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ENGINEERING DESIGN REPORT

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

Submitted by:
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Farallon PN: 188-001

For:
Woodworth Capital, Inc.
Formerly Known as Woodworth & Company, Inc.
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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AS	air sparge
AS/SVE	air sparge/soil vapor extraction
bgs	below ground surface
COCs	constituents of concern
DRO	total petroleum hydrocarbons as diesel-range organics
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Farallon	Farallon Consulting, L.L.C.
HASP	Health and Safety Plan
IOW	inches of water
Lakeview Facility	Woodworth Capital, Inc. (formerly known as Woodworth & Company, Inc.) Lakeview Facility located at 2800 104th Street South in Lakewood, Washington
mg/kg	milligrams per kilogram
µg/l	micrograms per liter
MTCA	Washington State Model Toxics Control Act Cleanup Regulation
NFA	*No Further Action*
ORC	Oxygen Release Compound
ORO	total petroleum hydrocarbons as oil-range organics
Property	Woodworth Capital, Inc. (formerly known as Woodworth & Company, Inc.) Lakeview Facility located at 2800 104th Street South in Lakewood, Washington
PQL	practical quantitation limit
Psi	pounds per square inch
QA	quality assurance
QA/QC	quality assurance/quality control
RI/FS Report	*Remedial Investigation/Feasibility Study Report, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499,* in progress, prepared by Farallon

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.
SAP	Sampling and Analysis Plan
scfm	standard cubic feet per minute
Site	Area of Concern 1 through Area of Concern 5
SVE	soil vapor extraction
TCE	trichloroethene
TPCHD	Tacoma-Pierce County Health Department
TPH	total petroleum hydrocarbons
TPST	TPST Soil Recyclers of Washington
VCP	Voluntary Cleanup Program
VOCs	volatile organic compounds
WAC	Washington Administrative Code
Woodworth	Woodworth Capital, Inc. (formerly known as Woodworth & Company, Inc.)
WSDOT	Washington State Department of Transportation

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Engineering Design Report (EDR) on behalf of Woodworth Capital, Inc. (formerly known as Woodworth & Company, Inc.) (Woodworth) for the remediation of dissolved-phase total petroleum hydrocarbons (TPH) as diesel-range organics (DRO) and as oil-range organics (ORO) in soil and groundwater, volatile organic compound (VOCs) in groundwater, and arsenic and lead in groundwater, collectively referred to as the constituents of concern (COCs), at the Lakeview Facility located at 2800 104th Street South in Lakewood, Washington (herein referred to as the Property) (Figure 1). The EDR 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 Property has been assigned VCP Identification No. SW 1012. The cleanup action will be conducted to meet the requirements for obtaining a No Further Action (NFA) determination for the Property from Ecology.

The objective of the cleanup action is to meet the threshold requirements of WAC 173-340-360 to protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for compliance monitoring. The selected cleanup action for the Property consists of excavation and removal of soil with concentrations of TPH exceeding the MTCA Method A cleanup levels; enhanced aerobic bioremediation for groundwater containing concentrations of TPH exceeding MTCA Method A cleanup levels; air sparge/soil vapor extraction (AS/SVE) for concentrations of VOCs exceeding MTCA cleanup levels in groundwater; and monitored natural attenuation, development of Site-specific cleanup levels, or institutional controls for concentrations of arsenic and lead exceeding MTCA cleanup levels in groundwater.

The selected cleanup action is based on the results of the *Remedial Investigation/Feasibility Study Report, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499* by Farallon (2009c), in progress (RI/FS Report); the Letter of Opinion from Ecology (2009), and a subsequent meeting with Ecology on December 2, 2009. The EDR documents the engineering concepts and design criteria used in developing the construction plans and specifications for cleanup of soil and groundwater with concentrations of COCs above the MTCA Method A cleanup levels. The construction plans and specifications are included in Appendix A.

1.1 CLEANUP ACTION RESPONSIBILITIES

The cleanup action is being conducted by:

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The environmental consultant for the cleanup action is:

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1.2 ORGANIZATION

The format of this Engineering Design Report and supporting documents meets the requirements of WAC 173-340-400 and has been organized into the following sections:

- **Section 2—Background.** This section describes the Property location, use, and history; surrounding facilities; the definition of the Site in accordance with WAC 193-340-200 and the areas of concern; the geology and hydrogeology of the Property; and previous investigations conducted at the Property.
- **Section 3—Permit Requirements.** This section discusses the permits required for the cleanup action.
- **Section 4—Cleanup Standards.** This section presents the cleanup standards, including the cleanup levels and points of compliance for soil and groundwater at the Site.
- **Section 5—Selected Cleanup Action.** This section provides a detailed description of the cleanup action.

- **Section 6—Compliance Monitoring.** This section describes compliance monitoring which includes protection, performance, and confirmation monitoring and sampling for the cleanup action. Quality assurance/quality control (QA/QC procedures to be followed also are presented.
- **Section 7—Schedule.** This section discusses the anticipated schedule for construction of the remediation system, the timing of the initial groundwater monitoring and sampling event, and excavation activities.
- **Section 8—Documentation Requirements.** This section describes the documentation to be provided for the cleanup action, including data management, field documentation, the Health and Safety Plan (HASP), and progress reports.
- **Section 9—Bibliography.** This section lists the source materials used in preparing the EDR.

2.0 BACKGROUND

This section provides brief background information, including a description of the Property, its historical use, and surrounding facilities; the definition of the Site; details pertaining to the environmental setting of the Property; and a summary of previous environmental investigations conducted at the Property. A more detailed discussion is provided in the *Remedial Investigation Work Plan, Woodworth & Company, Inc., Lakeview Facility, 2800 104th Street South, Lakewood, Washington 98499* dated January 26, 2009, prepared by Farallon (2009a) (RI Work Plan) and the RI/FS Report.

2.1 LAKEVIEW FACILITY DESCRIPTION

The Property is located north of Washington State Route 512 and 104th Street South, 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 four contiguous parcels, together totaling approximately 60 acres, which are used by Woodworth for recycling imported asphalt and concrete debris and for producing hot- and cold-mix asphalt.

Structures on the Property include an asphalt-processing plant, a truck maintenance shop building, a covered carport used for equipment storage, a Quonset-shaped building used for shredding and recycling asphalt shingles, and several small sheds and trailer homes used for storage, office space, or the service well (Figure 2). The southern portion of the Property is paved; the southwestern portion of the Property is used for truck parking. Employee parking areas and a stormwater collection retention pond with associated biofiltration swale are located at the southwest corner of the Property. An elevated gravel parking lot that currently is leased to a neighboring business and is 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 located near the center portion of the Property provides water for steam-cleaning equipment and roofing shingles (Figure 2). The water-supply well-head is located in a well-house.

The Property includes areas that are identified as the Site as defined by WAC 193-340-200. The Site is defined as the areas where contiguous concentrations of COCs were detected at concentrations exceeding the MTCA Method A cleanup levels. The physical boundaries of the Site are defined by the detected concentrations of COCs as documented in the RI/FS Report, 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 houses various pieces of equipment used for maintenance of the truck fleet and operations of the asphalt plant. Concentrations of DRO and ORO exceeding the MTCA Method A cleanup levels have been detected in shallow subsurface soil and groundwater.

AOC 2 is located directly north of the truck maintenance shop and currently is used for parking various pieces of trailer-mounted equipment and machinery. Concentrations of ORO exceeding the MTCA Method A cleanup level have been detected in soil.

AOC 3 is located in the western portion of the Property in an area that was used for the stockpiling of recycled asphaltic concrete and currently is used for the structural testing of asphalt. Concentrations of DRO exceeding the MTCA Method A cleanup level have been detected in shallow subsurface soil.

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 Washington State Department of Transportation (WSDOT) testing laboratory. Concentrations of VOCs exceeding the MTCA Method A cleanup level have been detected in groundwater.

AOC 5 is located in the area of reported landfilling of Atlas Foundry waste material in the northeastern portion of the Property. Concentrations of total and dissolved arsenic and lead exceeding the MTCA Method A cleanup levels have been detected in groundwater.

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 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 the early 1990s, WSDOT operated a mobile laboratory on the Property for testing asphalt mix, which included the 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, Woodworth personnel indicated that the likely location of the WSDOT mobile laboratory was in 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 that included clean dirt and rock, waste concrete and asphalt, waste concrete roof tiles, and Atlas Foundry cast steel waste material that consisted 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 by a thermal desorption process was conducted on the Property from 1991 to approximately 2005 under a Conditional Solid Waste Permit from TPCHD. In 1994, ownership of the soil treatment facility was transferred to TPST Soil Recyclers of Washington (TPST). 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

The former Cascade Demolition Landfill and the Cascade Asphalt Paving Company were located south and hydrologically up-gradient of the Property. Farther south is Washington State Route 512, beyond which is the McChord Air Force Base, directly up-gradient of the Property. Historical research revealed that releases of hazardous substances to subsurface soil and groundwater had occurred at various locations at the McChord Air Force Base. Several facilities of potential concern were identified southeast and east of the Property, including a facility containing leaking underground storage tanks with a confirmed release of petroleum hydrocarbons to soil, and a material-recovery facility.

2.4 GEOLOGY AND HYDROGEOLOGY

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 (Figure 1). 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. Areas along the west, north, and south Property boundaries are up to 35 feet higher in elevation than other portions of the Property.

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 2010). The origin of the gravel is attributed to multiple outburst floods from subsequently lower elevations of Glacial Lake Puyallup (Troost 2010). Soil encountered at the Property during the field activities for the remedial investigation consisted predominantly of poorly graded sand and gravel, separated by a layer or layers of silt and silty gravel into a shallow and a deep unit (Farallon 2009c).

Two groundwater-bearing zones that are separated by a discontinuous layer of silt and silty gravel that is up to 30 feet thick in some portions of the Property and a regional aquifer have been identified beneath the Property. A 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 ranges in thickness from 46 to 60 feet, 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 groundwater flow direction in the Shallow Water-Bearing Zone was observed to be generally to the north-northwest (Farallon 2009c). The direction of groundwater flow in the Deep Water-Bearing Zone ranges from the north in the southern portion of the Property to the east-northeast in the northern portion (Farallon 2009c). 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 used for industrial processes. The groundwater flow direction of the regional aquifer at the Property has not been determined.

2.5 PREVIOUS INVESTIGATIONS

Previous environmental investigations conducted at the Property by others between 1983 and 2008 are summarized in the RI Work Plan and the RI/FS Report. The results of the investigations conducted at the Property by others detected concentrations of VOCs, TPH, and metals in groundwater exceeding applicable MTCA cleanup levels.

The Remedial Investigation/Feasibility Study included advancement of soil borings, installation of monitoring wells, and collection and laboratory analysis of soil, groundwater, and surface water samples (Farallon 2009c). Concentrations of TPH were detected in soil and groundwater, and VOCs, arsenic, and lead were detected in groundwater exceeding MTCA Method A cleanup levels in the five AOCs (Figure 2). The selected cleanup action defined in the RI/FS Report includes:

- Excavation and on-Property recycling of soil containing concentrations of DRO and/or ORO exceeding MTCA Method A cleanup levels in AOC 1, AOC 2, and AOC 3;
- Enhanced aerobic bioremediation of groundwater with concentrations of TPH exceeding MTCA Method A cleanup levels in AOC 1;
- AS/SVE for removal of VOCs in groundwater at concentrations exceeding MTCA Method A cleanup levels in AOC 4; and
- Monitored natural attenuation, development of alternative cleanup levels, or institutional controls restricting groundwater use and exposure to shallow groundwater in AOC 5 where concentrations of arsenic and lead exceed MTCA Method A cleanup levels.

3.0 PERMIT REQUIREMENTS

The following section describes the permits required for implementation of the cleanup action.

3.1 NOTICE OF CONSTRUCTION/ORDER OF APPROVAL

In accordance with Regulation I Article 6 Section 6.03.c of the Puget Sound Clean Air Agency, a Notice of Construction/Order of Approval is required if more than 1,000 pounds of toxic air contaminants is emitted to the air per year as a result of operating a soil or groundwater remediation system. During the AS/SVE pilot tests, no VOCs were detected in the air discharge vent. Because it is anticipated that the AS/SVE remediation system to be installed in AOC 4 will generate emissions significantly less than the prescribed limit, filing a Notice of Construction and obtaining an Order of Approval will not be required. Farallon will analyze emission samples throughout the operation of the AS/SVE remediation system and will file a Notice of Construction if warranted.

3.2 ADDITIONAL PERMITS

Woodworth will be responsible for obtaining any additional permits during the course of the cleanup action, if deemed necessary.

4.0 CLEANUP STANDARDS

Cleanup standards as defined in WAC 173-340-700 include establishing cleanup levels, and the points of compliance at which the cleanup levels will be attained to meet the requirements for obtaining a NFA determination from Ecology. The cleanup standards have been established in accordance with MTCA (WAC 173-340-700 through WAC 173-340-760) as protective of human health and the environment, and comply with the requirements of applicable state and federal laws.

4.1 CLEANUP LEVELS

Cleanup levels are the concentrations of the identified COCs that will be met at the points of compliance to meet the requirements for an NFA determination. The cleanup levels are presented in the following sections by medium of concern.

4.1.1 Soil

The COCs in soil are DRO and ORO. The cleanup levels for DRO and ORO in soil are the MTCA Method A cleanup levels for unrestricted land uses, Table 740-1 of WAC 173-340-900. The Method A cleanup level is 2,000 milligrams per kilogram (mg/kg) for both DRO and ORO.

4.1.2 Groundwater

The COCs in groundwater are DRO, VOCs, arsenic, and lead. The cleanup levels for the COCs in groundwater are the MTCA Method A cleanup levels for unrestricted land uses. The MTCA Method A cleanup levels for groundwater are:

- DRO—500 micrograms per liter (µg/l);
- TCE—(the only VOC in groundwater found to exceed the MTCA Method A cleanup level at the Site)—5 µg/l;
- Arsenic—5 µg/l; and
- Lead—15 µg/l.

If concentrations of arsenic and lead in groundwater exceed the MTCA Method A cleanup levels during future groundwater monitoring, alternative Site-specific cleanup levels may be established for those two metals, or institutional controls may be placed on a portion of the property where arsenic and lead exceed the cleanup levels.

4.2 POINTS OF COMPLIANCE

The points of compliance have been established in accordance with WAC 173-340-740(6) for soil and WAC 173-340-720 for groundwater.

4.2.1 Soil

The point of compliance for soil is defined as soil throughout AOC 1, AOC 2, and AOC 3.

4.2.2 Groundwater

The points of compliance for groundwater are located on the Property and include the following, as shown on Figure 2:

AOC 1—Monitoring wells MW-11 and MW-13 for DRO and ORO. However, monitoring wells MW-11 and MW-13 may be decommissioned to accommodate excavation of TPH-contaminated soil. If so, replacement monitoring wells will be installed as points of compliance.

AOC 4—Monitoring wells MW-2, MW-14, MW-15, MW-16, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-23 for VOCs.

AOC 5—Monitoring well MW-12 for arsenic and lead, depending on the results of additional groundwater monitoring.

5.0 SELECTED CLEANUP ACTION

This section summarizes the selected cleanup action, which includes: excavation of soil with concentrations of TPH above MTCA Method A cleanup levels at AOC 1, AOC 2, and AOC 3; enhanced aerobic bioremediation of TPH in groundwater at AOC 1 using an oxygen release compound (ORC) or similar product; installation and operation of the AS/SVE remediation system for cleanup of VOCs in groundwater at AOC 4; and monitored natural attenuation and institutional controls to address concentrations of arsenic and lead in groundwater at AOC 5.

5.1 CLEANUP ACTION IN AOC 1

Concentrations of ORO exceed the MTCA cleanup level in AOC 1 (Figure 2). Excavation of soil with concentrations of ORO exceeding the MTCA Method A cleanup level in AOC 1 is the selected cleanup action to meet MTCA cleanup requirements.

A concentration of DRO exceeding the MTCA Method A cleanup level was detected in the groundwater sample collected from Shallow Water-Bearing Zone monitoring well MW-11 located in AOC 1. The selected cleanup action for TPH in groundwater in AOC 1 includes source removal (soil excavation) coupled with enhanced aerobic bioremediation. The enhanced aerobic bioremediation will consist of placing ORC or similar product in groundwater prior to backfilling the excavation.

5.1.1 Excavation

Excavation in AOC 1 will extend 1 to 2 feet into the saturated zone at an estimated depth of 6 to 11 feet bgs for placement of ORC (or similar product) in the bottom of the excavation. It is estimated that the total volume of soil to be excavated in AOC 1 ranges from 3,700 to 5,500 cubic yards.

Excavated soil will be recycled through the asphalt plant located on the Property. A Farallon Scientist will observe the excavation for evidence of petroleum contamination such as staining or sheen, petroleum-like odors, or concentrations of measurable organic vapors above the measured background levels, and will guide the contractor to remove contaminated material, as necessary. The excavation will be completed when the concentrations of TPH in soil samples collected from the base and sidewalls are below the MTCA Method A cleanup levels. The excavation will be backfilled with structural fill and compacted in 1-foot lifts using mechanical methods.

A 30- by 30-foot sampling grid will be used in the excavation in AOC 1 for defining soil sample locations to confirm that soil with concentrations of TPH above the cleanup level has been removed. The sampling grid will be established before excavation begins and will be maintained by the Farallon Scientist throughout the excavation.

Confirmation soil samples will be collected from the base and sidewalls at the final limits of the excavation. The confirmation soil samples will be submitted for laboratory analysis for DRO and ORO by Northwest Method NWTPH-Dx. Sidewall samples will be collected every 20 to 30 linear feet; bottom samples will be collected at the center of each 30-foot sampling grid. If

laboratory analysis detects concentrations of DRO or ORO above the MTCA Method A cleanup levels, the soil sample will be considered a performance sample, and the excavation will be extended. Where further excavation is not technically feasible, the soil samples collected at the edge of the pre-determined excavation limits will be considered confirmation soil samples. If laboratory analysis does not detect concentrations of DRO or ORO above the MTCA Method A cleanup levels, the final limits of excavation will have been reached, and the soil sample results will be considered a confirmation sample.

5.1.2 ORC Placement

The selected cleanup action for concentrations of TPH in groundwater at AOC 1 includes placement of ORC or similar product prior to backfilling the excavation to enhance aerobic degradation to reduce concentrations of TPH in groundwater. The ORC or similar product will be placed with the backfill material at the base of the excavation, approximately 1 to 2 feet into the saturated zone. The ORC or similar product will be applied in accordance with the manufacturer's recommended application rates to remediate groundwater in AOC 1.

5.2 CLEANUP ACTION IN AOC 2 AND AOC 3

Concentrations of DRO and ORO exceed the MTCA Method A cleanup levels in soil in AOC 2 and AOC 3 (Figure 2). Excavation of soil with concentrations of DRO and/or ORO above the MTCA Method A cleanup level in AOC 2 and AOC 3 is the selected cleanup action to meet MTCA cleanup requirements.

Concentrations of ORO in soil exceed the MTCA Method A cleanup level in the AOC 2 Equipment Parking Area at a depth of 2.5 feet bgs (Figure 2). The depth of excavation in AOC 2 likely will not exceed 11 feet bgs, as suggested by the results of head space measurements of organic vapors on soil samples collected from boring MW-13. Groundwater in AOC 2 was encountered at approximately 17 to 18 feet bgs and was not impacted by TPH. It is estimated that the total volume of soil to be excavated in AOC 2 will range from 2,000 to 3,100 cubic yards.

Concentrations of DRO in soil exceed the MTCA Method A cleanup level in the AOC 3 Former Recycled Stockpile Area at a depth of 4 feet bgs (Figure 2). The depth of excavation in AOC 3 likely will not exceed 8 feet bgs, as confirmed by laboratory analytical results for the soil samples collected at 8 and 16 feet bgs. It is estimated that the total volume of soil to be excavated in AOC 3 will range from 2,500 to 3,700 cubic yards.

5.3 CLEANUP ACTION IN AOC 4

AOC 4 is defined by concentrations of VOCs detected in groundwater that exceed the MTCA Method A cleanup level (Figure 2). The results of AS/SVE pilot tests confirmed that AS/SVE will reduce concentrations of VOCs in groundwater in AOC 4 to meet MTCA cleanup requirements in a reasonable time frame.

5.3.1 Air Sparge/Soil Vapor Extraction Pilot Tests

AS/SVE pilot tests were conducted by Farallon to determine obtainable flow rates and radii of influence in the shallow and deeper portions of the vadose zone. The AS/SVE pilot test results are summarized in Appendix B.

The first phase of the AS pilot test was conducted on air sparge (AS) well AS1 with an applied air flow rate of 2.5 standard cubic feet per minute (scfm). The observed test well-head pressure initially measured 60 pounds per square inch (psi) and decreased to 42 psi over a 3-hour period. Pressure response was monitored in soil vapor extraction (SVE) wells SVE1, SVE2, MW-2, MW-18, MW-20, MW-21, and MW-22 (Figure 2). The applied air flow rate was increased to 4.5 scfm for the second portion of the AS pilot test at well AS1, and the observed well-head pressure increased to near 55 psi. Measureable pressure response was observed in wells SVE2, MW-2, MW-18, MW-21, and MW-22 during both portions of the AS pilot test. These wells are located 31 to 159 feet from well AS1.

The AS pilot test apparatus was placed on monitoring well MW-14C to compare the observed test well-head pressure to that of well AS1. Pressure response was not monitored in surrounding wells. Air flow rates of 2.5 and 5.8 scfm were applied to monitoring well MW-14C, and observed test well-head pressure ranged between 18 and 22 psi. Results of the AS pilot test indicated that an applied air flow rate of 1.5 to 2.5 scfm produced optimal results and that well-head pressures vary at least between 18 and 60 psi.

The SVE pilot test was performed at wells SVE1 and SVE2 (Figure 2). The initial SVE pilot test performed at well SVE1 had an applied vacuum of 65 inches of water (IOW) and did not produce any flow. The SVE pilot test apparatus was moved to well SVE2. A vacuum of approximately 55 IOW was applied to the well and produced an initial flow rate of 29.6 scfm, which decreased to 10.3 scfm over a 3-hour period. Vacuum was measured in observation wells SVE1, MW-2, and MW-3. The vacuum response to the SVE pilot test was greatest in observation well MW-2, located approximately 75 feet from well SVE2. The SVE pilot test apparatus was placed back on well SVE1 to observe whether operating the pilot test at well SVE2 had impacted flow rates that could be obtained from well SVE1 as the test well. A vacuum of 15 IOW was initially applied to well SVE2 and increased in 5-IOW increments to 55 IOW. The measured flow at the test well ranged from 4.2 to 5.0 scfm. Results of the SVE pilot test indicated that an applied vacuum of 55 IOW and a flow rate of 10 scfm produced optimal results. Based on observed responses to the AS/SVE pilot tests, the AS/SVE well network will be based on a conservative radius of influence of approximately 80 feet, which will allow for the AS/SVE wells to be located on 120-foot centers (Figure 3).

Soil vapor samples were collected and analyzed during the SVE pilot tests using a GasTec pump and TCE-specific colorimetric detection tubes. Concentrations of TCE were not detected in the soil vapor discharged from well SVE2.

5.3.2 Air Sparge System

The results of the AS pilot test demonstrated that an AS system is technically feasible to reduce concentrations of VOCs in groundwater in the AOC 4 Asphalt Testing Area. The AS system

will inject pressurized air into groundwater, which will vaporize VOCs from groundwater to soil vapor. Compressed air will be provided by aboveground air compressors. Underground piping will transfer the pressurized air from the compressors to the injection wells for injection into groundwater near the base of the Deep Water-Bearing Zone at a depth of approximately 80 feet bgs. The injection wells will be located within the estimated extent of the VOC contamination plume (Figure 2). Based on the observed response to the AS pilot tests, the wells will be located on 120-foot centers, with a conservative radius of influence of approximately 80 feet for each well (Figure 3). The AS wells will be constructed of 2-inch-diameter polyvinyl chloride casings and 2-foot, 0.010-inch slotted screens. Well AS1 currently is located on the Site, and nine additional AS wells will be installed in AOC 4 to a depth of approximately 80 feet bgs and screened from an interval 1 foot into the observed silt layer and 1 foot above the silt layer at the base of the Deep Water-Bearing Zone.

Approximately 1.5 to 2.5 scfm of air will be injected at each AS well, and the air flow will be regulated through the AS well control arrays. During the AS pilot test, well AS1 experienced a high well-head pressure of 60 psi; tests performed on well MW-14C showed a significantly lower well-head pressure of approximately 20 psi. Because it is not possible to anticipate the number of AS wells that will produce the high well-head pressure, two separate AS control arrays will be constructed, designated as the high-pressure leg and the low-pressure leg. Three wells will be controlled through the high-pressure leg (55 psi) and will be connected to one compressor; the remaining seven wells will be controlled through the low-pressure leg (20 psi) and will be connected to three compressors in series. All four compressors will be Gast model 8HDM-10-M853. Air from the high-pressure leg compressor will pass through approximately 30 feet of cooling pipe prior to passing through the high-pressure leg control array. Air from the three low-pressure leg compressors will pass through approximately 20 feet of cooling pipe prior to the low-pressure leg control array. Air sparge flows will be started at 1.5 scfm per AS well and increased as necessary to achieve complete coverage of the contaminant plume in AOC 4.

A remediation equipment compound constructed adjacent to and south of the well-house will contain the compressors, AS control arrays, control system, and other equipment necessary for operation of the AS system. The equipment compound will be surrounded by chain link fencing with a locked gate. The control system will have shut-off switches and safety alarms.

Design details and the equipment layout are provided in Appendix A. A Site-specific Operation and Maintenance Plan will be prepared once system construction and start-up has been completed.

5.3.3 Soil Vapor Extraction System

The SVE system will be installed in conjunction with and in the same general location as the AS system in AOC 4 to recover soil vapor created from the AS system for discharge to the atmosphere. The SVE system will consist of 11 wells, of which 9 will be paired with and located adjacent to 9 of the AS wells (Appendix A). The SVE wells will be constructed of 4-inch-diameter polyvinyl chloride casings to depths of approximately 35 feet bgs and 0.010-inch slotted screens of variable length. The screen interval will depend on the depth of the Deep Water-Bearing Zone and the depth range of vadose soil above the Deep Water-Bearing Zone

observed during installation of the SVE wells. The well screens will be installed to intercept the more permeable soil layers closest to and above the groundwater surface.

The SVE wells will be connected via underground piping to a Rotron vacuum blower (model number DR6D89) located in the remediation compound. Extracted vapor will pass through a control array that allows the applied vacuum flow rate to be controlled for each well. Based on the observed response to the SVE pilot test, an applied vacuum of 55 IOW and a flow rate of 10 scfm will be applied to each well. An air-water separator (water knockout) will be installed prior to the intake pipe of the vacuum blower to protect the blower from water intake. Beneath the water knockout will be a water accumulation barrel to store the water accumulated from the water knockout. Air and vapors from the blower will be discharged directly to the atmosphere through a vent pipe located 15 feet above the roof line of the well house. It is not anticipated that treatment of the air discharge will be required. A control system will be installed that will include an automatic vacuum blower motor shutoff as a safety measure in the event of a high water level in the condensate water knockout or motor overload. The SVE control array, blower, water knockout, water accumulation barrel, and control system will be located in the same remediation equipment compound as the AS equipment.

Wastewater generated by operation of the AS/SVE remediation system will be stored in drums or a poly tank and sampled for VOCs pending disposal. If concentrations of VOCs are below the laboratory practical quantitation limit (PQL), the wastewater will be discharged into the existing private stormwater collection system. If concentrations of VOCs above the PQL are detected, air strippers may be installed and operated inside the drums or a poly tank to volatilize the VOCs from the wastewater. The wastewater will be resampled and discharged as described above once contaminant concentrations are below the laboratory PQLs.

Design details and the equipment layout are provided in Appendix A. A Site-specific Operation and Maintenance Plan will be prepared once system construction and start-up has been completed.

5.4 CLEANUP ACTION IN AOC 5

Concentrations of total and dissolved lead exceeding the MTCA Method A cleanup levels were detected in groundwater in the Shallow Water-Bearing Zone in AOC 5. Monitoring well MW-12 will be monitored and resampled to determine whether concentrations exceed MTCA Method A cleanup levels. Groundwater use in this area may be restricted by an institutional control if analytical results confirm that cleanup levels are exceeded.

The selected cleanup action to address concentrations of arsenic and lead in shallow groundwater in AOC 5 Atlas Foundry Waste includes the following steps:

- **Step 1**—Collection of groundwater samples from monitoring well MW-12 using low-flow sampling methods for analysis of total and dissolved lead and arsenic. If concentrations of total and dissolved lead and arsenic are below the MTCA Method A cleanup levels for four consecutive quarters, no cleanup action is necessary.

- **Step 2**—Installation of a monitoring well proximate to the location of monitoring well MW-12, designed and constructed to the specific subsurface conditions if concentrations of total or dissolved lead or arsenic exceed the MTCA Method A cleanup levels in the groundwater samples collected from monitoring well MW-12.

  Collection of groundwater samples from the monitoring well using low-flow sampling methods for analysis of total and dissolved lead and arsenic. If concentrations of total and dissolved lead and arsenic are below the MTCA Method A cleanup levels for four consecutive quarters, no cleanup action is necessary.

- **Step 3**—Development of Site-specific cleanup levels for lead and/or arsenic, with institutional controls for groundwater in AOC 5 if concentrations of total or dissolved lead or arsenic exceed the MTCA Method A cleanup levels in the monitoring well.

6.0 COMPLIANCE MONITORING

Compliance monitoring of soil and groundwater will be performed in accordance with the requirements of WAC 173-340-410 and will address protection, performance, and confirmation monitoring. Specific protocols for protection monitoring are provided in the Site-specific HASP, which is included in Appendix C.

6.1 PROTECTION MONITORING

Protection monitoring, including monitoring soil and ambient air, will be conducted during the cleanup action to confirm that human health and the environment are protected. Protection monitoring will include evaluation of the analytical results for the performance soil samples collected during the soil excavation activities in AOC 1, AOC 2, and AOC 3 and during construction of the AS/SVE wells and remediation system components in AOC 4, and air monitoring in AOC 1 through AOC 4 to ensure protection of human health and the environment during implementation of the cleanup action. The health and safety requirements and personal protective equipment necessary to reduce human exposure to toxic substances at the Site are provided in the HASP.

A photoionization detector will be used to monitor breathing zone vapors during the soil excavation activities to ensure worker and community safety. Compound-specific threshold concentrations are provided in the HASP.

6.2 PERFORMANCE MONITORING

The following sections include descriptions of performance monitoring for the planned cleanup action for soil and groundwater at the Site in AOC 1 through AOC 5.

6.2.1 Soil

Performance soil monitoring and sampling will be conducted to evaluate the performance of the excavation in AOC 1, AOC 2, and AOC 3. Performance soil samples will be collected from the excavation for laboratory analysis to determine the extent of excavation necessary to remove soil with concentrations of DRO or ORO above the MTCA Method A cleanup levels.

Discrete soil samples will be collected from the bottom and sidewalls of the excavation to define the extent of soil removal necessary and to serve as confirmation samples where cleanup levels are attained. The soil sampling frequency and locations are described in Section 5.1.1, Excavation. Procedures for sample collection and handling, analytical testing methods, and QA/QC sampling for soil performance monitoring are described in the Sampling and Analysis Plan (SAP) that is included in the RI Work Plan.

6.2.2 Groundwater

Performance groundwater monitoring and sampling will be conducted to monitor the progress of the groundwater cleanup in AOC 1, AOC 4, and AOC 5. Groundwater sampling will be performed on a quarterly basis prior to start-up of the AS/SVE remediation system for

monitoring wells associated with the cleanup action for VOCs, arsenic, and lead. Quarterly groundwater sampling from monitoring wells associated with the portion of the cleanup action related to TPH contamination will be initiated approximately 6 months after completion of the excavation activities, to allow subsurface conditions to stabilize following excavation activities.

Performance groundwater monitoring will be conducted as long as laboratory analysis detects concentrations of one or more of the COCs exceeding the MTCA Method A cleanup levels in groundwater samples collected from the point of compliance monitoring wells. If the performance monitoring conducted through the first year of quarterly groundwater monitoring and sampling does not detect concentrations of COCs in groundwater that exceed the MTCA Method A cleanup levels, the analytical results will be used as confirmation sampling results, and groundwater monitoring and sampling will be discontinued. Groundwater performance monitoring will continue until the analytical results confirm that the cleanup levels have been met at the points of compliance, at which time confirmation monitoring will be implemented. The performance monitoring point and the points of compliance for groundwater include the monitoring wells listed below, listed by AOC.

AOC 1—Monitoring wells MW-11 and MW-13 will be performance monitoring points and points of compliance for TPH in groundwater in AOC 1. If monitoring wells MW-11 and MW-13 are decommissioned by the excavation of TPH-contaminated soil, additional monitoring wells will be installed to provide for performance and compliance monitoring.

AOC 4—Monitoring wells MW-2, MW-14, MW-15, MW-16, MW-18, MW-19, MW-20, MW-21, MW-22, and MW-23 will be performance monitoring points and the points of compliance for VOCs in groundwater in AOC 4.

AOC 5—Monitoring well MW-12 will be the performance monitoring point and the point of compliance for total and dissolved arsenic and lead in groundwater in AOC 5. A new monitoring well may be constructed to address specific Site conditions, at which time the new performance monitoring point and the point of compliance may be reestablished. Procedures for sample collection and handling, analytical testing methods, and QA/QC sampling for groundwater performance monitoring are described in the SAP.

6.3 CONFIRMATION MONITORING AND SAMPLING

Confirmation sampling will be initiated once performance monitoring results indicate that the cleanup objectives have been achieved for soil and groundwater at the Site. Confirmation sampling will include analysis of soil and groundwater samples collected in accordance with WAC-173-340-410. The analytical results will be used to confirm that the cleanup objectives have been met.

6.3.1 Soil

Confirmation soil sampling will be conducted concurrently with the excavation activities at AOC 1, AOC 2, and AOC 3 and will be performed to confirm that soil with concentrations of DRO and/or ORO above the applicable MTCA cleanup levels have been removed. Sampling locations will include the bottom and sidewalls of the excavation. The soil confirmation samples

will be collected from undisturbed soil at the base and sidewalls of the excavation. Procedures for sample collection and handling, analytical testing methods, and QA/QC sampling for soil confirmation monitoring are as described for the soil performance monitoring.

6.3.2 Groundwater

Confirmation groundwater monitoring and sampling will be initiated once performance monitoring results indicate that the cleanup objectives have been achieved at the points of compliance for groundwater at compliance monitoring wells at AOC 1, AOC 4, and AOC 5. Groundwater confirmation sampling will be performed on a quarterly basis for four consecutive quarters. If the results of four quarters of performance sampling confirm that concentrations of COCs in groundwater are below MTCA Method A cleanup levels, the results will be considered confirmation sampling results, the cleanup will be considered complete, and no additional sampling will be necessary. Groundwater confirmation samples will be collected from the point of compliance monitoring wells as described in Section 6.2, Performance Monitoring Procedures for sample collection and handling, analytical testing methods, and QA/QC sampling for groundwater confirmation monitoring are referenced in Section 6.2, Performance Monitoring, and as described in the SAP.

6.4 QUALITY ASSURANCE

Quality assurance will be performed during the cleanup action to monitor the quality and usability of the performance and confirmation monitoring data. The frequency, scope, and duration of the quality assurance monitoring are detailed in the SAP.

7.0 SCHEDULE

It is anticipated that the AS/SVE remediation system construction activities will be completed within a 4- to 8-week period between January and March 2010, after which start-up of the remediation system will occur. The point of compliance monitoring wells are in place, and the first groundwater monitoring and sampling event will be conducted just prior to start-up of the remediation system. Excavation activities likely will be conducted in the second quarter of 2010.

8.0 DOCUMENTATION REQUIREMENTS

Documentation of the cleanup action will be prepared to meet MTCA requirements as presented in WAC 173-340-400 and 173-340-410. After client review and approval, applicable and relevant documentation generated for the cleanup action will be submitted to Ecology. Copies of the documentation will be retained in the Farallon file for a minimum of 3 years after completion of the project.

8.1 DATA MANAGEMENT

An established document control system will be implemented for the cleanup action, which includes the following, as appropriate: Technical Specifications; field documentation; boring and well logs; well purging and sampling documentation; sampling event data documentation; chain-of-custody documentation; waste inventory documentation; and sample labels.

8.2 FIELD DOCUMENTATION

Field personnel will keep a daily field log recorded on a Field Report form. Field notes will be as descriptive and inclusive as possible, so as to allow an independent party to reconstruct the sampling and construction activities from the recorded information. Language will be objective, factual, and free of inappropriate terminology. At a minimum, field documentation will include the names of the field personnel, date, job number, project identification and location, weather conditions, sample collection data, field equipment used, and any activities performed in a manner other than as specified. Other forms that are completed or used will be cited in the Field Report form and attached. The field sampling team will prepare a written Chain-of-Custody form, which will be filled out at the time the performance and laboratory confirmation samples are obtained. A detailed discussion of field documentation and chain-of-custody procedures are presented in the SAP.

8.3 HEALTH AND SAFETY

A HASP is required for all cleanup actions (WAC 173-340-810 and 296-62). The HASP must comply with the requirements of the Occupational Safety and Health Act of 1970 and the Washington Industrial Safety and Health Act (Chapter 49.17 of the Revised Code of Washington). Ecology approval of the submitted HASP is not required.

8.4 PROGRESS REPORTS

Quarterly Cleanup Action Status Reports will be prepared by Farallon to document cleanup activities, results of compliance monitoring events, and ongoing progress of the remediation program. The Cleanup Action Status Reports will include the following:

- A list of cleanup action activities that have taken place during that reporting period;
- Reviewed final data, including laboratory analyses, compliance monitoring data, and waste and disposal documentation;

- Groundwater elevation data and performance and/or confirmation monitoring results presented in summary tables and figures; and
- A list of deliverables for the upcoming quarter, if different from the schedule.

The first Cleanup Action Status Report will be prepared shortly after installation and start-up of the AS/SVE system and will include a construction summary and the as-built drawings for the AS/SVE system. It is expected that the first Cleanup Action Status Report will be completed during the second quarter of 2010.

Closure Reports will be prepared by Farallon once the cleanup action has been completed and the requirements of MTCA have been met for specific AOCs. Farallon expects that a total of four Closure Reports will be prepared for the Lakeview Facility. The first Closure Report will be prepared following the cleanup action by excavation in AOC 2 and AOC 3, anticipated to occur during the second quarter of 2010. The second Closure Report will be prepared to document the cleanup action and confirmation soil and groundwater sampling for AOC 1 and likely will be prepared in the second half of 2010. The third Closure Report will address the cleanup action in AOC 5, and the fourth Closure Report will summarize the cleanup action for AOC 4 following confirmation for their corresponding cleanup actions. Farallon cannot anticipate the timing for the final two Closure Reports at this time.

Unless otherwise specified, the Cleanup Action Status Reports, Closure Reports, and other documents submitted pursuant to the cleanup action will be sent in final format. Copies of the progress reports will be distributed to the appropriate parties.

9.0 BIBLIOGRAPHY

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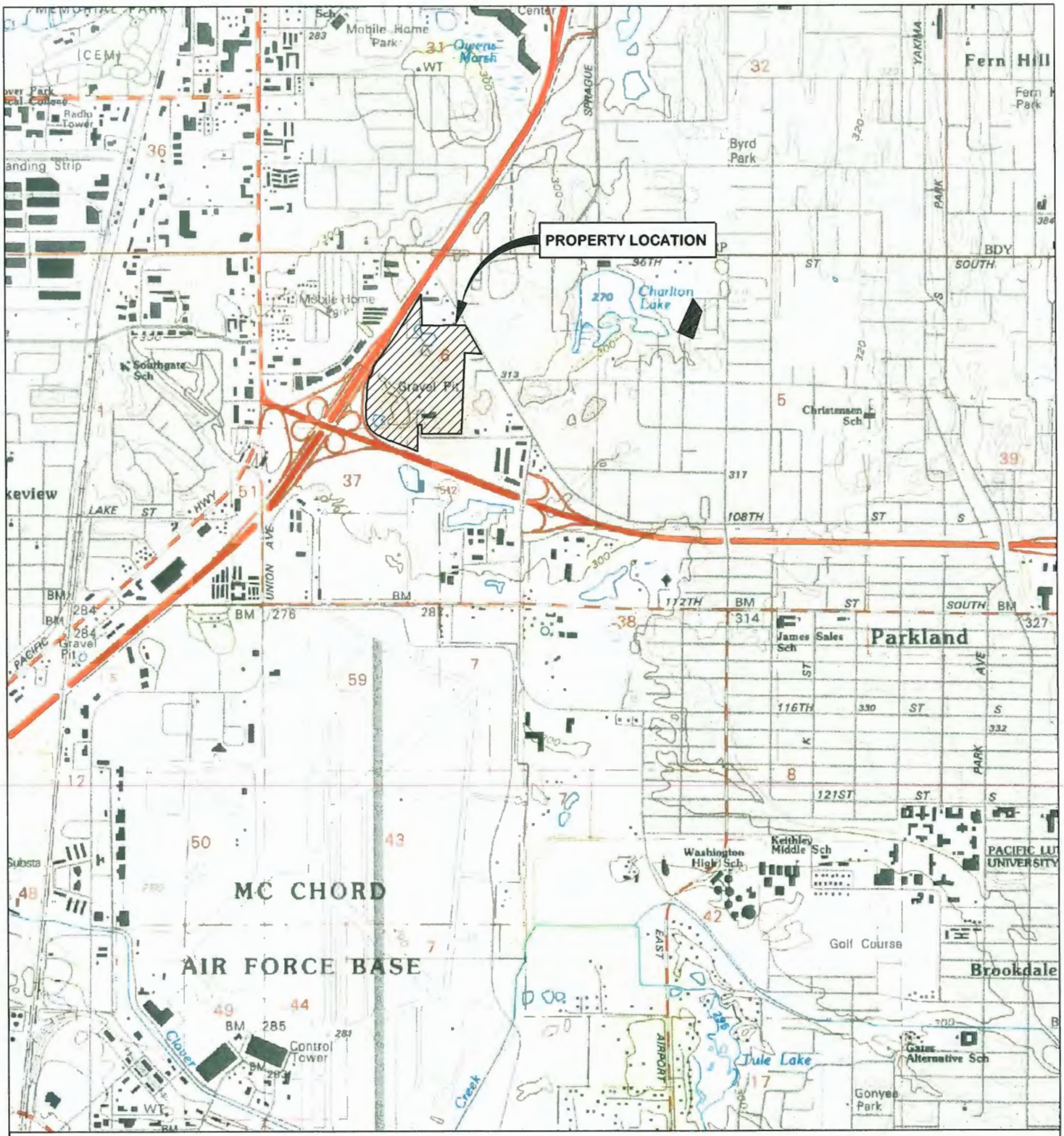
FIGURES

ENGINEERING DESIGN 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

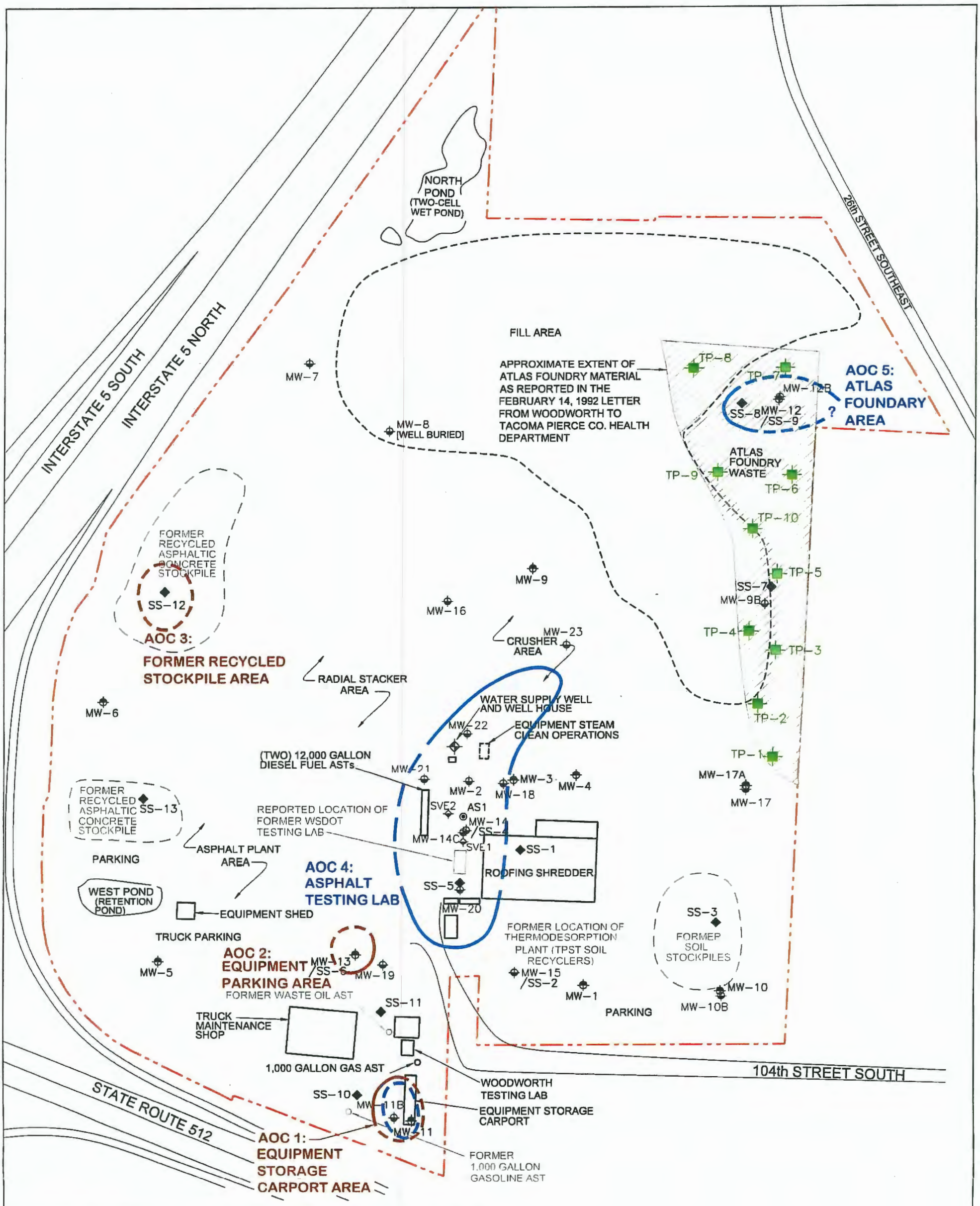
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

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: 1/06/10	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
- SVE1 — SOIL VAPOR EXTRACTION WELL
- AS1 — AIR SPARGE 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.

0 180
APPROXIMATE SCALE IN FEET

N

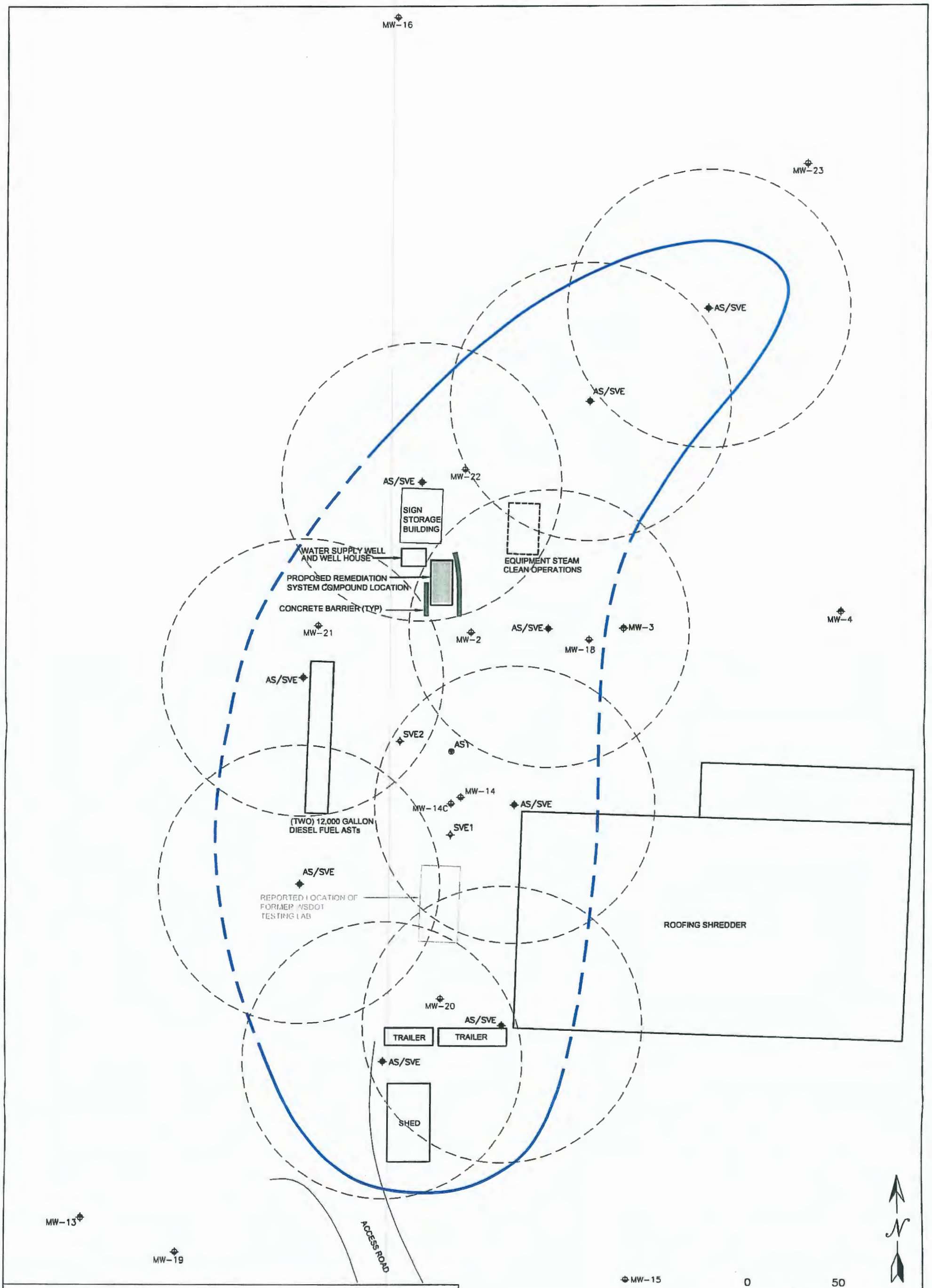
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 2

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

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 1/06/10	Disk Reference: 188001



LEGEND

- MW-11 ⌖ MONITORING WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- MW-15 ⌖ MONITORING WELL SCREENED IN DEEP WATER-BEARING ZONE
- SVE1 ✧ SOIL VAPOR EXTRACTION WELL SCREENED IN SHALLOW WATER-BEARING ZONE
- AS1 ◉ AIR SPARGE SCREENED IN DEEP WATER-BEARING ZONE
- AS/SVE ✦ PROPOSED AIR SPARGE AND SOIL VAPOR EXTRACTION WELL
- APPROXIMATE AREA OF GROUNDWATER CLEANUP ACTION
- AREAS OF INFLUENCE
- WSDOT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 3

AS/SVE WELL LOCATIONS AND AREAS OF INFLUENCE
WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON

FARALLON PN: 188-001

Drawn By: DEW	Checked By: BJ	Date: 1/06/10	Disk Reference: 188001

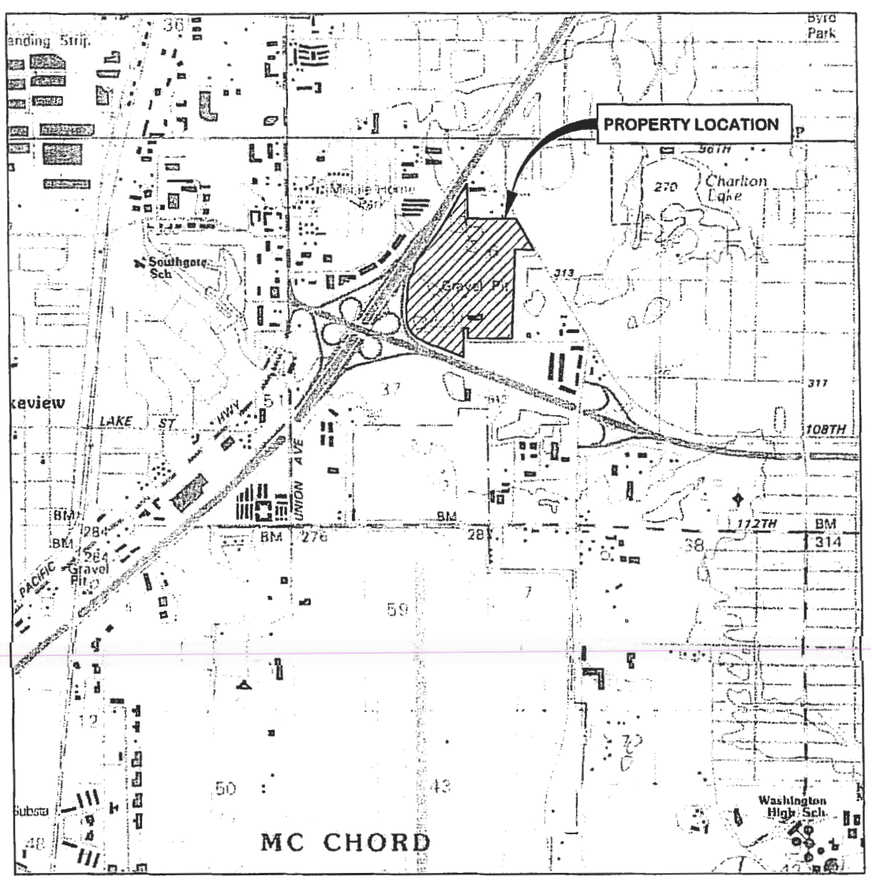
APPENDIX A
CONSTRUCTION PLANS AND SPECIFICATIONS

ENGINEERING DESIGN REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

CLEANUP ACTION AIR SPARGE / SOIL VAPOR EXTRACTION
AREA OF CONCERN (AOC) 5

WOODWORTH LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON



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

SITE LOCATION MAP
(NOT TO SCALE)

WASHINGTON

DRAWING INDEX

CLYDE N. MOORE
STATE OF WASHINGTON
14087
REGISTERED
PROFESSIONAL ENGINEER

1-6-2010

	1/05/2010	ISSUED FOR BIDDING	HF/DEW	CM	RM
	DATE	DESCRIPTION	BY	CKD.	APP.

PREPARED BY
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

PREPARED FOR
WOODWORTH CAPITAL, INC.
(FORMERLY KNOWN AS
WOODWORTH & COMPANY, INC.)
LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON 98499

WOODWORTH LAKEVIEW FACILITY
AOC 5 CLEANUP ACTION
LAKEWOOD, WASHINGTON
TITLE SHEET,
SITE LOCATION MAP, AND
DRAWING INDEX

SCALE	AS SHOWN
PROJECT NO.	188-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	1
OF	10

ELECTRICAL ABBREVIATIONS

A/AMP	AMP
AC	ALTERNATING CURRENT
BD	BUS DUCT
C	CURRENT
CB	CIRCUIT BREAKER
CLG	CEILING
DC	DIRECT CURRENT
DIS	DISCONNECT
DP	DOUBLE POLE
DT	DOUBLE THROW
EG	ENCLOSED AND GASKETED
E(OH)	ELECTRICAL (OVERHEAD)
E(UG)	ELECTRICAL (UNDERGROUND)
EMER	EMERGENCY
EPO	EMERGENCY POWER OFF
EMT	ELECTRICAL METALLIC TUBING
EXP	EXPOSED
FBO	FURNISHED BY OTHERS
FLEX	FLEXIBLE METAL CONDUIT
FRN	DUAL ELEMENT FUSE
GEN	GENERATOR
GFIC	GROUND FAULT INTERRUPTER
GND	GROUND
GRC	GALVANIZED RIGID CONDUIT
HOA	HAND-OFF-AUTO SWITCH
IRD	INFRARED DETECTOR
HP	HORSE POWER
HZ	CYCLES PER SECOND
JB	JUNCTION BOX
LFMC	LIQUID TIGHT FLEXIBLE METAL CONDUIT
M	MOTOR/MOTOR STARTER COIL
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON-FUSED
NO	NORMALLY OPEN
OL	OVERLOADS
PBS	PUSHBUTTON
PF	POWER FACTOR
PL	PILOT LIGHT
PLC	PROGRAMMABLE LOGIC CONTROLLER
RC	RIGID CONDUIT
RCPT	RECEPTACLE
SN	SOLID NEUTRAL
SP	SINGLE POLE
ST	SINGLE THROW
SW	SWITCH
TF/TRAN	TRANSFORMER
UF	UNDERFLOOR
UG	UNDERGROUND
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VP	VAPOR PROOF
WHT	WHITE
WP	WEATHER PROOF
XP	EXPLOSION PROOF

STANDARD ABBREVIATIONS

AF	AIR FILTER
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
APPROX	APPROXIMATELY
AF	AIR FILTER
AS	AIR SPARGE
BF	BLIND FLANGE
B.G.S.	BELOW GROUND SURFACE
BLDG	BUILDING
BOP	BOTTOM OF PIPE
BV	BALL VALVE
CONC	CONCRETE
CPLG	COUPLING
℄ /CL	CENTERLINE
CV	CONTROL VALVE/CHECK VALVE
DC	DOUBLE CONTAINED
Ø/DIA	DIAMETER
DWG	DRAWING
DP	DUAL PHASE
DPI	DIFFERENTIAL PRESSURE INDICATOR
EF	EACH FACE
EL/ELEV	ELEVATION
ELEC	ELECTRICAL
ELB	ELBOW
EPDM	ETHYLENE PROPYLENE RUBBER
EXIST/(E)	EXISTING
EXP	EXPANSION
EW	EACH WAY
EA	EACH
FC	FAIL CLOSE
FO	FAIL OPEN
FLXC	FLEXIBLE CONNECTION
FM	FLOW METER
FL	FLOW LINE
FT	FOOT
FUT	FUTURE
FIN GR	FINISHED GRADE
FE	FLANGED END
FNPT	FEMALE NATIONAL PIPE THREAD
GA	GAUGE
GAC	GRANULAR ACTIVATED CARBON
GALV	GALVANIZED
GI	GALVANIZED IRON
GPM	GALLONS PER MINUTE
GR	GRADE
GND	GROUND
GSKT	GASKET
GW	GROUNDWATER
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HORSEPOWER/HIGH PRESSURE
HR	HOUR
HS	HOSE
HYD	HYDRANT
HOA	HAND OFF AUTOMATIC
ID	INSIDE DIAMETER
IN	INCHES
INV	INVERT
IPS	IRON PIPE SIZE
JT	JOINT
JB	JUNCTION BOX
KO	KNOCK OUT
LSHH	LEVEL SWITCH
M	MOTOR
MAX	MAXIMUM
MH	MANHOLE
MJ	MECHANICAL JOINT
MIN	MINUTE/MINIMUM
MISC	MISCELLANEOUS
MNPT	MALE NATIONAL PIPE THREAD
MP	METER PUMP
MON.PORT	MONITORING PORT
MW	MONITORING WELL
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO.	NUMBER
N	NEW
NTS	NOT TO SCALE
NPDES	NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OVHD	OVERHEAD
#/LB	POUND
PB	PULL BOX
PBF	PROVIDED BY FARALLON
PC	PORTLAND CEMENT
PCC	PORTLAND CEMENT CONCRETE
PG	PRESSURE GAS
PL	PROPERTY LINE/PIPE LINE
PO	PUMP OUT
P	PRESSURE
PRV	PRESSURE RELEASE VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PTW	PRESSURE TREATMENT
PVC	POLYVINYL CHLORIDE
PV	PROCESS VARIABLE
PR	PAIR
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS/RISER
RC	REINFORCED CONCRETE
REQ	REQUIRED
REF	REFERENCE
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SHT	SHEET
SPEC	SPECIFICATION
SQ	SQUARE
STA	STATION
STD	STANDARD
STL	STEEL
SBO	SUPPLIED BY OWNER
ST	SAMPLE TAP
STR	STRAINER
SS	STAINLESS STEEL
STL	STEEL
SVE	SOIL VAPOR EXTRACTION
SW	SWITCH
TYP	TYPICAL
TOC	TOP OF CASING/CURB
TOS	TOP OF STEEL
TOW	TOP OF WALL
UBC	UNIFORM BUILDING CODE
UGPS	UNDERGROUND PULL SECTION
UTIL	UTILITY
V	VALVE/VENT/VOLTS
VAC	VACUUM
VAR	VARIES/VARIABLE
VERT	VERTICAL
VP	VAPOR
VRV	VACUUM RELIEF VALVE
W	WITH
W/O	WITHOUT
WS	WATER SURFACE/WATER STOP

PIPING, ELECTRICAL AND EQUIPMENT SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM OPERATED VALVE
- SOLENOID VALVE
- MOTOR OPERATED VALVE
- PRESSURE REGULATING VALVE
- DRAIN
- WELD CAP
- SCREWED CAP
- SCREWED PLUG
- FLANGE
- BLIND FLANGE
- REDUCER/INCREASER
- DIRECTION OF FLOW
- UNION
- FLEXIBLE PIPE COUPLING
- BLOWER OR FAN
- CENTRIFUGAL PUMP
- PITOT TUBE
- STRAINER
- TRAP
- FILTER
- DIAMETER
- FEMALE ADAPTER
- SILENCER
- NEEDLE VALVE
- FLOW METER
- HOSE BIB
- SAMPLE TAP/MONITORING PORT
- HEAT EXCHANGER
- PRESSURE RELIEF OR AIR RELIEF
- VACUUM RELIEF
- NORMALLY OPEN
- NORMALLY CLOSED
- MAGNETIC STARTER
- DUPLEX RECEPTACLE, 15A; WP-WEATHER PROOF
- ELAPSED TIME METER
- FUSE
- FUSED DISCONNECT
- CAMLOCK CONNECTION
- VERTICAL PIPERUN
- GROUND
- GROUND ROD (3/4" COPPER WELD)
- HEATER STRIP
- JUNCTION BOX, PB-PULLBOX
- KILOWATT HOUR METER
- MOTOR
- MOTOR OVERLOAD
- NON-FUSABLE DISCONNECT SWITCH
- PILOT LIGHT, R=RED, W=WHITE, G=GREEN
- SELECTOR SWITCH AO=AUTO OFF, HOA=HAND OFF AUTO
- SWITCH, 120-277V, 2-2POLE, 20A
- THERMOSTAT
- TIME DELAY RELAY, CR=CONTROL RELAY
- TRANSFORMER
- UNDERGROUND PULLBOX
- WEATHER PROTECTED
- 120/208V PANEL
- 277/480V PANEL
- *HIGH LIGHT STANDARD
- REVISION TO PLANS

INSTRUMENTATION ABBREVIATIONS AND SYMBOLS

INSTRUMENT LEGEND

FIRST LETTER INITIATING VARIABLE		SUCCEEDING LETTERS OUTPUT FUNCTIONS
A	ANALYSIS	ALARM
B	BURNER	
C	CONDUCTIVITY	CONTROL
D	DENSITY	DIFFERENTIAL
E	POTENTIAL (VOLTS)	PRIMARY ELEMENT
F	FLOW RATE	RATIO (FRACTION)
G	FIRE ALARM	GLASS (SIGHT GAUGE)
H	HAND (MANUALLY)	HIGH
I	CURRENT (AMPERES)	INDICATE
J	POWER	
K	TIME	
L	LEVEL	LEAK, LOW
M	MOISTURE/HUMIDITY	LIGHT (PILOT)
N	EQUIPMENT STATUS	
P	PRESSURE/VACUUM	POINT (TEST CONNECTION)
Q	QUANTITY	INTEGRATE (TOTALIZE)
R		RECORD/PRINT
S	SPEED	SWITCH
T	TEMPERATURE	TRANSMIT
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION/VOLUME	VALVE/DAMPER
W	WEIGHT/FORCE/TORQUE	
X	UNCLASSIFIED	UNCLASSIFIED
Y		RELAY/COMPUTE
Z	POSITION	DRIVE/ACTUATE

INSTRUMENT SYMBOLS

SYMBOL	DESCRIPTION
M	MOTOR
HOA	HAND-OFF-AUTO SELECTOR SWITCH
	LOCALLY MOUNTED INSTRUMENT
	CONTROL PANEL MOUNTED INSTRUMENT
I	INTERLOCK
-10	PLC SHUTDOWN ALARM

STANDARD SYMBOLS

SECTION — 4 / 3|6 — DETAIL NUMBER
CURRENT — REFERENCED

LEGEND

- AIR SPARGE/SOIL VAPOR EXTRACTION PIPING
- MW-11 MONITORING WELL SCREENED IN WATER-BEARING ZONE 1
- MW-15 MONITORING WELL SCREENED IN WATER-BEARING ZONE 3
- AS1 EXISTING AIR SPARGE WELL
- SVE2 EXISTING SOIL VAPOR EXTRACTION WELL
- PROPOSED AIR SPARGE AND SOIL VAPOR EXTRACTION WELL

ALL LOCATIONS ARE APPROXIMATE

GENERAL NOTES

1. A COPY OF THE PROJECT DESIGN DRAWINGS AND SPECIFICATIONS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES.
2. COPIES OF ALL PERMITS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES. THE CONTRACTOR SHALL COMPLY WITH ALL PERMIT REQUIREMENTS.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS.
4. BURIED UTILITIES SHOWN ON THE DRAWINGS ARE FOR GENERAL INFORMATION ONLY. UTILITY LOCATIONS ARE APPROXIMATE AND MAY NOT BE INCLUSIVE OF ALL UTILITIES THAT EXIST ON THE PROPERTY.
5. THE CONTRACTOR SHALL HAVE A PRIVATE UTILITY LOCATE SERVICE VERIFY ALL UTILITIES AND MARK THEIR LOCATIONS ON THE GROUND PRIOR TO STARTING CONSTRUCTION. FARALLON SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT IS FOUND BETWEEN EXISTING UTILITIES AND THE PROJECT DESIGN.
6. FARALLON SHALL BE NOTIFIED OF DISCREPANCIES BETWEEN CONTRACT DRAWINGS AND ACTUAL SITE CONDITIONS.
7. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE JOB SITE CONDITIONS AND ENSURE THE SAFETY OF ALL PERSONS AND PROPERTY FOR THE DURATION OF ON SITE PROJECT WORK. THE CONTRACTOR SHALL PROTECT STRUCTURES, UTILITIES, AND PAVING FROM DAMAGE, DIRECT OR INDIRECT, RESULTING FROM THE WORK. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY OVER THE DURATION OF ON SITE ACTIVITIES AND NOT BE LIMITED TO NORMAL WORKING HOURS.
8. ALL EXCAVATIONS SHALL BE PERFORMED IN STRICT ACCORDANCE WITH APPLICABLE U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT (WISHA) REGULATIONS. THE CONTRACTOR ASSUMES FULL RESPONSIBILITY FOR THE SAFETY OF ALL CONSTRUCTION OPERATIONS.
9. NO TRENCHES SHALL BE LEFT OPEN WHEN WORK IS NOT IN PROGRESS. ALL OPEN EXCAVATIONS SHALL BE FENCED.

CLYDE N. MOORE — STATE OF WASHINGTON — 14087 — REGISTERED PROFESSIONAL ENGINEER — 1-6-2010

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	DATE	DESCRIPTION	BY	CKD.	APP.

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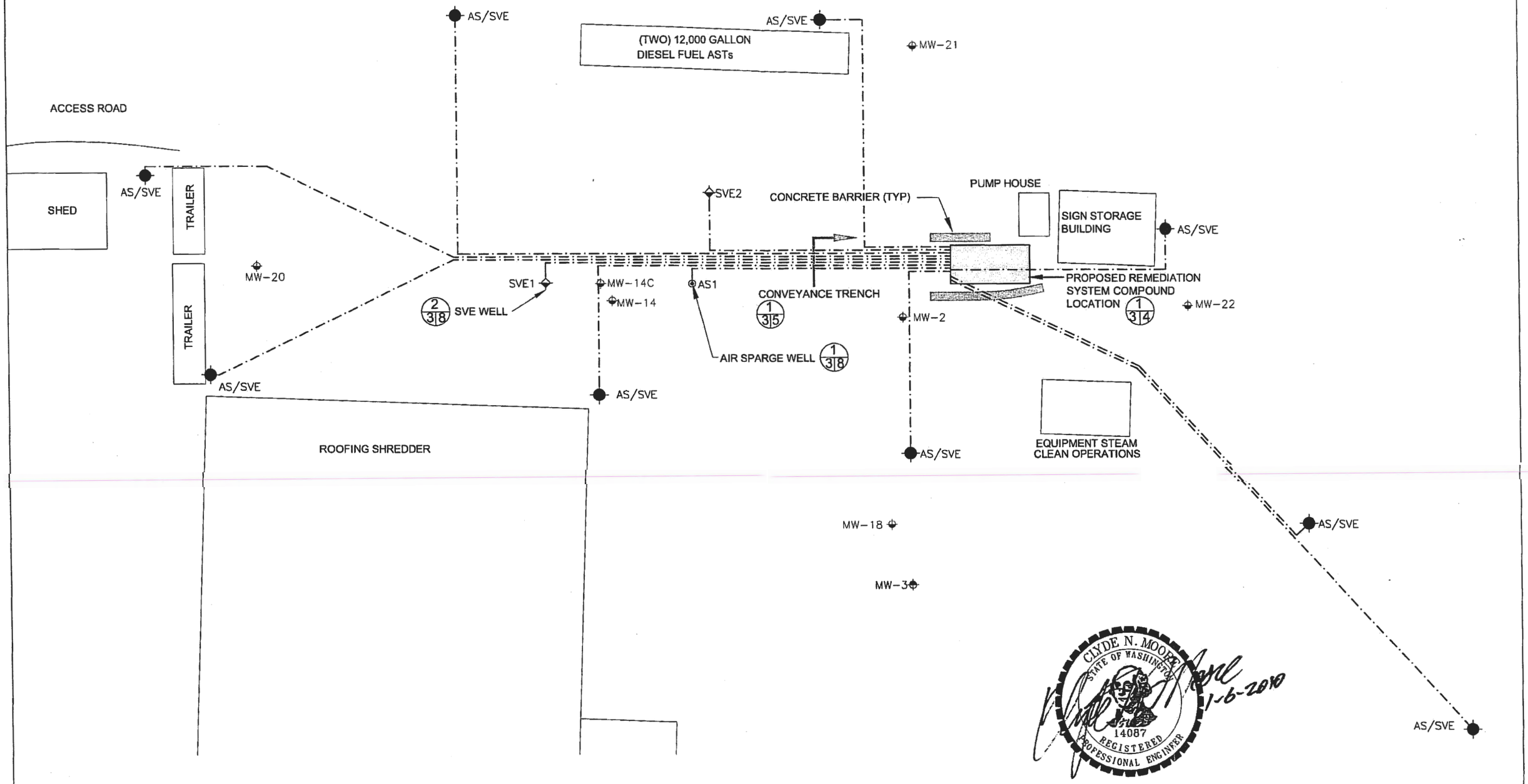
975 5th Avenue Northwest
Issaquah, WA 98027

PREPARED FOR
WOODWORTH CAPITAL, INC.
(FORMERLY KNOWN AS
WOODWORTH & COMPANY, INC.)
LAKEVIEW FACILITY
2800 104th STREET SOUTH
LAKEWOOD, WASHINGTON 98499

WOODWORTH LAKEVIEW FACILITY
AOC 5 CLEANUP ACTION
LAKEWOOD, WASHINGTON
GENERAL NOTES, LEGEND, SYMBOLS, AND ABBREVIATIONS

SCALE: AS SHOWN
PROJECT NO.: 188-001
FILE NAME: SYSTEM.dwg
SHEET NO.: 2 OF 10



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SITE PLAN

0 30

Scale in feet

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SITE PLAN WITH PROPOSED
REMEDIATION LAYOUT

SCALE	AS SHOWN
PROJECT NO.	188-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	3
OF	10

CONCRETE BARRIER

PUMP HOUSE

WATER SUPPLY WELL AND WELL HOUSE

3"Ø PVC

3"Ø PVC

WATER KNOCKOUT
ROTRON MS 300DS
MOISTURE SEPARATOR
(1/4|7)

3"Ø GALV STL

3"Ø GALV STL

VENT 5' ABOVE ROOF LINE

A

3"Ø SVE CONTROL ARRAY
(2/4|5)

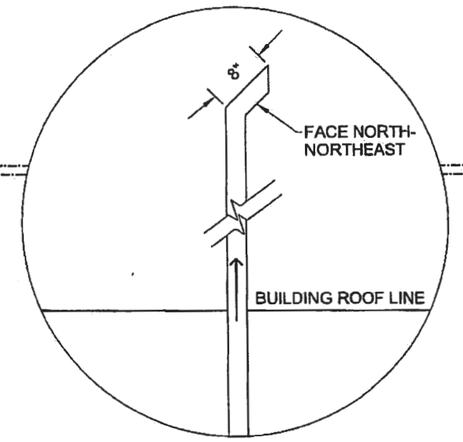
1" I.D. / 1 1/4" O.D. BRAIDED KURIYAMA TIGER FLEX HG100 CLEAR HOSE
WITH 1 1/4" GALV SS NUT AT TUBING END
LAYING ON BOTTOM OF BARREL

ROTRON
DR6D89
REGENERATIVE
BLOWER

WATER ACCUMULATION BARREL
WITH WATER LEVEL FLOAT SWITCH 6"
BELOW TOP OF BARREL

SVE CONTROL PANEL
LOCATE ADJACENT TO BLOWER
OR MOUNT ON WATER KNOCKOUT STAND

O
GATE



DETAIL A SVE VENT STACK
NOT TO SCALE

CONTROL PANEL
LOCATE ADJACENT TO COMPRESSOR
OR MOUNT ON WATER KNOCKOUT STAND

GAST 8H COMPRESSOR

LOW PRESSURE ARRAY

GAST 8H COMPRESSOR

AIR SPARGE MONITORING AND
CONTROL RISER (3/4|5)

3/8"Ø BRASS OR STAINLESS (TYP)

HIGH PRESSURE ARRAY

REDUCER (TYP)

1"Ø GALV STL

1"Ø GALV STL

1"Ø GALV STL

1"Ø GALV STL

(1/4|6) COOLING PIPE ARRAY

CONCRETE BARRIER

CONCRETE BARRIER

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PROFESSIONAL ENGINEER
1-6-2010

(1/4|3) COMPOUND LAYOUT

0 2
Scale in feet

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WOODWORTH LAKEVIEW FACILITY
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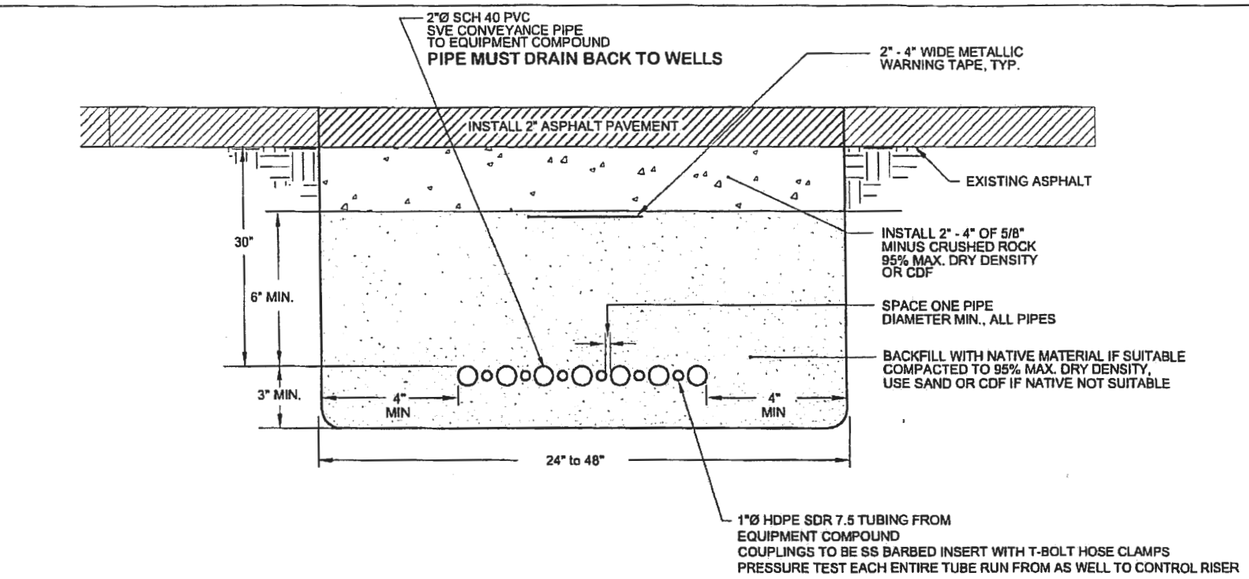
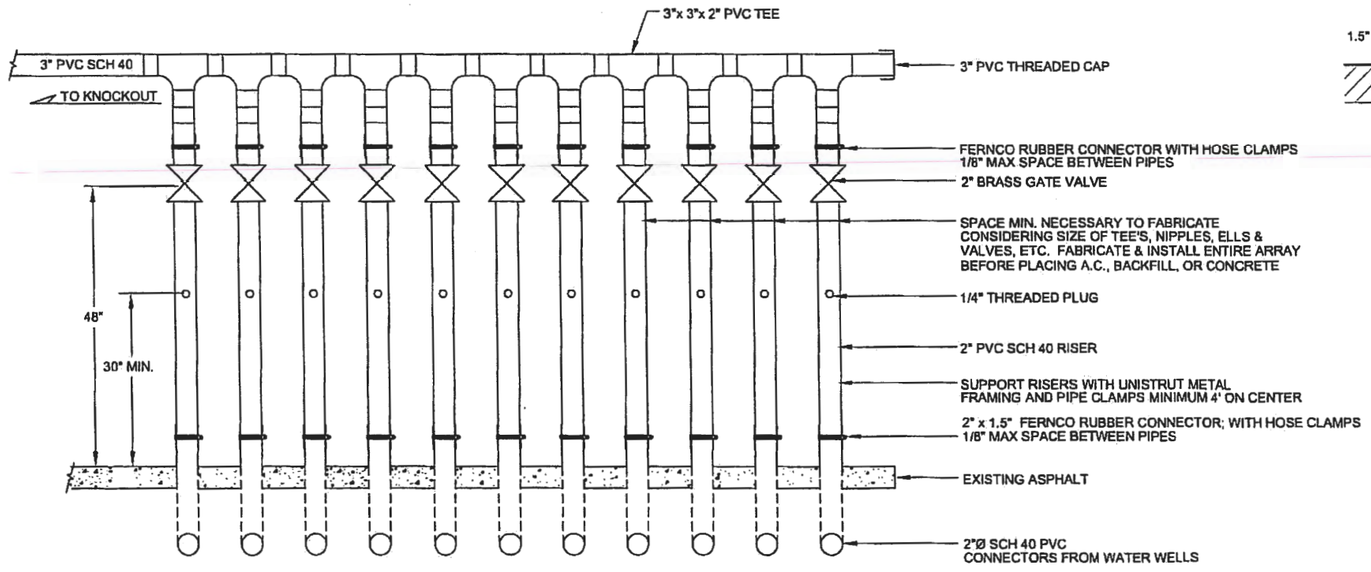
COMPOUND LAYOUT

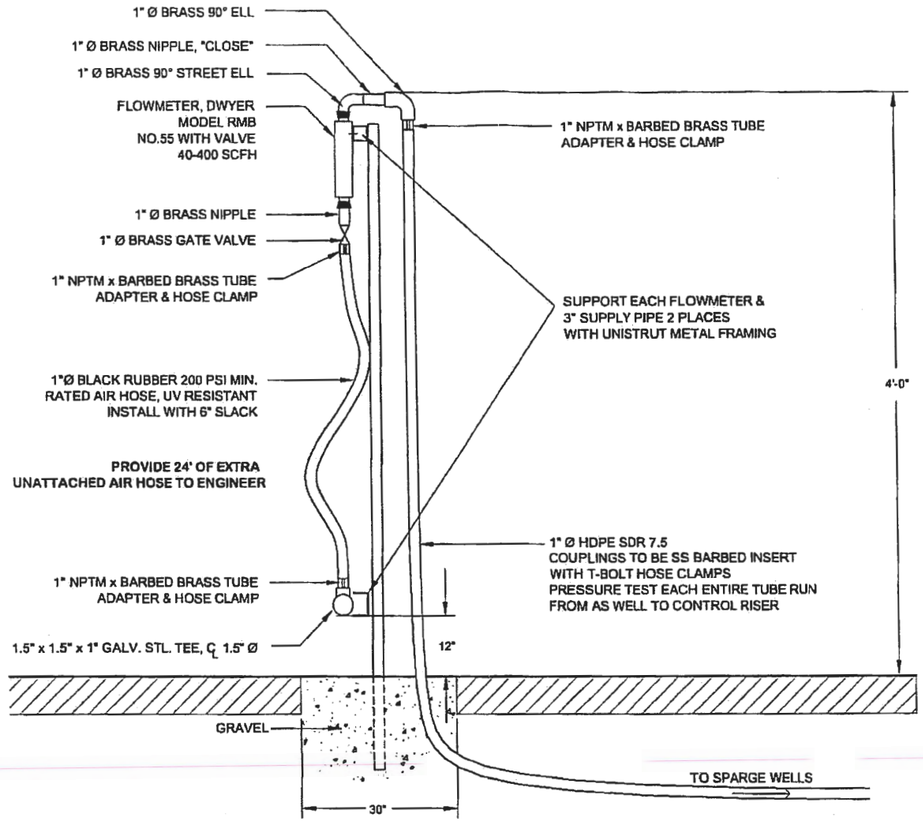
SCALE: AS SHOWN
PROJECT NO.: 188-001
FILE NAME: SYSTEM.dwg
SHEET NO.: 4 OF 10



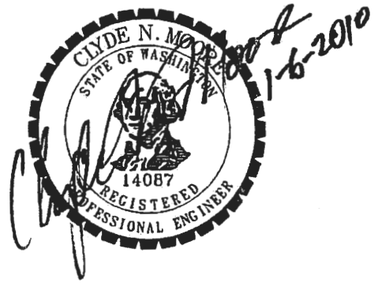
1/5/3 BRANCH CONVEYANCE TRENCH
NOT TO SCALE



2/5/4 SVE CONTROL ARRAY
NOT TO SCALE



3/5/4 AIR SPARGE MONITORING AND CONTROL RISER DETAIL
NOT TO SCALE



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AOC 5 CLEANUP ACTION
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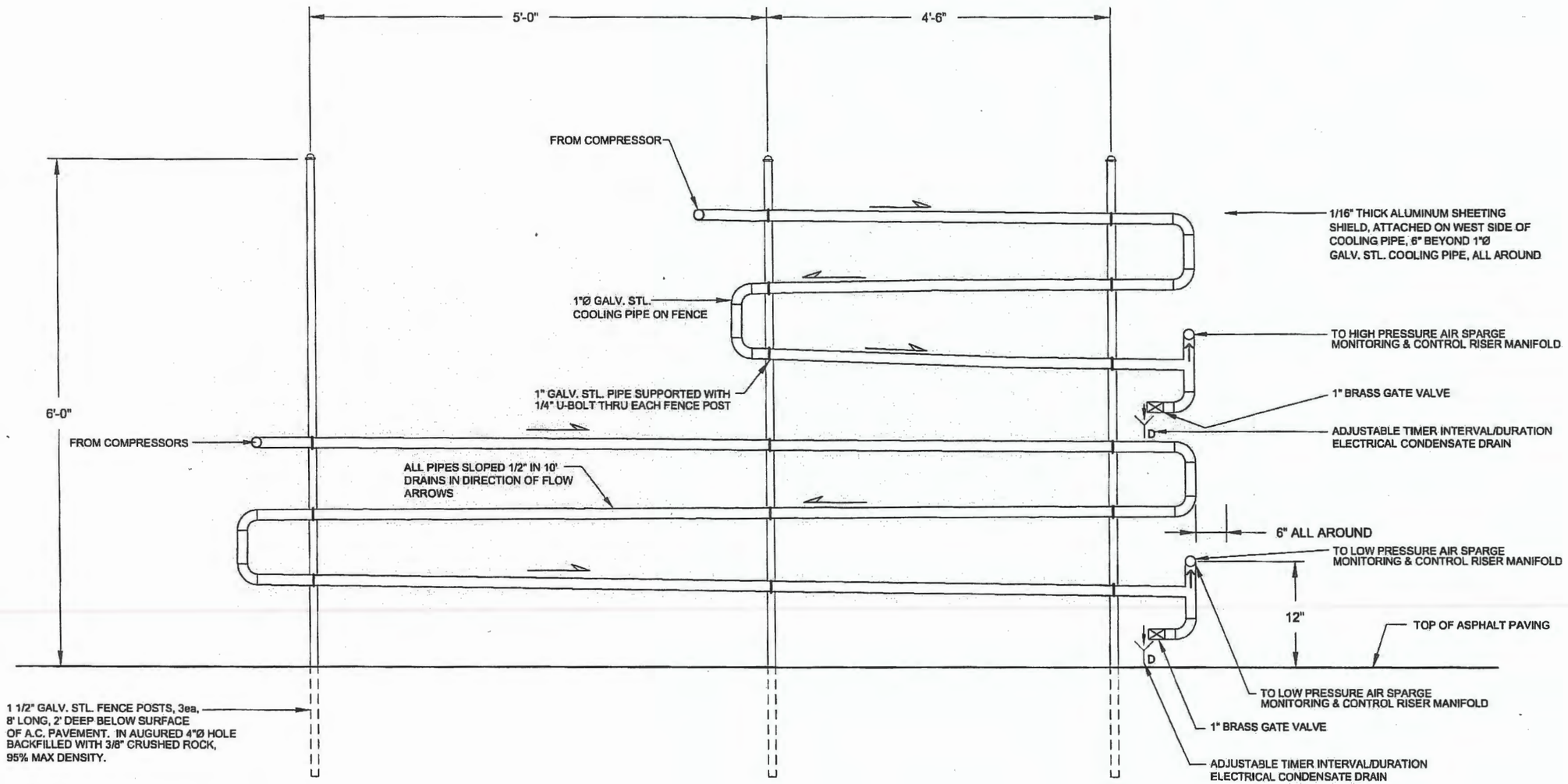
DETAILS

SCALE: AS SHOWN
PROJECT NO.: 188-001
FILE NAME: SYSTEM.dwg
SHEET NO.: 5 OF 10



1/6|4 COOLING PIPE ARRAY
NOT TO SCALE

N

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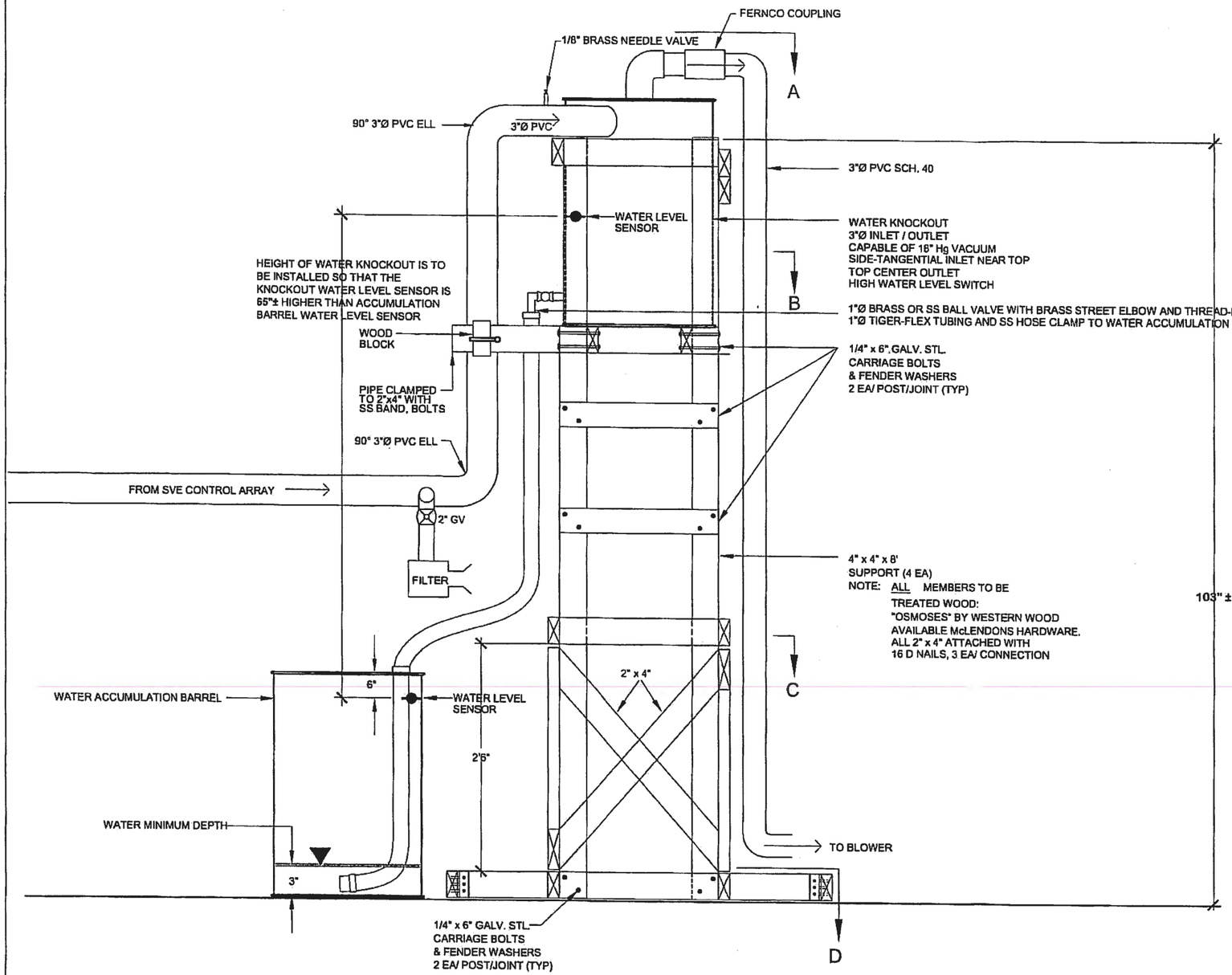
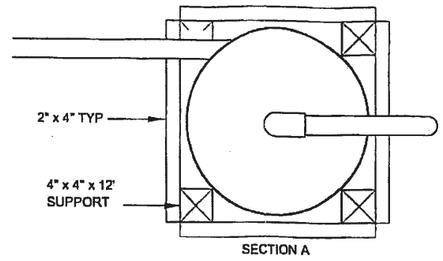
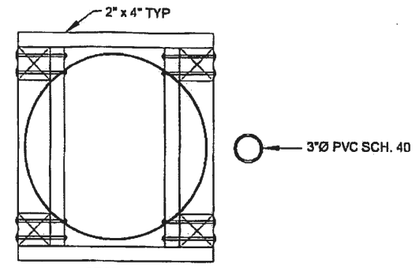
SPARGE AIR COOLING PIPE ARRAY DETAIL

SCALE	AS SHOWN
PROJECT NO.	188-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	6
OF	10

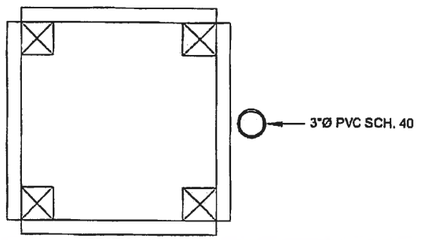




SECTION A



SECTION B



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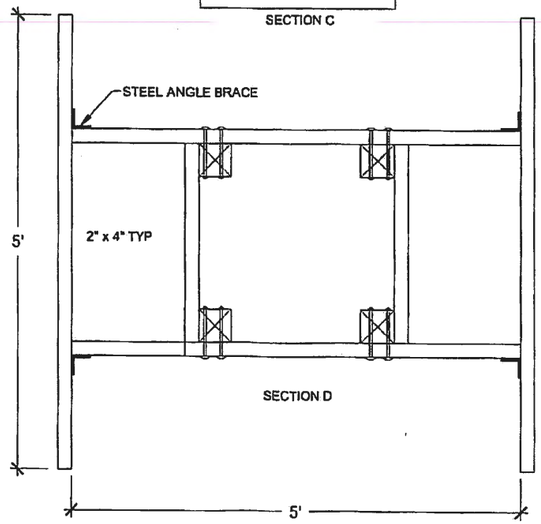

SECTION D

1/7|4 WATER KNOCKOUT DETAIL

NOT TO SCALE

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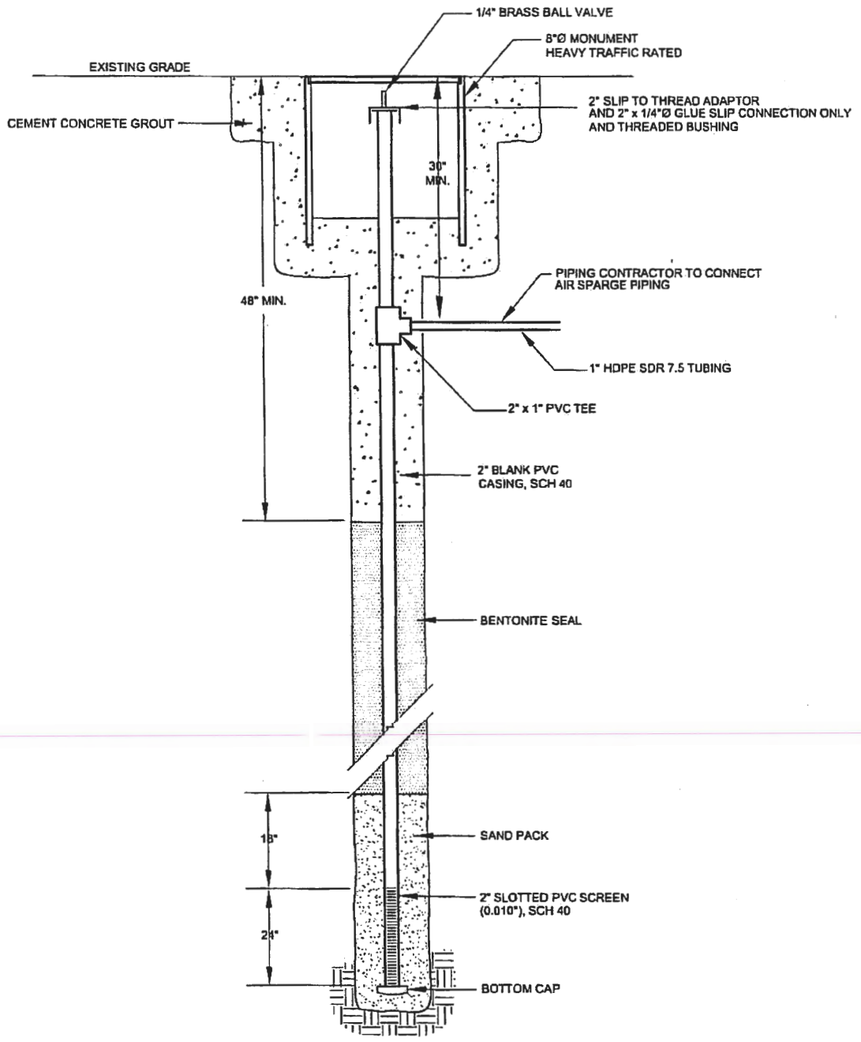
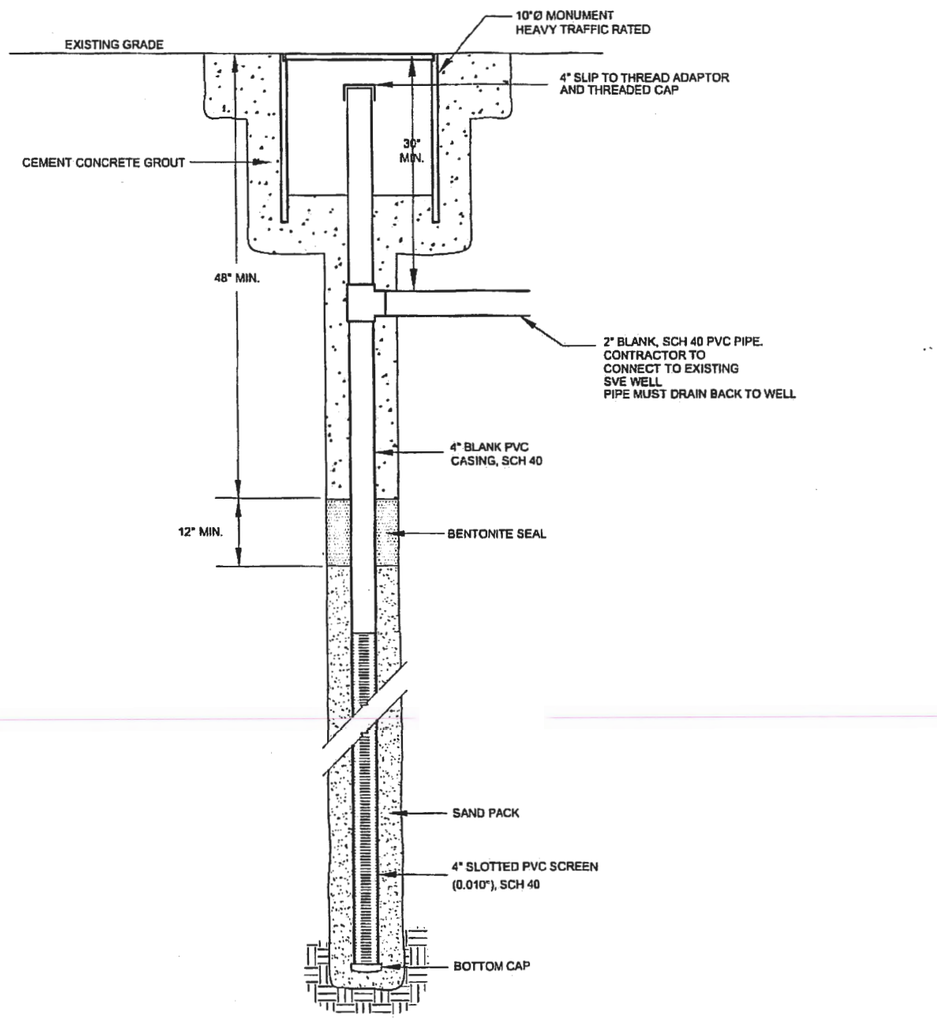
WATER KNOCKOUT DETAILS

SCALE	AS SHOWN
PROJECT NO.	188-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	7
OF	10



1/8 AIR SPARGE WELL (TYP)
NOT TO SCALE



2/8 SOIL VAPOR EXTRACTION WELL (TYP)
NOT TO SCALE

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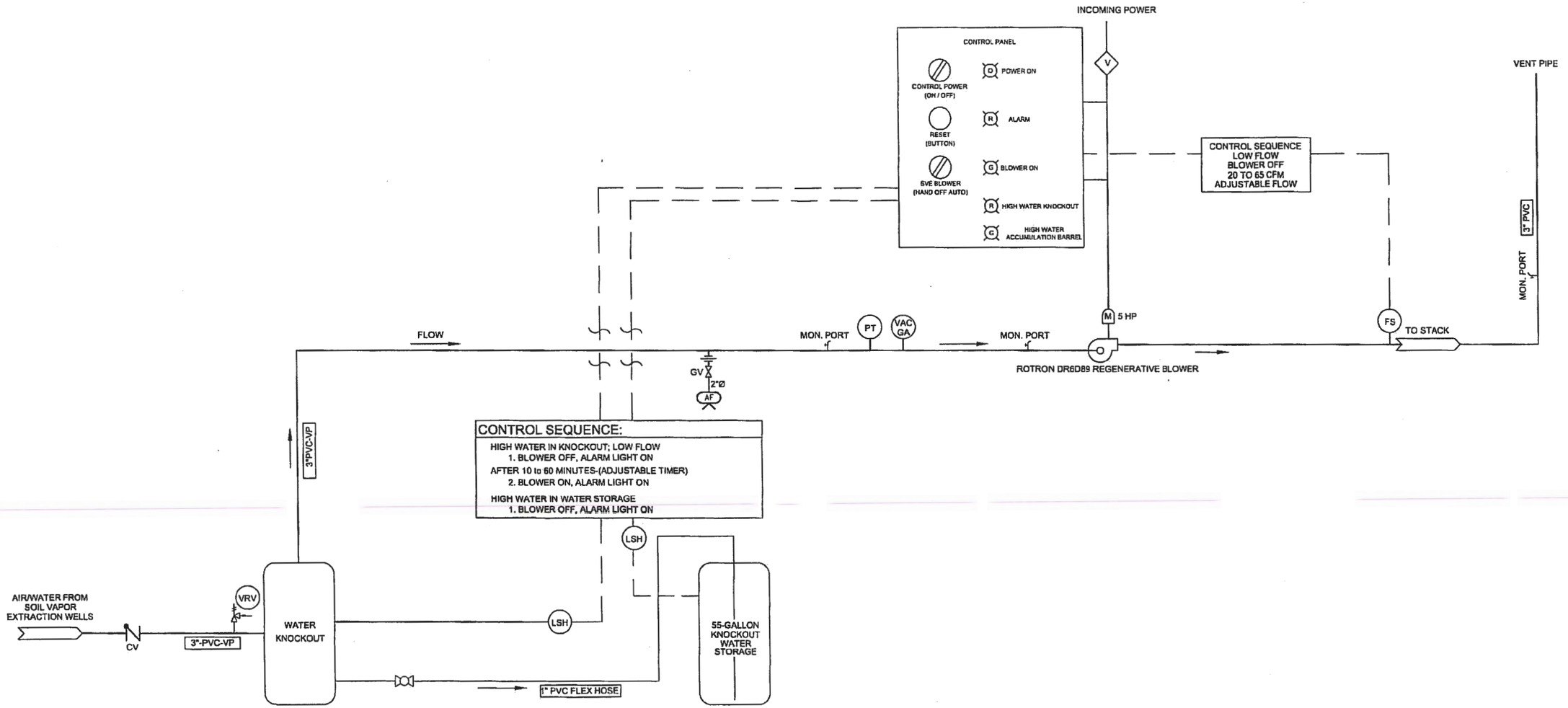
AIR SPARGE AND
SVE WELL DETAILS

SCALE	AS SHOWN
PROJECT NO.	188-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	8
OF	10



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	DATE	DESCRIPTION	BY	CKD.	APP.

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AOC 5 CLEANUP ACTION
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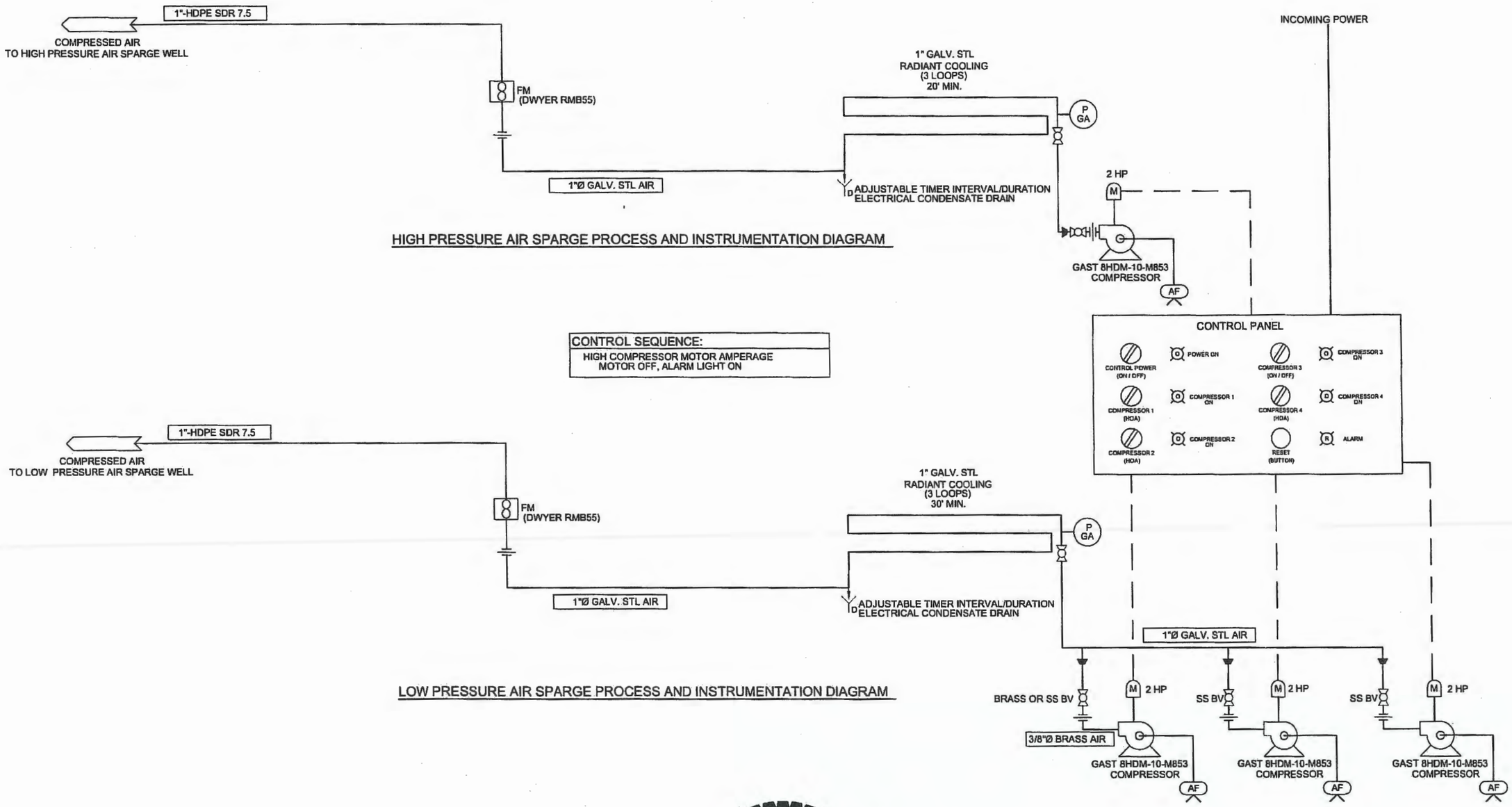
SVE
PROCESS AND
INSTRUMENTATION DIAGRAM

SCALE: AS SHOWN
PROJECT NO.: 188-001
FILE NAME: SYSTEM.dwg
SHEET NO.: 9 OF 10

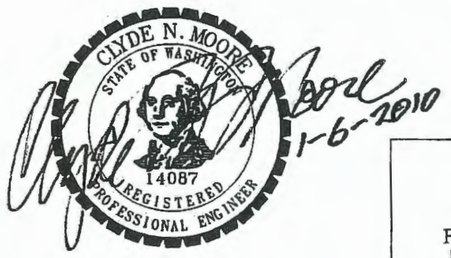


HIGH PRESSURE AIR SPARGE PROCESS AND INSTRUMENTATION DIAGRAM

CONTROL SEQUENCE:

HIGH COMPRESSOR MOTOR AMPERAGE
MOTOR OFF, ALARM LIGHT ON

LOW PRESSURE AIR SPARGE PROCESS AND INSTRUMENTATION DIAGRAM



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	DATE	DESCRIPTION	BY	CKD.	APP.

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AIR SPARGE PROCESS AND INSTRUMENTATION DIAGRAM

SCALE	AS SHOWN
PROJECT NO.	186-001
FILE NAME:	SYSTEM.dwg
SHEET NO.	10
OF	10

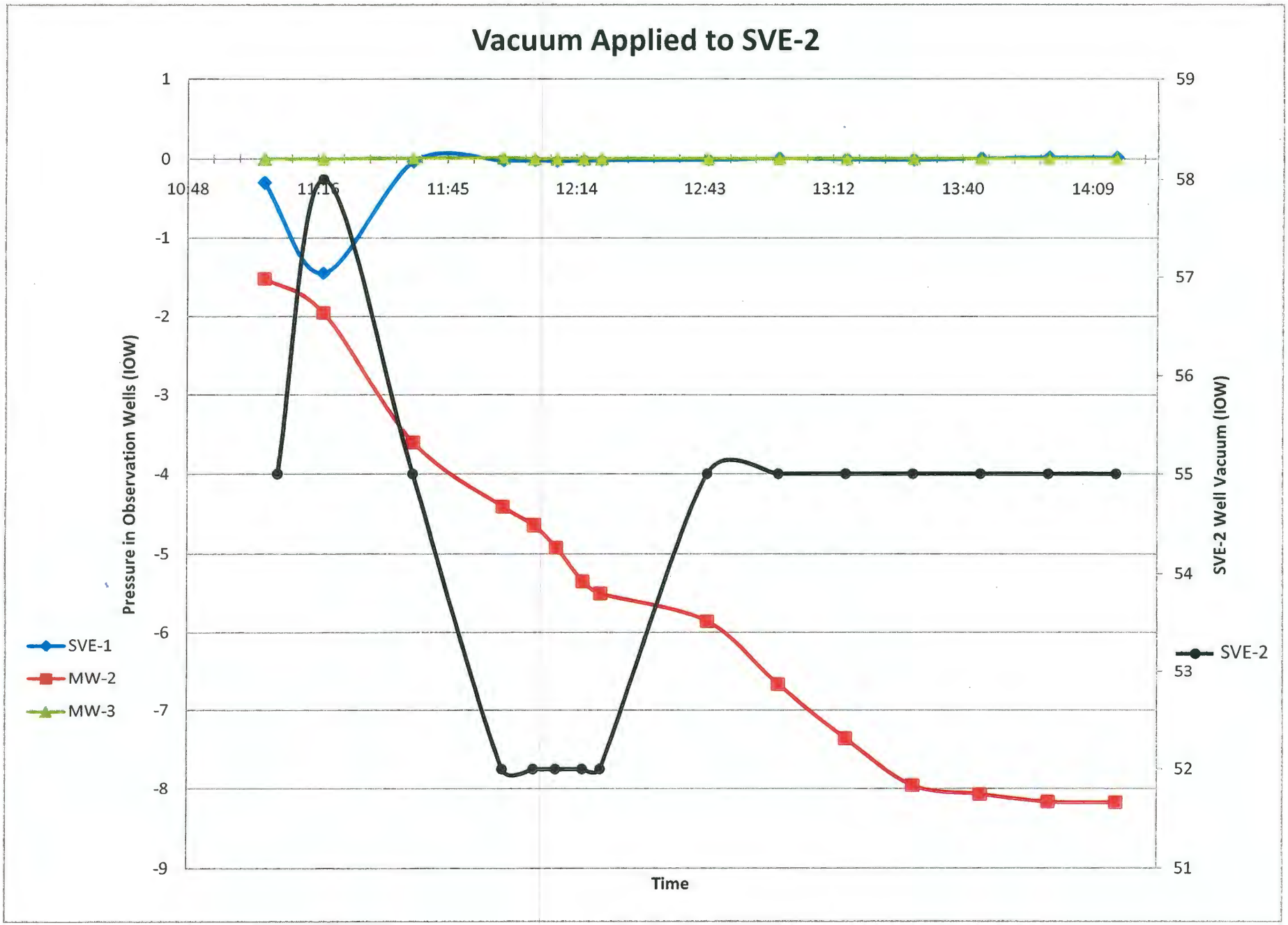
APPENDIX B
AS/SVE PILOT TEST RESULTS

ENGINEERING DESIGN REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

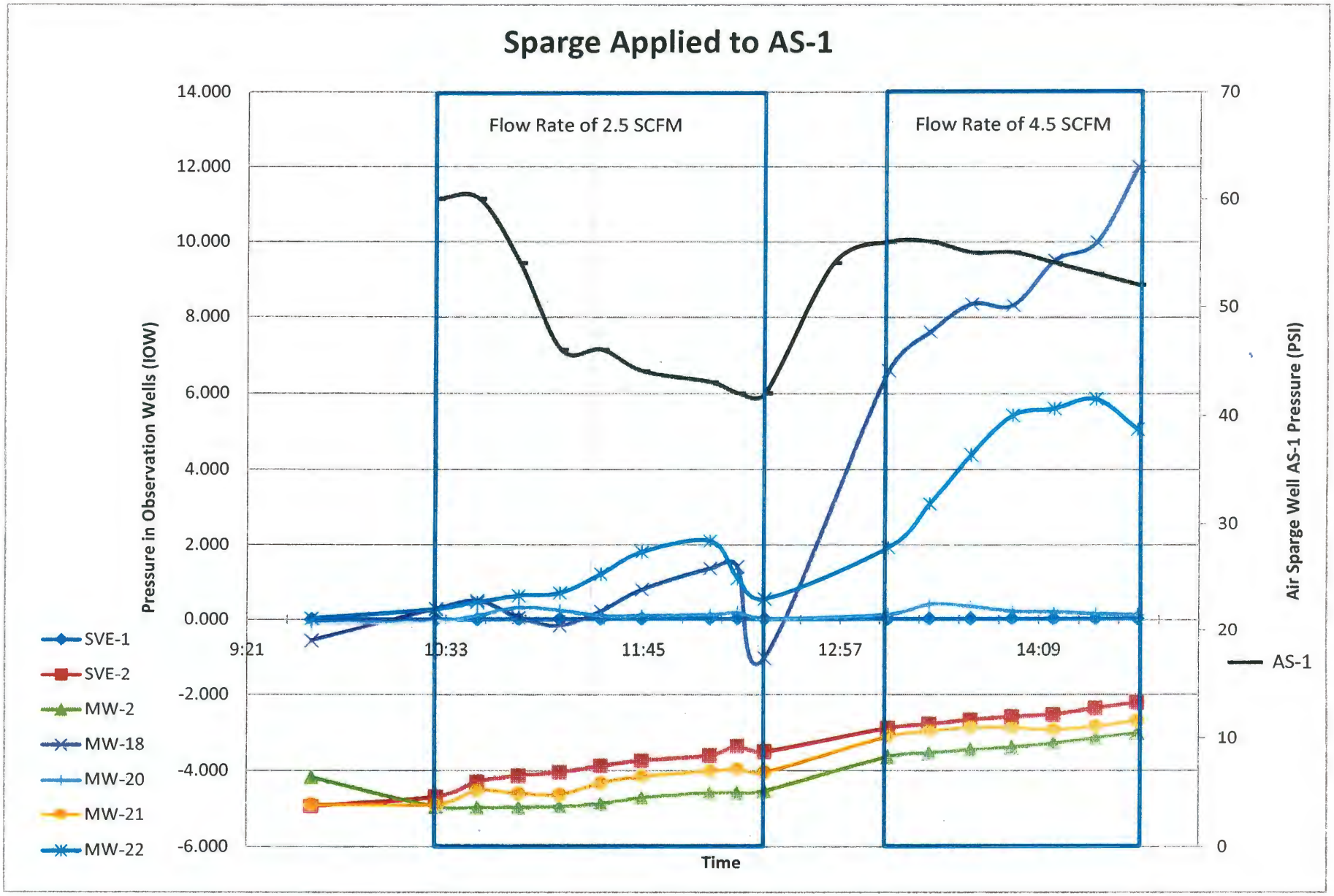
Farallon PN: 188-001

SOIL VAPOR EXTRACTION PILOT TEST DATA					DATE: 10/7/2009				
Farallon # 188-001			Project Name		Woodworth Lakeview Facility				
PERFORMED BY: Heidi Fischer and Jon Peterson									
TEST WELL NUMBER: SVE-1				Time of Day	Measured Vacuum in Nearby Wells (IOW)				
					MW-1	MW-2			
(Vacuum in nearby wells just prior to test)				1000	-1.306	-1.403			
(Distance from nearby wells to tested well)					56'	105'			
Test Well Vacuum (IOW)	Test Well dp (IOW)	Test Well Flow (SCFM)	Test Well PID Read.						
65	0.000	<1.9		1005	NM	NM			

SOIL VAPOR EXTRACTION PILOT TEST DATA					DATE: 10/7/2009				
Farallon # 188-001			Project Name		Woodworth Lakeview Facility				
PERFORMED BY: Heidi Fischer and Jon Peterson									
TEST WELL NUMBER: SVE-2				Time of Day	Measured Vacuum in Nearby Wells (IOW)				
					SVE-1	MW-2	MW-3		
(Vacuum in nearby wells just prior to test)				11:05	-0.291	-1.520	0.000		
(Distance from nearby wells to tested well)					56'	75	136		
Test Well Vacuum (IOW)	Test Well dp (IOW)	Test Well Flow (SCFM)	Test Well PID Read.						
55	0.25	29.6		11:08					
58	0.05	13.2		11:18	-1.451	-1.950	0.000		
55	0.03	10.3	0	11:38	-0.037	-3.600	0.010		
52	0.03	10.3		11:58	-0.024	-4.413	0.013		
52	0.03	10.3		12:05	-0.020	-4.645	0.000		
52	0.03	10.3		12:10	-0.030	-4.920	0.000		
52	0.03	10.3		12:16	-0.020	-5.348	0.000		
52	0.03	10.3		12:20	-0.020	-5.500	0.000		
55	0.03	10.3		12:44	-0.015	-5.860	0.000		
55	0.03	10.3		13:00	0.000	-6.670	0.000		
55	0.03	10.3		13:15	-0.010	-7.364	0.000		
55	0.03	10.3		13:30	-0.016	-7.955	0.000		
55	0.03	10.3		13:45	0.000	-8.071	0.000		
55	0.03	10.3		14:00	0.010	-8.168	0.000		
55	0.03	10.3	0	14:15	0.010	-8.177	0.000		


Vacuum Applied to SVE-2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
59
58
57
56
55
54
53
52
51
10:48
11:16
11:45
12:14
12:43
13:12
13:40
14:09
Pressure in Observation Wells (IOW)
SVE-2 Well Vacuum (IOW)
Time
SVE-1
MW-2
MW-3
SVE-2

SOIL VAPOR EXTRACTION PILOT TEST DATA				DATE: 10/7/2009					
Farallon # 188-001			Project Name	Woodworth Lakeview Facility					
PERFORMED BY: Heidi Fischer and Jon Peterson									
TEST WELL NUMBER: SVE-1				Time of Day	Measured Vacuum in Nearby Wells (IOW)				
(Vacuum in nearby wells just prior to test)				14:53					
(Distance from nearby wells to tested well)									
Test Well Vacuum (IOW)	Test Well dp (IOW)	Test Well Flow (SCFM)	Test Well PID Read.						
15	0.005	4.2		14:55					
20	0.005	4.2		14:56					
25	0.005	4.2		14:56					
30	0.005	4.2		14:56					
35	0.005	4.2		14:57					
40	0.007	5.0		14:57					
45	0.007	5.0		14:58					
50	0.005	4.2		14:58					
55	0.007	5.0		14:59					


Sparge Applied to AS-1
Flow Rate of 2.5 SCFM
Flow Rate of 4.5 SCFM
Pressure in Observation Wells (IOW)
Air Sparge Well AS-1 Pressure (PSI)
Time
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
-4.000
-6.000
70
60
50
40
30
20
10
0
9:21
10:33
11:45
12:57
14:09
SVE-1
SVE-2
MW-2
MW-18
MW-20
MW-21
MW-22
AS-1

IN-SITU AIR SPARGE PILOT TEST DATA			DATE: 10/8/2009							
Farallon # 188-001			Project Name Woodworth Lakeview Facility							
PERFORMED BY:			Heidi Fischer and Jon Peterson							
TEST WELL NUMBER: AS-1			Time of	Measured Pressure in Nearby Wells (IOW)						
			Day	SVE-1	SVE-2	MW-2	MW-18	MW-22	MW-21	MW-20
Depth to water in nearby wells prior to test				30.55	31.32	31.82	32.00	34.84	35.95	31.00
Pressure in nearby wells just prior to test			9:45	0.000	-4.930	-4.173	-0.570	0.030	-4.880	-0.115
Distance from nearby wells to tested well				45	31	70	105	159	101	139
Test Well Pressure (PSI)	Test Well Flow (SCFH)	Test Well Flow (SCFM)								
60	150	2.5	10:30	0.000	-4.674	-4.945	0.286	0.277	-4.892	-0.044
60	150	2.5	10:45	0.000	-4.288	-4.969	0.504	0.458	-4.522	0.102
54	150	2.5	11:00	0.004	-4.127	-4.963	0.043	0.642	-4.597	0.315
46	150	2.5	11:15	0.009	-4.039	-4.947	-0.171	0.715	-4.627	0.240
46	150	2.5	11:30	0.015	-3.874	-4.871	0.219	1.213	-4.329	0.101
44	150	2.5	11:45	0.019	-3.730	-4.713	0.800	1.800	-4.166	0.102
43	150	2.5	12:10	0.018	-3.600	-4.578	1.356	2.100	-4.024	0.128
42	150	2.5	12:20	0.018	-3.354	-4.573	1.405	1.100	-3.973	0.176
42	150	2.5	12:30	0.015	-3.501	-4.531	-1.025	0.550	-4.050	0.024
Water moving?				current	bubbles	can't tell	NM	NM	NM	NM
Depth to water (ft bgs)				29.60	30.65	31.60	31.06	34.72	35.80	30.68
Change in depth from beginning (ft)				0.95	0.67	0.22	0.94	0.12	0.15	0.32
54	275	4.6	12:55							
56	270	4.5	13:15	0.010	-2.872	-3.647	6.589	1.915	-3.116	0.134
56	270	4.5	13:30	0.011	-2.767	-3.544	7.610	3.078	-2.970	0.400
55	270	4.5	13:45	0.013	-2.654	-3.468	8.351	4.373	-2.865	0.341
55	270	4.5	14:00	0.010	-2.574	-3.395	8.314	5.419	-2.882	0.214
54	270	4.5	14:15	0.007	-2.520	-3.295	9.50	5.60	-2.926	0.202
53	275	4.6	14:30	0.010	-2.354	-3.155	10.00	5.85	-2.836	0.150
52	275	4.6	14:45	0.016	-2.215	-3.019	12.00	5.05	-2.695	0.118
Water moving?				bubbles	bubbles	can't tell	NM	NM	NM	NM
Depth to water (ft bgs)				28.96	30.36	31.20	28.73	33.55	34.57	29.80
Change in depth from beginning (ft)				1.59	0.96	0.62	3.27	1.29	1.38	1.20
38	150	2.5	15:20							

IN-SITU AIR SPARGE PILOT TEST DATA				DATE: 10/8/2009					
Farallon # 188-001			Project Name	Woodworth Lakeview Facility					
PERFORMED BY:		Heidi Fischer and Jon Peterson							
TEST WELL NUMBER:		MW-14C		Time of Day	Measured Pressure in Nearby Wells (IOW)				
Pressure in nearby wells just prior to test)									
(Distance from nearby wells to tested well)									
Test Well Pressure (PSI)	Test Well Flow (SCFH)	Test Well Flow (SCFM)							
18	150	2.5		1530					
18	150	2.5		1535					
22	350	5.8		1536	Bypass Valve completely closed (max flow)				
22	350	5.8		1541					

APPENDIX C
HEALTH AND SAFETY PLAN

ENGINEERING DESIGN REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

HEALTH AND SAFETY PLAN

WOODWORTH CAPITAL, INC.
FORMERLY KNOWN AS WOODWORTH & COMPANY, INC.
LAKEVIEW FACILITY
2800 104TH STREET SOUTH
TACOMA, WASHINGTON

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

Farallon PN: 188-001

For:
Mr. Cedric Brooks
Woodworth Capital, Inc.
Formerly known as Woodworth & Company, Inc.
1200 East D Street
Tacoma, Washington, 98421

January 20, 2010

HEALTH AND SAFETY PLAN
REVIEW AND APPROVAL

Client: Mr. Cedric Brooks
Facility Name: Woodworth Lakeview Facility
Project Name: Woodworth Capital Inc.
Project Number: 188-001
Start Date: 1/10/2010
End Date: To Be Determined

Plan Expiration Date: 7/10/2010 (*Last day of expected fieldwork or no longer than 6 months*).

APPROVED BY:

Branislav Jurista
Project Manager — Signature — Date: 1/11/2010

Richard McManus
Office Health and Safety Coordinator — Signature — Date: 1/14/2010

Heidi Fischer
Site Health and Safety Officer — Signature — Date: 1/14/2010

Peter Jewett
Principal-in-Charge — Signature — Date: 1/14/2010

This Health and Safety Plan (HASP) was written for the use of Farallon Consulting, L.L.C. (Farallon) and its employees. It may be used also by trained and experienced Farallon subcontractors as a guidance document. However, Farallon does not guarantee the health or safety of any person entering this Site.

Due to the potentially hazardous nature of the site and the activities occurring thereon, it is not possible to discover, evaluate, or provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but does not eliminate, the potential for injury. The health and safety guidelines in this HASP were prepared specifically for this site, its conditions, purposes, dates of field work, and personnel, and must be amended if conditions change.

Farallon claims no responsibility for the use of this HASP by others. This HASP will provide useful information to subcontractors and will assist them in developing their own HASP, but it should not be construed as a substitute for their own HASP. Subcontractors should sign this HASP (see *Health and Safety Plan Acknowledgment and Agreement Form*, Attachment 1) as an acknowledgement of hazard information and as notice that this HASP does not satisfy their requirement to develop their own HASP.

CONTENTS

ATTACHMENTS

1.0 SCOPE OF WORK

This HASP was prepared for the use of Farallon personnel while performing the following tasks.

- Soil Vapor Extraction and Air Sparge Well Installation;
- Soil Vapor Extraction and Air Sparge System Installation;
- Soil Excavation and Oxygen Release Compound Placement;
- Groundwater Monitoring; and
- Soil Vapor Extraction/Air Sparge System Operation and Maintenance.

2.0 BACKGROUND INFORMATION

Based on the information reviewed to date, past and current uses of the Site include:

- Surface mining of sand and gravel, which ceased in the 1980s due to depletion of sand and rock deposits. Since that time, the raw materials (i.e., crushed rock) used in the asphalt mix are brought to the Site from off-Site locations.
- Hot- and cold-mix asphalt production.
- Past landfilling of inert waste material such as waste concrete and asphalt, concrete roof tiles, refuse sand and slag from Atlas Foundry, and clean dirt and rock from various projects.
- Treatment of petroleum-contaminated soil. This business/operation was sold to TPST Soil Recyclers of Washington in 1994.
- Recycling of inert waste material such as concrete, masonry, asphalt, asphalt-based roofing shingles, and glass.
- Maintenance shop operations for the Woodworth Capital, Inc. truck fleet.

Investigations by others were conducted between 1983 and 2008. The results of the investigations conducted at the Property by others have detected concentrations of volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and metals in groundwater exceeding applicable Washington State Model Toxics Control Act Cleanup Regulation (MTCA) cleanup levels. Farallon conducted the Remedial Investigation/Feasibility Study (RI/FS) at the Property between August 2008 and August 2009, which included advancement of soil borings, installation of monitoring wells, and collection and laboratory analysis of soil, groundwater, and surface water samples. The results of the RI indicated that concentrations of TPH in soil and groundwater, and VOCs, arsenic and lead in groundwater at the Site exceed MTCA Method A cleanup levels in five Areas of Concern.

3.0 DRUG AND ALCOHOL POLICY

It is Farallon's policy to maintain a drug-free workplace. Farallon has a responsibility to all of its staff members to provide a safe and inoffensive work environment, and a responsibility to its clients to provide accurate and consistent service. For these reasons, Farallon prohibits the following behavior by staff members in the field:

- Use of tobacco in any form by any person at any time in sensitive or hazardous areas that may pose a health and safety or environmental risk. The Site Health and Safety Officer (SHSO) may designate an area away from hazards that is safe for tobacco use;
- Possession or consumption of alcohol, or being under the influence of alcohol during field activities;
- Abuse of prescription and/or over-the-counter drugs in such a manner as to negatively impact performance or field safety; and
- Possession, use, sale, or being under the influence of illicit drugs while in the field or during any work hours.

Violation of any of the above codes of conduct is grounds for immediate removal from the project site and discipline in accordance with Farallon company policy. If an incident occurs as a result of an employee's actions, drug and alcohol testing will be performed in accordance with Farallon company policy.

4.0 WEAPONS POLICY

Farallon employees, contractors, subcontractors, and their employees working at the site are to ensure that they do not bring weapons onto the work site. Weapons include but are not limited to guns, knives, and explosives. Tools that are used during the course of field events, including but not limited to box knives, are exempt from this weapons policy. All vehicles and persons can be subjected to search while working at the property.

Failure to comply with the weapons policy can result in disciplinary action for the individual(s) involved in accordance with Farallon company policy.

5.0 INCIDENT PREPAREDNESS AND RESPONSE

Farallon employees and subcontractors working on site must be prepared to appropriately respond to an incident involving injury, illness, death, spills, or utility breaches. This section outlines the degree of preparedness required for employees at a work site, and describes the actions to be taken in the event of a health and safety incident.

5.1 HEALTH AND SAFETY PREPAREDNESS

All individuals working at the site are required to be familiar with the contents of this HASP. Additionally, the items on the following health and safety preparedness list should be reviewed prior to the commencement of work and during daily health and safety meetings:

- The directions to the hospital (provided in Attachment 2);
- The locations of first aid kits, personal eye washes, and fire extinguishers;
- The locations of the keys to site vehicles; and
- Hand sign language providing for the immediate stoppage of work (such as a horizontal hand movement in front of the neck).

Additional topics for daily health and safety meetings are included in Attachment 3, Potential Topics for Daily Health and Safety Meeting. Participation in daily health and safety meetings should be documented in the Daily Health and Safety Briefing Log (Attachment 4).

5.2 INJURY OR ILLNESS

If an injury or illness occurs, the following actions should be taken, regardless of the severity of the injury or illness:

- Stop work.
- Determine whether emergency response staff (e.g., fire, ambulance) are necessary. If so, dial 911 on a cell phone or the closest available telephone. Describe the location of the injured person and provide other details as requested. If an individual requires non-emergency medical care at a hospital, follow the directions to the nearest hospital, which are provided in Attachment 2. IF EMERGENCY MEDICAL CARE IS NEEDED CALL 911.
- Administer first aid to the individual immediately, using the first aid kit provided in the site vehicle. Use the bloodborne pathogens kit and personal eyewash, as needed.
- Notify the SHSO immediately. The SHSO is responsible for preparing and submitting an Incident Report form to Farallon's Health and Safety Coordinator (HSC) within 24 hours of the incident, and for notifying the employee's supervisor and the Principal in Charge. The Incident Report form is provided in Attachment 5.

- ***All incidents must be reported to the HSC within 24 hours; however, the actual investigation need not be completed within 24 hours.*** **A telephone message that includes the date, time, and general incident circumstances should be left at one of the following numbers if the HSC cannot be reached directly:**
    - HSC work phone: (425) 295-0800
    - HSC cell phone: (425) 466-1032
    - If the HSC cannot be located contact the Principal-in-Charge.

- The SHSO will assume responsibility during a medical emergency until emergency response personnel arrive at the site.

5.3 REPORTING PROCEDURES FOR MINOR CUTS, SCRATCHES, BRUISES, ETC.

Every occupational illness or injury is to be reported immediately by the employee to the SHSO. The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC.

5.4 NEAR MISSES

A near miss is defined as an incident in which no personal injury is sustained and no property damage is incurred, but where injury and/or property damage could have occurred under slightly different timing or location.

In the event of a near miss, the following actions are to be taken:

- Stop work.
- Report the near miss to an SHSO immediately.
- The SHSO is to report the near miss to the HSC and complete the Near Miss Report form in Attachment 6.
- Resume work upon satisfactory resolution of the near-miss condition and documentation of the corrective action(s) taken by the SHSO.

5.5 MEDICAL INCIDENTS NOT REQUIRING AMBULANCE SERVICE

Medical incidents not requiring ambulance services include injuries and conditions such as minor lacerations, and sprains. In the event of an injury, an illness, or a condition that does not require ambulance service, the following actions are to be taken:

- Stop work.
- Administer first aid as necessary to stabilize the individual for transport to the hospital.
- The SHSO is to facilitate prompt transportation of the individual to the hospital. Directions to the nearest hospital are provided in Attachment 2.

- A representative of Farallon or the subcontractor is to drive the individual to the medical facility and remain at the facility until the individual is able to return to the jobsite, or arrangements for further care have been established.
- If the driver is not familiar with the route to the hospital, a second person who is familiar with the route is to accompany the driver and the injured employee to the hospital.
- If it is necessary for the SHSO to accompany the injured employee to a medical facility, provisions must be made for another employee who is trained and certified in first aid to act as the temporary SHSO before work at the jobsite can resume.
- If the injured employee is able to return to the jobsite the same day, he/she is to bring a statement from the doctor that provides the following information:
  - Date of incident
  - Employee's name
  - Diagnosis
  - Date he/she is able to return to work, and whether regular or light duty
  - Date he/she is to return to the doctor for a follow-up appointment, if necessary
  - Signature and address of doctor
- The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC.
- If the injured employee is unable to return to the jobsite the same day, the employee who transported him/her should bring the statement from the doctor back to the jobsite. The information on this statement should be reported to the HSC immediately.

5.6 EMERGENCY CASES REQUIRING AMBULANCE SERVICE

In the event of an injury or illness that requires emergency response and transport to a hospital by ambulance the following actions should be taken:

- **Dial 911** to request ambulance service.
- Notify the SHSO.
- Administer first aid until the ambulance service arrives.
- One designated company representative should accompany the injured employee to the medical facility and remain there until final diagnosis, treatment plan, and other relevant information has been obtained.
- The SHSO is to complete the Incident Report form provided in Attachment 5, and report the incident to the HSC immediately.

5.7 EMPLOYEE DEATH, OR HOSPITALIZATION OF THREE OR MORE EMPLOYEES

The procedures outlined in Section 6.2 should be followed in the event of an employee injury or illness. If an employee fatality occurs, the HSC, local emergency personnel and the coroner must be notified **immediately**. **The HSC will initiate the required State of Washington Deportment of Labor and Industries and Occupational Safety and Health Administration (OSHA) notifications within 8 hours of a fatality or the hospitalization of three or more employees.**

5.8 RESPONSE TO SPILLS OR UTILITY BREACHES

The location of underground utilities (e.g., product, sewer, telephone, fiber optic) and facilities (e.g., USTs, septic tanks, utility vaults) is to be noted prior to commencement of intrusive subsurface work activities. Use the public and private locate services as required and complete the Utility Clearance Log (Attachment 7). If a utility line or tank is breached or a spill or release occurs, the event is to be documented on the Incident Report form provided in Attachment 5 as soon as possible. The date, time, name of the person(s) involved, actions taken, and discussions with other affected parties are to be included. The SHSO, Project Manager (PM) and client are to be notified immediately. The PM is to notify the regulatory authority and/or utility company, as necessary.

In the event of a spill or release, the following actions should be taken:

1. Stay upwind of the spill or release.
2. Don appropriate personal protective equipment (PPE).
3. Turn off equipment and other sources of ignition.
4. Turn off pumps and shut valves to stop the flow or leak.
5. Plug the leak or collect drippings, when possible.
6. Use sorbent pads to collect the product and impede its flow, if possible.
7. Dial 911 or telephone the local fire department immediately if a fire or another emergency situation develops.
8. Inform the Farallon PM of the situation.
9. Determine whether the client would like Farallon to repair the damage or would rather use an emergency repair contractor.
10. Advise the client of spill discharge notification requirements, and establish who will complete and submit the required forms. ***Do not report or submit information to an agency without the client's consent.*** Document each interaction with the client and regulators, and note in writing names, titles, authorizations, refusals, decisions, and commitments to any action.

11. Do not transport or approve transportation of contaminated soils or product until proper manifests have been completed and approved. Be aware that soil and/or product may meet criteria for hazardous waste.
12. Do not sign manifests as a generator of wastes. Contact the PM to discuss waste transportation.

5.9 NOTIFICATIONS

A spill or release requires completion of an Incident Report form (provided in Attachment 5) per Farallon's Health and Safety program. **The PM must involve the client and/or generator in the incident reporting process. The client and/or generator is under obligation to report the incident to the appropriate government agency(ies). If the spill extends into waterways, the Coast Guard and the National Response Center must be notified immediately by the client or with his permission (800 424-8802).**

5.10 SHUTOFF VALVES AND/OR SWITCHES FOR UTILITIES AND PRODUCTS

Before starting work locate and list below the location of utility and product line shutoff valves and switches on the project site. Review the location of shutoff valves and switches with field personnel before beginning work.

The shutoff valves and/or switches for electrical, natural gas, gasoline, water lines, etc. are located:

To be filled in on-site.

6.0 EMERGENCY RESPONSE AND EVACUATION PLAN

Farallon personnel and subcontractors working on site are to be aware of site-specific emergency and evacuation procedures, including alarm systems and evacuation plans and routes. If an incident occurs that requires emergency response, such as a fire or spill, **CALL 911 and request assistance**. Farallon staff, subcontractors, and/or others working in an area where an emergency occurs are to evacuate to a safe location away from the incident area, preferably upwind, and take attendance.

For this project the emergency evacuation gathering location is to be determined once on the Site.

If the emergency causes the route to be obstructed, Farallon personnel and subcontractors are to move to an open area upwind of the hazard area, and remain there until instructed by emergency response personnel (e.g., police, fire, ambulance personnel, paramedics) to do otherwise.

Subcontractors have the responsibility to account for their own employees and provide requested information to emergency response personnel immediately upon request. Farallon staff, subcontractors, and/or contractors may not reenter the scene of the emergency without specific approval from emergency response personnel.

7.0 LOCAL EMERGENCY CONTACT NAMES AND TELEPHONE NUMBERS

Local emergency response personnel can be contacted at the following numbers. Directions and a map to the hospital are included in Attachment 2.

Emergency Contact	Name and Location	Telephone No.
Hospital	St. Clare Hospital 11315 Bridgeport Way Southwest Tacoma, Washington	(253) 588-1711
Police	Lakewood Police Department 5504 112th Street Southwest Lakewood, Washington	**911** or (253) 830-5000
Fire	Lakewood Fire Department District 2 10928 Pacific Highway Southwest Tacoma, Washington	**911** or (235) 582-4600
National Response Center		**1-800-424-8802**
Washington State Department of Ecology		**(360) 407-6300**
Poison Control		**1-800-424-5555**

8.0 PROJECT PERSONNEL AND RELEVANT INFORMATION

Questions about this project that are posed by neighbors, the press, or other interested parties should be directed to the Principal in Charge at Farallon: (425) 295-0800.

Woodworth Facility 188-001	General Project Responsibilities	Field Personnel Training Dates			Medical Surveillance Date
		40-Hour HAZWOPER	8-Hour Refresher	CPR/ First Aid	
Site Health and Safety Officer Branislav Jurista Office: (425) 295-0805	Implement this HASP. Has authority to stop work. Perform air quality tasks. Take charge of all incidents. Review subcontractor's HASP.	1996	3/15/2008	10/17/08	NA
Farallon Personnel Heidi Fischer Office: (425) 295-0800	Be familiar with HASP requirements and the Farallon Accident Prevention Program and Hazardous Waste Operations Program	7/20/2007	1/5/2009	10/17/08	11/12/2009
Principal-in-Charge Peter Jewett Office (425) 295-0800 Cell: (425) 765-9966	Provide immediate support upon notice of any incident.	NA	NA	NA	NA
Health and Safety Coordinator Richard McManus Office (425) 295-0800 Cell: (425) 466-1032	Provide support in implementing HASP. Provide immediate support upon notice of any incident.	NA	NA	NA	NA
Client Contact Mr. Cedric Brooks Office: (253) 383-3585	Provide known analytical data from work performed by others. Provide notice of site hazards. Provide access to site. Provide information regarding available emergency supplies at the site.	NA	NA	NA	NA

9.0 POTENTIAL AIRBORNE CONTAMINANTS

The potential airborne contaminants of concern in the immediate vicinity at the site are listed in the table on the following page. The table should be reviewed, and any questions directed to the SHSO.

POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION						
Chemical (or Class)	**OSHA PEL ACGIH TLV**	**Other Pertinent Limits**	**Properties**	**Routes of Exposure or Irritation**	**Acute Health Effects**	**Chronic Health Effects/ Target Organs**
1,1,1-Trichloroethane (methyl chloroform)	PEL - TWA 350 ppm TLV - 350 ppm STEL - 450 ppm	NIOSH Ceiling - 350 ppm	Colorless liquid with a mild, chloroform-like odor	Inhalation; skin absorption; ingestion; eye contact	Irritation to eyes, skin; headache; lassitude (weakness, exhaustion); central nervous system depressant; depression; poor equilibrium; dermatitis	Cardiac arrhythmias; liver damage. **Target Organs:** eyes, skin, CNS, cardiovascular system, liver
1,1,2-Trichloroethane	PEL TWA - 10 ppm ($45\ mg/m^3$) (skin) TLV - 10 ppm	NIOSH considers this compound to be a carcinogen REL TWA - 10 ppm ($45\ mg/m^3$) (skin)	Colorless liquid with a sweet, chloroform-like odor	Inhalation; skin absorption; ingestion; eye contact	Irritation to eyes, nose; central nervous system depressant; depression; dermatitis	Liver, kidney damage; potential occupational liver carcinogen. **Target Organs:** eyes, respiratory system, central nervous system, liver, kidneys
1,2-Dichloroethene (dichloroethylene)	PEL - TWA 200 ppm TLV - TWA 200 ppm	IDLH - 1000 ppm	Solvent odor	Inhalation; skin absorption; ingestion; eye contact	Typical solvent symptoms	Liver, kidney, and CNS symptoms
1,1-Dichloroethene (vinylidene chloride)	No PEL TLV – 5 ppm	NIOSH considers this compound to be a carcinogen	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor	Inhalation; skin absorption; ingestion; eye contact	Irritation to eyes, skin, throat; dizziness; headache; nausea; dyspnea (breathing difficulty)	Liver, kidney dysfunction; pneumonitis; potential occupational liver and kidney carcinogen. **Target Organs:** eyes, skin, respiratory system, CNS, liver, kidneys

POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION						
Chemical (or Class)	**OSHA PEL ACGIH TLV**	**Other Pertinent Limits**	**Properties**	**Routes of Exposure or Irritation**	**Acute Health Effects**	**Chronic Health Effects/ Target Organs**
Tetrachloroethene (Perchloroethylene)	PEL - 100 ppm TLV - 25 ppm	PEL Ceiling - 200 ppm TLV STEL – 100 ppm IDLH - 150 ppm NIOSH considers this compound to be a carcinogen	Colorless liquid with a mild, chloroform-like odor	Inhalation; skin absorption; ingestion; eye contact	Irritation to eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; vertigo (an illusion of movement); dizziness; lack of coordination; headache; skin erythema (redness)	Somnolence (sleepiness, unnatural drowsiness); liver damage; potential occupational liver carcinogen. **Target Organs:** Eyes, skin, respiratory system, liver, kidneys, CNS
Toluene	PEL - 200 ppm TLV - 50 ppm	NIOSH REL = 100 ppm TWA; 150 ppm STEL ILDH = 500 ppm	Sweet, pungent, benzene-like odor	Eye contact	Skin (dermatitis); eye, respiratory tract irritant; headache; dizziness; weakness; fatigue	CNS; liver; kidneys; skin
Acetone	PEL - 1000 ppm TLV - 500 ppm	NIOSH REL - 250 ppm TLV STEL - 750 ppm IDLH - 2500 ppm	Fragrant, mint-like odor	Inhalation, dermal, ingestion, eye contact	Irritation to eyes, nose, throat; headache; dizziness; dermatitis	CNS depressant; depression; liver, kidney damage
Benzene	PEL - 1 ppm TLV 0.5 ppm (skin)	PEL STEL - 5 ppm IDLH=500 ppm	Characteristic benzene odor	Inhalation; dermal; ingestion; eye contact	Skin (dermatitis); eye, respiratory tract irritant; headache; dizziness; nausea	Carcinogen; CNS; eye damage; bone marrow; blood; skin; leukemia
Naphthalene	PEL - 10 ppm TLV - 10 ppm	TLV-STEL= 15 ppm NIOSH REL=10 ppm REL-STEL=15 ppm IDLH - 250 ppm	Mothball-like odor	Inhalation; dermal; ingestion; eye contact	Skin, eye, mucous membrane irritant; nausea	Eyes; blood; skin; liver; kidneys; RBC; CNS
Xylenes	PEL - 100 ppm TLV - 100 ppm	TLV STEL - 500 ppm NIOSH REL - 100 ppm NIOSH REL STEL - 100 ppm IDLH - 900 ppm	Aromatic odor	Inhalation; dermal; ingestion; eye contact	Throat and skin irritant (dermatitis); headache; nausea; drowsiness; fatigue	CNS; liver; kidneys; skin; gastrointestinal damage; eye damage

POTENTIAL AIRBORNE CHEMICALS ON SITE FOR THIS PROJECT REVIEW THIS TABLE AND CONTACT THE SHSO WITH ANY QUESTION						
Chemical (or Class)	**OSHA PEL ACGIH TLV**	**Other Pertinent Limits**	**Properties**	**Routes of Exposure or Irritation**	**Acute Health Effects**	**Chronic Health Effects/ Target Organs**
Ethylbenzene	PEL - 100 ppm TLV - 100 ppm	PEL STEL - 125 ppm TLV STEL - 125 ppm NIOSH REL - 100 ppm REL STEL - 125 ppm IDLH - 800 ppm	Pungent, aromatic odor	Inhalation; dermal; ingestion; eye contact	Skin, eye, mucous membrane irritant; headache; dizziness; drowsiness	Eyes; respiratory tract; skin; CNS; blood; kidneys; liver
Lead	PEL - 0.05 mg/m^3 TLV - 0.05 mg/m^3	IDLH - 100 mg/m^3	A heavy, flexible, soft, gray solid	Inhalation; dermal; ingestion; eye contact	Lassitude (weakness, exhaustion); abdominal pain; gingival lead line; tremor; irritation to eyes; hypotension	Insomnia; facial pallor; anorexia; weight loss; malnutrition; constipation; colic; anemia; paralysis: wrist, ankles; encephalopathy; kidney disease; potential for damage to eyes, gastrointestinal tract, CNS, kidneys, blood, gingival tissue
Arsenic	PEL – 0.010 mg/m^3 TLV – 0.010 mg/m^3	IDLH – 5 mg/m^3	Metal, silver-gray or tin-white, brittle, odorless solid	Inhalation; dermal; eye contact; ingestion	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin	Liver; kidneys; skin; lungs; lymphatic sys
Trichloroethene (trichloroethylene)	PEL - 100 ppm TLV - 50 ppm	PEL Ceiling - 200 ppm NIOSH considers trichloroethylene to be a carcinogen	Colorless liquid (unless dyed blue) with a chloroform-like odor	Inhalation; dermal; ingestion; eye contact	Irritation to eyes, skin; headache; vertigo (an illusion of movement); visual disturbance; fatigue; giddiness; tremor; somnolence (sleepiness, unnatural drowsiness); nausea; vomiting; dermatitis	Cardiac arrhythmias; paresthesia; liver injury; potential occupational carcinogen of liver, kidney

10.0 POTENTIAL SITE HAZARDS AND APPROPRIATE PRECAUTIONS

The following tables list potential hazards and appropriate precautions associated with planned field work.

10.1 ENVIRONMENTAL DRILLING

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Clear drilling locations	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Traffic hazards Overhead or underground installations Product releases Property damage Occupant inconvenience	• Refer to Utility Clearance Log (**Attachment 7**). • Coordinate with Site Manger (or designee) to minimize potential conflicts. • Review proposed locations against available construction drawings and known utilities, tanks, product lines, etc. • Mark out the proposed borehole locations. • Call underground utility locating service for public line location clearance and obtain a list of utilities being contacted. If necessary, coordinate private line locator for private property. • Develop a traffic control plan with the client and local agencies, as applicable, which may include use of cones, barrier tape, jersey barriers, etc.
Mobilize with equipment/supplies suitable for drilling	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Vehicle accident Lifting hazards Delay or improper performance of work due to improper equipment on site	• Begin each work day with tailgate safety meeting. • Follow safe driving procedures. • Employ safe lifting procedures. • Verify that subcontractors are aware of their responsibilities for labor, equipment, and supplies. • Review permit conditions.
Visually clear proposed drilling locations	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Underground or overhead installations	• Complete Utilities and Structures checklist on the Utility Clearance Log (provided in **Attachment 7**) and adjust drilling locations as necessary.
Set up necessary traffic control	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Struck by vehicle during placement Vehicle accident resulting from improper placement of traffic control equipment	• Use buddy system for implementing traffic control plan, such as setting out cones and tape to define the safety area.

NOTES:
ACGIH = American Conference of Governmental Industrial Hygienists
AIHA = American Industrial Hygiene Association
AIHA WEEL = AIHA-set workplace environmental exposure limits
C = ceiling limit
CNS = central nervous system
CVS = cardiovascular system
IDLH = immediately dangerous to life or health
mg/m^3 = milligrams per cubic meter
NIOSH = National Institute for Occupation Safety and Health
OSHA = Occupation Safety and Health Administration
PEL = permissible exposure limit
ppm = parts per million
RBC = red blood cells
REL = recommended exposure limit set by National Institute for Occupational Safety and Health (NIOSH)
Skin = skin absorption
STEL = short-term exposure limit
TLV = threshold limit value set by ACGIH
TWA = time-weighted average

APPENDIX C
HEALTH AND SAFETY PLAN

ENGINEERING DESIGN REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Assist with set up of rig	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Vehicle accident during rig movement Damage caused by rig while accessing set-up location Contact with overhead installations Soft terrain Unexpected rig movement	• All staff should know the location of the kill switch for the drilling rig. • Verify a clear pathway to the drilling location, and clearance for raising mast. • Provide hand signals and guidance to the driver, as needed, to place rig. • Visually inspect rig (fire extinguisher on board, no oil or other fluid leaks, cabling and associated equipment in good condition, pressurized hoses secured with whip-checks or adequate substitute, jacks in good condition). • Use wooden blocks under jacks to spread load, if necessary. Chock wheels.
Set up exclusion zone(s) and work stations (drilling and logging and/or sample collection)	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, and work gloves.	Struck by vehicle during setup Slip or fall hazards	• Implement exclusion zone set-up. Set up work stations with clear walking paths to and from rig. Use safety tape and cone(s).
Clear upper 5 feet of drilling location using post-hole digger or hand auger	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Exposure to chemical hazards Hitting an underground utility Repetitive motion	• Keep full-face respirator with organic vapor cartridges readily accessible. • Initiate air quality monitoring in accordance with the air monitoring protocol presented in **Attachment 8**. • Stand upwind to avoid exposure whenever possible. • Use the organic vapor monitor aggressively to track the airborne concentration of contaminants close to potential sources, such as the core when it is being raised from the hole, the core is opened, etc. • Evaluate any soil samples inside a resealable plastic bag at arm's length. DO NOT EVALUATE THE SAMPLE IN THE OPEN, IN ORDER TO AVOID UNNECESSARY EXPOSURE. • Use correct lifting techniques and tools. • Complete the Pre-Drilling section of the Borehole Clearance Review form.

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Drilling	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Heat or cold Eye injury Noise Exposure to chemical hazards Breaching an underground utility Trip or fall Equipment failure	• Stand clear of operating equipment. • Use correct lifting techniques. Monitor air quality in accordance with the air monitoring protocol presented in **Attachment 8**. Monitor drilling progress. • Keep work area clear of tripping or slipping hazards. • Perform periodic visual inspections of drill rig.
Collect samples in accordance with sampling plan	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Heat or cold Eye injury Noise Exposure to chemical hazards Breaching an underground utility Trip or fall Equipment failure	• Stand clear of operating equipment. • Use correct lifting techniques. Monitor air quality in accordance with the air monitoring protocol presented in **Attachment 8**. Monitor drilling progress. • Keep work area clear of tripping or slipping hazards. • Perform periodic visual inspections of drill rig.

APPENDIX B
AS/SVE PILOT TEST RESULTS

ENGINEERING DESIGN REPORT
Woodworth Lakeview Facility
2800 104th Street South
Lakewood, Washington

Farallon PN: 188-001

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Manage cuttings	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Heat or cold Eye injury Noise Exposure to chemical hazards Breaching an underground utility Trip or fall Equipment failure	• Stand clear of operating equipment. • Use correct lifting techniques. Monitor air quality in accordance with the air monitoring protocol presented in **Attachment 8**. Monitor drilling progress. • Keep work area clear of tripping or slipping hazards. • Perform periodic visual inspections of drill rig.
Backfill borehole	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Trip hazards Eye injury from splashing or release of pressurized grout	• Mix grout to specification and completely fill the hole. • Use proper lifting techniques. • Keep work area clear of tripping hazards. • Verify presence of and/or authorization by required grouting inspectors.
Develop well	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Physical injury from mechanical failure, drill rig, or air compressor Trip hazards. Exposure to contaminants Electric shock	• Verify that equipment is in good working order and that pressurized hoses are whip-checked. • Keep full-face respirator with organic cartridges readily accessible. • Keep work area orderly. • Any generators must be equipped with GFCI circuit.
Gauge water levels and product thickness in wells, where applicable	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Inhalation or dermal exposure to chemical hazards Repetitive motion	• Have full-face respirator with organic cartridges readily accessible. • Conduct air quality monitoring in accordance with the protocol presented in **Attachment 8.** • Maintain a safe distance from the well head. • Bend at knees rather than at the waist.

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Purge well(s) and collect purge water	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Inhalation or dermal exposure to chemical hazards Slip or fall Contaminated water spill	• Use proper lifting techniques. • Use PPE, and adhere to air monitoring guidelines as presented in **Attachment 8**. • Keep work area clear of tripping or slipping hazards. • Store purge water in appropriate containers.
Collect groundwater samples in accordance with sampling plan	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Cross-contamination Back strain Inhalation or dermal exposure to chemical hazards Slip or fall Improper labeling or storage of samples Injury from broken sample bottle (cuts or acid burns)	• Decontaminate sampling equipment between each well (unless disposable). • Use proper lifting techniques. • Have full-face respirator with organic cartridges within 3-5 feet of working location, and readily accessible. • Label samples in accordance with sampling plan. • Keep samples stored in appropriate containers, at correct temperature, and away from work area. Handle bottles carefully.
Dispose of or store any purge water on site	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain Exposure to contaminants	• Use suitable equipment to transport water (e.g., pumps, drum dollies). • Have full-face respirator with organic cartridges within 3-5 feet of working location, and readily accessible. • Label storage containers properly, and locate in an isolated area away from traffic and other site functions. • Coordinate offsite disposal (where applicable).
Clean site; demobilize	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Traffic Lifting hazards	• Use buddy system to remove traffic control, as necessary. Leave site clear of refuse and debris. Clearly mark or barricade any borings that need topping off or curing at a later time. Notify site personnel of departure, final well locations, and any cuttings and/or purge water left onsite. Use proper lifting techniques.

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
Package and deliver samples to laboratory		Back strain Traffic accidents	• Handle and pack bottles carefully (e.g., bubble wrap bags). Use proper lifting techniques. • Apply safe driving practices.
Typical work	Steel-toed and -shank shoes, hard hat, safety glasses with side shields, hearing protection, reflective safety vest, leather gloves for non-chemical aspects of work Chemical-resistant gloves and apron if chemical exposure is suspected.	Weather-related incidents: automobile accidents, slips or falls	• Check weather reports daily. Project visits are not to be performed during inclement weather. Sampling may be performed during light rain mist. Wear raincoats. • Drive at speed limit or less, as needed, to keep a safe distance from vehicle in front. Avoid short stops.
Typical work		Cold Stress	• For temperatures below 40°F, adequate insulating clothing must be worn. If the temperature is below 20°F, workers will be allowed to enter a heated shelter at regular intervals. Warm, sweet drinks should be available. Coffee intake should be limited. • No one should begin work or return to work from a heated shelter with wet clothes. Workers should be aware of signs of cold stress, such as heavy shivering, pain in fingers or toes, drowsiness, or irritability. Onset of any of these signs is an indication that immediate return to a heated shelter is needed. • Refer to ACGIH TLV Booklet for section on Cold Stress.
Typical work		Heat Stress	• Discuss health effects and symptoms during daily health and safety meetings. • Drink water regularly(at least one cup every 20-30 minutes, depending upon level of effort and the PPE worn). • Refer to ACGIH TLV booklet for heat stress guidance, especially regarding PPE, type of work and frequency of breaks. • Breaks should be taken in an area cooler than the work area. • Monitor temperature and relative humidity using WBGT meter.

Job Steps	Personal Protective Equipment (PPE)	Potential Hazards	Critical Actions
No eating, drinking, or smoking on site No contact lenses to be worn on site No facial hair that would interfere with respirator fit			
A safety meeting is to be held every day, even if only one person is working on the project on a given day.			• Topics are to always include the work scheduled for the day and restatement of hazards and the means to avoid them. Other topics may include sampling in general, and advances in technology and how they may be applied to the project. Use the *Daily Health and Safety Briefing Log* in **Attachment 4** to log the topics discussed.

10.2 EXCAVATION ACTIVITIES

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Clear excavation locations.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic hazards, overhead and underground installations, product releases, property damage, dealer inconvenience.	• Refer to Utility Clearance Log. • Coordinate with facility contact (or designee) to minimize potential conflicts. • Review proposed locations against available construction drawings and known utilities, tanks, product lines, etc. • Mark out the proposed excavation locations. • Call the underground utility locating service for public line location clearance. Obtain a list of utilities being contacted. If necessary, coordinate private line locator for private property.
Set up necessary traffic control.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Being struck by vehicle during placement. Vehicle accident as a result of improper traffic control equipment placement.	• Use buddy system to place traffic control. • Implement traffic control plan as required.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Set up exclusion zone(s) and stockpile area and establish work areas/heavy equipment pathways.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Injury or exposure to public or other onsite personnel. Slip or fall hazards. Onsite vehicular accident with heavy equipment.	• Implement exclusion zone set-up instructions. • Establish clear walking paths between work stations.
Hand digging/post-holing where necessary to expose and protect underground installations as needed.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Damage to lines and associated physical hazards or property damage. Back strain. Injury or vehicle damage from falling into a hole.	• Use hand tools whenever possible. • Use proper lifting techniques. • Barricade or cover holes until job has been completed.
Assist with set up of heavy equipment.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Damage caused by heavy equipment while accessing set-up location. Being struck by equipment.	• Verify a clear pathway to excavation and stockpiling locations. • Provide hand signals and guidance to driver as needed to place rig. • Visually inspect equipment (fire extinguisher on board, no oil or other fluid leaks, cabling and associated equipment in good condition, pressurized hoses secured with whip-checks or adequate substitute, jacks in good condition). • Maintain eye contact with operator.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Commence excavation.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Heat or cold exposure. Exposure to chemical hazards. Hitting an underground or overhead utility. Flammable or oxygen-deficient atmosphere from accumulated vapors. Trip or fall. Side wall cave-in. Equipment failure. Noise.	• Monitor weather conditions and take breaks as needed for cold or hot weather. Conduct air monitoring as presented in Attachment 8. Include Lower Explosive Limit (LEL) and oxygen (O_2) monitoring. If >10% LEL or O_2 <19.5%, discontinue work or ventilate area with explosion-proof equipment. • Maintain required excavation set-backs for workers and equipment. Monitor condition of side walls and surrounding ground conditions. • Keep work area clear of tripping or slipping hazards. Perform periodic visual inspections of heavy equipment and keep equipment a minimum of 5 feet from excavation edge, or one foot away from the edge for every foot of depth, if greater than 5 feet deep. • Perform necessary soil classification. Slope or bench walls, or shore excavation to prevent cave-in. Keep all spoils > 2 feet from excavation edge. Keep excavation entry controlled and equipped with required ladders and crosswalks.
Collect samples in accordance with sampling plan.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Cave-in of side wall if entering excavation. Injury from heavy equipment. Exposure to site contaminants.	• Stay out of excavation whenever possible (collect samples from backhoe bucket). • Use agreed-upon hand signals with heavy equipment operators. • Monitor air around excavation in accordance with the protocol presented in Attachment 8.
Store excavated materials according to site-specific requirements.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Exposure to public. Traffic hazard, obstruction, or inconvenience to business operation. Improper storage or disposal.	• Have necessary storage containment and labeling available onsite. • Place materials in isolated location away from traffic and other site functions. • Stockpile excavated materials on suitable plastic or in appropriately designed container. Cover with plastic, and barricade access to waste in accordance with local regulations. • Coordinate proper disposal offsite, where applicable.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Backfill excavation.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Being struck by heavy equipment. Side wall collapse. Damage or accidents resulting from subsequent subsidence.	• Use agreed-upon hand signals with heavy equipment operators. • Compact soils to meet specifications. • Maintain eye contact with equipment operators.
Oxygen release compound (ORC) placement.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves, air filter mask.	Inhaling powder or getting powder in eyes.	• See manufacturer details on handling and MSDS
Clean site. Demobilize.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic. Safety hazard left on site. Lifting hazards.	• Use buddy system to remove traffic control, as necessary. • Leave site clear of refuse and debris. • Notify business personnel of departure. • Use proper lifting techniques or use mechanical assistance.
Package and deliver samples to laboratory.		Back strain. Traffic accidents	• Handle and pack bottles carefully (e.g., bubble wrap bags). • Use proper lifting techniques. • Apply safe driving practices
General			
Typical work.	Steel-toed and -shank shoes, hard hat, safety glasses with side shields, hearing protection, reflective safety vest, and leather gloves for non-chemical aspects of the work. If equipment contamination is suspected, wear chemical-resistant gloves during decontamination of equipment.	Weather-related incidents: automobile accidents, slips or falls.	• Check weather reports daily. Project visits are not to be performed during inclement weather. Sampling may be performed during light rain mist. Wear raincoats. • Drive at the speed limit or less as needed to keep safe distance from vehicle in front. Avoid short stops.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
No eating, drinking, or smoking on-site. No contact lenses to be worn on-site. No facial hair that would interfere with respirator fit.			
A safety meeting will be held each day, even if only one person is working on the project on any given day.			• Topics are always to include the work scheduled for that day, and restatement of hazards and the means to avoid them. Other topics may include sampling in general, and advances in technology and how they may be applied to the project. Use the *Daily Health and Safety Briefing Log* provided in Attachment 4 to log the topics discussed.

10.3 MONITORING WELL SAMPLING/GAUGING

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Mobilize with equipment/supplies suitable for sampling.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Vehicle accident. Lifting hazards. Delay or unsafe performance of work due to lack of necessary equipment on site. Cross-contamination of wells.	Follow safe driving procedures. Use proper lifting techniques. Review work plan to determine equipment/supply needs. Verity that all sampling/gauging equipment has been decontaminated. Bring ice for sample storage. Review the HASP. Gather the necessary PPE.
Set up necessary traffic control.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Struck by vehicle during placement. Vehicle accident as a result of improper traffic-control equipment placement.	Use buddy system for placing traffic control. Refer to the traffic control plan section of the HASP (which may include specific requirements based on encroachment permit).

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Set up exclusion zone(s).	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Struck by vehicle. Slip or fall hazards to workers.	Face incoming traffic. Implement exclusion zone setup instructions of the HASP (e.g., barricades, caution tape, cones). Set up work area free of trip hazards.
Gauge water levels and product thickness (where applicable) in wells.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain. Inhalation of, or dermal exposure to, chemical hazards. Repetitive motion.	Wear required PPE. Initiate air quality monitoring in accordance with the HASP. Maintain a safe distance from wellhead. Bend at knees rather than at waist.
Purge well(s) and collect purge water.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Cross-contamination. Back strain. Inhalation of, or dermal exposure to, chemical hazards. Slip or fall. Contaminated water spill.	Decontaminate purging equipment between each sampling location. Use proper lifting techniques. Use PPE and conduct monitoring in accordance with the HASP. Keep work area clear of tripping or slipping hazards. Store purge water in appropriate containers.
Collect samples in accordance with sampling plan.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Cross-contamination. Back strain. Inhalation of, or dermal exposure to, chemical hazards. Slip or fall. Improper labeling or storage. Injury from broken sample bottle (e.g., cut, or acid burn).	Decontaminate sampling equipment between each well (unless disposable equipment). Use proper lifting techniques. Use PPE in accordance with the HASP. Label samples in accordance with sampling plan. Keep samples stored in suitable containers, at correct temperature, and away from work area. Handle bottles carefully.
Dispose of or store purge water on site.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves. Respirator with organic vapor cartridges, chemical-resistant gloves, chemical-resistant apron as required.	Back strain. Exposure to contaminants. Damage or injury from improper use of on-site treatment system equipment. Improper storage or disposal.	Use suitable equipment to transport water (e.g., pumps, drum dollies). Wear PPE in accordance with the HASP. Review any necessary instructions for use of on-site treatment systems. Label storage containers properly and locate in an isolated area away from traffic and other site functions. Coordinate off-site disposal, where applicable.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Clean site/demobilize	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic. Safety hazard left on site. Lifting hazard.	Use buddy system to remove traffic control, as necessary. Leave site clear of refuse and debris. Notify business personnel of departure, and of any purge water left on site. Use proper lifting techniques.
Package and deliver samples to laboratory.		Bottle breakage. Back strain.	Handle and pack bottles carefully (e.g., bubble wrap bags). Use proper lifting techniques.

10.4 GROUNDWATER EXTRACTION AND/OR SOIL VAPOR EXTRACTION SYSTEM INSTALLATION

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Mark out the proposed trenching and aboveground structure locations. Call utility service clearance. Coordinate private line locator for private property.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic hazards. Overhead and underground lines and installations. Electrocution. Explosion. Product release. Property damage. Interruption of utility services.	Review proposed location map before arriving on site. Refer to Borehole Clearance Review form and coordinate with Site Manager (or designee) to minimize potential conflicts. Contact utility service at least two full working days before drilling and/or digging. Identify utilities to be contacted. Review proposed locations against available construction drawings and known utilities, tanks, product lines, etc. Perform preliminary site visit, where possible.
Cut pavement.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic hazard. Contact with utilities. Eye injury from flying debris. Back strain when moving equipment. Noise. Underground lines.	Identify and barricade work area. Avoid underground installations. Wear eye and hearing protection. Use proper lifting techniques and assistance when moving equipment (lift gate on truck may be necessary). Watch traffic.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Excavate trench and equipment pad footprint, as necessary.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Injury or accident from heavy equipment. Injury from damaging underground lines. Back strain. Collapse of trench onto workers. Vehicle or foot traffic hazards. Falling into open trench. Tripping hazards. Being struck by equipment. Noise. Potential chemical hazards.	Maintain a line of sight with vehicle operator. Use agreed-upon hand signals and work paths with operators. Hand excavate and protect underground lines that are in immediate path of trench. Use proper lifting techniques, and back support when hand digging. Use shoring/benching/sloping of trench walls if workers will have head and shoulders below top of trench (always for >5 ft deep, but may be required for <5 feet also). Maintain adequate access/egress locations for workers in trench. Keep trench covered in non-active work areas and between work shifts. Heed vehicle backup alarm and establish eye contact with operator. Keep work area tidy.
Install GWE and/or SVE hose and piping.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Collapse of trench onto workers. Vehicle or foot traffic hazards. Falling into open trench. Tripping hazards. Lifting hazards. Power tool hazards.	Use shoring/benching/sloping of trench walls if workers will have head and shoulders below top of trench (always for >5 feet deep, but may be required for <5 feet also). Maintain adequate access/egress locations for workers in trench. Keep trench covered in non-active work areas and between work shifts. Use proper lifting techniques. Keep work area tidy. Watch for traffic.
Pressure test piping (primary and secondary conduit, as required).	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Eye injury. Flying and loose debris. Noise.	Don't over pressurize piping (usually <10 psi). Verify security of end caps. Watch for traffic.
Install electrical line and conduit to well heads.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Collapse of trench onto workers. Vehicle or foot traffic. Falling into open trench. Trip hazards. Lifting hazards. Power tool hazards.	Use shoring/benching/sloping of trench walls if workers will have head and shoulders below top of trench (always for >5 feet deep, but may be required for <5 feet also). Maintain adequate access/egress locations for workers in trench. Keep trench covered in non-active work areas and between work shifts. Use proper lifting techniques. Keep work area tidy. Watch for traffic.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Backfill and pave trench.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Injury from heavy equipment. Leg or foot injury from compaction equipment. Accident or damage resulting from future subsidence. Traffic hazards. Noise.	Maintain a line of sight with equipment operators. Use agreed-upon hand signals. Wear suitable PPE during compaction. Perform compaction of backfill according to specifications. Watch for traffic.
Construct treatment equipment pad.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Damage from heavy equipment. Trip hazards. Body position/lifting hazards. Traffic hazards. Noise.	Use agreed-upon hand signals with truck operator. Keep work area free of debris. Keep supplies orderly. Watch for traffic.
Place and attach major equipment components.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Injury from transport equipment. Back strain when moving equipment. Injury from power tool use. Traffic.	Keep clear of equipment when large components are being set in place. Use mechanical assistance as needed to position equipment. Wear suitable PPE when bolting equipment to pad. Watch for traffic.
Connect GWE and/or SVE hose and piping and associated valves, sampling ports, and gauges.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Eye or other injury from hand tool use. Body position/lifting hazards. Injury from power tool use. Traffic.	Wear standard PPE. Use proper lifting techniques. Watch for traffic.
Install electrical control panel, equipment wiring and conduit, and system controls.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Electrical shock/electrocution. Fire from faulty wiring. Back strain when lifting panel into place. Injury from power tool use. Traffic.	Use lock-out/tag-out procedures to isolate main power supply. Do not perform electrical work in rain. Keep work surfaces dry, especially in standing locations. Use proper lifting techniques. Wear standard PPE. Watch for traffic.
Install fencing or other system enclosure.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Back strain. Injury from power tool use. Tripping hazards. Traffic.	Use proper lifting techniques. Obtain assistance, as needed. Wear standard PPE. Keep fencing and other materials neatly stacked until ready for installation. Watch for traffic.

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Place required labeling and signage.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Emergencies from fire, or from rupture of piping or other containment structures. Traffic.	Indicate emergency contact and telephone Number. Clearly label emergency shut-off switch(es). Properly label any hazardous materials (e.g., H_2O_2, petroleum-collection containers). Watch for traffic.
Clean site. Demobilize. Secure system.	Reflective vest, steel-toed and -shank shoes, hard hat, safety glasses with side shields, ear plugs or ear muffs, work gloves.	Traffic hazards. Nuisance or safety hazard left on site. Lifting hazards.	Use proper lifting techniques. Watch for traffic. Leave site clean of refuse and debris. Notify business personnel of departure.

10.5 AS/SVE SYSTEM OPERATION AND MAINTENANCE

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
Mobilize with proper equipment/supplies for O&M.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Vehicle accident. Lifting hazards. Delay or improper performance of work due to improper equipment on site.	Follow safe driving procedures. Employ safe lifting procedures. Make sure subcontractors are aware of their responsibilities for labor, equipment, and supplies. Review HASP and permit conditions and gather necessary PPE.
Set up necessary traffic control.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Struck by vehicle during placement. Vehicle accident as a result of improper traffic control equipment placement.	Use buddy system for placing traffic control, if necessary. Reference traffic control plan section of HASP (may include specific requirements based on permits).
Unload and set up test equipment.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Struck by vehicle. Trip hazards. Accident when maneuvering equipment. Lifting hazard. Electrical hazard. Adverse impacts to station sales.	Place equipment away from pump islands or other high traffic areas. Store hoses and electrical cords neatly and protect with traffic control equipment (e.g., cones, barricades). Provide hand signals and guidance to driver, as needed, when placing testing equipment trailers or other large equipment. Visually inspect

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
			equipment (e.g., fire extinguisher on board/available on site, no damaged hoses or electrical lines, pressurized hoses secured with whip-checks or adequate substitute, all vapor and/or water hoses firmly connected, equipment grounded). Use proper lifting techniques. Use GFIC on generators or other electrical equipment; inspect cords.
Set up exclusion zone(s) and work station.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Struck by vehicle during setup. Slip/fall hazards.	Implement exclusion zone setup instructions of HASP. Set up work station with clear walking paths to all testing locations. Face oncoming traffic.
Gauge water levels and product thickness (where applicable).	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Back strain, inhalation, or dermal exposure to chemical hazards. Repetitive motion. Eye injury from back pressure in wells. Traffic hazards.	Wear any additional PPE and initiate air quality monitoring in accordance with HASP. Maintain safe distance from wellheads. Bend at knees, rather than waist. Decontaminate equipment between measurements. Face oncoming traffic.
Commence performing O&M.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Explosion or fire. Trip hazards. Unauthorized release of contaminants. Eye injury from pressurized air or shrapnel from burst piping. Burn from heated piping or motors. Clothing caught on turning vanes on compressor and shaft. Exposure to contaminants (e.g., inhalation, dermal contact). Noise. Electrical hazards.	Follow equipment-specific operation instructions. Ensure that connections with barbed fittings on pressure gauges are secure. Be conscious of amount of torque placed on PVC connections to avoid breaking. Monitor pressure conditions; do not exceed pressure ratings for any component involved. Watch proximity to heated piping and contact with mufflers, motors, manifolds. Monitor influent vapor and oxygen concentrations, if applicable. Keep work area tidy and free of loose equipment. Monitor treatment system and collect data to ensure discharge is within permit parameters and capacity of any storage containers (e.g., concentrations, flow rates). Wear PPE in accordance with HASP (including ear protection, as necessary). Ensure lockout/tagout of all electrical equipment that may be handled. Use GIFC; inspect cords.
Shut down system (if necessary).	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing	Unauthorized release of contaminants from back	

Job Steps	Personal Protective Equipment	Potential Hazard	Critical Actions
	protection, gloves.	pressure. Eye injury from pressurized air or shrapnel from burst piping. Burn from heated piping or motors. Exposure to contaminants (e.g., inhalation, dermal contact).	
Collect samples in accordance with sampling plan.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Cross-contamination, improper sample labeling or storage, exposure to site contaminants. Repetitive motion. Cuts from colorimetric tubes. Body position.	Label samples in accordance with sampling plan. Keep samples stored in proper containers, at correct temperature, and away from work area. Perform air monitoring and wear proper PPE.
Store waste (e.g., water, carbon canisters) in accordance with site-specific requirements.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves	Back strain. Traffic hazard. Improper storage or disposal. If disposing through on-site treatment system, damage or injury from improper use of equipment.	Use proper equipment to transport waste containers (e.g., pumps, drum dollies). Have proper storage containment and labeling available on site. Place materials in isolated location away from traffic and other site functions. Label waste. Coordinate proper disposal off site (where applicable). Review instructions for use of on-site treatment systems.
Clean site/demobilize.	Safety glasses or goggles, hard hat, steel-toed and -shank boots, hearing protection, gloves.	Traffic hazard. Lifting hazards. Safety hazard left on site.	Use buddy system, as necessary, to remove traffic control. Use proper lifting techniques. Leave site clean of refuse and debris. Notify station personnel of departure and location of any stored waste.

11.0 WASTE CHARACTERISTICS

Waste anticipated to be generated on the project site:

Type(s): ☒ Liquid ☒ Solid ☐ Sludge ☐ Other (fill-in) _____

The approximate volume for each anticipated waste stream:

Waste: Solid Waste Cuttings Approximate Volume: Twenty 55-gallon drums

Waste: Water Produced from Sampling Approximate Volume: Ten 55-gallon drums

Waste: Excavated Contaminated Soil Approximate Volume: 12,500 cubic yards

Characteristics:

☐ Corrosive ☐ Flammable/Ignitable ☐ Radioactive ☐ Toxic

☐ Reactive ☐ Unknown ☐ Other *(specify)* (fill-in) _____

12.0 TRAFFIC CONTROL

Work on this project site will be performed in areas of uncontrolled traffic access. Traffic control/warning devices will be placed around the work area to prevent undesirable interface between pedestrian and automotive traffic and project workers and equipment. These devices may include:

- Cones
- Cautionary lights for vehicles
- Tubular markers
- Barricades
- Temporary fencing
- Barricade tape

The traffic control/warning devices will be placed around the work in such a way that traffic access is inhibited (i.e. cones placed less than 8 feet apart so cars cannot easily drive through work area without moving a cone). Barricade tape or temporary fencing will be used to inhibit access to the work area in locations where pedestrians will be encountered.

ATTACHMENT 1
HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT AND AGREEMENT FORM

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT AND AGREEMENT FORM

(All Farallon and subcontractor personnel must sign)

This Health and Safety Plan (HASP) has been developed for the purpose of informing Farallon employees of the hazards they are likely to encounter on the project site, and the precautions they should take to avoid those hazards. Subcontractors and other parties at the site must develop their own HASP to address the hazards faced by their own employees. Farallon will make a copy of this HASP available to subcontractors and other interested parties to fully disclose hazards we may be aware of, and to satisfy Farallon's responsibilities under the Occupational Safety and Health Administration (OSHA) Hazard Communication standard. Similarly, subcontractors and others on site are required to inform Farallon of any hazards they are aware of or that their work on site might possibly pose to Farallon employees, including but not limited to Material Safety Data Sheets for chemicals brought on site. This plan should NOT be understood by contractors to provide information pertaining to all of the hazards that a contractor's employees may be exposed to as a result of their work.

All parties conducting site activities are required to coordinate their activities and practices with the project Site Health and Safety Officer (SHSO). Your signature below affirms that you have read and understand the hazards discussed in this HASP, and that you understand that subcontractors and other parties working on site must develop their own HASP for their employees. Your signature also affirms that you understand that you could be prohibited by the SHSO or other Farallon personnel from working on this project for not complying with any aspect of this HASP.

Name	Title	Signature	Company	Date

ATTACHMENT 2
DIRECTIONS TO HOSPITAL

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

Google maps

Directions to 11315 Bridgeport Way SW, Tacoma, WA 98499
3.6 mi – about **6 mins**

2800 104th St Ct S, Lakewood, WA 98499

1.	Head **east** on **104th St Ct S** toward **24th Ave S** About 1 min	go 0.3 mi total 0.3 mi
2.	Turn **right** at **Steele St S**	go 0.1 mi total 0.4 mi
3.	Turn **left** to merge onto **WA-512 W** toward **Olympia/Tacoma** About 1 min	go 0.8 mi total 1.2 mi
4.	Take the exit onto **I-5 S** toward **Portland** About 1 min	go 1.5 mi total 2.8 mi
5.	Take exit **125** for **Bridgeport Way** toward **McChord A.F.B.**	go 0.2 mi total 3.0 mi
6.	Turn **right** at **Bridgeport Way SW** About 2 mins	go 0.5 mi total 3.5 mi
7.	Take the 3rd **right** onto **112th St SW** Destination will be on the right	go 0.1 mi total 3.6 mi

11315 Bridgeport Way SW, Tacoma, WA 98499

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

ATTACHMENT 3
POTENTIAL TOPICS FOR DAILY HEALTH AND SAFETY MEETING

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

POTENTIAL TOPICS FOR DAILY HEALTH AND SAFETY MEETING

- ☐ Emergency response plan, emergency vehicle (full of fuel) and muster point
- ☐ Route to medical aid (hospital or other facility)
- ☐ Work hours. Is night work planned?
- ☐ Hand signals around heavy equipment
- ☐ Traffic control
- ☐ Pertinent legislation and regulations
- ☐ Above- and below-ground utilities (energized or de-energized)
- ☐ Material Safety Data Sheets
- ☐ Reporting an incident: to whom, what, why, and when to report
- ☐ Fire extinguisher and first aid kit locations
- ☐ Excavations, trenching, sloping, and shoring
- ☐ Personal protective equipment and training
- ☐ Safety equipment and training
- ☐ Emergency telephone location(s) and telephone numbers (in addition to 911)
- ☐ Eye wash stations and washroom locations
- ☐ Energy lock-out/tag-out procedures. Location of "kill switches," etc.
- ☐ Weather restrictions
- ☐ Site security. Site hazards. Is special waste present?
- ☐ Traffic and people movement
- ☐ Working around machinery (both static and mobile)
- ☐ Sources of ignition, static electricity, etc.
- ☐ Stings, bites, large animals, and other nature-related injuries and conditions
- ☐ Working above grade
- ☐ Working at isolated sites
- ☐ Decontamination procedures (for both personnel and equipment)
- ☐ How to prevent falls, trips, sprains, and lifting injuries
- ☐ Right to refuse unsafe work
- ☐ Adjacent property issues (e.g., residence, business, school, daycare center)

ATTACHMENT 4
DAILY HEALTH AND SAFETY BRIEFING LOG

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

DAILY HEALTH AND SAFETY BRIEFING LOG

Date	
Start Time	
Issues Discussed	
1.	
2.	
3.	
4.	
5.	
Attendees	
Print Name	**Signature**
Meeting Conducted by	
Name (Site Health and Safety Coordinator)	**Signature**

ATTACHMENT 5
INCIDENT REPORT FORM

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

INCIDENT REPORT

NEAR MISS, ACCIDENTAL INJURY, OCCUPATIONAL ILLNESS, OR WORK PLACE INCIDENT

INCIDENT TYPE (TO BE COMPLETED BY HEALTH AND SAFETY COORDINATOR)			INCIDENT DATE
☐ FATALITY	☐ INDUSTRIAL NON-RECORDABLE	☐ SPILL/LEAK	☐ GENERAL LIABILITY
☐ LOST WORKDAY (LW)	☐ NON-INDUSTRIAL	☐ PRODUCT INTEGRITY	☐ CRIMINAL ACTIVITY
☐ LW RESTRICTED DUTY	☐ OFF-THE-JOB INJURY	☐ EQUIPMENT	☐ NOTICE OF VIOLATION
☐ OSHA MEDICAL OR ILLNESS WITHOUT LW	☐ MOTOR VEHICLE ACCIDENT	☐ BUSINESS INTERRUPTION	☐ NEAR MISS
☐ FIRST AID	☐ FIRE		

This report must be completed by the employee or Health and Safety Coordinator immediately upon learning of the incident. The completed report must be reviewed and signed by a Farallon Principal within 24 hours of the incident, even if employee is not available to review and sign. Employee or employee's doctor must submit a copy of the doctor's report, and any subsequent exams, to Richard McManus at Farallon within 24 hours of the initial exam. After hours or weekends, telephone Mr. McManus via cell phone: (425) 466-1032.

EMPLOYEE INFORMATION

LAST NAME	FIRST NAME AND MIDDLE INITIAL	TITLE	DATE OF BIRTH

EMPLOYMENT STATUS ☐ FULL-TIME ☐ PART-TIME ☐ HOURLY-AS-NEEDED	LENGTH OF EMPLOYMENT
DATE OF INJURY OR ONSET OF ILLNESS (MM/DD/YYYY)	TIME OF EVENT OR EXPOSURE ☐ AM ☐ PM

INJURY OR ILLNESS INFORMATION

EXACT LOCATION OF INCIDENT (GEOGRAPHICAL LOCATION, FLOOR, BUILDING, ETC.)	
COUNTY	ON EMPLOYER'S PREMISES? ☐ YES ☐ NO

COMPLETE DESCRIPTION OF INCIDENT; INCLUDE SPECIFIC ACTIVITY AT TIME OF INCIDENT (e.g., Lifting, Pushing, Walking)

DESCRIBE THE EQUIPMENT, MATERIALS, OR CHEMICALS THAT DIRECTLY HARMED THE EMPLOYEE (e.g., the machine that the employee struck or that struck the employee; the vapor inhaled; the material swallowed; what the employee was lifting or pulling)

DESCRIBE THE SPECIFIC INJURY OR ILLNESS (e.g., cut, strain, fracture, skin rash)

BODY PART(S) AFFECTED (e.g., back, left wrist, right eye)

DATE EMPLOYER NOTIFIED	TO WHOM REPORTED

MEDICAL PROVIDER INFORMATION (e.g., hospital, doctor, clinic)

NAME AND ADDRESS OF MEDICAL CARE PROVIDER	TELEPHONE NO.

TREATED IN EMERGENCY ROOM? ☐ NO ☐ YES	HOSPITALIZED OVERNIGHT AS INPATIENT? ☐ NO ☐ YES

INCIDENT REPORT, CONTINUED

SEVERITY OF INJURY OR ILLNESS	TIME LOSS (Check all that apply)	PHASE OF WORKDAY
☐ NO TREATMENT REQUIRED	☐ NO TIME LOSS	☐ PERFORMING NORMAL WORK DUTIES
☐ FIRST AID ONLY	☐ RETURN TO WORK THE NEXT DAY	☐ MEAL PERIOD
☐ MEDICAL TREATMENT	☐ RESTRICTED ACTIVITY:	☐ REST PERIOD
☐ FATALITY (ENTER DATE):	BEGIN DATE	☐ ENTERING/LEAVING
	RETURN DATE	☐ CHRONIC EXPOSURE
	☐ LOST WORKDAY, NOT AT WORK:	☐ OTHER (SPECIFY):
	BEGIN DATE	
	RETURN DATE	

MOTOR VEHICLE ACCIDENT		PROFESSIONAL DRIVER? ☐ YES ☐ NO	
TOTAL YEARS DRIVING	COMPANY VEHICLE? ☐ YES ☐ NO	VEHICLE TYPE	
NO. OF VEHICLES TOWED	NO. OF INJURIES	NO. OF FATALITIES	

THIRD PARTY INCIDENTS		
NAME OF OWNER	ADDRESS	TELEPHONE NO.
DESCRIPTION OF DAMAGE		
INSURANCE INFORMATION		
WITNESS NAME	ADDRESS	PHONE NO.
WITNESS NAME	ADDRESS	PHONE NO.

REVIEWED BY			
NAME (PRINT)	SIGNATURE	TITLE	DATE

ATTACHMENT 6
NEAR MISS REPORT FORM

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

NEAR MISS REPORT

This report is to be filled out by any employee involved in or witnessing a near miss. A near miss is an incident that did not result in any personal injury, property damage, or work interruption. It is a very important indicator of potentially harmful future accident.

Project No. _____ Project Name _____

Project Address _____

Date of incident: _____ Time:_____ ☐ AM ☐ PM

Exact location of incident _____

_____

Description of incident or potential hazard _____

_____

_____

_____

_____

_____

_____

Corrective action taken _____

_____

_____

_____

_____

_____

Employee Signature _____ Date _____

Printed Name _____

Supervisor Signature _____ Date _____

Printed Name _____

ATTACHMENT 7
UTILITY CLEARANCE LOGS

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

UTILITY CLEARANCE LOG

Project: _____ **Project Number**:_____

Location: _____ **Date**: _____

Instructions: This log must be completed by a Farallon staff member prior to any Farallon-directed excavation (e.g., test pit excavation) or drilling operations.

DRILLING OR EXCAVATION WORK MAY NOT PROCEED UNTIL UTILITY LOCATES HAVE BEEN COMPLETED.

(See One-Call Notification Procedure on Reverse Side of This Form)

Farallon is responsible for having underground utilities and structures located and marked when drilling or directing test pit excavation operations. Any drilling or excavation within two feet of a marked utility must be done with hand tools.

Owners of underground utilities are required by law to mark underground facilities on public and private property. Owners of underground utilities are **not required** to mark existing service laterals or appurtenances. Utility owners in Washington are required to subscribe to the one call service.

Private utility locate services must be hired to locate service laterals and other buried utilities (e.g., on-site electric distribution lines, irrigation pipes) on private property.

Remark after 10 days or maintain as appropriate.

Locate Check List

Map attached showing drilling or excavation sites and known utilities ☐

Attach copy of One-Call Utility Notification Ticket (http://www.searchandstatus.com/) ☐

One-Call Utility Notification Ticket Number:_____

Attach copy of Private Locate Receipt ☐

Photos taken of all excavation/drilling locations (Download to project file) ☐

Facility Contact/Manager Approval: Name_____ Signature_____

Utilities and Structures

Type	Utility Name	Public Utilities Marked	Private Utilities/Laterals Marked	How Marked[1]
Petroleum product lines				
Natural gas line				
Water line				
Sewer line				
Storm drain				
Telephone cable				
Electric power line				
Product tank				
Septic tank/drain field				
Other				

[1]Flags, paint on pavement, wooden stakes, etc.

Farallon Consulting, L.L.C.

Field Team Leader_____ Date_____

Electric **RED**	*Gas-Oil-Steam* **YELLOW**	*Comm-CATV* **ORANGE**	*Water* **BLUE/PURPLE**	*Sewer* **GREEN**	*Temp Survey* **PINK**

ONE-CALL UTILITY LOCATE REQUEST PROCEDURE

THE ONE-CALL UTILITY LOCATE CENTER REQUIRES 48 HOURS TO MARK UTILITIES BEFORE YOU CAN DIG OR DRILL

In Washington Call 1-800-424-5555 In Oregon Call 1-800-332-2344

Washington state law requires that "before commencing **any** excavation" that the excavator or driller provide notice to all owners of underground utilities by use of the one-call locator service. Further, the law requires that the excavator/driller shall not dig/drill until all known utilities are marked. To fully comply with the law the following utility locate procedure is required:

1. **Call before you dig or drill** – Notify the One-Call Utility Notification Center (OCUNC) a minimum of two full business days before digging or drilling. Document your notification on a Utility Locate Telecon Form. Provide the following information (Bold indicates required information):
    a. **Your name, phone number, company name, mailing address, Farallon Account Number #25999**
    b. The name and phone number of an alternate contact person
    c. If the work is taking place within 10 feet of any overhead power lines.
    d. **What type or work is being done.**
    e. **Who the work is being done for.**
    f. **The county and city the work is taking place in.**
    g. **The address or the street where the work is taking place.**
    h. The nearest cross street.
    i. The distance and direction of the worksite from the intersection.
    j. **Marking instructions, (specific instructions as to where the work is taking place).**
    k. Township, range, section, and quarter section of the worksite.
2. **Record the utilities that will be notified** – OCUNC will tell you what utilities are on or adjacent to the site based on their database. Record the name of the utility on the reverse side of this form.
3. **Confirm the utilities notified have marked the utilities in the field** – Before digging or drilling walk the site and confirm that the utilities that were notified marked the utilities in the field.
4. **If a locate appears to be missing** – If a utility locate appears to be missing, and the utility has not notified you that there are no utilities in the area, call OCUNC and:
    a. **Provide the OCUNC locate number**
    b. **Clearly state which utility has not been marked. The call is being recorded.**
    c. **Ask for a contact at that utility.**
5. **Call contact(s) for missing utility(s)** – Call the contacts for missing utility locates and determine why no locate appears in field.
6. **Record reason(s) for missing locate(s)** – There may be reasons that locates do not appear in the field (e.g., no utilities are located on the site, utility has been abandoned).

Electric	*Gas-Oil-Steam*	*Comm-CATV*	*Water*	*Sewer*	*Temp Survey*
RED	**YELLOW**	**ORANGE**	**BLUE/PURPLE**	**GREEN**	**PINK**

Record the reason given. IF THEY ARE LATE – YOU WAIT TO DRILL OR DIG. If the utility failed to mark within the required two days they are liable for delay costs.

7. **Hand dig within two feet** – When digging or drilling within two feet of any marked utility the utility must be exposed first by using hand tools.

Electric	*Gas-Oil-Steam*	*Comm-CATV*	*Water*	*Sewer*	*Temp Survey*
RED	**YELLOW**	**ORANGE**	**BLUE/PURPLE**	**GREEN**	**PINK**

FARALLON CONSULTING, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington
98027

TELEPHONE CONVERSATION
Date:_____ **Time:**_____
Project Name:_____
Job No:_____
Phone No:1-800-424-5555 WA, 1-800-332-2344
OR_____
Prepared By/Initials: _____
Call: ☐ **Placed** ☐ **Received**

Contact/Title:_____

Agency/Region: One-Call Utility Notification Center

PROJECT:_____

1. Your name and the Farallon Account Number #25999_____

2. What is the type of work being conducted? (Environmental drilling, test pit excavation)

_____

3. Who is the property owner? _____

4. County and city were work is being done?_____

5. Address or street where work is taking place?_____

_____

6. Nearest cross street?_____

7. Distance and direction of the worksite from the intersection?_____

8. Marking Instructions (Generally locate on entire site including rights-of-way and easements):_____

_____

_____

9. What time and date will the locate be completed?_____

10. Utility Locate Request Number?_____

11. Utilities that will be notified?_____

_____

12. Any Overhead Concerns? No_____

_____

cc:_____ **Page**_____ **of**_____

Note: Bold indicates required information

ATTACHMENT 8
AIR MONITORING TABLE AND FORMS

HEALTH AND SAFETY PLAN
Woodworth Lakeview Facility
Tacoma, Washington

Farallon PN: 188-001

ACTION LEVEL TABLE FOR AIR MONITORING

The Air Monitoring table (following page) presents protocol for monitoring ambient air for constituents of concern and other parameters that may affect worker safety. Please note the following with respect to use of this table:

- The Level for Respirator Use indicates the concentration at which a respirator must be donned. It does not require that the job stop. The respirator is a piece of equipment that is to be used while determining why a concentration has reached that level. Implement engineering controls such as water mist, spray foam, plastic cover, etc. to reduce the concentration.
- The Level for Work Stoppage indicates the concentration at which work on the job must stop. Determine why a concentration has reached that level, and how it can be decreased. Site evacuation is not necessary at this level. Stopping work does not imply that the concentration level will decrease. Implement engineering controls to reduce the concentration; resume work when it is safe to do so.
- These values can be modified under particular site conditions and with specific knowledge of the contaminant(s). Should such conditions arise, contact Farallon's Health and Safety Officer, Richard McManus at (425) 295-0800.

AIR MONITORING

Chemical (or Class)	Monitoring Equipment	Task	Monitoring Frequency and Location	Level for Respirator Use	Level for Work Stoppage
Volatile Organic Vapors	Flame ionization detector (FID)/ photoionization detector (PID) as appropriate for chemicals of concern. Read manual to determine. Draeger Tube for vinyl chloride (Model 1/a; Part Number 67 28031). Draeger Tube for benzene (Model 0.5/a).	From start of mobilization to completion and demobilization.	Sampling should be continuous during the project while disturbing potentially contaminated soil, uncovering and/or removing tanks and piping, or drilling —at least every 15 minutes in the breathing zone. Sample at the exclusion zone boundaries every 30 minutes. Continuously sample during each soil and groundwater sampling interval. If 10 parts per million (ppm) in breathing zone, collect a Draeger Tube for benzene and/or vinyl chloride (depending upon contaminants of concern).	20 ppm above background sustained in breathing zone for 2 minutes, and no benzene and/or vinyl chloride tube discoloration. If a color change appears on the tube for benzene or vinyl chloride at 10 ppm on FID/PID, don respirator. If no Draeger Tube is available, the level for respirator use is to be 5 ppm.	50 ppm above background in breathing zone and no vinyl chloride or benzene tube discoloration. Stop work if tube indicates > 1 ppm for benzene or vinyl chloride. If no Draeger Tube is available, stop work at 25 ppm.

AIR MONITORING EQUIPMENT CALIBRATION/CHECK LOG

Date	Instrument/ Model No.	Serial No.	Battery Check OK?	Zero Adjust OK?	Calibration Gas (ppm)	Reading (ppm)	Leak Check	Performed By	Comments

AIR MONITORING LOG

Date	Time	Location	Source/Area/ Breathing Zone	Instrument	Concentration/Units	Sampled by