediate groundwater. SVE would help remediate an unidentified source area in the vadose soil. Can be amended with ozone to shorten the time frame for cleanup.	Heterogeneous soil and discontinuous shallow water-bearing zone require careful attention for SVE screen installation. Reduced radius of influence for AS wells given soil type and depths to contaminated areas. High costs.
In-Situ Chemical Treatment	$900,000	Not estimated	1.5 years	3 years	Will actively remediate groundwater. Shorter time for cleanup.	Heterogeneous soil and discontinuous shallow water-bearing zone require careful attention for injection screen installation. Difficult delivery and contact will require a large number of injection points with multiple injection depths per point. Large volume of oxidant. Permitting requirements and regulatory issues for injections.
Ex-Situ Physical/Chemical Treatment	$650,000	$900,000	2 years	4 years	Will actively remediate groundwater.	Limited by storage/treatment capacity. May not address potential source. Large volume of water to treat. Disposal and/or re-injection issues. High costs.
Enhanced Anaerobic Bioremediation of VOCs	>$1,000,000	Not estimated	3 years	6 years	Not considered due to high cost and a number of disadvantages.	Difficulty with existing groundwater geochemistry and lack of existing biodegradation. Potential for incomplete biodegradation resulting in concentrations of degradation products. Longer time frame. High costs.
Enhanced Aerobic Bioremediation of TPH	$35,000	$80,000	1.5 years	3 years	Very effective and low cost if used in conjunction with soil removal by excavation.	Longer time frame if applied without soil removal by excavation. May require multiple injections of enhancement agent (ORC or similar) if applied without soil removal by excavation.
Monitored Natural Attenuation	$130,000	$250,000	15	30	Low annual cost.	May not meet cleanup criteria within a reasonable time frame. No evidence of existing biodegradation. Will require restrictive covenants.

APPENDIX A
BORING AND WELL CONSTRUCTION LOGS

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

USCS Classification and Graphic Legend

Major Divisions			USCS Graphic Symbol	USCS Letter Symbol	Lithologic Description
Coarse-Grained Soil (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well graded GRAVEL, well graded GRAVEL with sand
				GP	Poorly graded GRAVEL, GRAVEL with sand
		GRAVEL WITH FINES (Appreciable amount of fines)		GP-GM	Poorly graded GRAVEL - GRAVEL with sand and silt
				GM	Silty GRAVEL
				GC	Clayey GRAVEL
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well graded SAND
				SP	Poorly graded SAND
		SAND WITH FINES (Appreciable amount of fines)		SP-SM	Poorly graded SAND - silty SAND
				SM	Silty SAND
				SC	Clayey SAND
				SM-ML	SILT - Silty SAND
Fine-Grained Soil (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	SILT
				CL	CLAY
				OL	Organic SILT
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic SILT
				CH	Inorganic CLAY
				OH	Organic CLAY
		Highly Organic Soil		PT	Peat
OTHER MATERIALS	PAVEMENT			AC	Asphalt concrete
				CO	Concrete
	OTHER			RK	Bedrock
				WD	Wood Debris
				DB	Debris (Miscellaneous)
				PC	Portland cement

Legend

- Sample Interval
- Grab Sample Interval
- Water level at time of drilling
- Water level at time of sampling
- Blank Casing
- Screened Casing

- Cement Grout
- Bentonite
- Sand Pack
- Well Cap

Solid line indicates sharp contact between units well defined.

Dashed line indicates gradational contact between units.

feet bgs = feet below ground surface
NE = Not Encountered
NA = Not Applicable
PID = Photoionization Detector
PN = Project Number
*ppm = parts per million total organic vapors in isobutylene equivalents using a 10.6 electron volt lamp
USCS = Unified Soil Classification System

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-9B

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: D. Clement

Date/Time Started:	01/22/09 1345	**Sampler Type:**	4" Steel
Date/Time Completed:	01/23/09 1115	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	27', 60'
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	122
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	119
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0	Silty SAND (60% sand, 40% silt), fine to medium sand, brown, moist, no odor, roots, wood fragments.	SM	100 100		0.1			Concrete
10	SILT (90% silt, 10% sand), fine sand, gray-brown, moist, no odor.	ML			0.1	MW9B-012209-9		
	Silty SAND with gravel (60% sand, 25% silt, 15% gravel), fine to medium sand, fine to coarse gravel, gray-brown, moist, no odor, brick fragments.	SM	100 100		0.2			Casing
20	SILT with gravel (70% silt, 20% gravel, 10% sand), fine sand, fine gravel, gray, moist, no odor.	ML	100		0.3	MW9B-012209-19		
	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray-brown, wet, no odor.	GP	100		0.4	MW9B-012209-27		
	Silty GRAVEL (60% gravel, 40% silt), fine to coarse gravel, gray, moist, no odor.	GM	100 100		1.2 1.1 0.5	MW9B-012209-30-GW MW9B-012209-31	X	Bentonite
	SILT (90% silt, 10% gravel), fine gravel, gray, moist, no odor.	ML	100 100		0.0 0.1	MW9B-012209-42		Casing
50	Silty GRAVEL (60% gravel, 40% silt), fine to coarse gravel, gray, moist, no odor.	GM	100		0.0 0.1	MW9B-012209-50		

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	301.55
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	301.23
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1150033.94
Screened Interval (ft bgs):	109-119	**Boring Abandonment:**	Sand pack		Y: 674137.48

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-9B

Depth (feet bgs.): 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125

Lithologic Description	USCS
Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor. Several 1- to 2-inch lenses starting at 79 feet of poorly-graded SAND (100% sand), fine to medium, brown, wet, no odor.	GP
Silty GRAVEL (60% gravel, 40% silt), fine to coarse gravel, gray, moist, no odor.	GM

% Recovery: 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100

PID (ppm)	Sample ID	Sample Analyzed
0.0	MW9B-012209-60	
0.0		
0.0	MW9B-012209-70-GW	X
0.0		
0.0		
0.1		
0.4		
0.8		
0.8		
1.0		
1.0		
0.9	MW9B-021209	X
0.8	MW9B-012309-119	
0.2	MW9B-012309-119-GW	
	MW-9B-012309-122	

Well Construction Details: Bentonite; Casing; Bentonite; Casing; Sand pack; Screen; Sand pack

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	301.55
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	301.23
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1150033.94
Screened Interval (ft bgs):	109-119	**Boring Abandonment:**	Sand pack		Y: 674137.48

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-10B

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/29/09 1150	**Sampler Type:**	4" Steel
Date/Time Completed:	01/30/09 1200	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	28, 71
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	130
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	127
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	PID (ppmv)	Sample ID	Boring/Well Construction Details
0–8	No recovery		0			Concrete
8–29	Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor. At 18 feet one 2-inch thick lens of SILT (60% silt, 40% sand), fine sand, gray, moist, no odor.	GM	50, 100, 100, 100	1.1, 0.7, 0.7, 1.4, 1.0	MW10B-012909-18	Casing
29–45	Poorly-graded SAND with gravel (60% sand, 35% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, brown-black, wet, no odor.	SP	100, 100, 100, 100	0.7, 0.9, 0.9, 0.7, 0.4	MW10B-012909-28; MW10B-012909-34	Bentonite
45–60	Silty GRAVEL with sand (60% gravel, silt 25% sand 15%), fine to coarse gravel, fine to coarse sand, gray-brown, moist to 71 feet then wet, no odor.	GM	100, 100, 100	0.5, 0.6, 0.5, 0.5, 0.3	MW10B-012909-44	Casing; Bentonite

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	311.27
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	310.91
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149952.42
Screened Interval (ft bgs):	117-127	**Boring Abandonment:**	Bentonite		Y: 673370.49

FARALLON CONSULTING

975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-10B

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
			100				
65				0.4			
			100				
70				0.2			
	Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray, wet, no odor. At 97 feet one 2-inch lens of poorly-graded SAND (100% sand), fine to medium sand, brown, wet, no odor.	GP	100		MW10B-012909-72		
75				0.1			Casing
			100				
80				0.2	MW10B-012909-80		
85			100				
				0.1			
90			100				
				0.1			Bentonite
95			100				
				0.0			
100			100				
	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP		0.1			
105			100				
				0.2			Casing
110			100				
				0.6			
115			100				
				0.5			
120			100				
				0.2			Screen
			100		MW10B-020409	X	
125				0.1	MW10B-013009-127		Sand pack
	Silty GRAVEL (60% gravel, 35% silt, 5% sand), fine to coarse gravel, fine sand, gray, moist, no odor.	GM	100	0.2			
130							Bentonite
				0.1	MW10B-013009-130		
135							

Well Construction Information

Monument Type:	Flush mount	Filter Pack:	10/20 Sand	Ground Surface Elevation (ft):	311.27
Casing Diameter (inches):	2"	Surface Seal:	Concrete	Top of Casing Elevation (ft):	310.91
Screen Slot Size (inches):	0.010	Annular Seal:	Bentonite	Surveyed Location:	X: 1149952.42
Screened Interval (ft bgs):	117-127	Boring Abandonment:	Bentonite		Y: 673370.49

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-11B

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/28/09 1500		**Sampler Type:**	4" Steel
Date/Time Completed:	01/29/09 0915		**Drive Hammer (lbs.):**	NA
Equipment:	Sonic		**Depth of Water (ft bgs):**	7.5, 20
Drilling Company:	Boart Longyear		**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Ken Phillips		**Total Well Depth (ft bgs):**	58
Drilling Method:	Sonic			

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–4	Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, brown, moist, slight petroleum-like odor at 2.5 feet, brick fragments.	GM		5.2			Concrete
4–8	Tar & asphalt	GM	100	61.6	MW11B-012809-3	X	
				7.0			
8–13	Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, brown-black, moist to 7.5 then wet, petroleum-like odor, tar and asphalt mixed in with soil.	SP	100	3.4	MW11B-012809-8	X	Casing
				2.4			
13–16	Poorly-graded SAND with gravel (75% sand, 20% gravel, 5% silt), gray-brown, wet, no odor, wood fragments.		100	5.6			
16–20	Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, black, moist to wet, faint petroleum-like odor, wood fragments, tar.	GM		5.7	MW11B-012809-15		
				2.1			
			100	8.2			
20–21	Large rock fragment	ML		2.4	MW11B-012809-20		Bentonite
21–24	Sandy SILT (60% silt, 40% sand), fine sand, gray, moist, no odor.	GM		0.7			
			100	1.0			
				0.6			
				0.7			
24–50	Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor. From 35 to 50 feet few 1- to 2-inch lenses of poorly-graded SAND (100% sand), fine to coarse, gray, wet, no odor.		100	0.5			Casing
			100	0.9			
			100	0.4			Bentonite
			100	0.4			
			100				
50–60	Poorly-graded GRAVEL with sand (75% gravel, 20% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray-brown, wet, no odor.	GP		0.7	MW11B-012909-50		Screen
			100		MW11B-020609	X	
				0.3			Sand pack
			100				Bentonite
				0.3	MW11B-012909-60		

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	287.53
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	287.31
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149316.19
Screened Interval (ft bgs):	48-58	**Boring Abandonment:**	Bentonite		Y: 673131.6

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW12 / SS9

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: John Schmitt

Date/Time Started:	10/02/08 0730	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/02/08 1225	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	42
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	50
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	50
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Sample ID	Boring/Well Construction Details
0	Poorly graded sand with silt and gravel (sand 50%, gravel 40%, silt 10%), fine to medium sand, fine to coarse gravel, dark brown, moist, no odor.	SP-SM			Concrete
5	Silty sand with gravel (sand 60%, gravel 20%, silt 20%), fine to medium sand, fine to coarse gravel, dark brown, moist, no odor.	SM	100		2" diam PVC casing
	Poorly graded gravel with silt and sand (gravel 60%, sand 30%, silt 10%), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP-GM		SS9-10-100208 @ 0825	Bentonite seal
	Poorly graded gravel with silt and sand (gravel 60%, sand 30%, silt 10%), fine to coarse gravel, fine to coarse sand, grey, moist, no odor.	GP-GM	100		
	Poorly graded gravel with silt and sand (gravel 60%, sand 30%, silt 10%), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP-GM		SS9-19-100208 @ 0850	
20	Poorly graded sand with gravel (sand 70%, gravel 30%), fine to medium sand, fine to coarse gravel, grey-brown, moist, no odor, pieces of brick and white chalky substance present.	SP	80	SS9-28-100208 @ 0915	
			80		
	Poorly graded gravel with sand (gravel 70%, sand 30%, silt 5%), fine to coarse gravel, moist, no odor.	GP		SS9-40-100208 @ 0955	
	Poorly graded gravel with sand (gravel 70%, sand 30%, silt 5%), fine to coarse gravel, wet, no odor.	GP	70		10/20 sand pack; 0.010 slot PVC well screen
50	Silty gravel (gravel 70%, silt 20%, sand 10%), fine to coarse gravel, wet, no odor.	GM			

Other columns: Sample Interval, USGS Graphic, Blow Counts 8/8/8, PID (ppmv), Sample Analyzed.

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	313.88
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	313.32
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	40-50	**Boring Abandonment:**	NA		Y:

FARALLON CONSULTING

975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-12B

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/21/09 0920	**Sampler Type:**	4" Steel
Date/Time Completed:	01/22/09 0900	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	38, 75
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	125
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	121
Drilling Method:	Sonic		

Column headings: Depth (feet bgs.) | Sample Interval | Lithologic Description | USCS | USGS Graphic | % Recovery | Blow Counts 8/8/8 | PID (ppmv) | Sample ID | Sample Analyzed | Boring/Well Construction Details

Depth scale (feet bgs.): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55

Lithologic Description

1. Poorly graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, dark brown, moist, no odor, brick fragments, organics.
2. Poorly graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, light brown, moist, no odor.
3. Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, gray, moist, no odor, brick fragments.
4. Poorly-graded SAND with gravel (60% sand, 35% gravel, 5% silt), fine to coarse sand, fine gravel, gray-brown, moist, no odor, brick fragments, white chalky substance at 22.5 feet.
5. Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, brick fragments, wood pieces.
6. Poorly-graded SAND with gravel (60% sand, 35% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, brown, moist, strong organic odor, wood fragments.
7. Poorly-graded SAND with gravel (60% sand, 35% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, brown, moist, strong organic odor, wood, concrete, and steel mesh fragments.
8. Poorly-graded GRAVEL with sand (75% gravel, 20% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray, wet, organic odor, concrete fragments and concrete steel mesh fragments, steel shard at 40 feet.
9. Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to medium sand, gray, moist, no odor, brick fragments.
10. Sandy SILT with gravel (55% silt, 25% sand, 20% gravel), fine to coarse sand, fine gravel, gray, moist, no odor.
11. Silty GRAVEL (75% gravel, 15% silt, 5% sand), fine to coarse gravel,

USCS (in order, top to bottom): GP, GP, GM, SP, GP, SP, SP, GP, GM, ML, GM, GP, ML

% Recovery (in order, top to bottom): 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100, 100

PID (ppmv) (in order, top to bottom): 0.5, 0.2, 0.0, 0.3, 0.2, 1.8, 6.2, 10.2, 3.0, 1.0, 1.1, 0.5

PID (ppmv)	Sample ID	Sample Analyzed
6.2	MW12B-012109-33	X
1.0	MW12B-012109-49	
1.1	MW12B-012109-52	
0.5	MW12B-012109-55	

Boring/Well Construction Details (in order, top to bottom): Concrete, Casing, Bentonite, Casing

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	313.74
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	313.53
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1150061.62
Screened Interval (ft bgs):	111-121	**Boring Abandonment:**	Sand pack		Y: 674541.35

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-12B

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
60	fine to coarse sand, gray, moist, no odor.			0.4			Bentonite
	Poorly-graded GRAVEL with sand (75% gravel, 20% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray, moist, no odor.		100				
65	Gravelly SILT (60% silt, 35% gravel, 5% sand), fine to coarse gravel, fine sand, gray-brown, moist, no odor.			0.6			
70			100	0.5			
			100				
75	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP		0.6	MW12B-012109-74		Casing
80			100	0.6			
85			100	0.5			
90			100	0.4	MW12B-012109-89-GW	X	Bentonite
95			100	0.4			
100			100	0.5			
105			100	0.9			Casing
110			100	1.1			Sand pack
115			100	20.2	MW12B-021209	X	Screen
120	Several lenses of poorly graded SAND (90% sand, 5% gravel, 5% silt), grey, wet, no odor. One lens at 101 feet of sandy SILT (60% silt, 40% sand), fine sand, grey, wet, no odor.		100	23.0			
	Silty GRAVEL wih sand (55% gravel, 30% silt, 15% sand), fine gravel, fine to coarse sand, gray, moist, no odor.	GM	100	0.1	MW12B-012209-121	X	Sand pack
125				0.1	MW12B-012209-125		

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	313.74
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	313.53
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1150061.62
Screened Interval (ft bgs):	111-121	**Boring Abandonment:**	Sand pack		Y: 674541.35

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW13 / SS6

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: Jon Peterson

Date/Time Started:	10/07/08 0930	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/07/08 1200	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	17, 20
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	25
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	24
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Boring/Well Construction Details
0	Poorly-graded sand with gravel (Sand 60%, gravel 40%), fine sand, coarse gravel, tan, loose, dry, no odor	SP					Concrete
	Gravelly silt with sand (Silt 50%, gravel 30%, sand 20%), coarse gravel, fine sand, tan, soft, moist, oily- odor in gray-stained clumps of sand, no sheen	ML	90		1.9	SS6-2.5-100708 @ 0945	
5	2.5-5' bgs: moist, no odor, no sheen						2" diam PVC casing
			100				
10							Bentonite seal
			90		0.0	SS6-11-100708 @ 1000	
15							10/20 sand pack
	Poorly graded gravel with sand (Gravel 60%, sand 40%), coarse gravel, fine sand, gray, loose, wet, solvent-like odor	GP	90		2.5	SS6-17-100708 @ 1020	
20	Gravelly silt with sand (Silt 50%, gravel 30%, sand 20%), coarse gravel, fine sand, tan, soft, moist, no odor	ML					
	Poorly graded gravel with sand (Gravel 60%, sand 40%), coarse gravel, fine sand, gray, loose, wet, no odor	GP					
	Gravelly silt with sand (Silt 50%, gravel 30%, sand 20%), coarse gravel, fine sand, tan, soft, moist, no odor	ML					0.010 slot PVC well screen
25	Gravelly silt (Silt 60%, gravel 40%), coarse, gray, stiff, moist, no odor	ML					Bentonite plug
	Gravelly silt with sand (Silt 50%, gravel 30%, sand 20%), coarse gravel, fine sand, gray, medium stiff, wet, no odor	ML					

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	284.97
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	284.73
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	14-24	**Boring Abandonment:**	NA		Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW14 / SS4

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: John Schmitt

Date/Time Started:	10/03/08 1020	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/03/08 1300	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	20,33
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	55
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0–1	Asphalt	GP						Concrete
1–15	Poorly graded gravel with sand (gravel 60%, sand 40%, trace silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP	90 90					2" diam PVC casing Bentonite seal
15–20	Poorly graded gravel with silt and sand (gravel 60%, sand 30%, silt 10%), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP-GM						
20–27	Poorly graded gravel with sand (gravel 70%, sand 25%, silt 5%), fine to coarse gravel, moist, no odor.	GP						
27–32	Poorly graded gravel with silt and sand (gravel 70%, sand 20%, silt 10%), fine to coarse gravel, moist, no odor.	GP-GM						
32–38	Poorly graded sand with gravel (sand 60%, gravel 40%, trace silt), medium to coarse sand, fine to coarse gravel, wet.	SP						
38–41	Poorly graded sand with silt and gravel (sand 60%, gravel 30%, silt 10%), medium to coarse sand, fine to coarse gravel, wet.	SP-SM						
41–45	Poorly graded gravel with sand (gravel 70%, sand 30%, trace silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP						10/20 sand pack
45–50	Poorly graded sand with gravel (sand 50%, gravel 50%), wet, no odor.	SP	60					0.010 slot PVC well screen
50–55	Poorly graded gravel with sand (trace silt), fine to coarse gravel, medium to coarse sand, brown, wet, no odor.	GP						

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	280.28
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	279.79
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	50-55	**Boring Abandonment:**	NA		Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-14C

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/26/09 1340	**Sampler Type:**	4" Steel
Date/Time Completed:	01/26/09 1710	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	27
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	80
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	77
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP	100					Concrete
6	Poorly-graded SAND (90% sand, 5% gravel, 5% silt), fine to coarse sand, fine gravel, brown, moist, no odor.	SP	100		0.3	MW14C-012609-6		
8.5	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse grave, fine to coarse sand, brown, moist to 15 feet, wet at 15 to 21.5 feet, moist 21.5 to 27 feet, no odor. Wet section may be due to drillers using water to clean sampler threads prior to sample removal.	GP	100, 100, 100		0.2, 0.2, 0.3, 0.1, 0.3	MW14C-012609-8		Casing
27	Silty SAND with gravel (60% sand, 25% gravel, 15% silt), fine to coarse sand, fine to coarse gravel, brown, wet, no odor.	SM	100		0.1	MW14C-012609-27		
30	Poorly-graded GRAVEL with sand (65% gravel, 30% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP	100, 100		0.1, 0.2	MW14C-012609-30		Bentonite

Depth scale: 0, 5, 10, 15, 20, 25, 30, 35

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	280.35
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	279.99
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149449.26
Screened Interval (ft bgs):	67-77	**Boring Abandonment:**	Sand pack		Y: 673688.28

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-14C

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
40	X						0.7			
	X				100					
45	X	Poorly-graded GRAVEL with sand (65% gravel, 30% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor, few 1- to 2-inch lenses of poorly graded SAND (90% sand, 5% gravel, 5% silt), fine to coarse sand, fine gravel, brown wet, no odor.	GP				1.1			Casing
	X				100					
50	X						2.3			
	X				100					
55	X						1.1			
	X				100					
60	X						1.4			Bentonite
	X				100					
65	X						2.2			
	X				100					Sand Pack
70	X	Silty SAND with gravel (60% sand, 25% gravel, 15% silt), fine to coarse sand, fine to coarse gravel, gray, wet, no odor.	SM				0.3	MW14C-012609-69		
	X				100			MW14C-020509	X	Screen
75	X									
	X	Sandy SILT (60% silt, 40% sand), fine sand, gray, moist, no odor.	ML		100		0.1	MW14C-012609-77		
80							0.1	MW14C-012609-80		Bentonite

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	280.35
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	279.99
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	**X:** 1149449.26
Screened Interval (ft bgs):	67-77	**Boring Abandonment:**	Sand pack		**Y:** 673688.28

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW15 / SS2

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: John Schmitt

Date/Time Started:	10/02/08 1345	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/03/08 1000	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	18
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	50
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	48
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0	Asphalt							Concrete
	Poorly graded gravel with sand (gravel 80%, sand 20%, trace silt), fine to coarse gravel, fine to coarse sand, dark black to brown, moist, no odor.	GP	50					
5	Silty gravel with sand (gravel 60%, sand 20%, silt 20%), fine to coarse gravel, fine to medium sand, olive brown, moist to 18 feet then wet, no odor.	GM	100			SS2-5-100208 @ 1405		2" diam PVC casing
10			100			SS2-10-100208 @ 1415		Bentonite seal
15			80			SS2-16-100208 @1445		
20	Poorly graded gravel with sand (gravel 80%, sand 15%, silt 5%), fine to coarse gravel, fine to coarse sand, olive brown, wet, no odor.	GP	100					
30	Poorly graded gravel with sand (gravel 70%, sand 25% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP	90					
40	Poorly graded gravel with sand (gravel 80%, sand 15%, silt 5%), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP	100					10/20 sand pack; 0.010 slot PVC well screen
50								

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	278.66
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	278.37
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	43-48	**Boring Abandonment:**	NA		Y:

Farallon Consulting

975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW16

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: Jon Peterson

Date/Time Started:	10/06/08 1340	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/06/08 1700	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	16, 31
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	40
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	38.5
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Boring/Well Construction Details
0	Well-graded sand with gravel (Sand 60%, gravel 40%), fine to coarse sand, coarse gravel, tan, loose, dry, no odor	SW	100				Concrete
	Well-graded sand (100%), fine to coarse, brown, loose, moist, no odor	SW			0.0	MW16-3-100608 @ 1355	
5	Gravelly silt (Silt 60%, gravel 40%), coarse gravel, brown, stiff, moist, no odor	ML					2" diam PVC casing
	Well-graded sand (100%), fine to coarse, brown, loose, moist, no odor	SW					
	Gravelly silt (Silt 60%, gravel 40%), coarse gravel, brown, stiff, moist, no odor	ML					
10	Well-graded sand with silt and gravel (55% sand, 35% gravel, 10% silt), fine to coarse sand, coarse gravel, tan, loose, dry, no odor	SW-SM	100				Bentonite seal
	Well-graded sand (Sand 90%, gravel 10%), fine to coarse sand, coarse gravel, gray, medium dense, moist, no odor	SW					
15	Well-graded sand with silt and gravel (55% sand, 35% gravel, 10% silt) fine to coarse sand, coarse gravel, tan, loose, moist, no odor	SW-SM			0.0	MW16-15-100608 @ 1410	
	Poorly-graded gravel (Gravel 100%), fine, gray, loose, wet, no odor	GP					
20	Well-graded sand (Sand 90%, gravel 10%), fine to coarse sand, coarse gravel, gray, medium dense, moist, no odor	SW	100				
25	Well-graded sand with gravel (Sand 75%, gravel 25%), fine to coarse sand, coarse gravel, tan, dense, moist, no odor	SW			0.0	MW16-27-100608 @1600	
	Gravelly silt (Silt 60%, gravel 30%, sand 10%), coarse gravel, fine sand, gray, medium-stiff, moist to wet, no odor 31' bgs: wet	ML					10/20 sand pack
30	Well-graded sand with gravel (Sand 75%, gravel 25%), fine to coarse sand, coarse gravel, gray, loose, wet, no odor	SW	90				0.010 slot PVC well screen
35							
	Well-graded sand with gravel (Sand 75%, gravel 25%), fine to coarse sand, coarse gravel, tan, loose, wet, no odor	SW					Bentonite plug
40							

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	278.23
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	278.00
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	28.5-38.5	**Boring Abandonment:**	NA		Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW17

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: Jon Peterson

Date/Time Started:	09/30/08 1530	**Sampler Type:**	Sonic core bag
Date/Time Completed:	09/30/08 1530	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	16,45
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	50
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	50
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Boring/Well Construction Details
0	Asphalt	GP	100				Concrete
	Poorly-graded sand with gravel (Sand 60%, gravel 35%, silt 5%), mostly fine to medium sand, fine gravel, brown, moist, no odor	SP					
5	Poorly-graded gravel with sand (Gravel 60%, sand 39%, silt <1%), fine to medium gravel, fine to mostly-coarse sand, brown, moist, no odor	GP	100		3.7	MW17-5-093008 @ 1600	2" diam PVC casing
10	8' bgs: Above unit is interbedded with silty gravel with sand (Gravel 60%, sand 20%, silt 20%), brown, moist, no odor	GM	90		1.8	MW17-10-093008 @ 1610	Bentonite seal
15	Poorly-graded sand (Sand 90%, gravel <5%, silt <5%), fine sand, fine gravel, gray, moist, no odor 16' bgs: saturated	SP	30		1.4	MW17-15-093008 @ 1630	
20	Silty gravel with sand (Gravel 60%, silt 20%, sand 20%), fine to coarse gravel, mostly fine to medium sand, brown, wet, no odor 22' bgs: moist, decreasing silt content	GM	100				
25	Poorly-graded gravel with sand (Gravel 60%, sand 35%, silt 5%), fine to coarse gravel, fine to medium sand, gray-brown, moist, no odor	GP	100				
30	32' bgs: 10% silt now in lithologic unit		100				
35	Silty gravel with sand (Gravel 50%, sand 30%, silt 20%), fine to coarse gravel, fine to coarse sand, brown, moist, no odor	GM	100				
40			75				10/20 sand pack
45	Poorly-graded gravel with sand (Gravel 80%, sand 15%, silt 5%), fine gravel, medium to coarse sand, brown, wet, no odor	GP	100				0.010 slot PVC well screen
50							

Well Construction Information

Monument Type:	Flush	**Filter Pack:**	10/20 sand	**Ground Surface Elevation (ft):**	281.96
Casing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	281.78
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X:
Screened Interval (ft bgs):	40-50	**Boring Abandonment:**	NA		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-17A

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/28/09 0830	**Sampler Type:**	4" Steel
Date/Time Completed:	01/28/09 1220	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	20
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	36
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	35
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed
0–8	Poorly-graded GRAVEL with sand (60% gravel, 40% sand), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP	100		0.5		
8–15	Poorly-graded SAND with gravel (75% sand, 20% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, brown, moist, no odor.	SP	100; 100		0.3	MW17A-012809-8	
15–20	Silty GRAVEL with sand (60% gravel, 20% sand, 20% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor. More moist from 16 to 17 feet, but not saturated; less moist from 17 to 20 feet.	GM	100		0.3	MW17A-012809-15	
20–30	Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist to 20 feet then wet 20 to 28 feet, no odor.	GP	100; 100; 100		0.3; 0.3	MW17A-012809-20	
30–35	Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GM	100		0.5	MW17A-012809-30; MW17A-020409	X
35–36	Silty GRAVEL with sand (50% gravel, 30% silt, 20% sand), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, very dense.	GM			0.1	MW17A-012809-35	

Boring/Well Construction Details

0–2 ft	Concrete
2–25 ft	Casing; Bentonite
25–35 ft	Sand pack; Screen
35–36 ft	Bentonite

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	282.23
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	281.72
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149998.98
Screened Interval (ft bgs):	25-35	**Boring Abandonment:**	Bentonite		Y: 673780.51

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-18

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: D. Clement

Date/Time Started:	01/27/09 1135	**Sampler Type:**	4" Steel
Date/Time Completed:	01/27/09 1500	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	24
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	60
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	60
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0	Asphalt, paving debris	AC					Concrete
0–15	Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown , moist, no odor. More moist from 10 to 15 feet but not saturated.	GM	100, 100, 100	0.4, 0.5			
15–24	Silty GRAVEL (60% gravel, 35% silt, 5% sand), fine to coarse gravel, fine to coarse sand, gray-brown, moist, no odor.	GM	100, 100	1.1, 0.4	MW18-012709-15		Casing
24–51	Poorly graded GRAVEL with sand (60% gravel, 35% sand, 5% silt) fine to coarse gravel, fine to coarse sand, brown, wet, no odor. From 35 to 51, few 1- to 2-inch lenses of poorly-graded SAND (100% sand), gray, wet, no odor.	GP	100, 100, 100, 100, 100	0.1, 0.1, 0.3, 0.1, 0.2	MW18-012709-24		Bentonite; Casing
51–60	Poorly-graded SAND with gravel (75% sand, 20% gravel, 5% silt), fine to coarse sand, fine to coarse gravel, gray, wet, no odor.	SP	100, 100	0.5, 0.4, 0.3	MW18-012709-51; MW18-020509; MW18-012709-60	X (MW18-020509)	Sand pack; Screen

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	278.09
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	277.67
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149528.63
Screened Interval (ft bgs):	50-60	**Boring Abandonment:**	Sand pack		Y: 673785.23

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: MW-19

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	01/23/09 1500	**Sampler Type:**	4" Steel
Date/Time Completed:	01/26/09 1035	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic	**Depth of Water (ft bgs):**	20, 38
Drilling Company:	Boart Longyear	**Total Boring Depth (ft bgs):**	55
Drilling Foreman:	Ken Phillips	**Total Well Depth (ft bgs):**	55
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery
0–20	Gravelly SILT with sand (55% silt, 30% gravel, 15% sand), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	ML	100, 100, 100, 100
20–35	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, wet, no odor.	GP	100, 100, 100
35–38	Gravelly SILT with sand (55% silt, 30% gravel, 15% sand), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	ML	
38–55	Poorly-graded GRAVEL with sand (80% gravel, 15% sand, 5% silt), fine to coarse gravel, fine to coarse sand, gray, wet, no odor, few one-inch lenses of sandy GRAVEL (60% gravel, 40% sand), fine gravel, fine to coarse sand, gray, wet, no odor.	GP	100, 100, 100, 100

Depth (approx. ft bgs)	PID (ppmv)	Sample ID	Sample Analyzed
5	0.0	MW19-012309-5	
10	0.0		
15	0.0		
20	0.4	MW19-012609-20	X
25	0.4		
30	0.3		
35	0.2	MW19-012609-35	
38	0.1	MW19-012609-38	
40	0.9		
45	1.7		
50	1.3	MW19 020509	X
55	2.1	MW19-012609-55	

Boring/Well Construction Details: Concrete; Casing; Bentonite; Sand pack; Screen

Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	10/20 Sand	**Ground Surface Elevation (ft):**	284.71
Casing Diameter (inches):	2"	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	284.46
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Surveyed Location:**	X: 1149293.81
Screened Interval (ft bgs):	45-55	**Boring Abandonment:**	Sand pack		Y: 673431.78

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS1

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: Jon Peterson

Date/Time Started:	10/06/08 1140	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/06/08 1330	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	18
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Boring/Well Construction Details
0	Well-graded sand (Sand 90%, gravel 10%), fine to coarse sand, coarse gravel, brown, loose, moist, faint odor at 3' bgs	SW	65				
	Silty sand with gravel (Sand 55%, silt 30%, gravel 15%), fine sand, fine to coarse gravel, gray, loose, moist, no odor	SM			0.0	SS1-3-100608 @ 1200	
5	5-13' bgs: brown, moist, no odor		90				
10							Bentonite
	Silt with gravel (Silt 70%, gravel 20%, sand 10%), coarse gravel, fine sand, tan, stiff, moist, no odor	ML			3.0	SS1-13.5-100608 @ 1210	
15			90				
	18-19' bgs: wet				0.0	SS1-17-100608 @1240	
20	Silt with gravel (Silt 70%, gravel 20%, sand 10%), coarse gravel, fine sand, gray, stiff, moist, no odor						

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS3

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: John Schmitt

Date/Time Started:	09/30/08 1330	**Sampler Type:**	Sonic core bag
Date/Time Completed:	09/30/08 1530	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	22
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	25
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded sand with gravel (Sand 60%, gravel 30%, silt 10%), medium sand, fine gravel, dark brown, moist, no odor	SP		100					
5					90			SS3-5-093008 @ 1350		
		Silty sand with gravel (Sand 60%, gravel 25%, silt 15%), fine to medium sand, fine gravel, dark brown, moist, no odor	SM							
10					100					Bentonite
		Poorly-sorted sand (Sand 99%, trace gravel, trace silt), fine to medium sand, fine gravel, light brown, moist, no odor, native material	SP							
15					100			SS3-15-093008 @ 1420		
		Poorly-graded gravel (Gravel 100%), coarse gravel, gray, moist, no odor 22-25' bgs: saturated	GP							
20								SS3-20-093008 @ 1510		
25										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	291.647
Casing Diameter (inches):	NA	**Surface Seal:**	Gravel	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS5

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: Jon Peterson

Date/Time Started:	10/06/08 0845	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/06/08 1130	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	20.5
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	25
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly graded sand with silt and gravel (Sand 55%, gravel 30%, silt 15%), fine sand, coarse gravel, brown, dense, moist, gravel includes concrete and asphalt debris, asphalt odor at 2-2.5' bgs and black staining	SP-SM		100		13.0	SS5-2-100608 @ 0910		
5					90					
10		Gravelly silt with sand (Silt 55%, gravel 30%, sand 15%), fine gravel, fine sand, gray, dense, moist, no odor	ML				4.1	SS5-10-100608 @ 0920		
		Poorly graded sand with silt and gravel (Sand 55%, gravel 30%, silt 15%), fine sand, coarse gravel, brown, dense, moist, no odor, no debris	SP-SM							
15					80					
20		20-25' bgs: large gravel to boulders					1.0	SS5-20-100608 @ 0935		
25										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	281.52
Casing Diameter (inches):	NA	**Surface Seal:**	Asphalt	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS7

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: John Schmitt

Date/Time Started:	10/02/08 1225	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/02/08 1345	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	NA
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Well-graded sand with gravel (sand 60%, gravel 40%, trace silt), fine to coarse sand, fine gravel.	SW							
5					100			SS7-5-100208 @ 1245		
		Silt (silt 90%, sand 10%), fine sand, grey-brown, moist, no odor.	ML							
10								SS7-10-100208 @ 1305		
		Silty sand (sand 70%, silt 30%, trace gravel), fine sand, fine to coarse gravel, moist, no odor, stringers of clayey silt.	SM							
15					80			SS7-15-100208 @ 1310		
		Gravelly silt (silt 70%, gravel 30%), fine to coarse gravel, olive brown to brown, moist, no odor.	ML							
20										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS8

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: John Schmitt

Date/Time Started:	10/01/08 1500	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/01/08 1640	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	NA
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	17
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Asphalt								
		Poorly graded gravel with sand (gravel 70%, sand 30%, trace silt), fine to coarse gravel, fine to coarse sand.	GP		100					
5		Weathered asphalt, concrete, and roofing material.	GP		60			SS8-5-100108 @ 1520		
10		Poorly graded gravel with silt and sand (gravel 60%, sand 30%, silt 10%), fine to coarse gravel, fine to coarse sand, grey, moist, no odor, rounded gravel.	GP-GM		50					Bentonite
15		Refusal at 17 feet.			50			SS8-15-100108 @ 1540		

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X: NA
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS10

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: Jon Peterson

Date/Time Started:	10/07/08 1530	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/07/08 1630	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	Unknown
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	15
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Silty gravel with sand (Gravel 60%, silt 25%, sand 15%), fine to coarse gravel, fine sand, brownish-gray, loose, moist, no odor, tough drilling due to cobbles	GM		100					
							0.0	SS10-3-100708 @ 1600		
5					90					
10					0		0.0	SS10-10-100708 @ 1615		Bentonite
15										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	287.59
Casing Diameter (inches):	NA	**Surface Seal:**	Asphalt	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS11

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: Jon Peterson

Date/Time Started:	10/07/08 1415	**Sampler Type:**	Sonic core bag
Date/Time Completed:	10/07/08 1530	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	19.5
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Lithologic Description	USCS	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0	Well-graded sand with gravel (Sand 70%, gravel 30%), fine to coarse sand, fine to gravel, brown, loose, moist, no odor (PVC debris at 4' bgs)	SW	100		0.0	SS11-3-100708 @ 1430		
5	Silty gravel (Gravel 60%, silt 30%, sand 10%), fine to coarse gravel, fine sand, gray, moist, no odor 5.5-6' bgs: wet area (with PVC shards)	GM	100					
10	Gravelly silt (Silt 60%, gravel 30%, sand 10%), fine to coarse gravel, fine sand, gray, stiff moist, no odor	ML	90					Bentonite
15			100					
	Sandy silt (Silt 60%, sand 30%, gravel 10%), fine sand, fine gravel, gray, stiff, moist no odor	ML			0.0	SS11-18-100708 @ 1440		
20	Silty gravel (Gravel 60%, silt 30%, sand 10%), fine to coarse gravel, fine sand, gray, wet, no odor	GM						

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	286.54
Casing Diameter (inches):	NA	**Surface Seal:**	Asphalt	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS12

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: John Schmitt

Date/Time Started:	09/30/08 0940	**Sampler Type:**	Sonic core bag
Date/Time Completed:	09/30/08 1130	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	5
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded gravel with sand (Gravel 80%, sand 15%, silt 5%), fine gravel, fine to coarse sand, dark brown, moist, no odor 4-5' bgs: gray, odor, no sheen	GP							
							0.0	SS12-2-093008 @ 1000		
							0.0	SS12-4-093008 @ 1006		
5		Poorly-graded gravel with sand (Gravel 80%, sand 15%, silt 5%), fine gravel, fine to coarse sand, gray, wet, no odor, no sheen	GP							
		Poorly-graded gravel with silt (Gravel 80%, sand 10%, silt 10%), fine to coarse gravel, fine to medium sand, reddish-brown, moist, no odor	GP-GM							
		Silty gravel with sand (Gravel 70%, sand 15%, silt 15%), fine to coarse gravel, fine to medium sand, reddish-brown, moist, no odor	GM				0.0	SS12-8-093008 @ 1030		
10										Bentonite
15										
							0.0	SS12-16-093008 @ 1105		
20										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	277.15
Casing Diameter (inches):	NA	**Surface Seal:**	Gravel	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: SS13

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: John Schmitt

Date/Time Started:	09/30/08 1130	**Sampler Type:**	Sonic core bag
Date/Time Completed:	09/30/08 1300	**Drive Hammer (lbs.):**	NA
Equipment:	Sonic LAR	**Depth of Water (ft bgs):**	15
Drilling Company:	Boart-Longyear	**Total Boring Depth (ft bgs):**	20
Drilling Foreman:	Jeremy Thompson	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Sonic		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded gravel with sand (Gravel 80%, sand 20%), fine gravel, fine to coarse sand, brown, moist, no odor (degraded asphalt) 1-6' bgs: some gravel is coarse	GP					SS13-2-093008 @ 1200		
5		Poorly-graded gravel with sand (Gravel 70%, sand 30%), fine gravel and some coarse gravel, fine to coarse sand, brown, moist, no odor, concrete and roofing debris	GP							
10		Poorly-graded gravel with sand (Gravel 70%, sand 20%, silt 10%), fine to coarse gravel, fine to medium sand, grayish-brown, moist, no odor	GP					SS13-8-093008 @ 1210		Bentonite
15		15' bgs: Interbeds of poorly-graded gravel with silt (Gravel 70%, silt 20%, sand 10%), fine to coarse gravel, fine sand, grayish-brown, wet, no odor						SS13-15-093008 @ 1230		
		Gravelly silt (Silt 80%, gravel 15%, sand 5%), fine gravel, fine sand, olive-brown, moist to wet, no odor	ML							
20										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	278.7
Casing Diameter (inches):	NA	**Surface Seal:**	Gravel	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Surveyed Location:**	X:
Screened Interval (ft bgs):	NA	**Boring Abandonment:**	Bentonite		Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-1

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started: 02/03/09 0945
Date/Time Completed: 02/03/09 1015
Equipment: Deere 450C LC
Drilling Company: Woodworth & Co., Inc.
Drilling Foreman: Reg
Drilling Method: Backhoe

Sampler Type: 22" bucket
Drive Hammer (lbs.):
Depth of Water (ft bgs): 11'
Total Boring Depth (ft bgs): 15
Total Well Depth (ft bgs):

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, concrete debris with rebar. Minor amounts of waste material such as shoe, glass fragments, metal, brick, and plastic sheeting.	GM				0.1			
							0.2	TP1-020309-2 0905		
							0.2			
5							0.1	TP1-020309-6 1000	X	
							0.1			
10		Water at approximately 11 feet.					0.3	TP1-020309-10 1010		
							0.2			
15		Surface topography, road limit the depth of excavation to a maximum of 15 feet below ground surface.					0.1			

Well Construction Information

Monument Type:
Casing Diameter (inches):
Screen Slot Size (inches):
Screened Interval (ft bgs):
Filter Pack:
Surface Seal:
Annular Seal:
Boring Abandonment:
Ground Surface Elevation (ft):
Top of Casing Elevation (ft):
Surveyed Location: X: Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-2

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	02/03/09 1022	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1050	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	NE
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	15
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Concrete debris.	CO							
		Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, dark brown, moist, no odor until 3 feet then musty odor, brick fragments, wood fragments.	GM				0.3			
		Sandy SILT (75% silt, 25% sand), fine sand, gray-brown, moist, no odor, wood fragments.	ML				0.3	TP2-020309-3 1030		
5							0.3			
		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, moist, rotting-wood-like odor, brick fragments, wood fragments.	GM				0.5	TP2-020309-6 1035	X	
		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), brown, moist, no odor, brick fragments, wood fragments, concrete debris, and asphalt. Minor amounts of waste material such as a traffic cone, plastic sheeting, plastic six-pack ring, and bottle caps.	GP				0.3			
							0.1			
10							0.2			
							0.2			
15							0.1	TP2-020309-15 1040		

Well Construction Information

Monument Type:	**Filter Pack:**	**Ground Surface Elevation (ft):**
Casing Diameter (inches):	**Surface Seal:**	**Top of Casing Elevation (ft):**
Screen Slot Size (inches):	**Annular Seal:**	**Surveyed Location:** X:
Screened Interval (ft bgs):	**Boring Abandonment:**	Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-3

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started: 02/03/09 1055
Date/Time Completed: 02/03/09 1115
Equipment: Deere 450C LC
Drilling Company: Woodworth & Co., Inc.
Drilling Foreman: Reg
Drilling Method: Backhoe

Sampler Type: 22" bucket
Drive Hammer (lbs.):
Depth of Water (ft bgs): NE
Total Boring Depth (ft bgs): 20
Total Well Depth (ft bgs):

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, organics, brick fragments, concrete debris. Minor amounts of waste material such as a piece of high pressure hosing and a tin can.	GM				0.1			
							0.2			
							0.2	TP3-020309-3 1100	X	
5							0.3			
							0.2			
10							0.1			
		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, black, moist, no odor.	GP				0.2	TP3-020309-11 1105		
							0.3			
15							0.2			
							0.1			
							0.2			
20							0.2	TP3-020309-20 1110		

Well Construction Information

Monument Type:
Casing Diameter (inches):
Screen Slot Size (inches):
Screened Interval (ft bgs):

Filter Pack:
Surface Seal:
Annular Seal:
Boring Abandonment:

Ground Surface Elevation (ft):
Top of Casing Elevation (ft):
Surveyed Location: X: Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-4

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: D. Clement

Date/Time Started:	02/03/09 1120	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1145	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	16
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	16
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Concrete fill (80-90% concrete with rebar), some sand mixed in	CO				0.0			
							0.1			
		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, concrete with rebar, brick fragments, wood fragments, with a minor amount of waste material such as chain link fencing, metal post, yellow traffic paint chips, wire mesh, plastic sheeting, wood stakes, and metal duct.	GP				0.2	TP4-020309-4 1125		
5							0.2			
							0.1	TP4-020309-7 1130	X	
							0.2			
10							0.1			
							0.2			
15							0.1			
							0.1	TP4-020309-16 1135		

Well Construction Information

Monument Type:	**Filter Pack:**	**Ground Surface Elevation (ft):**
Casing Diameter (inches):	**Surface Seal:**	**Top of Casing Elevation (ft):**
Screen Slot Size (inches):	**Annular Seal:**	**Surveyed Location:** X:
Screened Interval (ft bgs):	**Boring Abandonment:**	Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-5

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: D. Clement

Date/Time Started: 02/03/09 1240
Date/Time Completed: 02/03/09 1310
Equipment: Deere 450C LC
Drilling Company: Woodworth & Co., Inc.
Drilling Foreman: Reg
Drilling Method: Backhoe

Sampler Type: 22" bucket
Drive Hammer (lbs.):
Depth of Water (ft bgs): NE
Total Boring Depth (ft bgs): 20
Total Well Depth (ft bgs):

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, grass, roots. No fill material observed.	GP				0.0			
							0.1			
5							0.1			
							0.7	TP5-020309-7 1250	X	
							0.3			
10		3" band of sandy SILT (60% silt, 40% sand), fine sand, gray, moist, no odor.					0.2	TP5-020309-10 1255		
							0.2			
15							0.1			
							0.0			
							0.2			
20		Increased moisture in soil, no water observed in excavation.					0.1	TP5-020309-20 1300		

Well Construction Information

Monument Type:
Casing Diameter (inches):
Screen Slot Size (inches):
Screened Interval (ft bgs):

Filter Pack:
Surface Seal:
Annular Seal:
Boring Abandonment:

Ground Surface Elevation (ft):
Top of Casing Elevation (ft):
Surveyed Location: X: Y:

Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-6

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	02/03/09 1315	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1335	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	NE
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	16
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, dark brown, moist, no odor.	GP				0.2			
							0.1			
5		Sandy SILT (60% silt, 40% sand), fine sand, gray-green, moist, musty odor.	ML				0.3	TP6-020309-5 1316		
							0.3			
10		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, gray-green, increasingly moist, musty odor. Interbedded with sandy SILT layer as described above.	GM				0.2	TP6-020309-10 1318		
							0.1			
		White, soft, flaky material observed in single location, approximately 1-2 square inches of material. Sample at 14 feet includes material.					0.1	TP6-020309-14 1323	X	
15		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor. Significant sloughing in excavation, material may not be from this depth.	GP				0.1	TP6-020309-16 1325		

Well Construction Information

Monument Type:	**Filter Pack:**	**Ground Surface Elevation (ft):**
Casing Diameter (inches):	**Surface Seal:**	**Top of Casing Elevation (ft):**
Screen Slot Size (inches):	**Annular Seal:**	**Surveyed Location:** X:
Screened Interval (ft bgs):	**Boring Abandonment:**	Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-7

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	02/03/09 1340	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1400	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	Small seep at 5'
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	18
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor.	GP				0.1			
							0.3			
5							0.1			
		Groundwater seep at 5 feet below ground surface on east sidewall of excavation, no water observed along other sidewalls.					0.2	TP7-020309-7 1345		
		Concrete, brick, and steel fragments					0.2			
10		Silty GRAVEL with sand (60% gravel, 25% sand, 15% silt), fine to coarse gravel, fine to coarse sand, green-gray, moist, musty odor, concrete, brick, and steel fragments.	GM				0.2	TP7-020309-10 1350	X	
		Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, concrete fragments.	GM				0.3	TP7-020309-12 1355		
							0.2			
15		Silty GRAVEL with sand (60% gravel, 25% silt, 15% sand), fine to coarse gravel, fine to coarse sand, gray-green, moist, no odor, concrete fragments.	GM				0.1			
							0.2			

Well Construction Information

Monument Type:	**Filter Pack:**	**Ground Surface Elevation (ft):**
Casing Diameter (inches):	**Surface Seal:**	**Top of Casing Elevation (ft):**
Screen Slot Size (inches):	**Annular Seal:**	**Surveyed Location:** X:
Screened Interval (ft bgs):	**Boring Abandonment:**	Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-8

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started:	02/03/09 1407	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1435	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	NE
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	16
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, with various fragments and debris such as concrete, asphalt, ceramic, wood, brick fragments, and a small amount of waste material such as rubber, tile, a large steel nail, and an aluminum pop can.	GP				0.1			
							0.1			
								TP8-020309-4 1415	X	
5							0.1			
							0.1			
							0.0			
10										
							0.1	TP8-020309-11 1420		
		Waste material in soil decreasing in concentration.					0.0			
15		Soil extremely hard, excavator cannot penetrate past 16 feet below ground surface.					0.1			
								TP8-020309-16 1430		

Well Construction Information

Monument Type:	**Filter Pack:**	**Ground Surface Elevation (ft):**
Casing Diameter (inches):	**Surface Seal:**	**Top of Casing Elevation (ft):**
Screen Slot Size (inches):	**Annular Seal:**	**Surveyed Location:** X:
Screened Interval (ft bgs):	**Boring Abandonment:**	Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-9

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA
Farallon PN: 188-001
Logged By: D. Clement

Date/Time Started: 02/03/09 1438
Date/Time Completed: 02/03/09 1458
Equipment: Deere 450C LC
Drilling Company: Woodworth & Co., Inc.
Drilling Foreman: Reg
Drilling Method: Backhoe

Sampler Type: 22" bucket
Drive Hammer (lbs.):
Depth of Water (ft bgs): 11
Total Boring Depth (ft bgs): 16
Total Well Depth (ft bgs):

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, brown, moist, no odor, concrete and asphalt debris, and a small amount of waste material such as caution tape.	GP							
		Brick fragments observed, very little asphalt.								
5								TP9-020309-5 1445	X	
10		Water encountered at approximately 11 feet below ground surface.						TP9-020309-11 1450		
15		Fewer brick fragments observed.								
								TP9-020309-16 1455		

Well Construction Information

Monument Type:
Casing Diameter (inches):
Screen Slot Size (inches):
Screened Interval (ft bgs):

Filter Pack:
Surface Seal:
Annular Seal:
Boring Abandonment:

Ground Surface Elevation (ft):
Top of Casing Elevation (ft):
Surveyed Location: X: Y:

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: TP-10

Client: Woodworth & Company, Inc.
Project: Woodworth Lakeview Facility
Location: Lakewood, WA

Farallon PN: 188-001

Logged By: D. Clement

Date/Time Started:	02/03/09 1500	**Sampler Type:**	22" bucket
Date/Time Completed:	02/03/09 1525	**Drive Hammer (lbs.):**	
Equipment:	Deere 450C LC	**Depth of Water (ft bgs):**	NE
Drilling Company:	Woodworth & Co., Inc.	**Total Boring Depth (ft bgs):**	11.5
Drilling Foreman:	Reg	**Total Well Depth (ft bgs):**	
Drilling Method:	Backhoe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppmv)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Asphalt debris (75%) with poorly-graded GRAVEL with sand (60% gravel, 35% sand, 5% silt), fine to coarse gravel, fine to coarse sand, black, moist, no odor.	GP							
							0.7			
							0.5	TP10-020309-2 1500		
		2-3 bricks in soil					0.3			
5		Concrete fragments observed.								
							0.2	TP10-020309-6 1515	X	
							0.1			
10										
		Large slab of concrete, excavator cannot penetrate below 11.5 feet below ground surface.						TP10-020309-11 1520		

Well Construction Information

Monument Type:	Filter Pack:	Ground Surface Elevation (ft):
Casing Diameter (inches):	Surface Seal:	Top of Casing Elevation (ft):
Screen Slot Size (inches):	Annular Seal:	Surveyed Location: X:
Screened Interval (ft bgs):	Boring Abandonment:	Y:

APPENDIX B
LABORATORY ANALYTICAL REPORTS

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

APPENDIX C
TERRESTRIAL ECOLOGICAL EVALUATION
TABLE 749-1 OF MTCA

DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

Table 749-1
Simplified Terrestrial Ecological Evaluation – Exposure Analysis Procedure under WAC 173-340-7492(2)(a)(ii).[a]

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre). "Undeveloped land" means land that is not covered by existing buildings, roads, paved areas or other barriers that will prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil.	
1) From the table below, find the number of points corresponding to the area and enter this number in the box to the right.	
Area (acres) / Points: 0.25 or less — 4 0.5 — 5 1.0 — 6 1.5 — 7 2.0 — 8 2.5 — 9 3.0 — 10 3.5 — 11 4.0 or more — 12	4
2) Is this an industrial or commercial property? See WAC 173-340-7490(3)(c). If yes, enter a score of 3 in the box to the right. If no, enter a score of 1.	3
3) Enter a score in the box to the right for the habitat quality of the site, using the rating system shown below[b]. (High = 1, Intermediate = 2, Low = 3)	3
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2. See footnote c.	2
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	4
6) Add the numbers in the boxes on lines 2 through 5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified terrestrial ecological evaluation may be ended under WAC 173-340-7492 (2)(a)(ii).	12

Footnotes:

a It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score (1) for questions 3 and 4.

b **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:
Low: Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.
High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of Fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.
Intermediate: Area does not rate as either high or low.

c Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use by mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

JUNE 2009

SIMPLIFIED TEE FOR WOODWORTH LAKEVIEW FACILITY

12 > 4