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September 27, 2019

Christopher Maurer
State of Washington Department of Ecology
Toxics Cleanup Program
PO Box 47600
Olympia, Washington 98504-7600

SUBJECT **Remedial Investigation Report**
Swindahl Properties LLC aka Modutech Marine Inc
2218 Marine View Drive
Tacoma, Washington 98422
VCP Project No.: SW1653

Dear Mr. Maurer,

At the request of Carl Swindahl, Aerotech Environmental Consulting, Inc. ("Aerotech") has prepared the enclosed *Remedial Investigation Report* which summarizes environmental investigation activities to date. As described in the enclosed report, Aerotech requests an opinion from the Voluntary Cleanup Program ("VCP") upon meeting the substantive requirements of the MTCA.

Aerotech and Mr. Carl Swindahl appreciate your assistance in the matter. Please do not hesitate to contact me, at (360) 731-4573 with any questions.

Sincerely,

Justin Foslien
Senior Licensed Geologist

ENCLOSURE
Aerotech 's *Remedial Investigation Report*, dated September 26, 2019

REMEDIAL INVESTIGATION REPORT

Performed at:
Swindahl Properties LLC
aka Modutech Marine Inc.
2218 Marine View Drive
Tacoma, Washington 98422

AEROTECH
Environmental Consulting Inc.

September 26, 2019

Anchorage Seattle Portland

Cost-effective environmental solutions
for the western United States and Alaska

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Remedial Investigation Report

Site Name:	Swindahl Properties LLC aka Modutech Marine Inc.
Site Address:	2218 Marine View Drive Tacoma, Washington 98442
Alternate Location Info:	Pierce County, Washington Parcel Number: 0321264056

Ecology Facility Site ID No.:	1631646
Cleanup Site No.:	14602
Voluntary Cleanup Program Project No.:	SW1653

Prepared By:
Justin Foslien
Aerotech Environmental Consulting Inc.
13925 Interurban Ave South Suite 210
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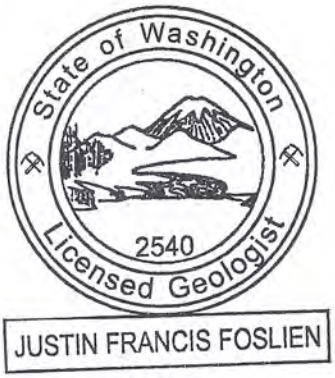
Prepared For:
Carl Swindahl
2218 Marine View Drive
Tacoma, Washington 98422

Signature:

Date: 9/26/19



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ACRONYMS AND ABBREVIATIONS

Aerotech	Aerotech Environmental Consulting, Inc
bgs	below ground surface
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
COPCs	Constituents of Potential Concern
CSCSL	Confirmed and Suspected Contaminated Sites List
CSID	Cleanup Site Identification number
CSM	Conceptual Site Model
CULs	Cleanup Levels
Ecology	Washington State Department of Ecology
FSID	Facility Site Identification Number
Golder	Golder Associates, Inc.
MTCA	Model Toxics Control Act
PID	Photoionization Detector
PCBs	Polychlorinated Biphenyls
PVC	Polyvinyl Chloride
RI	Remedial Investigation
Riley	The Riley Group, Inc.
TDS	Total Dissolved Solids
TEE	Terrestrial Ecological Evaluation
TPH	Total Petroleum Hydrocarbon
TPHg	Total Petroleum Hydrocarbon – Gasoline Range
TPHd	Total Petroleum Hydrocarbon – Diesel Range
TPHo	Total Petroleum Hydrocarbon – Heavy Oil Range
VCP	Voluntary Cleanup Program
VOCs	Volatile Organic Compunds
WAC	Washington State Administrative Code

EXECUTIVE SUMMARY

The subject Property is a rectangular-shaped approximately 5.98-acre (260,470 square foot) Parcel of industrial land located on the Hylebos Waterway in Tacoma, Washington. Significant bodies of water include Commencement Bay approximately two miles northwest.

The subject Property is configured with four buildings and a small boatyard that comprise the facility for the fiberglass and steel boat manufacturer, Modutech Marine, Inc. Two adjoining office buildings are situated in the center of the Parcel facing northeast toward Marine View Drive. Asphalt paved parking spaces are provided northeast of the buildings. Adjacent to the east is the manufacturing and production warehouse. A fabrication and spray building is situated along the east Property border. South of the building are material storage sheds, including a metal shipping container housing shelves of petroleum products. West of the warehouse are two large canvas tents that are used for sandblasting vessels. The eastern portion of the Property houses several boats, trailers, electric hoists, metal parts and pieces, and wood products.

The contiguous office buildings comprise approximately 6,560 square feet and are configured with offices, a reception area, restrooms, and a conference room. The warehouse comprises approximately 19,136 square feet and houses the marine manufacturing, repair, and production operations. Additionally, the warehouse contains an electrical room, an employee break area, a welding shop, and an approximately 1,530 square foot mezzanine used for storage. The building along the southeast Property boundary comprises approximately 4,440 square feet and is divided into two sections; one side was used for spray applications and the other side was used for fabrication.

The subject Property was first developed sometime prior to 1940 with the construction of a residence and a garage or shed. Between 1960 and 1965, the residence was vacant. By 1969, the former structures were demolished, and the present-day warehouse was constructed to occupy the ship building plant, Tide Bay Inc. By 1975, the Property occupied Martinolich Ship Builders. In 1980, a two-story office building and a dock marina were constructed. By then, the boat manufacturer, Marine Technical Services, occupied the Property. In 1985, a material storage shed was constructed. In 2013, an additional two-story office building was constructed onto the existing structure. The subject Property has been occupied by the steel and fiberglass marine boat manufacturer, Modutech Marine Inc, since 1986 throughout to present-day.

During a Site Inspection conducted by the Department of Ecology on June 17, 1992, inspectors confirmed the presence of sandblast grit spread along the roads and surfaces in certain areas of the Site. Following a request by Ecology to stop contaminants from spent sandblast grit from reaching the Hylebos Waterway, Modutech Inc removed the waste sandblast grit from the subject Property. The Model Toxics Control Act requires confirmation sampling to confirm that remedial efforts have been successful at a Site. Based on the information provided, confirmatory sampling had not been completed.

Soil and Groundwater:

The presence of arsenic and lead in the subsurface has been confirmed above the MTCA A Industrial CULs. Vertical and horizontal definition of the extent of metals above cleanup standard has been achieved to the extent practicable.

Arsenic in groundwater previously exceeded Method A CULs in the upgradient well MW1. Subsequent analyses of TDS from the site wells confirmed an average concentration above 10,000 mg/l in the four groundwater monitoring wells. The average TDS present within the four monitoring wells permits the shallow aquifer to be characterized as non-potable per WAC 173-340-720(2)(b)(ii). No concentrations of arsenic have exceeded CULs in the source area associated with the shoreline fill.

Based on the existing information collected from Swan Properties LLC, the delineation of heavy metals above CUL's is complete and isolated to three general areas. Further management will be required to prevent the exposure of Arsenic or Lead to human health and the environment. Aerotech recommends submitting this report to the Ecology with a request for opinion on the activities completed to date.

It is Aerotech's current understanding that the residual soil at the Site will eventually be capped in the areas above MTCA Method A Industrial CULs. This plan of action will also require the subsequent submittal of an environmental covenant to ensure the cap after installation remains intact.

1. INTRODUCTION

The purpose of this Remedial Investigation ("RI") is to characterize the nature and extent of contamination at the Site. Aerotech Environmental Consulting, Inc ("Aerotech") was retained by Mr. Carl Swindahl of Swindahl Properties LLC to summarize the work completed at the Site and obtain an opinion from the VCP regarding the substantive requirements of the MTCA.

Under MTCA, 173-340-200 Washington Administrative Code ("WAC") the Site is defined by the nature and extent of contamination associated with one or more releases of hazardous substances prior to any cleanup of the contamination. Aerotech has completed several investigations to define the Site based on previous release associated with spent sandblast grit.

1.1. GENERAL SITE INFORMATION

Site Name:	Swindahl Properties LLC
	aka Modutech Marine Inc.
Site Address:	2218 Marine View Drive
	Tacoma, Washington 98422
Facility Site Identification number (FSID):	1631646
Cleanup Site Identification number (CSID):	14602
Voluntary Cleanup Program (VCP):	SW1653
Project Consultant:	Aerotech Environmental Consulting, Inc.
Project Consultant Contact Information:	Justin Foslien
	13925 Interurban Avenue South,
	Suite No. 210
	Seattle, Washington 98168
	(206) 257-4211
	justin@dirtydirt.us
Property Owner:	Carl Swindahl
	2218 Marine View Drive
	Tacoma, Washington 98422
	(253) 272-9319
	carl@modutechmarine.com

1.2. SITE LOCATION/DEFINITION

The subject Property (2218 Marine View Drive; Parcel #0321264056) is comprised of one rectangular-shaped 5.98-acre parcel of industrial land, located on the southwest side of Marine View Drive in Tacoma, Washington occupied by Modutech Marine Inc. (Figures 1 & 2).

Four buildings and a small boatyard comprise the facility buildings for the fiberglass and steel boat manufacturer, Modutech Marine, Inc. Two adjoining office buildings are situated in the center of the parcel facing northeast toward Marine View Drive. Asphalt paved parking spaces are provided northeast of the buildings. Adjacent to the east is the manufacturing, repair, and production warehouse. A fabrication and spray building is situated along the east Property border. South of the building are material storage sheds, including a metal shipping container housing shelves of petroleum products.

West of the warehouse are two large canvas tents that are used for sandblasting and painting vessels. The northwest corner of the Property is used for heavy equipment storage. The eastern portion of the Property houses several boats, trailers, electric hoists, metal parts and pieces, and wood products (Figure 3).

The contiguous office buildings comprise approximately 6,560 square feet and are configured with offices, a reception area, restrooms, and a conference room. The warehouse comprises approximately 19,136 square feet and houses the marine manufacturing and production operations. Additionally, the warehouse contains an electrical room, an employee break area, a welding shop, and an approximately 1,530 square foot mezzanine used for storage. The building along the southeast Property boundary comprises approximately 4,440 square feet and is divided into two sections; one side was used for spray applications and the other side was used for fabrication.

The marina houses 50 covered slips and is accessible via a dock in the southeast corner of the Property. There are no permanent live-on board residents.

The Site is situated between the Hylebos Waterway (leading to Commencement Bay), which is immediately southwest, and bluffs of northeast Tacoma located across Marine View Drive (Figure 3).

The MTCA site (Site) is defined by the extent of release to soil as heavy metals associated with the sand blasting grit at the *Swindahl Properties LLC* parcel.

1.2.1. SURROUNDING AREA DESCRIPTION:

Adjoining and adjacent properties and landmarks include Marine View Drive (Highway 509) adjoining to the north; the Hylebos Waterway to the south; Norpoint Way Northeast adjacent to the north; Interstate Five approximately 2½ miles south; Highway 167 approximately three miles south; Interstate 705 approximately three miles southwest; Highway 7 approximately four miles southwest; and Highway 16 approximately five miles southwest. Significant bodies of water include Commencement Bay approximately two miles northwest.

1.2.2. PHYSIOGRAPHIC SETTING/TOPOGRAPHY

The precise Property location is N 47° 16' 25.21" / W 122° 22' 44.61" as determined by Google Earth mapping data. The Site elevation is approximately 13 feet above mean sea level. As observed during the Site visit and confirmed on the USGS topographic map, the subject Property exhibits a surficial drainage towards the southwest, based upon overall Site topography. Additionally, the assumed general groundwater flow is to the southwest.

1.3. SITE HISTORY

The subject Property was first developed sometime prior to 1940 with the construction of a residence and a garage or shed. Between 1960 and 1965, the residence was vacant. By 1969, the former structures were demolished, and the present-day warehouse was constructed to occupy the ship building plant, Tide Bay Inc. By 1975, the Property occupied Martinolich Ship Builders. In 1980, a two-story office building and a dock marina were constructed. By then, the boat manufacturer, Marine Technical Services, occupied the Property. In 1985, a material storage shed was constructed. In 2013, an additional two-story office building was constructed onto the existing structure. The subject Property has occupied the steel and fiberglass marine boat manufacturer, Modutech Marine Inc, since 1986 throughout to the present-day.

During a Site Inspection conducted by the Department of Ecology on June 17, 1992, inspectors confirmed the presence of sandblast grit spread along the roads and surfaces in certain areas of the Site. Following a request by Ecology to stop contaminants from spent sandblast grit from reaching the Hylebos Waterway, Modutech Inc removed the waste sandblast grit from the subject Property.

The Riley Group, Inc. ("Riley") completed a Phase I Environmental Site Assessment, September 11, 2009 at the Modutech Marine Inc. identifying three recognized environmental conditions:

1) A hazardous release was previously identified on the Site in the form of sand blast grit. The grit was previously deposited in various locations throughout the Site. At Ecology request, the grit was excavated and disposed of off-Site. Visual observation was conducted by Site occupants and Ecology inspectors to determine that the bulk of the grit had been removed from the Site. However, no confirmatory soil or groundwater sampling has been performed. Contaminants of concern confirmed at the Site include arsenic, cadmium, lead, PCBs and carcinogenic PAHs. MTCA requires that sampling be performed to confirm that remedial efforts have been successful at the Site.

2) The Site has been occupied by a boat manufacturing facility since the mid-1960s. While hazardous materials and wastes appear to be currently handled in accordance with Ecology recommendations, historical chemical handling and/or waste disposal practices (particularly prior to the current ownership) are unknown. Chemicals used and wastes generated at the Site have likely historically included, but are not necessarily limited to fiberglass resin, petroleum products, chlorinated and non-chlorinated solvents, and/or lead-based paints. Sampling would be necessary to determine whether any historical on-Site activities have adversely affected soil and/or groundwater quality.

3) The northwest adjoining property is currently listed on Ecology's Confirmed and Suspected Contaminated Sites List (CSCSL) for groundwater contamination identified near a right-of way pump station. The extent of the petroleum-affected groundwater is unknown at this time. Additional investigation would be necessary to determine if this off-Site release has adversely affected soil and/or groundwater quality at the subject Site.

On October 21, 2009, Riley advanced a total of four test probes (SP1 through SP4) to a maximum depth of 6 feet below ground surface ("bgs"). Each test probe was advanced at the approximate four locations identified above, where elevated concentrations of the specified contaminants of concern were previously reported (Riley. 2009b).

A total of 8 discrete soil samples were collected during this project. In general, samples were collected of surficial and deeper fill material, respectively. Soil samples were screened in the field for the presence of volatile organic compounds ("VOCs") using a portable gas analyzer equipped with a photo-ionization detector ("PID"). No elevated PID field screening results were noted (Riley. 2009b).

Samples were selected based on the historical detections of the specified contaminants of concern. Samples SPI-1 and SP2-0.5 were collected from beneath the existing concrete pavement and selected based on the previous detection of Carcinogenic Polycyclic Aromatic Hydrocarbons ("cPAHs") and metals, respectively, in shallow soils. Samples SP3-3 and SP4-3 were collected from the deeper fill layer, which was reportedly overlain by the previously excavated sandblast grit (Riley. 2009b).

A *Phase I Environmental Site Assessment*, completed February 26, 2018 by Aerotech, identified Contaminants of Concern as compounds related to spent sandblast grit: Metals ("MTCA 5") which include Arsenic, Chromium, Cadmium, Lead and Mercury (Aerotech 2018a).

In March and April 2018, Aerotech subsequently advanced 28 soil borings completed during the Site Characterization, performed on March 8, March 28, and April 2, 2018. Soil borings were advanced in areas where the approximate locations of former suspect fill areas. Samples were collected from depths ranging from 3 to 12 feet bgs. Soil samples collected from soil borings SB04, SB07, SB08, SB11, SB20, SB25, and SB27 contained concentrations of Arsenic and Lead above the MTCA Method A Industrial Cleanup Levels ("CULs").

A groundwater monitoring well network consisting of MW1 through MW4 was installed to evaluate the impact of Arsenic and Lead to groundwater beneath the Site. Groundwater samples collected from monitoring wells MW1 through MW4 did not contain concentrations of Arsenic and Lead above the MTCA Method A CULs (Aerotech 2018b). Further information may be found in Aerotech's *Site Characterization Report*, *Swindahl Properties LLC* dated April 19, 2018.

An Additional Site Characterization Report, performed on June 29, 2018, included the advancement of ten soil borings in the area near SB25. The purpose was to delineate the vertical and horizontal extent of Arsenic and Lead. Aerotech collected additional samples from soil boring locations SB02, SB12, SB19, SB24, SB25, and SB29 through SB33. Samples were collected from depths ranging from 3 to 16 feet below ground surface. Soil samples collected from soil boring SB25 contained of Arsenic and Lead above the CULs (Aerotech 2018c). Further information may be found in Aerotech's *Additional Site Characterization Report*, *Swindahl Properties LLC* dated July 20, 2018.

1.4. SITE USE

1.4.1. CURRENT PROPERTY USES AND FACILITIES

Modutech Marine Inc, a steel and fiberglass marine boat manufacturer, has occupied the Property from 1986 throughout to present-day (Figure 3). The Property consists of a paved parking lot and as well as with compacted gravel on most of the parcel.

1.4.2. PROPOSED OR POTENTIAL FUTURE SITE USES

Planned use for the Property is to continue as a steel and fiberglass marine boat manufacturing facility as Modutech Marine Inc. There are no Plans for redevelopment currently. The parcel is zoned as industrial use (Figure 5).

1.4.3. REGULATORY STATUS

Aerotech entered the Site as "Swindahl Properties LLC" into the VCP under Ecology in June 2018. Christopher Mauer of the Southwest Regional Office Toxics Cleanup Program has been assigned as the Ecology Project Manager.

1.4.4. TRANSPORTATION/ROADS

The Property is located south of the Marine View Drive (Highway 509) in Northeast Tacoma. Access is obtained through a driveway on the south side of Marine View Drive. Traveling south on Highway 509 until 54th Avenue East which interchanges with Interstate 5. Interstate 5 that connects Canada to Mexico lies to the south (Figures 1 through 3).

1.4.5. WATER SUPPLY

The City of Tacoma supplies potable water within the city limits. The City of Tacoma reports its water source as the upper eastern sections of the Green River watershed along the western flanks of the Cascade Mountains; the city also maintains groundwater production wells within the same area, in the vicinity of the Eagle Gorge Reservoir and the Howard Hanson Dam, approximately twenty miles east of the subject Property. A municipal well field, utilized during high demand periods, is located near Interstate 5 in south Tacoma, over six miles south of the subject Property.

2. FIELD INVESTIGATIONS

2.1. PREVIOUS ENVIRONMENTAL INVESTIGATIONS

A total of four groundwater monitoring wells have been completed on-Property to date. Monitoring of the groundwater wells has occurred quarterly since 2018 (Aerotech 2018b; 2018d; 2018e; 2019).

A total of 3 investigations have been completed at the Swindahl Properties LLC and are summarized in the following reports:

- The Riley Group ("Riley"). November 10, 2009. *Focused Phase II Investigation.*
- Aerotech. April 19, 2018. *Site Characterization Report.*
- Aerotech. July 20, 2018. *Additional Site Characterization Report.*

A chronological summary of work completed at the Site during the investigations listed above can be found in Appendix B. A summary of historical soil analytical data and historical groundwater analytical data can be found in Tables 1 and 2, respectively. All historical boring logs are included in Appendix C. All currently existing wells and soil boring locations are shown on Figure 6. All activities completed by Aerotech were in accordance with Aerotech Field Protocols (Appendix D).

2.2. ENVIRONMENTAL INVESTIGTION SUMMARY

A total of 33 soil borings and four Site groundwater monitoring wells (MW-1 through MW4) have been advanced at the. The soil analytical results can be found in Table 1 and Figure 6. Groundwater analytical results are summarized in Table 2 and Figure 7.

2.2.1. CONSTITUENTS OF POTENTIAL CONCERN

Constituents of potential concern ("COPCs") based on current and past uses of the Property include the compounds listed in WAC Chapter 173-340-900 Table 830-1 Required Testing for Petroleum Releases. The following table lists COPCs for the Site:

Potential Source	COPCs
Sand Blasting Grit	• Arsenic • Cadmium • Chromium • Lead • Mercury

Based on the laboratory analytical results from environmental activities conducted at the Site, concentrations of arsenic and lead have been detected above MTCA Method A screening levels in soil collected from the Site. A groundwater sample collected from the upgradient groundwater monitoring well exceeded the MTCA Method A screening level for groundwater.

Ecology identified PCBs, cPAHs as well as metals as contaminants of concern. The subsequent investigations completed by Riley and Aerotech for the characterization of potential environmental concerns at the site included the analysis for TPHd, TPHo, cPAHs, VOCs, PCBs, arsenic, chromium, cadmium, lead and mercury. Based on the previous investigations, contaminants of concern associated with the sand blasting grit release have been isolated to arsenic and lead.

2.2.2. SOIL

Locations of soil samples are depicted on Figure 6. Laboratory analytical results indicated arsenic and

lead above the MTCA Method A screening levels. The depths of the soil samples range from 0.5 to 16 feet bgs. A summary of laboratory analytical results, sample depth, and sample date for each soil sample submitted for analysis is presented in Table 1.

2.2.3.SURFACE WATER

Surface Water has not been evaluated on the Property.

2.2.4.GROUNDWATER

Four groundwater monitoring wells (MW1 through MW4; Figure 7) have been installed at the Site since 2018.

Aerotech installed three four 2-inch PVC groundwater monitoring wells (MW2 through MW4) along the Modutech Marine Inc. shore adjacent the concrete shoreline fill north, and at an upgradient location MW1 along the northeastern property boundary.

A summary of laboratory analytical results, and sample date for each groundwater sample submitted for analysis is presented in Table 2.

2.2.5.SEDIMENT

Sediment has not been evaluated on the Property.

2.2.6.AIR/SOIL VAPOR

Typically, when the Preliminary Assessment determines the COPCs are not volatile in nature, the vapor assessment is complete. Out of an abundance of caution, Aerotech took the evaluation a step further after some stained soil at SB31 that also smelled oily.

To further evaluate the potential air/soil pathway Aerotech utilized the Modified Approach for Assessing the Vapor Intrusion Pathway for Sites with Petroleum Contamination taken from the *Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion - Toxics Cleanup Program Implementation Memorandum No. 14* (Ecology, 2016):

1) An initial release to the environment occurred based on the previous investigation data and regulatory records did occur;
2) No immediate action was necessary;
3) Site conceptual model based on characterization data has been completed;
4) No other volatile contaminants other than petroleum have been identified;
5) No precluding factors are present at the Site;
6) The previous locations of elevated hydrocarbons occurred in the areas which are less than 30 feet laterally from the Site building;
7) Samples collected at the Site ranged in depth from 0.5 – 12 feet bgs. The 5 foot interval samples do not meet the vertical screening distance of 6 ft;
8) Therefore, a Tier 1 assessment approach is appropriate.

A Tier I assessment evaluates the site areas identified in the Preliminary Assessment and determines which areas – or which portions of these areas – may potentially be threatened by VI. For the *Swindahl Properties LLC* Site, no current soil samples collected have contained VOCs above Method A Screening Levels. Since no VOCs have been detected in the soil above Method A Screening Levels, the subsurface contaminant concentrations will be too low to potentially result in unacceptable indoor air concentrations in any site area.

Therefore, the protection of the air/soil vapor pathway is complete, and no further evaluation is necessary.

2.2.7. NATURAL RESOURCES/WILDLIFE

A Terrestrial Ecological Evaluation ("TEE") form has been completed and included in this report.

2.2.8. CULTURAL HISTORY/ARCHEOLOGY

No information or reports of historical investigations have indicated a need for additional research of Property history or archaeology.

2.2.9. INTERIM ACTIONS

During a Site Inspection conducted by the Department of Ecology on June 17, 1992, inspectors confirmed the presence of sandblast grit spread along the roads and surfaces in certain areas of the Site. Following a request by Ecology to stop contaminants from spent sandblast grit from reaching the Hylebos Waterway, Modutech Inc removed the waste sandblast grit from the subject Property. Visual observation was conducted by Site occupants and Ecology inspectors to determine that the bulk of the grit had been removed from the Site.

3. NATURAL CONDITIONS

3.1. SITE GEOLOGY

The Puget Sound lies within a tectonic trough situated between the Olympic Mountains to the west, and the northern Cascade Mountains to the east. This trough is characterized by fault zones accommodating north-south compressional rotation, commonly resulting in predominant north-south and northwest-southeast oriented faults and fault zones. Elliott Bay lies north of the Seattle Fault Zone, while Tacoma's Commencement Bay lies south of the northernmost Tacoma Fault zone rupture. A major fault is mapped below the bluffs on which central Tacoma was developed, along the western margin of Commencement Bay. Commencement Bay and the Puyallup River Basin lie on the down dropped side of the fault. The uppermost soils are dominated by alluvial sediments and occasionally volcanic mud flows originating on the slopes of Mount Rainier.

The Geologic map of the Tacoma North 7.5-Minute Quadrangle mapped the Site as artificial fill. The fill consists of fine to medium grained sand and gravelly sand with occasional pieces of debris intermixed. Along the eastern portion of the Site along the shoreline, the fill material extended from the grade surface to approximately 10-12 feet bgs. The fill decreases in thickness from the grade surface to approximately 4 feet bgs toward MW1 and the western portion of the Site. Beneath the fill, a well sorted silty sand with alternating layers of fine sand and silt indicated the historical tide flat deposits.

GENERALIZED LITHOLOGY

0 – 10 ft	Fill – Asphalt, then silty gravel GM and well sorted sand SP
10 – 19 feet below grade	SP – Brown well sorted sand and then silt ML.

Figure 8 depicts the location of a Northwest-Southeast and Southwest-Northeast geologic cross sections. The cross sections illustrating generalized subsurface conditions observed at the Property can be found on Figure 9.

3.2. SITE HYDROGEOLOGY

The principal aquifers in the Puget Sound Region occur in glacial drift, that along with finer grained interglacial sediments, underlie the basin lowland to depths often exceeding 1,000 feet. Sand and gravel units within the glacial drift form the principle aquifers. These aquifers receive ample recharge from the typically heavy precipitation characteristic of western Washington. The glacial drift in the Puget Sound region varies greatly in composition and water yielding capacity. Typically, wells in glacial drift that tap silt, clay, or till in the region at approximately 75 to 100 feet below ground surface may have yields of 100 gallons or more per minute. Deeper wells tapping thick, saturated layers of highly permeable gravel and coarse sand, typically at depths greater than 250 feet below ground surface, can yield more than 1,000 gallons per minute.

Because tidal fluctuations approach 15 or more feet in the Tacoma area, rhythmic fluctuations in ground water levels twice daily and flow direction may occur within some low-lying areas near Commencement Bay. Under some conditions, tidal fluctuations may potentially influence groundwater flow at the subject Property, given its location immediately adjacent to the Hylebos Waterway.

Jones, Orr and Ebbert depict the shallow alluvial aquifer of Commencement Bay as hydraulically connected to adjoining glacial aquifers above; in general groundwater is expected to flow from the bluffs above, toward Commencement Bay and the Puyallup River, with a significant flow component in the direction of river flow, toward Commencement Bay.

The upper alluvial aquifer is characterized as a distinct hydrogeologic unit, hydraulically connected to more permeable sandy or gravelly units along the valley margins, often lying underneath glacial till

"Aquifer Qcl [Jones et al, 1999] is generally a confined aquifer except where it is exposed at the surface, where it is unconfined, or not completely saturated beneath Qvt (Vashon Till). It consists largely of sand and gravel deposits but does contain silt and clay within the sand and gravel matrix.... The altitude of the top of this aquifer ranges from 50 feet below sea level to 509 feet above sea level."

3.2.1. GROUNDWATER CONDITIONS

Groundwater occurs in the shallow fill beneath the Site comprised of poorly graded fill gravely sand. The water table depth typically ranges between 2.41 and 9.00 feet bgs (Table 2). Previous maps summarize in a rose diagram depict the local flow of groundwater is toward the west and southwest and the Hylebos Waterway (Figures 10 and 11).

3.3. SURFACE WATER

The Site is currently covered with compacted gravel, concrete and asphalt. In the event of a storm water overflow at the Property, stormwater surface runoff is collected via catch basins and conveyed via storm sewers that drain toward the west and the Hylebos Waterway.

The nearest surface water body is the Hylebos Waterway located immediately to the southwest of *Swindahl Properties LLC* (Google Earth, 2019).

3.4. ECOLOGICAL RECEPTORS

3.4.1. SENSITIVE RECEPTOR SURVEY ANALYSIS

The nearest surface water body is the Hylebos Waterway located immediately south of the Property (Google Earth, 2019). Based on the anticipated capping of contaminated areas with concentrations above the MTCA Method A screening levels on the Property; it is unlikely that soil beneath the subject Property would pose a future risk to surface waters.

The nearest potable water well is located within the Port of Tacoma for Emergency Use. The City of Tacoma owns the well located approximately 0.70 miles cross or downgradient to the west of the Site on the western side of the Hylebos Waterway (Health, 2019). The well is designated TIDEFLATS ACN703 and extends to a depth of 775 feet.

The Site is located within the 10 year time of travel radius area for the City of Fircrest groundwater well Well#9 AAY 306 (Health, 2009).

3.4.2. TERRESTRIAL ECOLOGICAL EVALUATION

The subject Property has been determined to be exempt from the requirements of the Terrestrial Ecological Evaluation (“TEE”), in accordance with Washington Administrative Code (“WAC”) 173-340-7491(1)(b), due to the anticipated barriers to exposure. Swindahl Properties LLC will be asphalting the surface at the parcel constituting a physical barrier to all contaminated soil preventing exposure to plants and wildlife. An institutional control will be implemented to ensure management of the remaining contamination.

4. CONCEPTUAL SITE MODEL

The conceptual site model is a "conceptual understanding of a site that identifies potential or suspected sources of hazardous substances, types and concentrations of hazardous substances, potentially contaminated media, and actual and potential exposure pathways and receptors." As defined by MTCA WAC 173-340-200 (WAC, 2017). This report has provided details regarding how COPCs were released, the types and extent of constituents detected at the Site, and actual and potential receptors. This section provides a conceptual summary of the detailed information described in the previous sections. Figure 12 presents a graphical representation of the conceptual model for the Site.

4.1. SOURCES OF CONSTITUENTS OF CONCERN

The sandblast git is the source of heavy metals on the Site released to soil of COPCs that were stored and used during the ship building activities that have historically and currently occur at the Site. These releases were focused in the vicinity of the concrete shoreline fill.The heavy metal COPCs were released to soil; the metals then spread by gravity transport into the vadose zone, and by direct leaching to groundwater from saturated soils. The Property is currently utilized as marine ship building business and the surface cover is compacted gravel, concrete and asphalt.

4.2. FATE AND TRANSPORT

The fate and transport of the COPCs are governed by the specific properties of the constituents and the surrounding environmental conditions at the Site. Heavy metals remaining from the sandblast grit identified in 1992, remain in limited areas along the shoreline associated with the fill. Adsorption and desorption processes of heavy metals control their fate and transport in soil. Previous study associated with the Tacoma Smelter Plume has shown the mobility of arsenic and lead is limited (Golder, 2011).

4.3. EXPOSURE PATHWAYS AND RECEPTORS

The Property is within an industrial use area that includes public streets, businesses, and other industrial activities. The streets and parking lots are covered with asphalt or concrete. There is some terrestrial habitat in the area upgradient of the Site, associated with the bluffs across Marine View Drive. Current exposure pathways and receptors are limited to the following:

- Incidental ingestion of surface soils;
- Incidental ingestion of groundwater from leaching of soil:

There is a potential for a future direct contact exposure pathway whereby construction workers digging in subsurface soil may be exposed to COPCs. CULs will be developed based on industrial worker exposure CULs.

4.4. POTENTIAL FUTURE EXPOSURE PATHWAYS AND RECEPTORS

Future land use in the area is expected to industrial, therefore the MTCA Method A and B CULs are applicable to this Site. No significant changes in zoning are expected in the foreseeable future.

4.5. SOIL CLEANUP STANDARDS

The following pathways are considered for the establishment of soil CULs at the Site:

- Protection of human health via direct exposure using the MTCA Method A CULs;
- Protection of ecological receptors, an ecological evaluation is required under MTCA;
- Protection of groundwater resources from COCs leaching from soil; and
- Protection of indoor air from vapor intrusion from soil containing hydrocarbon concentrations exceeding the MTCA Method A CULs.

In developing CULs, the following Site-specific information is relevant:

- The Site and the adjacent properties are currently zoned for regional industrial use;
- Soil containing residual COPCs remains near buried associated with the concrete shoreline fill at the *Swindahl Properties LLC*

4.6. GROUNDWATER CLEANUP STANDARDS

The following pathways are considered for the establishment of groundwater CULs at the Site:

- Protection of human health via direct exposure using the MTCA Method A CULs;
- Protection of ecological receptors, an ecological evaluation is required under MTCA;
- Protection of groundwater resources from COCs leaching from soil; and
- Protection of indoor air from vapor intrusion from soil containing hydrocarbon concentrations exceeding the MTCA Method A CULs.

In developing CULs, the following Site-specific information is relevant:

- The Site and the adjacent properties are currently zoned for industrial use; and
- Groundwater containing residual COPCs is present at the Site (Table 2).
- Total dissolved solids ("TDS") present within three of the four monitoring wells permits the shallow aquifer to be characterized as non-potable per WAC 173-340-720(2)(b)(ii)
- Groundwater containing residual COPCs at the Property has only been present with in the upgradient well MW1

4.7. CLEANUP STANDARDS FOR INDOOR/AMBIENT AIR, SOIL GAS, SUB-SLAB SOIL GAS

In developing CULs for indoor air, the following Site-specific information is relevant:

- Residual COPCs present at the Site are not volatile and therefore do not pose a risk to human health and the environment via the vapor pathway.

4.8. CLEANUP LEVELS

Based on the current conditions present at the Site, MTCA Method A industrial is the appropriate CUL for both soil and groundwater.

	MTCA Industrial Cleanup Levels			
COPC	**Soil – Method A Industrial (mg/kg)**	**Soil – Method B Direct Contact (µg/kg)**	**Groundwater (µg/L)**	**Indoor Air (µg/m3)**
PAHs	2	N/A	0.1	N/A
PCBs	10	N/A	0.1	N/A
TPHd	2000	N/A	500	N/A
TPHo	2000	N/A	500	N/A
Arsenic	20	N/A	5	N/A
Cadmium	2	N/A	5	N/A
Chromium	19a	N/A	50	N/A
Lead	1000	N/A	15	N/A
Mercury	2	N/A	2	N/A

a = Chromium CULs presented is the more restrictive Chromium VI value. Chromium III is 2,000 mg/kg.

5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1. SUMMARY AND CONCLUSIONS

The subject Property was first developed sometime prior to 1940 with the construction of a residence and a garage or shed. Between 1960 and 1965, the residence was vacant. By 1969, the former structures were demolished, and the present-day warehouse was constructed to occupy the ship building plant, Tide Bay Inc. By 1975, the Property occupied Martinolich Ship Builders. In 1980, a two-story office building and a dock marina were constructed. By then, the boat manufacturer, Marine Technical Services, occupied the Property. In 1985, a material storage shed was constructed. In 2013, an additional two-story office building was constructed onto the existing structure. The subject Property has been occupied by the steel and fiberglass marine boat manufacturer, Modutech Marine Inc, since 1986 throughout to present-day.

During a Site Inspection conducted by the Department of Ecology on June 17, 1992, inspectors confirmed the presence of sandblast grit spread along the roads and surfaces in certain areas of the Site. Following a request by Ecology to stop contaminants from spent sandblast grit from reaching the Hylebos Waterway, Modutech Inc removed the waste sandblast grit from the subject Property. The Model Toxics Control Act requires confirmation sampling to confirm that remedial efforts have been successful at a Site. Based on the information provided, confirmatory sampling had not been completed.

The presence of arsenic and lead in the subsurface has been confirmed above the MTCA A Industrial CULs. Vertical and horizontal definition of the extent of metals above cleanup standard has been achieved to the extent practicable.

Arsenic in groundwater previously exceeded Method A CULs in the upgradient well MW1. Subsequent analyses of TDS from the site wells confirmed concentrations above 10,000 mg/l in three of the four groundwater monitoring wells. The TDS present within three of the four monitoring wells permits the shallow aquifer to be characterized as non-potable per WAC 173-340-720(2)(b)(ii). No concentrations of arsenic have exceeded CULs in the source area associated with the shoreline fill.

5.2. RECOMMENDATIONS

Based on the existing information collected from *Swan Properties LLC*, the delineation of heavy metals above CUL's is complete and isolated to three general areas. Further management will be required to prevent the exposure of arsenic or lead to human health and the environment. Aerotech recommends submitting this report to the Ecology with a request for opinion on the activities completed to date.

It is Aerotech's current understanding that the residual soil at the Site will eventually be capped in the areas above MTCA Method A Industrial CULs. This plan of action will also require the subsequent submittal of an environmental covenant to ensure the cap after installation remains intact.

6. LIMITATIONS

For any documents cited that were not generated by Aerotech, the data taken from those documents is used "as is" and is assumed to be accurate. Aerotech does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents.

This report and the works performed have been undertaken in good faith, with due diligence and with the expertise, experience capability and specialized knowledge necessary to perform the Work in a good and workmanlike manner and within all accepted standards pertaining to providers of environmental services, in Washington at the time of investigation. No soil engineering or geotechnical references are implied or should be inferred. The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points.

7. REFERENCES

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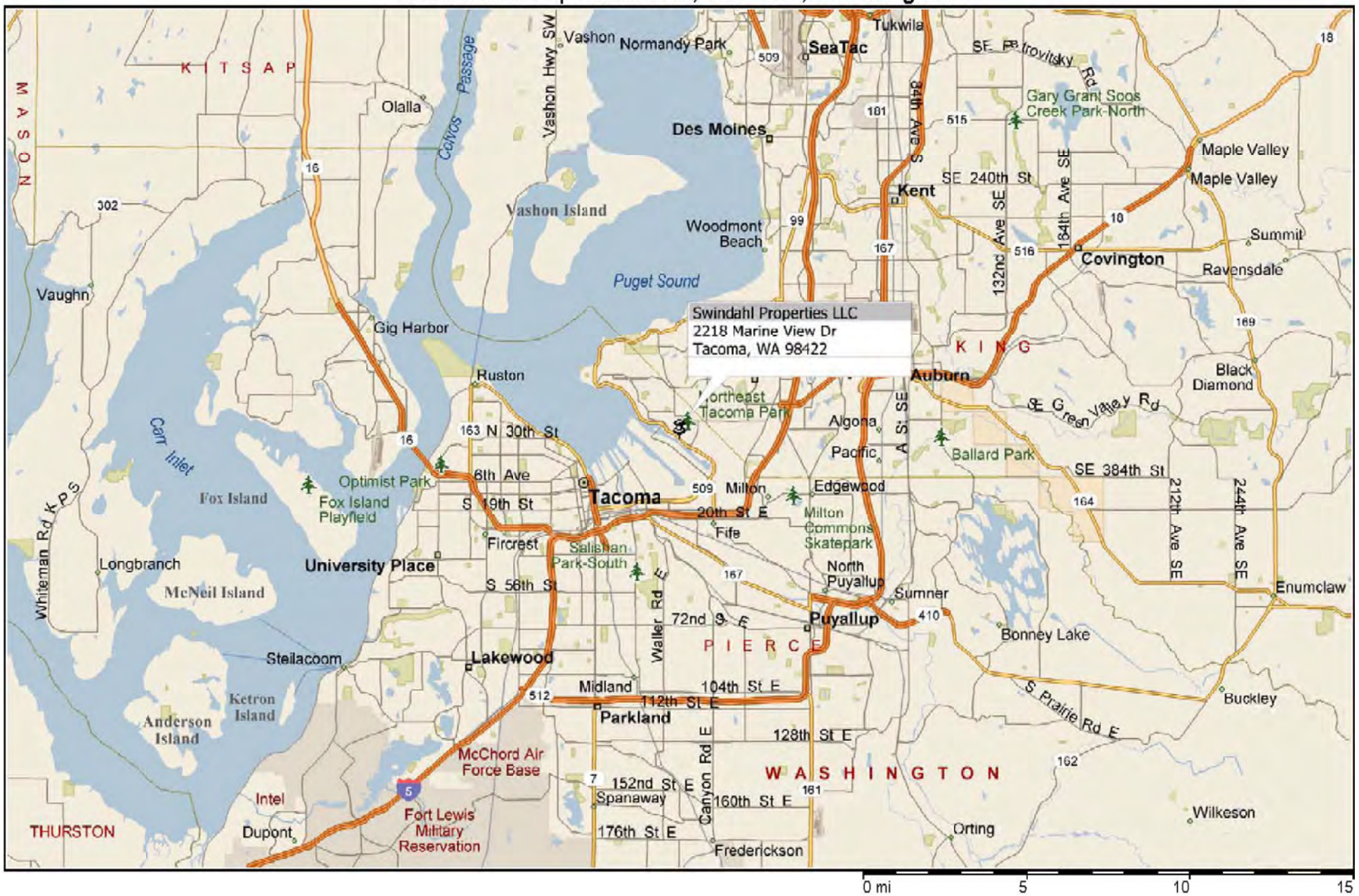
• Figures

Swindahl Properties LLC, Tacoma, Washington

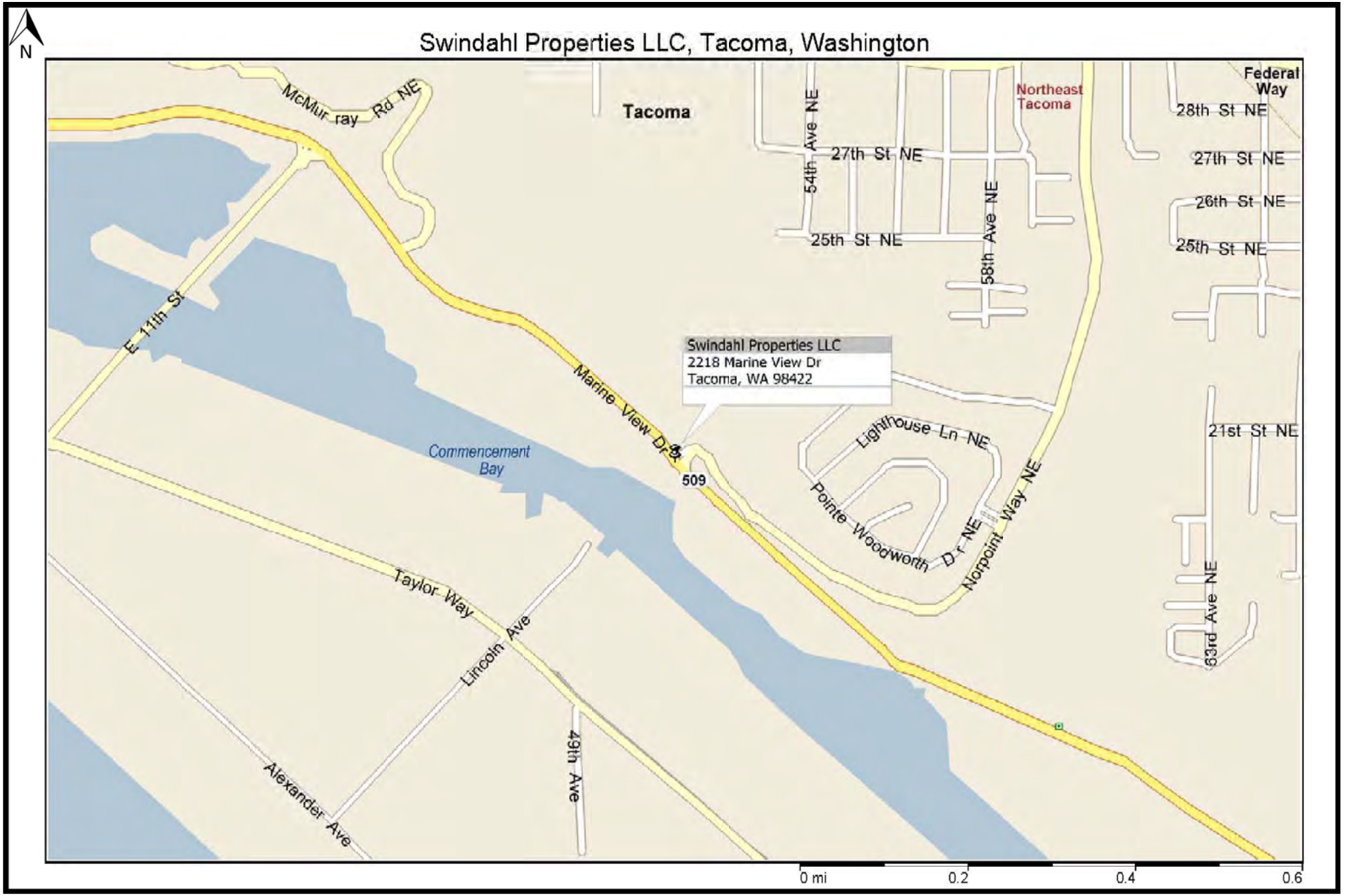


AEROTECH ENVIRONMENTAL CONSULTING

REGIONAL MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 04/19/18
By: Nick Gerkin
Figure: 1

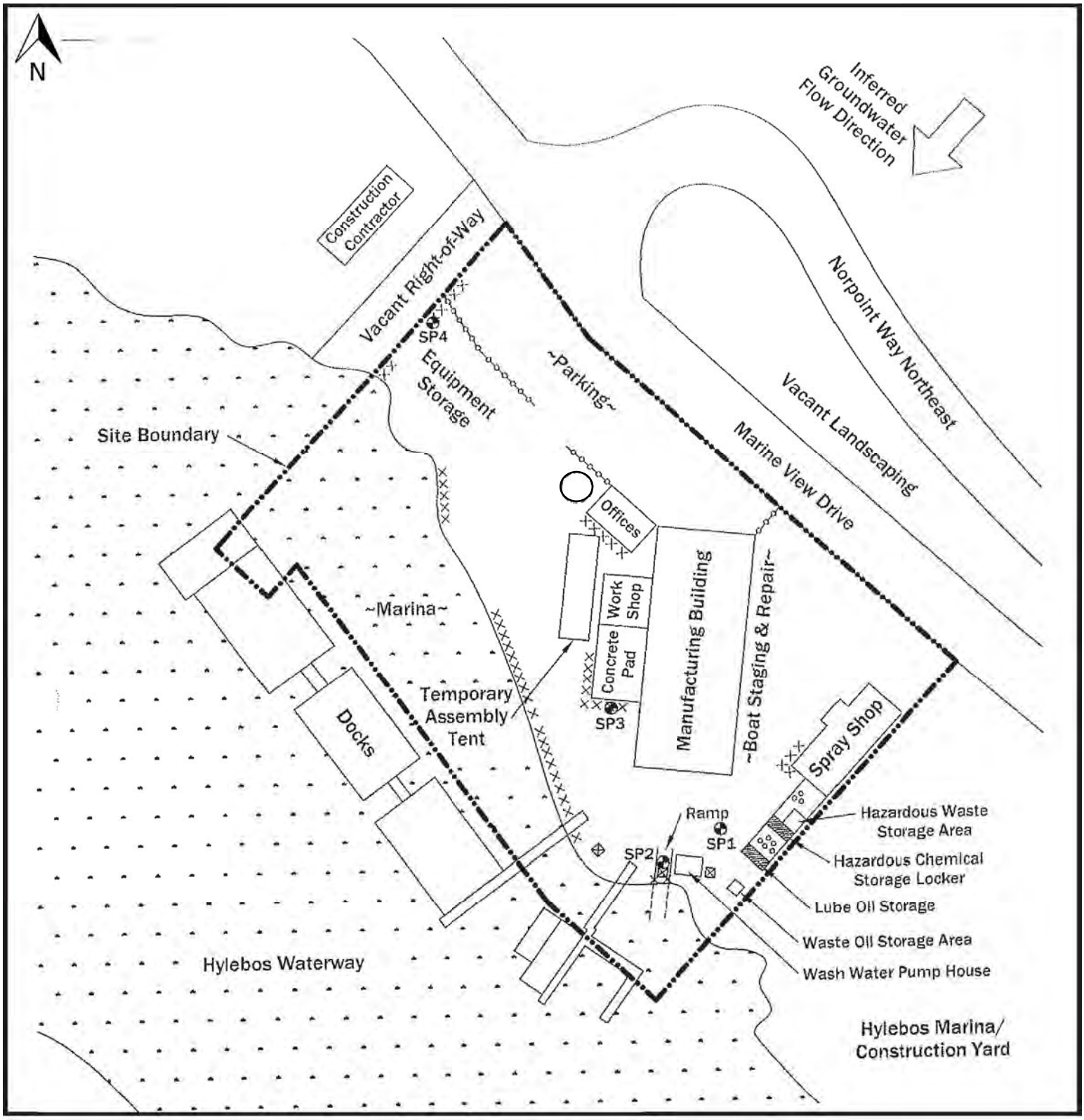


AEROTECH ENVIRONMENTAL CONSULTING

NEIGHBORHOOD MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 04/19/18
By: Nick Gerkin
Figure: 2



EXPLANATION

SP4 — Approximate Boring Location by Riley - 10/21/09

XXX — Approximate Location of Suspect Fill Areas

⊠ — Wash Water Catch Basin

◯ — Approximate Location of Former Septic Tank

○ — Drum

Map utilized from "Figure 2 - Site and Surrounding Area" *Focused Phase II Investigation* (Riley, 2009a)

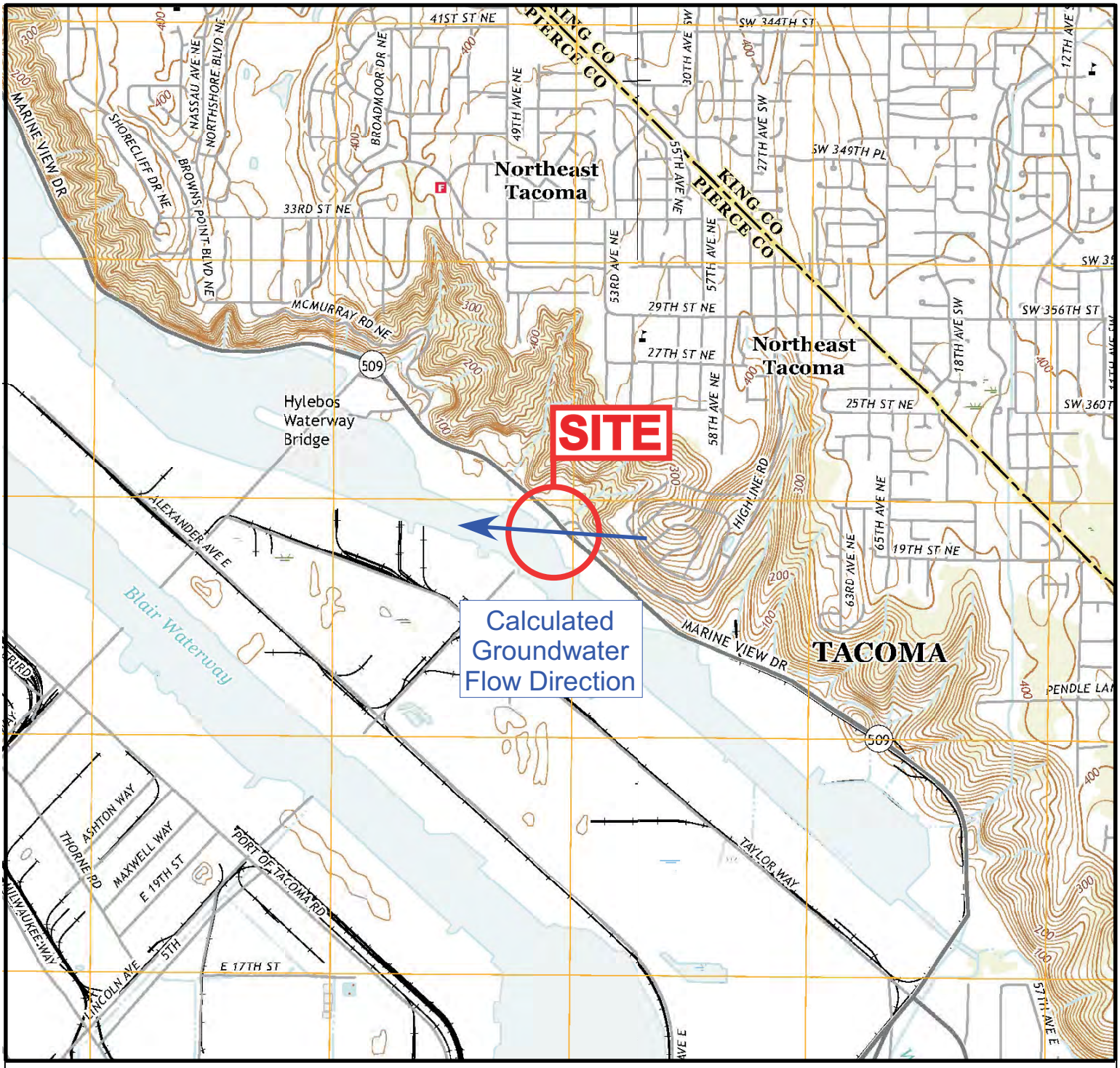
0 25 50 100
SCALE (feet)

AEROTECH ENVIRONMENTAL CONSULTING

SITE VICINITY MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 09/04/19
By: Justin Foslien
Figure: 3

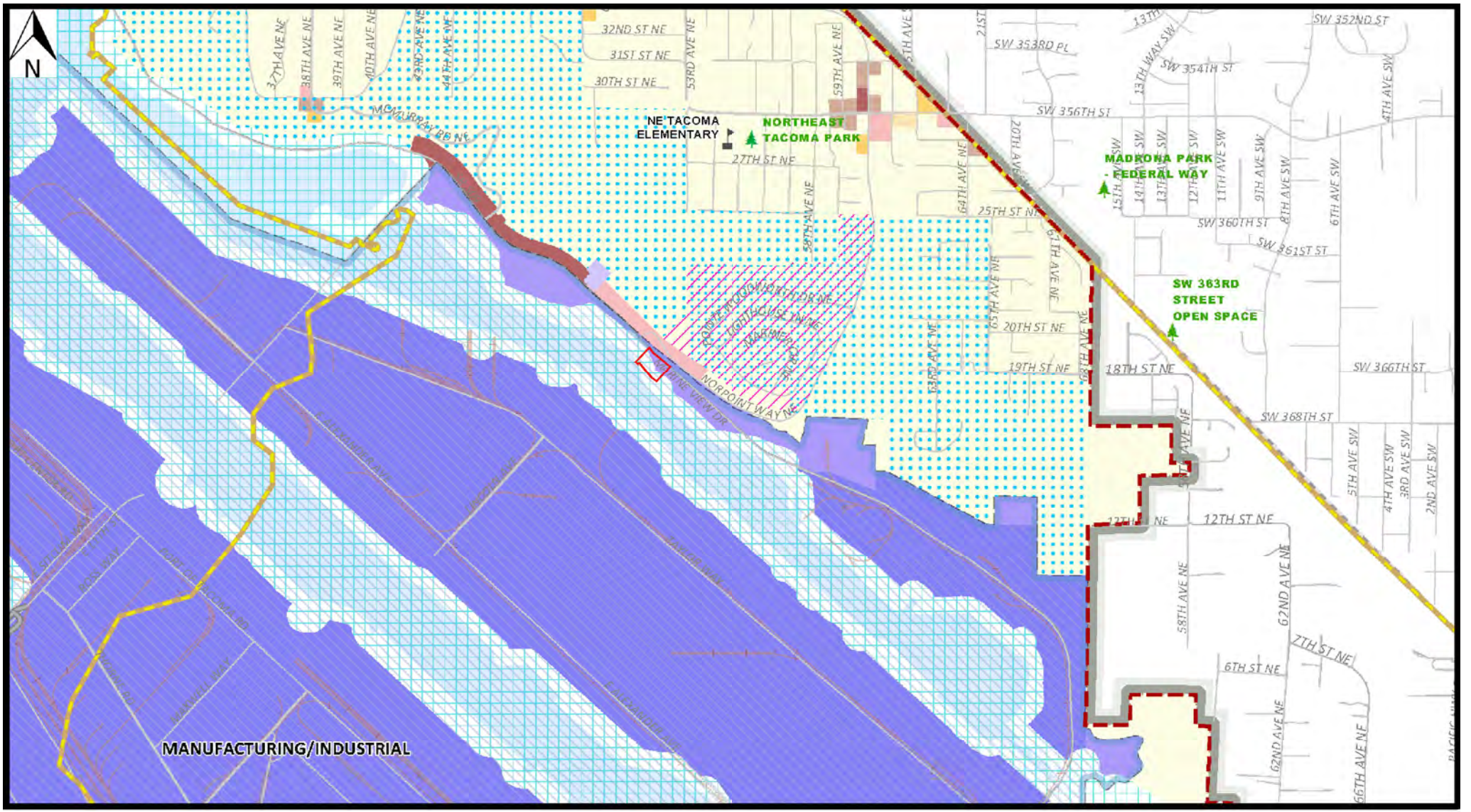


AEROTECH
ENVIRONMENTAL CONSULTING

USGS TOPOGRAPHIC MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 01/18/19
By: Nick Gerkin
Figure: 4



EXPLANATION

Approximate Parcel Property Boundary

City of Tacoma - Information Technology
GIS/Data/Analytic Services
Last Updated August 28, 2018

Tacoma

M1: Light Industrial

M2: Heavy Industrial

M3: Port Maritime Industrial

C1: Commercial

C2: Commercial

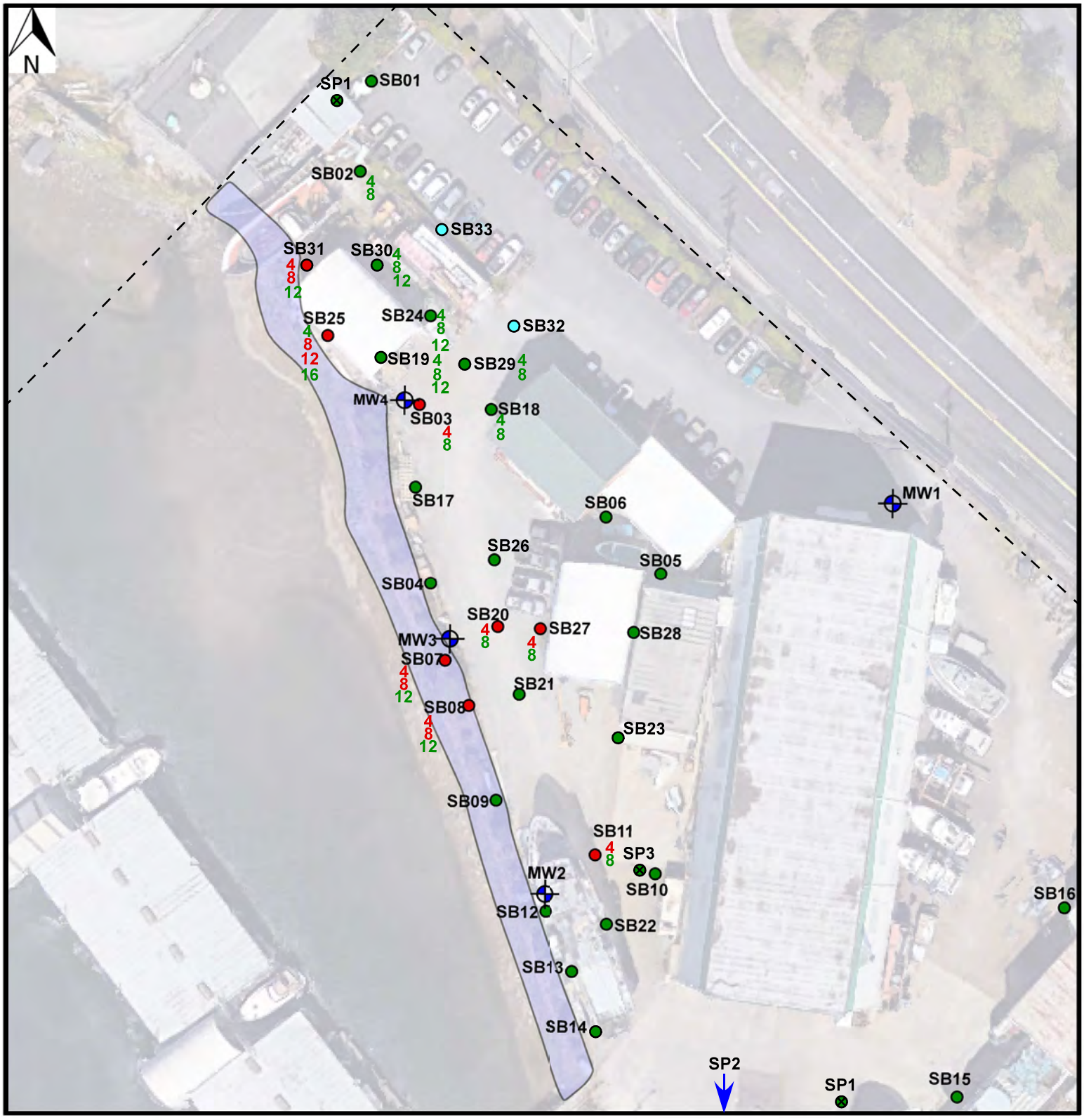
AEROTECH ENVIRONMENTAL CONSULTING

VICINITY ZONING MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

0 0.5 1
SCALE (mile)

Date: 09/09/19
By: Justin Foslien
Figure: 5



EXPLANATION

0 25 50 100
SCALE (feet)

Depth of Sample (feet)
SB31
4
8
12

SB28 — Aerotech Soil Boring Location

SP4 — Riley Group 2009 Phase II Soil Boring Location

MW4 — Groundwater Monitoring Well

Concrete Shoreline Fill

Property Line

Green numbers and symbols indicate concentrations below the MTCA Method A Cleanup Levels

Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

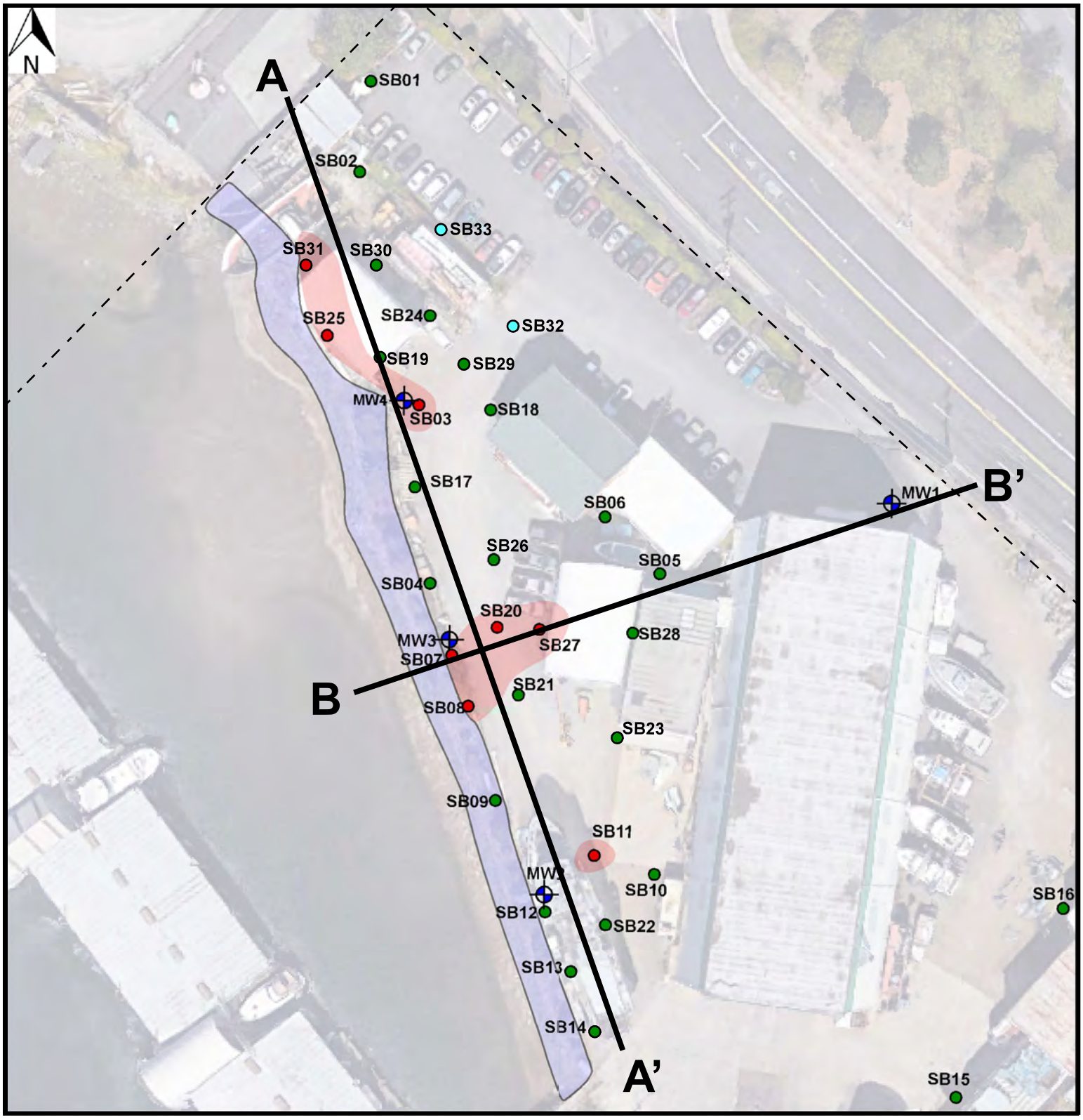
Blue numbers and symbols indicate samples collected for lateral delineation; however, existing data from surrounding boring(s) deemed analyses not necessary

AEROTECH ENVIRONMENTAL CONSULTING

CUMULATIVE SOIL ANALYTICAL RESULTS

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 09/09/19
By: Justin Foslien
Figure: 6



EXPLANATION

0 25 50 100
SCALE (feet)

SB31
Depth of Sample (feet)
4
8
12

SB28 Soil Boring Location

MW4 Groundwater Monitoring Well

Property Line

Concrete Shoreline Fill

Soil Remaining In Place Above MTCA Method A Industrial Cleanup Levels

Green numbers and symbols indicate concentrations below the MTCA Method A Cleanup Levels

Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

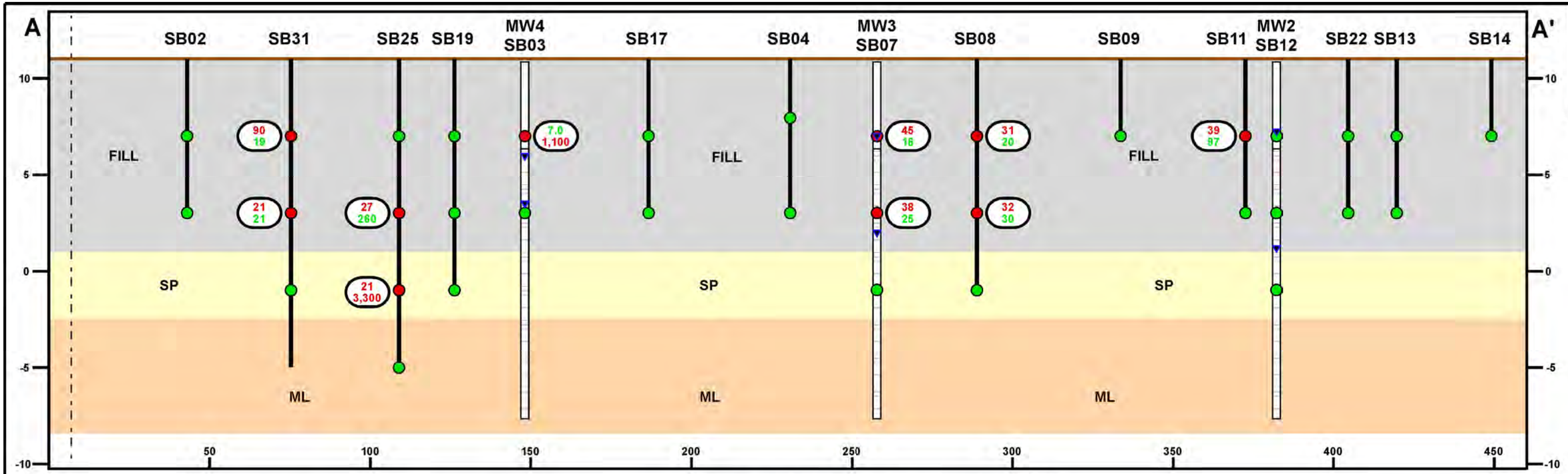
Blue numbers and symbols indicate a samples were collected for lateral delineation however existing data from surrounding boring(s) deemed analyses not necessary

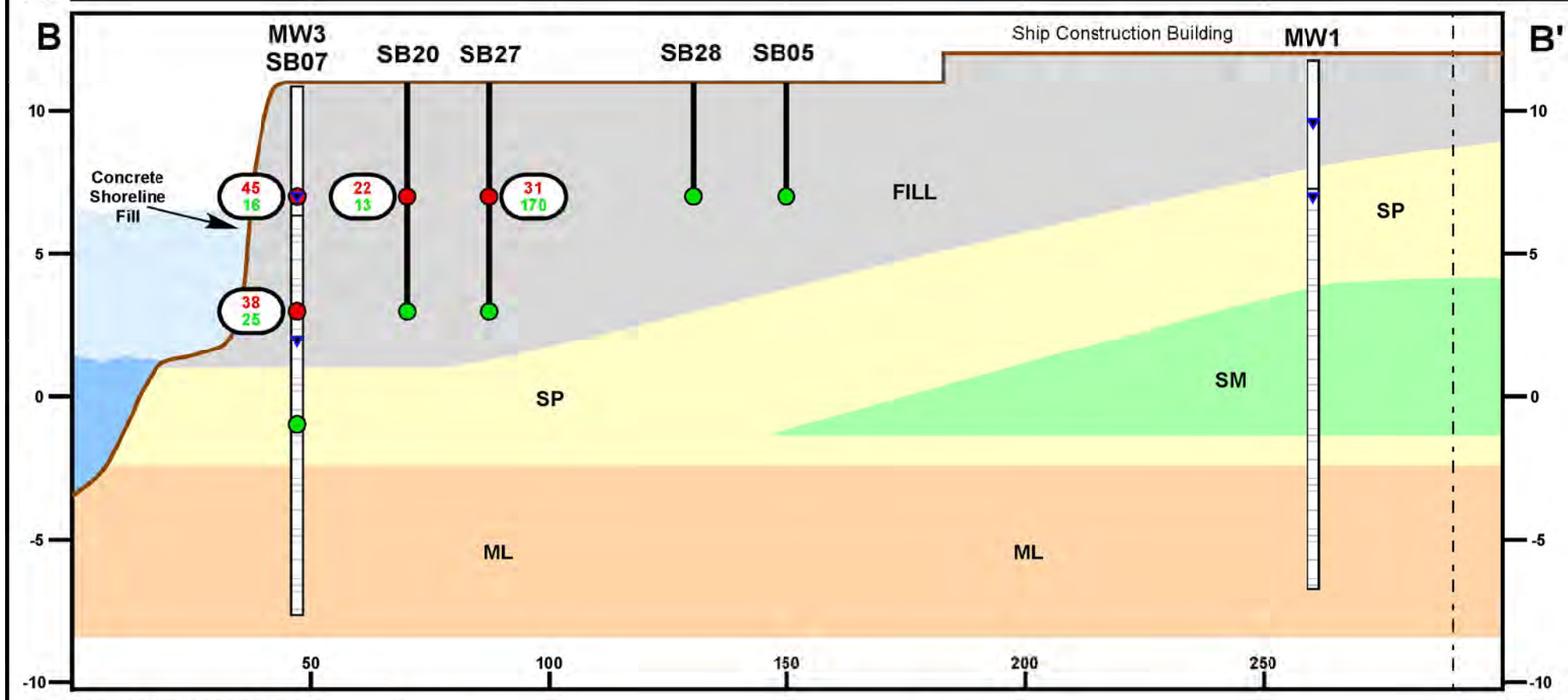
AEROTECH ENVIRONMENTAL CONSULTING

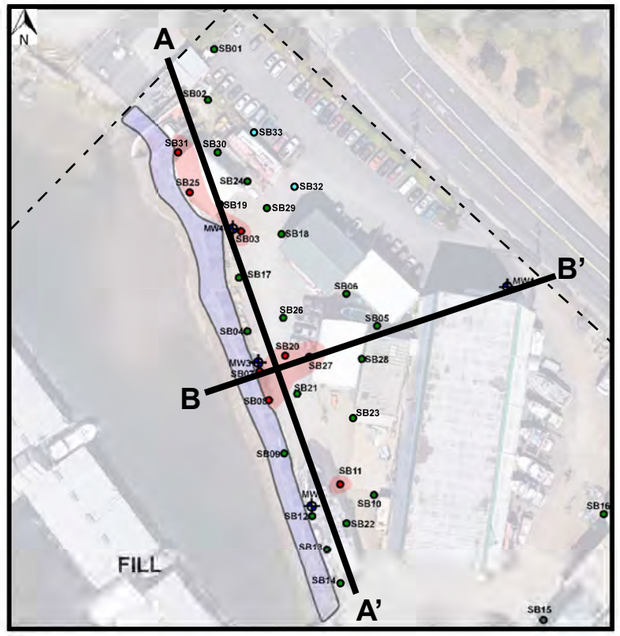
CROSS SECTION TRAVERSE MAP

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 09/26/19
By: Nick Gerkin
Figure: 8







-Horizontal Distances in Feet
-Elevations in Feet Above MSL

6X Vertical Exaggeration

AEROTECH
ENVIRONMENTAL CONSULTING

EXPLANATION

Green numbers and symbols indicate concentrations below the MTCA Method A Cleanup Levels

Red numbers and symbols indicate concentrations above the MTCA Method A Cleanup Levels

Soil Sample Location

Historical Water Level (Highs & Lows)

Screened Interval

FILL

SP

ML

SM

CROSS SECTIONS

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 09/26/19

By: Nick Gerkin

Figure: 9

EXPLANATION

MW4
Groundwater Monitoring Well

5.72
Groundwater Elevation (Feet Above MSL)

Water Elevation Countour

Concrete Shoreline Fill

Property Line

0 25 50 100
SCALE (feet)

Calculated Groundwater Flow Direction and Gradient:

0.015 ft/ft

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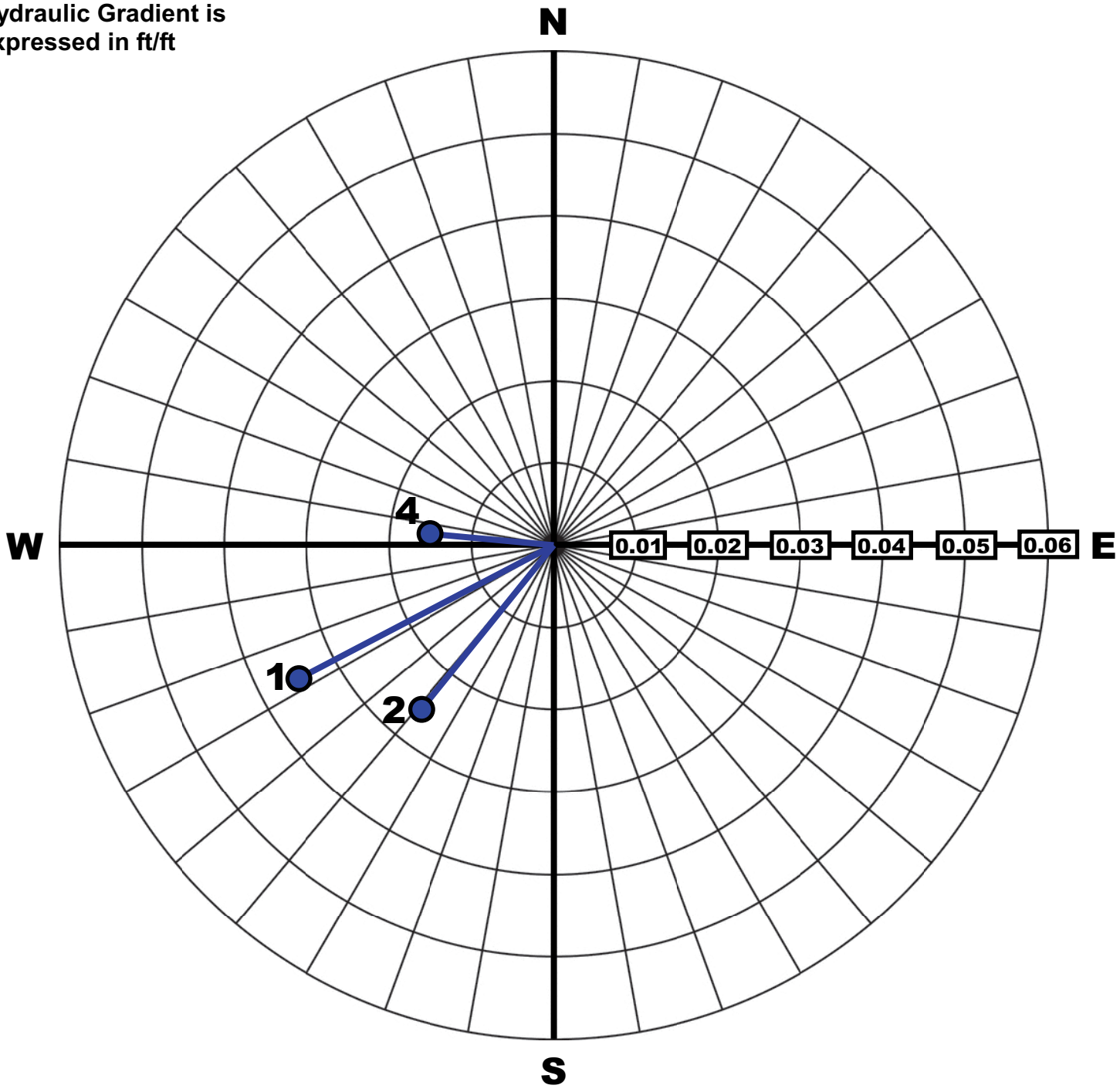
ENVIRONMENTAL CONSULTING

POTENTIOMETRIC SURFACE MAP 01/10/19

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Date: 01/18/19
By: Nick Gerkin
Figure: 10

Hydraulic Gradient is expressed in ft/ft



GAUGING EVENTS

1 04/11/18

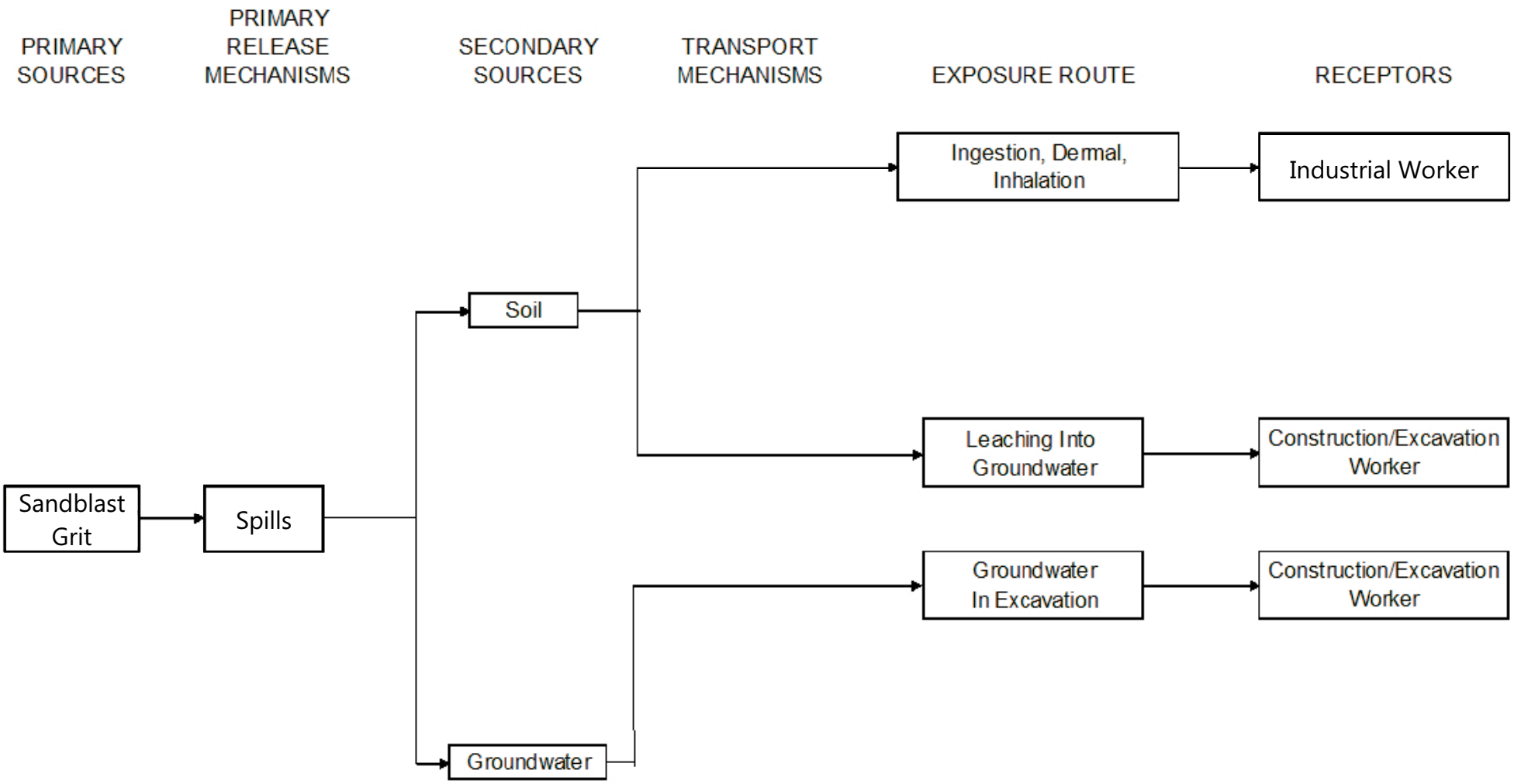
2 07/13/18

3 10/09/18 (Not Plotted Due to Variable Direction)

4 01/10/19

10/09/18 is Omitted form the Rose Diagram due to Drastic Flow Direction and Gradient Variation Across the Site

AEROTECH ENVIRONMENTAL CONSULTING	**ROSE DIAGRAM**	**Swindahl Properties LLC** **2218 Marine View Drive** **Tacoma, Washington**	**Date:** 01/18/19 **By:** Nick Gerkin **Figure:** 11



AEROTECH ENVIRONMENTAL CONSULTING

CONCEPTUAL SITE MODEL

Swindahl Properties LLC.
2418 Marine View Drive
Tacoma, Washington

Date: 09/19/19
By: Justin Foslien
Figure: 12

• Tables

TABLE 1
SOIL ANALYTICAL RESULTS
Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

The Riley Group, Inc. - Focused Phase II Subsurface Investigation - November 10, 2009

Sample ID	Soil Boring/Point Well ID	Sampling Date	Sample Depth	TPHd	TPHo	cPAHs	PCBs	Arsenic	Lead	Chromium	Cadmium	Mercury	VOCs
			Feet BGS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SP1-1	SP1	10/21/09	1	--	--	ND	--	--	--	--	--	--	--
SP1-3.5	SP1	10/21/09	3.5	--	--	--	--	--	--	--	--	--	--
SP2-0.5	SP2	10/21/09	0.5	--	--	--	--	<5.0	<0.5	6	<1.0	<0.5	--
SP2-4	SP2	10/21/09	4	--	--	--	--	--	--	--	--	--	--
SP3-1	SP3	10/21/09	1	--	--	--	--	--	--	--	--	--	--
SP3-3	SP3	10/21/09	3	--	--	--	--	<5.0	<0.5	14	<1.0	<0.5	--
SP4-1	SP4	10/21/09	1	--	--	--	--	--	--	--	--	--	--
SP4-3	SP4	10/21/09	3	--	--	--	ND	<1.0	6.2	2.0	<1.0	<0.5	--
MTCA Method A Industrial Cleanup Levels				2,000	2,000	2	10	20	1,000	19	2	2	Varies

Aerotech Environmental Consulting, Inc. - Site Characterization Report - April 19, 2018 & July 20, 2018

Sample ID	Soil Boring/Point Well ID	Sampling Date	Sample Depth	TPHd	TPHo	cPAHs	PCBs	Arsenic	Lead	Chromium	Cadmium	Mercury	VOCs
			Feet BGS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB01@3'	SB01	03/08/18	3	--	--	--	--	2.2	5.4	2.0	<1.0	<0.5	--
SB02@4'	SB02	03/08/18	4	--	--	--	--	2.9	5.0	2.0	<1.0	<0.5	--
SB02A(4)	SB02	06/29/18	4	<20	<50	--	--	--	--	--	--	--	--
SB02A(8)	SB02	06/29/18	8	<20	<50	--	--	2.2	2.9	--	--	--	--
SB02A(12)	SB02	06/29/18	12	<20	<50	--	--	--	--	--	--	--	--
SB03@4'	SB03	03/08/18	4	--	--	--	--	7.0	**1,100**	18	<1.0	<0.5	--
SB03A(8)	SB03	03/28/18	8	--	--	--	--	<1.0	50	--	--	--	--
SB04@3'	SB04	03/08/18	3	--	--	--	--	<1.0	6.2	2.0	<1.0	<0.5	--
SB04A(8)	SB04	04/02/18	8	--	--	--	--	1.5	27	--	--	--	--
SB05@4'	SB05	03/08/18	4	--	--	--	--	19	210	4.0	1.6	<0.5	--
SB06@4'	SB06	03/08/18	4	--	--	--	--	1.7	67	2.1	<1.0	<0.5	--
SB07@4'	SB07	03/08/18	4	--	--	--	--	**45**	16	3.1	<1.0	<0.5	--
SB07A(8)	SB07	03/28/18	8	--	--	--	--	**38**	25	--	--	--	--
SB07B(12)	SB07	04/02/18	12	--	--	--	--	1.3	1.4	--	--	--	--
SB08@4'	SB08	03/08/18	4	--	--	--	--	**31**	20	3.2	<1.0	<0.5	ND
SB08A(8)	SB08	03/28/18	8	--	--	--	--	**32**	30	--	--	--	--
SB08B(12)	SB08	04/02/18	12	--	--	--	--	17	30	--	--	--	--
SB09@4'	SB09	03/08/18	4	--	--	--	--	9.1	160	12	<1.0	<0.5	--
SB10@4'	SB10	03/08/18	4	--	--	--	--	4.7	25	4.6	<1.0	<0.5	--
SB11@4'	SB11	03/08/18	4	--	--	--	--	**39**	97	5.9	<1.0	<0.5	--
SB11A(8)	SB11	03/28/18	8	--	--	--	--	1.2	7.7	--	--	--	--
MTCA Method A Industrial Cleanup Levels				2,000	2,000	2	10	20	1,000	19	2	2	Varies

TABLE 1
SOIL ANALYTICAL RESULTS
Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Aerotech Environmental Consulting, Inc. - Site Charaterization Report - April 19, 2018 & July 20, 2018 (continued)

Sample ID	Soil Boring/Point Well ID	Sampling Date	Sample Depth	TPHd	TPHo	cPAHs	PCBs	Arsenic	Lead	Chromium	Cadmium	Mercury	VOCs
			Feet BGS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB12@4'	SB12	03/08/18	4	--	--	--	--	17	490	9.2	<1.0	<0.5	--
SB12A(8)	SB12	03/28/18	8	--	--	--	--	9	290	--	--	--	--
SB12B(12)	SB12	03/08/18	12	--	--	--	--	10	15	--	--	--	--
SB13@4'	SB13	03/08/18	4	--	--	--	--	11	220	5.9	<1.0	<0.5	--
SB14@4'	SB14	03/08/18	4	--	--	--	--	6.1	4.8	1.3	<1.0	<0.5	--
SB15@4'	SB15	03/08/18	4	--	--	--	--	3.4	23	4.5	<1.0	<0.5	--
SB16@4'	SB16	03/08/18	4	--	--	--	--	14	40	6.2	<1.0	<0.5	--
SB17(4)	SB17	03/28/18	4	--	--	--	--	1.4	290	--	--	--	--
SB17(8)	SB17	03/28/18	8	--	--	--	--	<1.0	33	--	--	--	--
SB18(4)	SB18	03/28/18	4	--	--	--	--	<1.0	3.2	--	--	--	--
SB18(8)	SB18	03/28/18	8	--	--	--	--	<1.0	6.7	--	--	--	--
SB19(4)	SB19	03/28/18	4	--	--	--	--	17	850	--	--	--	--
SB19(8)	SB19	03/28/18	8	--	--	--	--	1.6	33	--	--	--	--
SB19A(8)	SB19	06/29/18	8	<20	<50		--	<1.0	34	--	--	--	--
SB19A(12)	SB19	06/29/18	12	<20	<50	0.0525	--	<1.0	4.1	--	--	--	--
SB20(4)	SB20	03/28/18	4	--	--	--	--	**22**	13	--	--	--	--
SB20(8)	SB20	03/28/18	8	--	--	--	--	1.9	18	--	--	--	--
SB21(4)	SB21	03/28/18	4	--	--	--	--	14	11	--	--	--	--
SB21(8)	SB21	03/28/18	8	--	--	--	--	3.8	24	--	--	--	--
SB22(4)	SB22	03/28/18	4	--	--	--	--	5.9	38	--	--	--	--
SB22(8)	SB22	03/28/18	8	--	--	--	--	4.7	9.2	--	--	--	--
SB23(4)	SB23	03/28/18	4	--	--	--	--	2.4	91	--	--	--	--
SB23(8)	SB23	03/28/18	8	--	--	--	--	1.3	7.6	--	--	--	--
SB24(4)	SB24	04/02/18	4	--	--	--	--	<1.0	2.7	--	--	--	--
SB24(8)	SB24	04/02/18	8	--	--	--	--	11	12	--	--	--	--
SB24A(12)	SB24	06/29/18	12	<20	<50	--	--	1.3	1.6	--	--	--	--
SB24A(16)	SB24	06/29/18	16	--	--	--	--	--	--	--	--	--	--
SB25(4)	SB25	04/02/18	4	--	--	--	--	2.0	4.3	--	--	--	--
SB25(8)	SB25	04/02/18	8	--	--	--	--	**27**	260	--	--	--	--
MTCA Method A Industrial Cleanup Levels				2,000	2,000	2	10	20	1,000	19	2	2	Varies

TABLE 1
SOIL ANALYTICAL RESULTS
Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington
3 of 3

Aerotech Environmental Consulting, Inc. - Site Charaterization Report - April 19, 2018 & July 20, 2018 (continued)

Sample ID	Soil Boring/Point Well ID	Sampling Date	Sample Depth	TPHd	TPHo	cPAHs	PCBs	Arsenic	Lead	Chromium	Cadmium	Mercury	VOCs
			Feet BGS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB25A(8)	SB25	06/29/18	8	<20	1,600	--	--	--	--	--	--	--	--
SB25A(12)	SB25	06/29/18	12	<20	1,600	0.924	--	**21**	**3,300**	--	--	--	--
SB25A(16)	SB25	06/29/18	16	--	--	0.0525	--	3.8	32	--	--	--	--
SB26(4)	SB26	04/02/18	4	--	--	--	--	4.3	470	--	--	--	--
SB26(8)	SB26	04/02/18	8	--	--	--	--	1.6	26	--	--	--	--
SB27(4)	SB27	04/02/18	4	--	--	--	--	**31**	170	--	--	--	--
SB27(8)	SB27	04/02/18	8	--	--	--	--	2.0	19	--	--	--	--
SB28(4)	SB28	04/02/18	4	--	--	--	--	<1.0	3.8	--	--	--	--
SB29(4)	SB29	06/29/18	4	--	--	--	--	<1.0	10	--	--	--	--
SB29(8)	SB29	06/29/18	8	--	--	--	--	2.8	2.2	--	--	--	--
SB29(12)	SB29	06/29/18	12	--	--	--	--	--	--	--	--	--	--
SB30(4)	SB30	06/29/18	4	--	--	--	--	2.1	30	--	--	--	--
SB30(8)	SB30	06/29/18	8	<20	<50	--	--	3.5	8.4	--	--	--	--
SB30(12)	SB30	06/29/18	12	<20	<50	0.0525	--	<1.0	2.4	--	--	--	--
SB30(16)	SB30	06/29/18	16	--	--	--	--	--	--	--	--	--	--
SB31(4)	SB31	06/29/18	4	<20	<50	--	--	**90**	19	--	--	--	--
SB31(8)	SB31	06/29/18	8	<20	<50	0.0525	--	**21**	21	--	--	--	--
SB31(12)	SB31	06/29/18	12	44	<50	0.0525	--	1.6	20	--	--	--	--
SB31(16)	SB31	06/29/18	16	<20	<50	--	--	--	--	--	--	--	--
SB32(4)	SB32	06/29/18	4	--	--	--	--	--	--	--	--	--	--
SB32(8)	SB32	06/29/18	8	--	--	--	--	--	--	--	--	--	--
SB32(12)	SB32	06/29/18	12	--	--	--	--	--	--	--	--	--	--
SB33(4)	SB33	06/29/18	4	--	--	--	--	--	--	--	--	--	--
SB33(8)	SB33	06/29/18	8	--	--	--	--	--	--	--	--	--	--
SB33(12)	SB33	06/29/18	12	--	--	--	--	--	--	--	--	--	--
MTCA Method A Industrial Cleanup Levels				2,000	2,000	2	10	20	1,000	19	2	2	Varies

MTCA = Model Toxic Control Act Cleanup Level (WAC173-340-900)
BGS = Below Ground Surface mg/kg = milligram of analyte per kilogram of soil
< = not detected at indicated Laboratory Detection Limits -- = not analyzed
Arsenic, Cadmium, Chromium and Lead by EPA Method 7010
Mercury by EPA Method 7471
cPAHs = Carcenogenic Polycyclic Aromatic Hydrocarbons by 8270C or 8270 SIM
PCBs by EPA Method 8082
VOCs by EPA Method 8260B
ND = Not Detected (minimum detection limit unknown)
Bolded numbers and red-shaded cells denote concentrations above the MTCA Method A Cleanup Levels for soil
cPAHs results were calculated using the toxic equivalent concentration factors from Table 708-1 and adding them together for each sample
For samples where no cPAHs were detected, 1/2 of the reporting limit was used to calculate the result value

TABLE 2
GROUNDWATER ANALYTICAL RESULTS

Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington 98422

MW1

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHd	TPHo	Benzene	Toluene	Ethyl-benzene	Xylenes	cPAHs	Dissolved Arsenic	Total Arsenic	Dissolved Lead	Total Lead	Total Dissolved Solids
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
18.5	04/11/18	2.41	11.75	9.34	--	--	--	--	--	--	--	<2.0	3.0	<2.0	<2.0	--
	07/13/18	5.01	11.75	6.74	--	--	--	--	--	--	--	<2.0	3.0	<2.0	<2.0	--
	10/09/18	4.81	11.75	6.94	--	--	--	--	--	--	<0.1	<2.0	**8.0**	<2.0	<2.0	--
	01/10/19	2.42	11.75	9.33	--	--	--	--	--	--	--	<2.0	2.0	<2.0	<2.0	220
	MTCA Method A Cleanup Levels				500	500	5	1,000	700	1,000	0.1*	5	5	15	15	--

MW2

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHd	TPHo	Benzene	Toluene	Ethylbenzene	Xylenes	cPAHs	Dissolved Arsenic	Total Arsenic	Dissolved Lead	Total Lead	Total Dissolved Solids
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
18.9	04/11/18	8.70	10.27	1.57	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	07/13/18	9.35	10.27	0.92	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	10/09/18	5.20	10.27	5.07	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	01/10/19	3.29	10.27	6.98	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	20,000
	MTCA Method A Cleanup Levels				500	500	5	1,000	700	1,000	0.1*	5	5	15	15	--

MW3

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHd	TPHo	Benzene	Toluene	Ethylbenzene	Xylenes	cPAHs	Dissolved Arsenic	Total Arsenic	Dissolved Lead	Total Lead	Total Dissolved Solids
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
19.3	04/11/18	9.00	10.72	1.72	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	07/13/18	8.95	10.72	1.77	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	10/09/18	5.57	10.72	5.15	--	--	--	--	--	--	<0.1	<2.0	<2.0	<2.0	<2.0	--
	01/10/19	3.98	10.72	6.74	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	20,000
	MTCA Method A Cleanup Levels				500	500	5	1,000	700	1,000	0.1*	5	5	15	15	--

MW4

Well Depth	Sampling Date	Ground Water Level	Elevation (TOC north)*	Water Level Elevation	TPHd	TPHo	Benzene	Toluene	Ethylbenzene	Xylenes	cPAHs	Dissolved Arsenic	Total Arsenic	Dissolved Lead	Total Lead	Total Dissolved Solids
Feet		Feet Below TOC	Feet Above MSL	Feet Above MSL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
19.6	04/11/18	6.90	11.02	4.12	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	--
	07/13/18	7.10	11.02	3.92	<200	<500	<1.0	<1.0	<1.0	<1.0	<0.1	<2.0	<2.0	<2.0	<2.0	--
	10/09/18	7.79	11.02	3.23	<200	<500	--	--	--	--	<0.1	<2.0	<2.0	<2.0	<2.0	--
	01/10/19	5.30	11.02	5.72	--	--	--	--	--	--	--	<2.0	<2.0	<2.0	<2.0	11,000
	MTCA Method A Cleanup Levels				500	500	5	1,000	700	1,000	0.1*	5	5	15	15	--

EXPLANATION

MTCA = Model Toxic Control Act Cleanup Level (WAC173-340-900)

TOC = Top of Casing MSL = Mean Sea Level

< = not detected at indicated Laboratory Detection Limits -- not analyzed NM = Not Measured

TPHd - Total Petroleum Hydrocarbons as Diesel and TPHo - Total Petroleum Hydrocarbons as Oil by NWTPH-Dx extended

Benzene, Toluene, Ethylbenzene and Xylenes by EPA Method 8021B

* = Effective concentration using Toxic Equivalency Factor per WAC 173-340-708{e}: SUM(Benzo(a)pyrene (x1), Benzo(a)anthracine (x0.1), Benzo(b)fluoranthene (x0.1), Benzo(k)fluoranthene (x0.1), Chrysene (x0.01), Dibenz(a,h)anthracene (x0.1), Indeno(1,2,3-cd)pyrene (x0.1)

cPAHs by EPA Method 8270 SIM Arsenic and Lead by EPA Method 7010

Bolded numbers and red-shaded cells denote concentrations above the MTCA Method A Cleanup Levels for groundwater

Bolded numbers and gray-shaded cells denote total concentrations above the MTCA Method A Cleanup Levels for groundwater, but dissolved concentrations below the MTCA Method A Cleanup Levels

Appendix A

Legal Description of Property & Owner and Operator History

APPENDIX A

LEGAL DESCRIPTION OF PROPERTY

Tax Description Parcel 0321264056

Section 26 Township 21 Range 03 Quarter 44 : COM AT SE COR OF GOVT LOT 11 OF SEC TH N 400 FT TH S 45 DEG 22 MIN 22 SEC W 450.27 FT TO NELY BDRY LI OF HYLEBOS WW TH N 48 DEG 18 MIN 36 SEC W ALG SD NELY BDRY LI 279.13 FT TO POB TH CONT ALG SD BDRY LI N 48 DEG 18 MIN 36 SEC W 9.19 FT TO SLY COR OF PARCEL 2 AS REC UNDER AUD FEE # 1841496 TH N 33 DEG 40 MIN 14 SEC W 506.22 FT TO ELY R/W LI OF LINCOLN AVE AS EXT NELY FROM SLY SIDE OF HYLEBOS WW TH S 42 DEG 48 MIN 45 SEC W ALG SD R/W 47.95 FT TO NLY BDRY LI OF HYLEBOS WW TH N 48 DEG 18 MIN 36 SEC W ALG SD WW BDRY LI 48.62 FT TO ELY R/W LI OF LINCOLN AVE CYD TO PIERCE CO UNDER AUD FEE # 465573 TH N 42 DEG 48 MIN 45 SEC E ALG SD R/W LI 342.13 FT TO SWLY COR OF A TR OF LD CYD TO CY OF TAC UNDER AUD FEE # 2382303 TH S 47 DEG 16 MIN 56 SEC E ALG SWLY LI OF SD TR 182.20 FT TH CONT ALG SD WLY LI S 51 DEG 48 MIN 36 SEC E 168 FT TO INTER SLY R/W LI OF MARINE VIEW DR TH S 48 DEG 18 MIN 36 SEC E ALG SD R/W 200.39 FT TH S 42 DEG 48 MIN 45 SEC W 430.08 FT TO POB SUBJ TO EASE SEG G 4985

CHRONOLOGICAL LISTING OF KNOWN PAST OWNERS AND OPERATORS

OWNER	LESSEE	BUSINESS OPERATOR	YEARS OF OCCUPATION
Unknown	--	Tide Bay Inc.	1969-1975
Unknown	--	Martinolich Ship Builders	1975-1980
Unknown	--	Marine Technical Services	1980-1986
Swindahl Properties LLC	--	Modutech Marine Inc.	1986-present

Appendix B

Summary of Previous Investigations

APPENEDIX B

Summary of Previous Investigations
Swindahl Properties LLC
2218 Marine View Drive
Tacoma, Washington

Site Assessment

The Riley Group, Inc. ("Riley") completed a Phase I Environmental Site Assessment, September 11, 2009 at the Modutech Marine Inc. identifying three recognized environmental conditions:

1) A hazardous release was previously identified on the Site in the form of sand blast grit. The grit was previously deposited in various locations throughout the Site. At Ecology request, the grit was excavated and disposed of off-Site. Visual observation was conducted by Site occupants and Ecology inspectors to determine that the bulk of the grit had been removed from the Site. However, no confirmatory soil or groundwater sampling has been performed. Contaminants of concern confirmed at the Site include arsenic, cadmium, lead, PCBs and carcinogenic PAHs. MTCA requires that sampling be performed to confirm that remedial efforts have been successful at the Site.
2) The Site has been occupied by a boat manufacturing facility since the mid-1960s. While hazardous materials and wastes appear to be currently handled in accordance with Ecology recommendations, historical chemical handling and/or waste disposal practices (particularly prior to the current ownership) are unknown. Chemicals used and wastes generated at the Site have likely historically included, but are not necessarily limited to fiberglass resin, petroleum products, chlorinated and non-chlorinated solvents, and/or lead-based paints. Sampling would be necessary to determine whether any historical on-Site activities have adversely affected soil and/or groundwater quality.
3) The northwest adjoining property is currently listed on Ecology's Confirmed and Suspected Contaminated Sites List (CSCSL) for groundwater contamination identified near a right-of way pump station. The extent of the petroleum-affected groundwater is unknown at this time. Additional investigation would be necessary to determine if this off-Site release has adversely affected soil and/or groundwater quality at the subject Site.

On October 21, 2009, Riley advanced a total of four test probes (SP1 through SP4) to a maximum depth of 6 feet bgs. Each test probe was advanced at the approximate four locations identified above, where elevated concentrations of the specified contaminants of concern were previously reported (Riley. 2009b).

A total of 8 discrete soil samples were collected during this project. In general, samples were collected of surficial and deeper fill material, respectively. Soil samples were screened in the field for the presence of volatile organic compounds ("VOCs") using a

portable gas analyzer equipped with a photo-ionization detector ("PID"). No elevated PID field screening results were noted (Riley. 2009b).

Samples were selected based on the historical detections of the specified contaminants of concern. Samples SPI-1 and SP2-0.5 were collected from beneath the existing concrete pavement and selected based on the previous detection of Carcinogenic Polycyclic Aromatic Hydrocarbons ("cPAHs") and metals, respectively, in shallow soils. Samples SP3-3 and SP4-3 were collected from the deeper fill layer, which was reportedly overlain by the previously excavated sandblast grit (Riley. 2009b).

A *Phase I Environmental Site Assessment*, completed February 26, 2018 by Aerotech, identified Contaminants of Concern as compounds related to spent sandblast grit: Metals ("MTCA 5") which include Arsenic, Chromium, Cadmium, Lead and Mercury (Aerotech 2018a).

In March and April 2018, Aerotech subsequently advanced 28 soil borings completed during the *Site Characterization*, performed on March 8, March 28, and April 2, 2018. Soil borings were advanced in areas where the approximate locations of former suspect fill areas. Samples were collected from depths ranging from 3 to 12 feet below ground surface ("bgs"). Soil samples collected from soil borings SB04, SB07, SB08, SB11, SB20, SB25, and SB27 contained concentrations of Arsenic and Lead above the MTCA Method A Industrial Cleanup Levels ("CULs").

A groundwater monitoring well network consisting of MW1 through MW4 was installed to evaluate the impact of Arsenic and Lead to groundwater beneath the Site. Groundwater samples collected from monitoring wells MW1 through MW4 did not contain concentrations of Arsenic and Lead above the MTCA Method A Cleanup Levels (Aerotech 2018b).

An *Additional Site Characterization Report*, performed on June 29, 2018, included the advancement of ten soil borings in the area near SB25. The purpose was to delineate the vertical and horizontal extent of Arsenic and Lead. Aerotech collected additional samples from soil boring locations SB02, SB12, SB19, SB24, SB25, and SB29 through SB33. Samples were collected from depths ranging from 3 to 16 feet below ground surface. Soil samples collected from soil boring SB25 contained of Arsenic and Lead above the CULs (Aerotech 2018c).

The presence of Arsenic and Lead in the subsurface has been confirmed above the MTCA A Cleanup Levels. Vertical and horizontal definition of the extent of metals above cleanup standard has been achieved to the extent practicable.

Historical Remediation Activities

Between 1989 and 1995, the Department of Ecology inspected the Site and recommended containing sandblast grit at the Site for off-site disposal, installing a berm around the hazardous waste storage area, removing paint waste from the ramp area, discontinuing

boat painting operations in the ramp area, and installing a wash water recycle system. In 1993, Ecology staff observed that the bulk of the sandblast grit material had been removed. According to an interview conducted by Riley with then Ecology Manager, Ms. Joyce Mercuri, Ecology's goal at the time was to remove sources of pollution from the Hylebos Waterway uplands and thus confirmation soil sampling was not requested following removal at the Site.

Groundwater Monitoring Activities

Aerotech began groundwater monitoring at the Site in April 2018. Four consecutive quarters of groundwater monitoring ended in January 2019 with the only detection above MTCA Method A Cleanup Levels in the sample collected from MW1 in October 2018. The subsequent sampling event included the analyses of total dissolved solids ("TDS") to evaluate potability of the water since the Site is immediately adjacent to the Hybelos Waterway.

In accordance with WAC Chapter 173-340-720, groundwater with naturally occurring total dissolved solids ("TDS") levels > 10,000 mg/L may be deemed non-potable. TDS measures minerals and salts dissolved in water. TDS are typically those compounds that cannot be removed by traditional water filters. The EPA secondary drinking water standard for TDS is 500 mg/L. TDS exceeded 10,000 mg/L in groundwater collected from three of the four groundwater monitoring wells at the Site.

Appendix C

Historical Soil Boring Logs

AEROTECH
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Depth (ft)	Groundwater		Visual or Olfactory Evidence	Blow Counts	Recovery		USCS Classification	Soil Classification/ Description **UNIFIED SOIL CLASSIFICATION SYSTEM EXPLANATION**	Well Construction		
							GW	**GRAVELS**, well-graded* OR Gravel+Sand mix, little-no fines			
							GP	**GRAVELS**, poorly-graded* OR Gravel+Sand mix, little-no fines			
							GM	**GRAVELS**, silty OR Gravel-sand-silt mix			
							GC	**GRAVELS**, clayey OR Gravel-sand-clay mix			
							SW	**SAND**, well-graded OR **Gravelly Sands**, little-no fines			
							SP	**SAND**, poorly-graded OR **Gravelly Sands**, little-no fines			
							SM	**SAND**, silty OR Sand-silt mix			
							SC	**SAND**, clayey OR Sand-clay mix			
							ML	**SILT**, inorganic (very fine sands, rock flour, silty or clayey fine			
								sands) OR Clayey silts with slight plasticity			
							CL	**CLAY**, inorganic, low-med plasticity (gravelly, sandy, silty, lean)			
							OL	**SILT**, organic, AND **SILT-CLAY**, organic, low plasticity			
							MH	**SILT**, inorganic (micaceous or diatomaceous fn sndy/silty soils)			
								OR SILTY SOILS, elastic SILTS			
							CH	**CLAY**, inorganic, high plasticity, fat clays			
							OH	**CLAY**, organic, med-high plasticity OR Organic SILTS			
							PT	**PEAT** and other highly organic SOILS			
								**** Terminology clarification:*** *The term "**Well graded**" is a synonym for "**Poorly sorted**," both meaning that a wide range of particle sizes are present. The former term is employed in geotechnical descriptions, while the latter is preferred by the USDA in characterizing topsoils and subsoils.*			

AEROTECH ENVIRONMENTAL CONSULTING

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BORING LOG #: MW1

Project Name: Swindahl Properties LLC

Project Number: 218-4036

Site Location: 2218 Marine View Drive, Tacoma, WA

Borehole Location: East Side of Site, just South of Main Driveway

Logged by: N. Gerkin

Boring Depth: 20.5 feet

GW Encountered: YES

Static GW Level: 4 feet

Drilling Contractor:	BoreTec
	Valleyford, WA
Drilling Method:	HSA
Borehole Diameter:	8.25"
Sampler Type:	Split Spoon
ECY WELL ID#:	BJN093
Licensed Driller:	Maclen Escarsega
	3160

Surveyed Casing Elev.: 11.75' above MSL

Work Date: 04/05/18

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
1							Asphalt Surface	
2						GM	FILL - Silty GRAVEL with Sand, brown to gray, slightly moist, very fine to very coarse sand, fine to coarse subrounded to subangular gravel. Well graded. No distinct odor.	
3				9				
4		0.0		11				
5				17				
6						SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
7								
8				2				
9		0.0		3				
10				2		SM	Silty SAND with GRAVEL, gray to tan, saturated, fine to coarse sand, small to medium subrounded gravel, very well graded. Decomposed organic material. No distinct odor.	
11								
12				2				
13		0.0		1				
14				2		SP	SAND - Same as 4-8	
15								
16				3				
17		0.0		5		ML	Clayey Silt with SAND, gray to tan, saturated, medium plasticity, coarse Sand lenses as above. No distinct odor.	
18				2				
19				6				
20		0.0		8				
				8				
21								
22							Bottom of borehole at 20.5 ft. Well installed.	
23							2-inch diameter. 0.020-inch slot screen from 4 to 19 feet bgs.	
24							Well was completed with concrete from 0.5 to 1 feet bgs, followed by bentonite from 1 to 3 feet bgs, followed by Colorado silica sand from 3 to 19.5 feet bgs.	
25								

AEROTECH ENVIRONMENTAL CONSULTING

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BORING LOG #: MW2/SB12

Project Name: Swindahl Properties LLC

Project Number: 218-4036

Site Location: 2218 Marine View Drive, Tacoma, WA

Borehole Location: West Side of Site, just North of Boat Ramp

Logged by: N. Gerkin **Boring Depth:** 20.5 feet

GW Encountered: YES **Static GW Level:** 11 feet

Drilling Contractor:	BoreTec
	Valleyford, WA
Drilling Method:	HSA
Borehole Diameter:	8.25"
Sampler Type:	Split Spoon
ECY WELL ID#:	BJN094
Licensed Driller:	Maclen Escarsega
	3160

Surveyed Casing Elev.: 10.27' above MSL
Work Date: 04/05/18

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
1							Gravel Surface	
2		0.0				GM		
3								
4							FILL - Silty GRAVEL with Sand, brown to gray, slightly moist, very fine to very coarse sand, fine to coarse subrounded to subangular gravel. Well graded. Concrete. No distinct odor.	
5								
6								
7		0.0						
8								
9								
10						SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
11		0.0						
12								
13								
14		0.0						
15								
16								
17						ML	Clayey Silt with SAND, gray to tan, saturated, medium plasticity, coarse Sand lenses as above. Occassional Organic Matter No distinct odor.	
18								
19				7		SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
20		0.0		6 7				
21								
22							Bottom of borehole at 20.5 ft. Well installed.	
23							2-inch diameter. 0.020-inch slot screen from 4 to 19 feet bgs.	
24							Well was completed with concrete from 0.5 to 1 feet bgs, followed by bentonite from 1 to 3 feet bgs, followed by Colorado silica sand from 3 to 19.5 feet bgs.	
25								

Direct Push Recovery

Split Spoon Recovery

AEROTECH ENVIRONMENTAL CONSULTING

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BORING LOG #: MW3/SB07

Project Name: Swindahl Properties LLC

Project Number: 218-4036

Site Location: 2218 Marine View Drive, Tacoma, WA

Borehole Location: West Side of Site, West of Work Tents

Logged by: N. Gerkin **Boring Depth:** 20.5 feet

GW Encountered: YES **Static GW Level:** 10 feet

Drilling Contractor:	BoreTec
	Valleyford, WA
Drilling Method:	HSA
Borehole Diameter:	8.25"
Sampler Type:	Split Spoon
ECY WELL ID#:	BJN095
Licensed Driller:	Maclen Escarsega
	3160

Surveyed Casing Elev.: 10.72' above MSL
Work Date: 04/05/18

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
1							Gravel Surface	
2		0.0				GM		
3								
4							FILL - Silty GRAVEL with Sand, brown to gray, slightly moist, very fine to very coarse sand, fine to coarse subrounded to subangular gravel. Well graded. Concrete fragments. No distinct odor.	
5								
6								
7		0.0						
8								
9								
10						SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
11		0.0						
12								
13								
14								
15								
16								
17		0.0				ML	Clayey Silt with SAND, gray to tan, saturated, medium plasticity, coarse Sand lenses as above. Occassional Organic Matter No distinct odor.	
18								
19				8				
20		0.0		8 8		SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
21								
22							Bottom of borehole at 20.5 ft. Well installed.	
23							2-inch diameter. 0.020-inch slot screen from 4 to 19 feet bgs.	
24							Well was completed with concrete from 0.5 to 1 feet bgs, followed by bentonite from 1 to 3 feet bgs, followed by Colorado silica sand from 3 to 19.5 feet bgs.	
25								

Direct Push Recovery

Split Spoon Recovery

AEROTECH ENVIRONMENTAL CONSULTING

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BORING LOG #: MW4/SB03

Project Name: Swindahl Properties LLC

Project Number: 218-4036

Site Location: 2218 Marine View Drive, Tacoma, WA

Borehole Location: West Side of Site, West of Work Tents

Logged by: N. Gerkin **Boring Depth:** 20.5 feet

GW Encountered: YES **Static GW Level:** 10 feet

Drilling Contractor:	BoreTec
	Valleyford, WA
Drilling Method:	HSA
Borehole Diameter:	8.25"
Sampler Type:	Split Spoon
ECY WELL ID#:	BJN096
Licensed Driller:	Maclen Escarsega
	3160

Surveyed Casing Elev.: 11.02' above MSL
Work Date: 04/05/18

Depth (ft)	Groundwater	PID (ppm)	Sample	Blow Counts	Recovery	USCS Classification	Soil Classification/ Description	Well Construction
1							Gravel Surface	
2		0.0				GM		
3							FILL- Silty GRAVEL with Sand, brown to gray, slightly moist, very fine to very coarse sand, fine to coarse subrounded to subangular gravel. Well graded. No distinct odor.	
4								
5								
6								
7								
8		0.0					FILL - Clayey SILT with Sand, gray, saturated, medium plasticity, Copper Wire present.	
9								
10								
11		0.0				SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
12								
13								
14								
15								
16								
17		0.0				ML	Clayey Silt with SAND, gray to tan, saturated, medium plasticity, coarse Sand lenses as above. Occassional Organic Matter No distinct odor.	
18								
19				4				
20		0.0		9 5		SP	SAND, dark gray with some red granules, saturated, poorly graded, trace fine sand and silt. No distinct odor.	
21								
22							Bottom of borehole at 20.5 ft. Well installed.	
23							2-inch diameter. 0.020-inch slot screen from 4 to 19 feet bgs.	
24							Well was completed with concrete from 0.5 to 1 feet bgs, followed by bentonite from 1 to 3 feet bgs, followed by Colorado silica sand from 3 to 19.5 feet bgs.	
25								

Direct Push Recovery

Split Spoon Recovery

Appendix D

Field Protocols

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(360) 710-5899

512 W. International Airport Road, Suite 201
Anchorage, Alaska 99518
(907) 575-6661

SOIL BORING AND WELL INSTALLATION STANDARD OPERATING PROCEDURE

EQUIPMENT *(Items in italic provided by drilling subcontractor, verify according to the site sampling plan they bring the appropriate equipment and material.)*

- Sampling and Analyses Plan (SAP)
- Site-specific sampling plan
- Sample location map
- Sample table
- Safety equipment, as specified in the Health and Safety Plan
- Permanent pens/marker (e.g. Sharpies®)
- Site logbook, boring log and/or sampling form
- Camera
- Candlestick/cones/barricade
- Caution tape
- Trash bags/plastic sheeting
- Assorted tools (e.g. shovels, wrenches, etc.)
- *Annular materials: silica sand, bentonite pellets and chips, grout*
- *Monitoring well materials: 2-inch schedule 40 PVC riser, well screen and end caps*
- *Completion materials: posts or traffic rated steel monuments, concrete mix, concrete forms*
- *Drilling rig (e.g. hollow stem auger, air/mud rotary, direct push, or sonic)*
- *Disposable acetate liners for direct push*
- *Decontamination equipment such as pressure washer to decontaminate rig and bucket with water and phosphate-free soap (e.g. Alconox®, Liquinox®) for split spoon samplers*

Preliminary Activities

Prior to the onset of field activities at the site, Aerotech obtains the appropriate permit(s) from the governing agency(s). Advance notification is made as required by the agency(s) prior to the start of work. Aerotech marks the borehole locations and contacts the local one call utility locating service at least 2 full business days prior to the start of work to mark buried utilities. Borehole locations may also be checked for buried utilities by a private geophysical surveyor. Additionally, borehole locations may be cleared via air-knife and vacuum operations where proposed locations are in close proximity of buried utilities. Fieldwork is conducted under the advisement of a state registered professional geologist. Monitoring well construction will

comply with Monitoring Well Construction: General, 690-240-100 through Well Seals, WAC 173-160.

Drilling

Aerotech contracts a licensed driller to advance each boring and collect soil samples. The specific drilling method (e.g., hollow-stem auger, direct push method, or sonic drilling), sampling method [e.g., core barrel or California-modified split spoon sampler (CMSSS)] and sampling depths are documented on the boring log and may be specified in a work plan. Soil samples are typically collected at the capillary fringe and at 5-foot intervals to the total depth of the boring. To determine the depth of the capillary fringe prior to drilling, the static groundwater level is measured with a water level indicator in the closest monitoring well to the boring location, if available.

The borehole is advanced to just above the desired sampling depth. For CMSSSs, the sampler is placed inside the auger and driven to a depth of 18 inches past the bit of the auger. The sampler is driven into the soil with a standard 140-pound hammer repeatedly dropped from a height of 30 inches onto the sampler. The number of blows required to drive the sampler each 6-inch increment is recorded on the boring log. For core samplers (e.g., direct push), the core is driven 18 inches using the rig apparatus.

Soil Sampling

Soil is collected according to Aerotech's SOIL SAMPLING STANDARD OPERATING PROCEDURE.

Grab Groundwater Sampling from Soil Boring

In the event that undeveloped grab-groundwater samples are necessary for the scope of work, a temporary well screen is placed across the desired interval of the soil boring. The sample can be collected via disposable bailer or peristaltic pump and disposable tubing. Additionally if direct push technology has been utilized for advancing the soil boring, a groundwater sample, is collected from the boring by using HydropunchTM sampling technology. In the case of using HydropunchTM technology, after collecting the capillary fringe soil sample, the boring is advanced to the top of the soil/groundwater interface and a sampling probe is pushed to approximately 2 feet below the top of the static water level. The probe is opened by partially withdrawing it and thereby exposing the screen. New polyethylene tubing with a peristaltic pump or decontaminated bailer is used to collect a water sample from the probe. The water sample is then emptied into laboratory-supplied containers constructed of the correct material and with the correct volume and preservative to comply with the proposed laboratory test. The container is slowly filled with the retrieved water sample until no headspace remains and then promptly sealed with a Teflon-lined cap, checked for the presence of bubbles, labeled, entered onto a COC record and placed in chilled storage at 4° Celsius. Laboratory-supplied trip blanks accompany the water samples as a quality assurance/quality control procedure. Equipment blanks may be collected as required. The samples are kept in chilled storage and transported under COC protocol to a client-approved, state-certified laboratory for analysis.

Field Screening Procedures

Aerotech staff place the soil from the middle of the sampling interval into a plastic re-sealable bag. The bag is then labeled with the sample number. The tip of a photoionization detector (PID) or similar device is inserted through the plastic bag to measure organic vapor concentrations in the headspace. The highest sustained PID measurement is recorded on the boring log. At a minimum, the PID or organic vapor monitoring device is calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration are recorded on a calibration log. Instruments such as the PID are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of petroleum hydrocarbons in the soil matrix with the same precision as laboratory analysis. Aerotech trained personnel describe the soil in the bag according to the Unified Soil Classification System and record the description on the boring log, which is included in the final report.

Backfilling of Soil Boring

If a well is not installed, the boring is backfilled from total depth to approximately 5 feet below ground surface (bgs) with either neat cement or bentonite grout using a tremie pipe. The boring is backfilled from 5 feet bgs to approximately 1 foot bgs with hydrated bentonite chips. The borehole is completed from 1 foot bgs to surface grade with material that best matches existing surface conditions and meets local agency requirements. Site-specific backfilling details are shown on the respective boring log.

Monitoring Well Construction

A well (if constructed) is completed using materials documented on the boring log or specified in a work plan. The well is constructed with slotted casing across the desired groundwater sampling depth(s) and completed with blank casing to within 6 inches of surface grade. No further construction is conducted on temporary wells. For permanent wells, the annular space of the well is backfilled with Monterey sand from the total depth to approximately 2 feet above the top of the screened casing. A hydrated granular bentonite seal is placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to the desired depth using a tremie pipe. The well may be completed to surface grade with a 1-foot thick concrete pad. A traffic-rated well vault and locking cap for the well casing may be installed to protect against surface-water infiltration and unauthorized entry. Site-specific well construction details including type of well, well depth, casing diameter, slot size, length of screen interval and sand size are documented on the boring log or specified in the work plan.

Monitoring Well Development

Following well construction, each monitoring well is developed and surveyed according to Aerotech's MONITORING WELL DEVELOPMENT AND SURVEYING STANDARD OPERATING PROCEDURE.

Well Sampling

Following development, groundwater is collected according to Aerotech's LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURE.

Decontamination Procedures

Aerotech and/or the contracted driller decontaminate soil and water sampling equipment between each sampling event with a non-phosphate solution, followed by a minimum of two tap water rinses. Deionized water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

Waste Treatment and Soil Disposal

Soil cuttings and decontamination fluids generated from the drilling or sampling are stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. Unless otherwise specified in the contract with Aerotech, the client is responsible for disposal of investigation derived waste. Should Aerotech be contracted to complete disposal for the client, drums containing investigation derived waste are subsequently transported under manifest to a client- and regulatory-approved facility for disposal.

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SOIL SAMPLING STANDARD OPERATING PROCEDURE

EQUIPMENT

- Sampling and Analyses Plan (SAP)
- Site-specific sampling plan
- Sample location map
- Sample table
- Safety equipment, as specified in the Health and Safety Plan
- Permanent pens/marker (e.g. Sharpies®)
- Site logbook and/or sampling form
- Camera
- Screening equipment (e.g. Photoionization detector (PID))
- Survey stakes or flags
- Tape measure or measuring wheel
- Plastic sheet
- Soil collection device, heavy equipment (e.g. spoons spade shovel, hand auger, hollow stem auger – split spoon sampler, direct push rig – macro core, shelby tube, backhoe)
- Syringes for EPA Method 5035
- Syringe tool for EPA Method 5035 (e.g. En Core® sampler)
- Pre-weighed and preserved sample vials for EPA Method 5035
- Stainless steel and/or plastic bowls (only if homogenizing composite samples)
- Sample containers, precleaned (e.g., I-Chem)
- Chain-of-custody forms, custody seals, sample labels
- Ziploc® Bags
- Insulated cooler
- Ice
- Plastic bags for sample containers and ice
- Decontamination equipment including tap water and/or deionized water and phosphate-free soap (e.g. Alconox®, Liquinox®)

Soil Sampling

Soil samples are preserved in the metal or plastic sleeve used with the California-modified split spoon sampler (CMSSS) or core sampler, in glass jars or other containers according to the test method and regulatory guidelines (e.g., Environmental Protection Agency Method 5035). Sleeves are removed from the sample barrel, and the lowermost sample sleeve is labeled. Soil is collected from the split spoon sample or direct push core sample into appropriate containers based on the planned test method. Besides the use of a drilling rig, soil may also be collected via hand auger or with a scoop or spoon from the surface or a selected interval from an excavation, trench or test pit.

Soil Sample Collection

Aerotech field personnel are to review the SAP for sample locations and analysis as well as obtain photograph(s) of the material before sampling. If the soil sample is to be a discrete sample, collect soil using a clean/decontaminated stainless-steel (organic analyses) or plastic (inorganic analyses) spoon. If the soil sample is to be a composite, collect soil from all locations to be sampled into one stainless-steel (organic analyses) or plastic (inorganic analyses) bowl and homogenize the soil. If the soil sample is to be a discrete sample for volatile analyses, collect soil using a syringe and place into appropriate pre-weighed sample vial (Volatiles samples may not be composited.).

Next, use the syringe, stainless-steel or plastic spoon to transfer soil sample as appropriate into sample container as specified by the analytical test method. Label and manage sample containers. Decontaminate sampling equipment between each sampling event with a non-phosphate solution, followed by a minimum of two tap water rinses. Deionized water may be used for the final rinse. Ensure activities are well documented in the site logbook or on a designated sampling form. (i.e. collection method, presence of sheen or odor and PID measurement.

Field Screening Procedures

Aerotech field staff place soil from sampling interval into a plastic re-sealable bag. The bag is then labeled with the sample number. The tip of a photoionization detector (PID) or similar device is inserted through the plastic bag to measure organic vapor concentrations in the headspace. The highest sustained PID measurement is recorded on the boring log. At a minimum, the PID or organic vapor monitoring device is calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration are recorded on a calibration log. Instruments such as the PID are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of petroleum hydrocarbons in the soil matrix with the same precision as laboratory analysis. Aerotech trained personnel describe the soil in the bag according to the Unified Soil Classification System and record the description on the boring log, sampling form or logbook. Selected soil samples for analysis are then placed Samples are placed in a cooler chilled to 4º Celsius and transported to a state-certified laboratory under chain-of custody (COC) protocol.

Extractable Petroleum Hydrocarbons (EPH)/Volatile Petroleum Hydrocarbons (VPH)

To evaluate the potential utilization of site specific cleanup levels (e.g. Ecology's Method B or Method C cleanup levels), Aerotech field personnel will collect additional sample volume to complete EPH/VPH analysis. This test will be completed on samples that are containing petroleum hydrocarbons only, utilizing the previously discussed field screening procedures as well as contaminant source data from previous investigation work.

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MONITORING WELL DEVELOPMENT AND SURVEYING

EQUIPMENT

- Well location map
- Safety equipment, as specified in the Health and Safety Plan
- Permanent pens and markers (e.g. Sharpies®)
- Field notebook and/or sampling form
- Survey equipment
- Surge Block
- 55-Gallon Drums
- 5-Gallon Buckets
- 3/8" Tubing
- DC Power Source
- Whale® Pump
- Water Level Indicator
- Hand Tools (e.g. socket set, screw drivers)
- Watch
- Decontamination equipment including tap water and/or deionized water and phosphate-free soap (e.g. Alconox®, Liquinox®)

Preliminary Activities

Prior to the onset of field activities at the site, Aerotech obtains permission from the client to perform activities and obtains any appropriate permit(s) from potential governing agencies. Aerotech field personnel acquires surge block, tubing, down well pump, water quality monitoring equipment, containers for storing purge water and decontamination fluids and survey equipment, and verifies all are in operating condition. Fieldwork is conducted under the advisement of a state registered professional geologist.

Monitoring Well Development

When a permanent groundwater monitoring well is installed, proper well development is necessary to ensure that complete hydraulic connection is made and maintained between the well and the aquifer material surrounding the well screen and filter pack. Well development should

begin no sooner than 48 to 72 hours after well installation to allow grout to cure prior to improvement.

A surge block is used to move sediments from the filter pack into the well casing. A surge block consists of a rubber and metal plunger attached to Schedule 80 PVC sections of sufficient length to reach the bottom of the well. The surge block is constructed of materials that will not introduce contamination into the well. The surge block is moved up and down the well screen interval and then removed, followed by pumping with a downwell pump to remove any sand and silt brought into the well by the surging action. Care is taken to not surge too strongly with subsequent casing deformation or collapse. Surging will be followed by additional pumping to remove fine materials that may have entered the well during the surging effort.

After surging has been completed and the sand content of the pumped water has decreased, a submersible pump is used to continue well development. The pump should be moved up and down the well screen interval until the obtained water is relatively clear. Well development will continue until the water in the well clarifies. It should be noted that where very fine-grained formations are opposite the screened interval, continued well development until clear water is obtained might be impossible. Decisions regarding when to cease development where silty conditions exist will be made between amongst Aerotech personnel.

During well development, the primary criteria used to evaluate whether the well has been completely developed is water clarity. As mentioned above, clear water can often be impossible to obtain with environmental monitoring wells.

The minimum volume of water purged from the well during development will be approximately a minimum of 3 borehole volumes (wells will typically not reach stabilization of water quality parameters before this condition is achieved and may not have reached stability even after this threshold has been achieved). The above is a general guideline for difficult well development. Development water will be stored in 55-gallon Department of Transportation (DOT) -approved drums.

Surveying

If required, wells are surveyed relative to an established benchmark of known elevation above mean sea level to an accuracy of +/- 0.005 foot. The casing is notched or marked on one side to identify a consistent surveying and measuring point.

Decontamination Procedures

Aerotech personnel completing the monitoring well development equipment will also decontaminate between each monitoring well. The decontamination procedure will consist of washing with a non-phosphate solution, followed by a minimum of two tap water rinses. Deionized water may be used for the final rinse.

Waste Storage and Disposal

Decontamination fluids and purge water from well development and sampling activities are stored on site in labeled, DOT-approved storage containers. No containers will be left on-site

without a label indicating the material matric, accumulation date, project name, project address and Aerotech contact information. Unless otherwise specified in the contract with Aerotech, the client is responsible for disposal of investigation derived waste. Should Aerotech be contracted to complete disposal for the client, drums containing investigation derived waste are subsequently transported under manifest to a client- and regulatory-approved facility for disposal.

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LOW-FLOW GROUNDWATER SAMPLING STANDARD OPERATING PROCEDURE

EQUIPMENT

- Sampling and Analyses Plan (SAP)
- Site-specific sampling plan
- Sample location map
- Sample table
- Safety equipment, as specified in the Health and Safety Plan
- Permanent pens and markers (e.g. Sharpies®)
- Field notebook and/or sampling form
- Camera
- YSI water quality monitoring equipment (e.g. YSI monitor and flow through cell)
- Sample containers, precleaned (e.g., I-Chem)
- 55-Gallon Drums
- Two 5-Gallon Buckets
- 3/8" Tubing
- Power Source/cables
- Peristaltic or down-well pump
- Water Level Indicator
- Tool box with hand tools (e.g. socket set, screw drivers)
- Trash bags/plastic sheeting
- Candlestick/cones/barricade
- Caution tape
- Scissors/knife
- Paper towels
- Watch
- Decontamination equipment including tap water and/or deionized water and phosphate-free soap (e.g. Alconox®, Liquinox®)
- Chain-of-custody forms, custody seals, sample labels
- Ziploc® Bags
- Insulated cooler
- Ice
- Plastic bags for sample containers and ice

The following protocol and sampling procedures were designed to meet or exceed standards for groundwater monitoring well sampling, as specified by the State of Washington Department of Ecology *"Standard Operating Procedures for Purging and Sampling Monitoring Wells, Version 1.0,"* dated and approved on October 4, 2011. These procedures are strictly adhered to by Aerotech field staff:

Cross-Contamination Mitigation Protocol

A sampling table is set up adjacent to the well head in order to protect field equipment from contact with the ground, to prevent or minimize the possible introduction of foreign materials into the wells, and in general in order to mitigate the possibility of cross-contamination. Where previous laboratory data is available, or where visual of olfactory indicators provide initial evidence, well sampling order is arranged to proceed with the least contaminated well, often the upgradient groundwater monitoring wells, and sampling order proceeds by sampling wells associated with successively higher contamination levels. Thus, the wells exhibiting the highest contamination levels are sampled last, in order to minimize the possibility of cross contamination.

A fresh pair of disposable Nitrile gloves is worn at each well. Equipment neither disposable nor dedicated to wells, is washed in a dedicated container prepared with non-phosphate detergent and triple rinsed in a second container prepared with distilled and/or deionized water. Surfaces that cannot be readily submerged for the purpose of decontamination, are sprayed with wash water followed by rinse water, and wiped with a fresh disposable paper towel. For shallow wells that require a peristaltic pump, dedicated tubing is left in each well after sampling, however, for deeper wells that require a submersible pump, dedicated tubing is recovered from wells after each use, and deployed to a designated dedicated clean plastic bag, bearing a label indicating well identification information.

Water Level Measurement

Prior to the well purge process and the collection of groundwater samples, groundwater levels are measured at the north side of the ("TOC") with a piezometer/water level indicator, by slowly lowering the sensor into wells prior to purging, in order to minimize disturbances. The water levels are measured twice, with tape a marked in 0.01 foot increments, in order to reduce possible reading error. Where appropriate, free product thickness is measured with gas level indicator paste or an interface indicator. Upon arrival, each well is visual inspected and the condition of the well and well head are noted.

Groundwater Monitoring Well Purge and Sampling Methodologies

Prior to groundwater sample collection, A dedicated length of high density polyethylene tubing is lowered into each well to a level near the middle of the screened interval. A dedicated length of clean silicone tubing is utilized within the pump mechanism. The wells are purged by means of low flow techniques, during which time groundwater is monitored for physical parameters, including temperature, pH, specific conductivity, dissolved oxygen (DO), and oxidation-reduction potential (ORP), by means of a multi-parameter device mounted upon a flow cell, until such time as values recorded have stabilized and equilibrium conditions are verified according to State guidelines. This protocol ensures that collected groundwater samples are

representative of in-situ groundwater conditions. Readings are recorded once every 2 to 5 minutes, including water level measurement. The pumping rate shall remain below 1 L/min during monitoring and sampling procedures. This is verified by periodically filling a one-Liter graduated cylinder and recording the rate, adjusting the pump as necessary. The water column within the well should remain within 5% of the static height during the purge and sample process, if this cannot be achieved, the pump rate will be reduced until the water level stabilizes. The following conditions must be met in three consecutive readings prior to sampling:

• pH	+/- 0.1 standard units
• Specific Conductivity	+/- 10.0 mS/cm for values < 1,000 mS/cm
	+/- 20.0 mS/cm for values > 1,000 mS/cm
• DO	+/- 0.05 mg/L for values < 1 mg/L
	+/- 0.2 mg/L for values > 1 mg/L
• Temperature	+/- 0.1 degrees Celcius
• ORP	+/- 10 mV

Groundwater samples are collected in containers specified by the laboratory for the analyses established at the Site, and in accordance with State of Washington regulations or guidelines. Sample containers are labeled with site name, well identification, and date of collection information. Each sample is documented on a *Chain of Custody* (“”COC”) form, and immediately placed in an iced cooler (maintained at 4 degrees Celcius or less) for transport to a certified laboratory for analysis. Please note that any purge water suspected or confirmed to contain concentrations above the MTCA Cleanup Levels is drummed and left on Site.

Appendix E

Terrestrial Ecological Evaluation

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Terrestrial-ecological-evaluation.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Swindahl Properties LLC	
Facility/Site Address: 2218 Marine View Drive Tacoma, Washington 98442	
Facility/Site No: 1631646	VCP Project No.: SW1653

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: Justin Foslien		Title: Senior Licensed Geologist
Organization: Aerotech Environmental Consulting Inc.		
Mailing address: 13925 Interurban Avenue South		
City: Seattle	State: WA	Zip code: 98168
Phone: 206 257-4211	Fax: 206 402 3872	E-mail: justin@dirtydirt.us

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☒ Yes *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown *If you answered **"NO" or "UNKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☒ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☐ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

[±] "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

[#] "Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

B. Simplified evaluation.

1. Does the Site qualify for a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No or Unknown *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 3** below.*

☐ No *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

☐ Yes *If you answered **"YES,"** then answer **Question 4** below.*

☐ No *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

☐ Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*

☐ Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

☐ Area of soil contamination at the Site is not more than 350 square feet.

☐ Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

☐ No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

- ☐ No issues were identified during the problem formulation step.
- ☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

- ☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*
- ☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use?
Check all that apply. See WAC 173-340-7493(3).

- ☐ Literature surveys.
- ☐ Soil bioassays.
- ☐ Wildlife exposure model.
- ☐ Biomarkers.
- ☐ Site-specific field studies.
- ☐ Weight of evidence.
- ☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

- ☐ Confirmed there was no problem.
- ☐ Confirmed there was a problem and established site-specific cleanup levels.

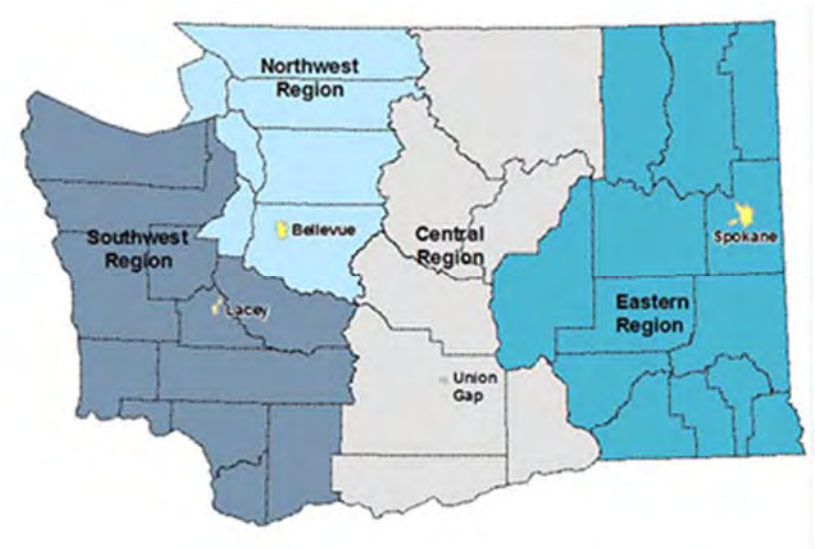
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region: Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	**Central Region:** Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	**Eastern Region:** Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

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