MW 2900

PBS | Engineering + Environmental

Groundwater Monitoring Event December 2016

Seattle Maritime Academy
4455 Shilshole Avenue NW
Seattle, Washington

Prepared for:

State of Washington
Department of Enterprise Services
PO Box 41012
Olympia, Washington 98504-41012

And

Seattle Central College
1701 Broadway
Seattle, WA 98122

Project No. 40535.163
February 13, 2017

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TABLE OF CONTENTS

SUPPORTING DATA

1.0 INTRODUCTION

PBS Engineering and Environmental Inc. (PBS) has completed the December 2016 Groundwater Monitoring Event (GME) at the Seattle Maritime Academy (SMA), located at 4455 Shilshole Avenue NW in Seattle, Washington (site or property). The December 2016 GME represents the 10th consecutive quarter annual sampling event at the site.

The SMA property is situated on 2.2 acres of land adjacent to the northeast abutment of the Ballard Bridge, between the Lake Washington Ship Canal (Salmon Bay) and Shilshole Avenue NW in the Ballard district of the City of Seattle (King County tax parcel 0467000155). A site Vicinity Map is presented in Figure 1.

The site currently operates as a division of Seattle Central College for vocational and technical training needs for the maritime industry. The existing facility consists of a one-story classroom building built in 1987, though construction activities related to a new instructional center are currently underway.

The Property was previously enrolled in the Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP Project No.: NW2900). In April 2016 the Property withdrew from the VCP program and is currently being managed as an Independent Cleanup under a Compliance Monitoring Plan (CMP). The CMP includes a groundwater monitoring program and annual reporting to Ecology. The site is listed on Ecology's Facility list, identification No. 41467614.

2.0 BACKGROUND

The site is part of the Salmon Bay waterfront which became an industrial setting in the late 1800s. A railroad trestle and at least one wood shingle mill were located on the property. The wood shingle mill burnt down at least twice. Rather than rebuild, the owners donated the property for use as marine education. The first education building was constructed in 1987. Seattle Central College (SCC) is currently developing the site with a new instructional center building.

Potential on-site sources of contamination include site filling with impacted dredge material, wood waste from the shingle mills and fire damaged materials from the two reported fires at the property. Creosote uses on site that may have resulted in elevated PAH, TPH and arsenic impacts include presence of railroad ties, wood waste in fill and presence of the timber bulkhead. Releases related to the operation of a railroad may also have impacted the site subsurface materials.

The original subsurface investigation performed by PBS in September 2013 was conducted to evaluate current conditions on the property to identify potential areas of contamination as a precursor to the construction of a new building on the site.

The following potential contaminants of concern were included in the sampling plans for the property, based on a site history which included potential port and rail use and site filling activities:

- Gasoline range total petroleum hydrocarbons (TPH) by method NWTPH-Gx
- Diesel range TPH by method NWTPH-Dx
- Benzene, toluene, ethylbenzene and xylenes (BTEX) and other volatile organic compounds (VOCs) by EPA Method 8021B and 8260C)
- Polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270D SIM
- Select metals (MTCA 5) by EPA Method 6020

Based on subsurface investigation data presented in the *Subsurface Investigations- Proposed Development at Seattle Maritime Academy, PBS, October 2013, December 2013, and February 2014*, as well as groundwater data obtained from the June 2014 sampling event, the fill material that exists beneath the proposed building area and shallow groundwater contained petroleum hydrocarbon related contamination above Washington Department of Ecology (Ecology) MTCA Level A Cleanup Levels.

According to the Washington Department of Ecology (Ecology) MTCA Cleanup Regulations WAC 173-340-300 (2) Release Report, any owner or operator of a property who has information that a hazardous substance has been released to the respective site, must provide notice to Ecology.

The notice of release dated December 19, 2013, was received by the Ms. Donna Musa, Initial Investigation / Site Hazard Assessment Coordinator with the NWRO Toxics Cleanup Program, WA Dept of Ecology located at 3190 160th Ave SE, Bellevue WA 98008. The project site was assigned the Environmental Report Tracking System *(ERTS)* reference #645883. The Property was enrolled in the Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP Project No.: NW2900).

3.0 SITE INVESTIGATIONS

Groundwater Monitoring Event

The December 2016 GME was conducted on December 22 and included the sampling of three of the four on-site groundwater monitoring wells (MW2 - MW4). MW1 was gauged but not sampled during this investigation because of it has been demonstrated to meet cleanup criteria. Well locations are presented in Figure 2 - Site Plan. Well construction details are presented in Attachment I - Well Construction Logs.

Monitoring well information is summarized in the following Table 1:

Table 1: Monitoring Well Construction Summary

Monitoring Well Identification	Screened Interval (feet bgs)	Well Depth (feet bgs)
MW1	4 - 9	9
MW2	3 - 8	8
MW3	2.5 – 7.5	7.5
MW4	2.3 – 7.5	7.5

Prior to sampling the wells were gauged using an interface probe. Static water levels (SWLs) ranged from 2.23 feet below top of casing (fbTOC) in MW4 to 5.15 fbTOC in MW1.

Groundwater purging and sampling was conducted using a peristaltic pump, employing low flow sampling methodology with pumping rates not exceeding 0.34 liters/minute and creating minimal drawdown in the well. Groundwater field parameters (conductivity, pH, temperature, dissolved oxygen and oxidation-reduction potential) were recorded during purging using a YSI Model 556MSP water-quality analyzer equipped with a flow-through cell.

Once groundwater parameters stabilized, which indicates groundwater is representative of the aquifer formation and is not well column water, a sample was collected. PBS personnel wore new disposable nitrile gloves when collecting samples. Detailed groundwater sampling information is presented in Attachment II - Groundwater Sampling Forms.

All samples were collected in laboratory-supplied containers, placed on ice in a cooler and transported to Friedman and Bruya Laboratory in Seattle, Washington, within specified holding times and under chain-of-custody documentation. Analyses were conducted under a 5-day turnaround time and included the following:

- Diesel range TPHs by method NWTPH-Dx
- Dissolved arsenic and lead by EPA method 200.8
- Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270D SIM

4.0 APPLICABLE REGULATIONS AND CLEANUP CRITERIA

Contaminated site assessment and cleanup is conducted under the MTCA, Chapter 70.105D Revised Code of Washington [RCW]. Chapter 173-340 of the Washington Administrative Code (WAC) provides a workable process for MTCA to accomplish effective and expeditious cleanups in a manner that protects human health and the environment. The applicable standards for this Site are the MTCA Method A Groundwater Cleanup Levels (Table 720-1), the adopted cleanup criteria.

Site assessment and cleanup on Site has been and will continue to be performed in accordance with MTCA regulations.

5.0 FINDINGS

Groundwater Elevation and Flow Direction

Groundwater elevation was generally similar during this monitoring period, as compared to the prior monitoring period.

Groundwater flow direction was determined graphically on a scaled site plan, using the tabulated groundwater elevations. Groundwater direction was determined to be towards the southwest. Groundwater elevation data from this sampling event and the previous nine GMEs, calculated groundwater flow directions and hydraulic gradients are presented in Table 2 and shown on Figure 2. A copy of the surveyor's report is included in Attachment III.

Also presented in Table 2 is the elevation of Salmon Bay on the sampling date. Salmon Bay elevation is monitored to allow for evaluation of groundwater – surface water interaction. Groundwater and surface water continue to show significant vertical difference. The elevation of groundwater in MW2 was 0.69-feet lower than the elevation of Salmon Bay and groundwater at MW4 was 1.48-feet higher than Salmon Bay. The finding indicates that the bulkhead acts as a hydraulic barrier, which minimizes the interaction of shallow groundwater with Salmon Bay.

Groundwater Sample Results

Arsenic concentrations in monitoring wells MW2 and MW3 exceed the adopted Cleanup Level (5 micrograms per liter [µg/l]). Concentrations were 10.1 and 10.0 µg/l, respectively.

No additional analytes were identified above the laboratory method reporting limit (MRL) and/or adopted Cleanup Criteria. Contaminants of concern, apart from arsenic, have been reported below the Cleanup Levels for unrestricted land use for at least the past four quarter annual monitoring events.

Groundwater analytical results are presented in Table 3. A copy of the laboratory report and chain of custody documentation is included in Attachment IV.

Arsenic Occurrence and Trend Analysis

Arsenic has been monitored in groundwater over 10 consecutive quarter annual monitoring events, beginning in June 2014. Arsenic concentrations continue to fluctuate at low levels that sometimes exceed and other times are below the Cleanup Level. The general trend is downward, and appears to correspond to the excavation and removal of over 3000 cubic yards of TPH and PAH contaminated soil, and subsequent capping of the site with impermeable building and concrete surfaces.

The subject site history included suspect creosote pilings and railroad activity, which are potential sources of arsenic. However, since the levels of arsenic have been relatively stable and decreasing over the monitoring period and the associated contaminants associated with creosote use on site, such as TPHs and PAHs, are no longer present in the groundwater samples, arsenic detected in site groundwater does not appear to be a result of a significant, human induced release of arsenic to the environment.

Arsenic is a common and naturally occurring element. Its movement from the solid soil matrix to dissolved phase and back is largely influenced by geochemical parameters such as pH and the presence of dissolved oxygen. The anaerobic or low-oxygen environmental, likely influenced by the previous presence of PAHs and TPHs, may have lead to desorption or dissolution of naturally occurring arsenic.

Detected arsenic may also be influenced by airborne deposits from smelter operations.

The presence of low level arsenic in site groundwater is in the range of regional background concentrations and is not considered to be a significant risk to human health or the environment.

Based on these findings and documentation of the relatively static low arsenic levels, additional groundwater monitoring data is not considered to add value to the site characterization. The monitoring program's expense to the College appears to have a negatively disproportionate cost to value.

Quality Control Sampling

Quality control (QC) sampling conducted during the investigation is described below:

One blind duplicate sample was submitted to the laboratory for analysis without notification of which sample had been duplicated. A duplicate groundwater sample (DUP-10.22.16) from MW3 was analyzed for diesel. Results were <50 µg/L for the original sample and <50 µg/L for the duplicate sample.

6.0 RECOMMENDATIONS

With regard to the findings of GME conducted on site, the following recommendations are made:

1. Retain a copy of this report. These findings will be reported to Ecology in the 2016 annual report in accordance with the CMP.

2. Discontinue the groundwater monitoring and amend the CMP to reflect the change in the groundwater monitoring program.

3. Following the 2016 Annual Report to Ecology, discontinue the annual report requirement and amend the CMP to reflect the change in the reporting program.

4. It is understood that Seattle Central College may pursue a No Further Action letter at some time in the future. As such, it is recommended that the groundwater wells be retained as future points of compliance, as needed.

7.0 LIMITATIONS

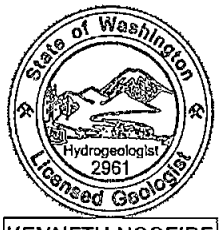
PBS has prepared this report for use by Washington Department of Enterprise Services and Seattle Central College. This report is for the exclusive use of the client and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without the expressed written consent of the client and PBS.

This study was limited to the tests, locations, and depths as indicated to determine the absence or presence of certain contaminants. The site as a whole may have other contamination that was not characterized by this study. The findings and conclusions of this report are not scientific certainties but, rather, are probabilities based on professional judgment concerning the significance of the data gathered during the course of this investigation. PBS is not able to represent that the site or adjoining land contain no hazardous waste, oil or other latent conditions beyond that detected or observed by PBS.

Sincerely,
PBS Engineering and Environmental Inc.

Ken Nogeire, LHG
Senior Geologist/Hydrogeologist

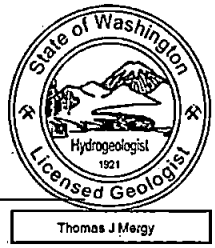
February 13, 2017
Date



KENNETH NOGEIRE

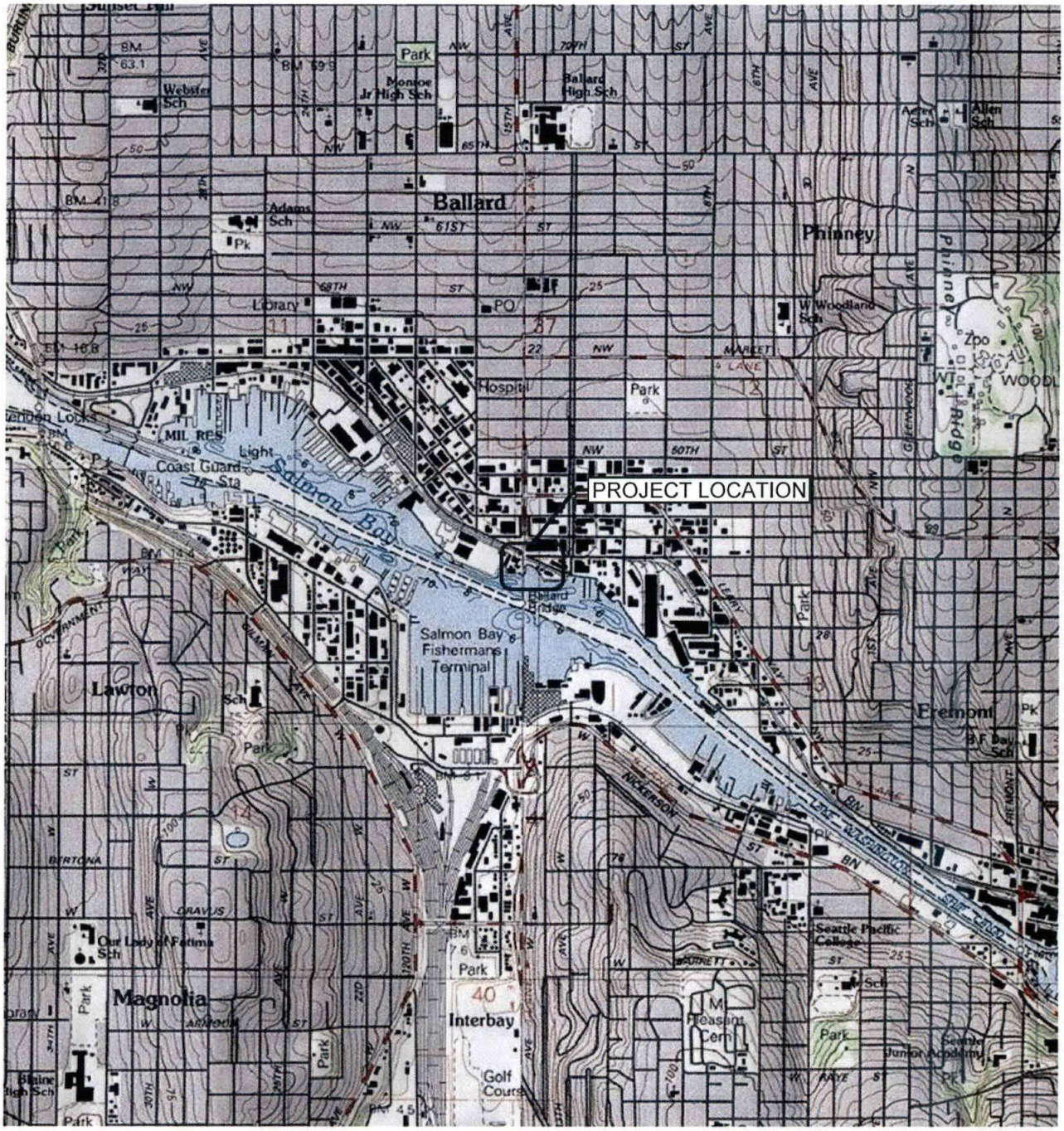
Thomas Mergy, LHG
Senior Hydrogeologist
Environmental Services Manager

February 13, 2017
Date



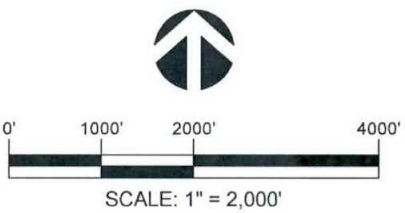
Thomas J Mergy

FIGURES



SOURCE: USGS Seattle North W, WA QUADRANGLE 1979, PHOTO REVISED 1983.

WASHINGTON



SCALE: 1" = 2,000'

PREPARED FOR: SEATTLE MARITIME ACADEMY

PBS	PROJECT # 40535.163 DATE FEB 2017	VICINITY MAP 4455 SHILSHOLE AVENUE NW SEATTLE, WASHINGTON	FIGURE 1

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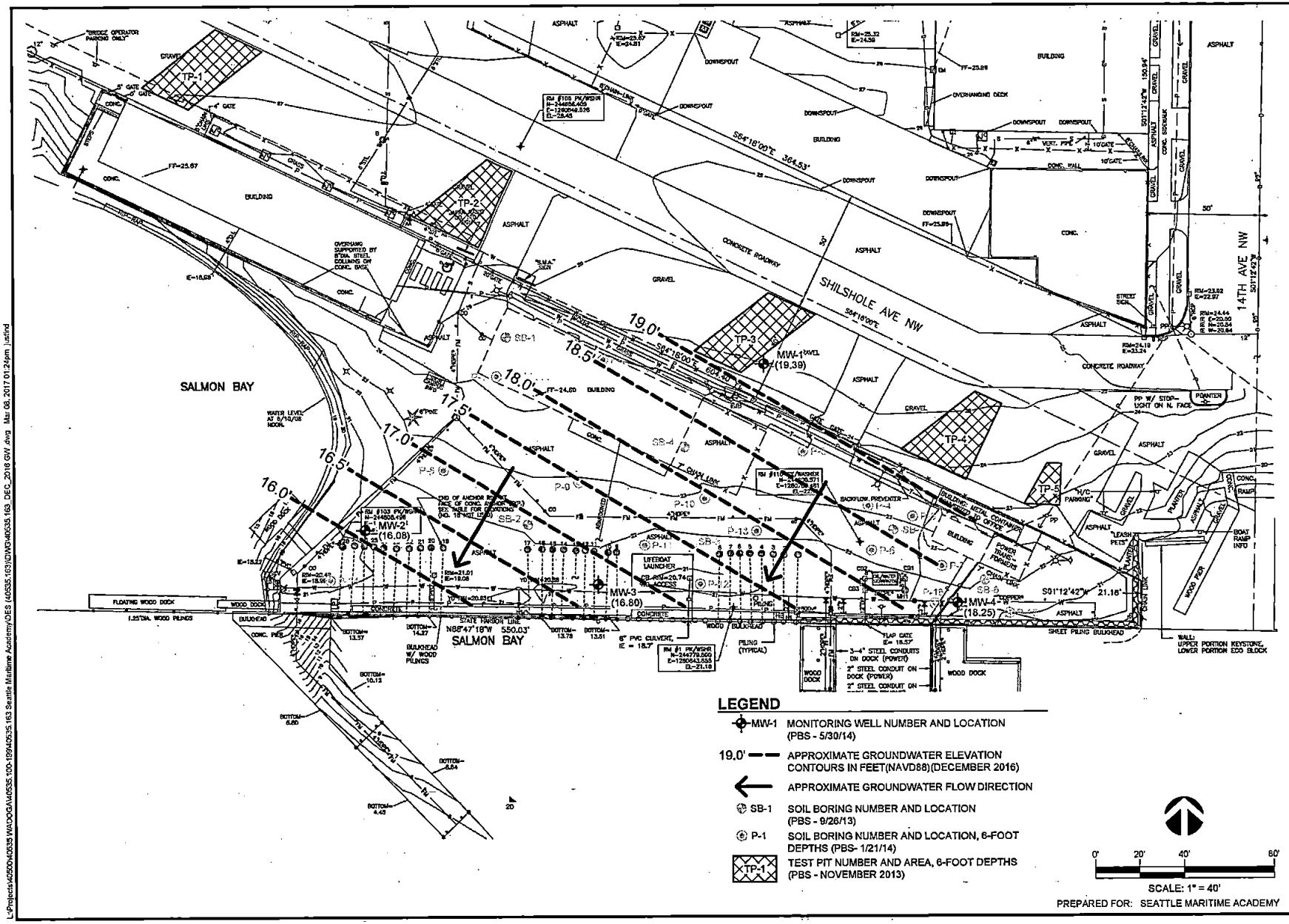

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SEATTLE MARITIME ACADEMY
GROUNDWATER CONTOUR MAP - DECEMBER 2016
4455 SHILSHOLE AVENUE NW
SEATTLE, WASHINGTON

BORING LOCATIONS	
PROJECT:	40535.163
DATE:	FEBRUARY 2017
FIGURE:	2

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TABLES

TABLE 2 GROUNDWATER ELEVATION AND FLOW DIRECTION

Site: Seattle Maritime Academy, Seattle, Washington
Project No: 40535.163

Monitoring Well Identification	Groundwater Monitoring Event	Top of Casing (TOC) elevation	Depth to water (feet)	Groundwater Elevation (feet)	Salmon Bay Elevation (feet)
MW1	June 9, 2014	24.54	3.40	21.14	18.68
	September 26, 2014		4.83	19.71	16.80
	December 23, 2014		4.44	20.10	16.80
	March 16, 2015*		-[1]	-[1]	17.66
	July 31, 2015		5.21	19.33	17.21
	October 22, 2015		6.19	18.35	17.02
	January 7, 2016		5.60	18.94	16.75
	April 29, 2016		4.50	20.04	18.58
	August 1, 2016		5.19	19.35	17.62
	December 22, 2016		5.15	19.39	16.77
MW2	June 9, 2014	20.39	1.71	18.68	18.68
	September 26, 2014		2.28	18.11	16.80
	December 23, 2014		3.56	16.83	16.80
	March 16, 2015		2.61	17.78	17.66
	July 31, 2015		3.19	17.20	17.21
	October 22, 2015		3.34	17.05	17.02
	January 7, 2016		3.58	16.81	16.75
	April 29, 2016		1.76	18.63	18.58
	August 1, 2016		3.50	16.89	17.62
	December 22, 2016		4.31	16.08	16.77
MW3	June 9, 2014	20.71	2.00	18.71	18.68
	September 26, 2014		2.85	17.86	16.80
	December 23, 2014		3.75	16.96	16.80
	March 16, 2015		2.91	17.80	17.66
	July 31, 2015		3.52	17.210	17.21
	October 22, 2015		3.86	16.85	17.02
	January 7, 2016		3.74[2]	NA	16.75
	April 29, 2016		2.14[2]	NA	18.58
	August 1, 2016		3.11[2]	NA	17.62
	December 22, 2016		3.91[2]	NA	16.77
MW4	June 9, 2014	20.48	1.50	18.98	18.68
	September 26, 2014		1.92	18.57	16.80
	December 23, 2014		1.81	18.67	16.80
	March 16, 2015		2.18	18.30	17.66
	July 31, 2015		2.37	18.11	17.21
	October 22, 2015		2.91[3]	17.57[3]	17.02

TABLE 2 GROUNDWATER ELEVATION AND FLOW DIRECTION

Site: Seattle Maritime Academy, Seattle, Washington
Project No: 40535.163

Monitoring Well Identification	Groundwater Monitoring Event	Top of Casing (TOC) elevation	Depth to water (feet)	Groundwater Elevation (feet)	Salmon Bay Elevation (feet)
MW4	January 7, 2016	20.48	2.30	18.18	16.75
	April 29, 2016		1.39	19.09	18.58
	August 1, 2016		2.15	18.33	17.62
	December 22, 2016		2.23	18.25	16.77

Notes:
Elevation vertical datum is NAVD88 per City of Seattle benchmark 7501
Salmon Bay elevations per US Army Core of Engineers Water Quality Division (Seattle Office)
[1] Unable to sample MW1 due to the location of temporary construction offices
[2] MW3 was damaged and repaired at new elevation. Data not used in groundwater elevation calculation
[3] MW4 water level dropped after well cap removal. Data not used in October 2015 groundwater flow direction calculation

Date of Depth to Water Measurement	Groundwater Flow Direction	Hydrualic Gradient (feet/feet)
June 8, 2014	2° East of South (South)	0.028
September 26, 2014	13° West of South (South)	0.016
December 23, 2014	37° West of South (Southwest)	0.025
July 31, 2015	20° West of South (Southwest)	0.017
October 22, 2015	2° West of South (Southwest)	0.014
January 7, 2016	28° West of South (Southwest)	0.015
April 29, 2016	10° West of South (South)	0.012
August 1, 2016	24° West of South (Southwest)	0.017
December 22, 2016	29° West of South (Southwest)	0.021

Groundwater flow direction was determined graphically on a scaled site plan, using the tabulated groundwater elevations and survey data

TABLE 3 GROUNDWATER ANALYTICAL RESULTS

Site: Seattle Maritime Academy, Seattle, Washington
Project No: 40535.163

Result ug/L (micrograms per liter)																
Monitoring Well Identification	Groundwater Monitoring Event	TPHs			VOCs				Metals					PAHS		
		Gx	Dx	Heavy Oil	Benzene	Toluene	Ethyl Benzene	Xylenes	arsenic	cadmium	chromium	lead	mercury	B(a)P	Naph	Carcinogenic PAHs
MW1	June 8, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	<1.00	<0.200	0.759	<0.100	<0.100	<0.100	<0.100	<0.100
	September 26, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	<1.00	<0.200	<0.5	<0.100	<0.100	<0.100	<0.100	<0.100
	December 23, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	<1.00	<0.200	<0.5	<0.100	<0.100	<0.100	<0.100	<0.100
	March 16, 2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	July 31, 2015	<50.0	<50.0	<99.9	<1.00	<1.00	<1.00	<1.00	<1.00	<0.200	<0.500	<1.00	<0.100	<0.102	<0.102	<0.102
	October 22, 2015	<50.0	<49.9	<99.8	<1.00	<1.00	<1.00	<1.00	<1.00	<0.200	<0.500	<1.00	<0.100	<0.100	<0.100	<0.100
	January 7, 2016	<100	<60	<280	<1.00	<1.00	<1.00	<3.00	<1.00	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	April 29, 2016	-	<50	<250	-	-	-	-	<1.00	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	August 1, 2016	-	<50	<250	-	-	-	-	<1.00					<0.06	<0.06	<0.06
	December 22, 2016	Not sampled during this investigation														
MW2	June 8, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	**13.8**	<0.200	1.31	<0.100	<0.100	<0.100	<0.100	<0.100
	September 26, 2014	<50.0	67.7	<100	<1.0	<1.0	<1.0	<1.0	**21.4**	<0.200	3.95	<0.100	<0.100	<0.100	<0.100	<0.100
	December 23, 2014	<50.0	<50.0	141	<1.0	<1.0	<1.0	<1.0	**9.91**	<0.200	3.95	<0.100	<0.100	<0.100	<0.100	<0.100
	March 16, 2015	<50	<50	210	<1.0	<1.0	<1.0	<2.0	**11.4**	<0.200	<0.500	<1.00	<0.100	<0.100	<0.100	<0.100
	July 31, 2015	<50	<49.9	429	<1.00	<1.00	<1.00	<1.00	**14.9**	<0.200	0.642	<1.00	<0.100	<0.0992	<0.0992	<0.0992
	October 22, 2015	<50	<49.9	306	<1.00	<1.00	<1.00	<1.00	**14.3**	<0.200	0.612	<1.00	<0.100	**0.296**	0.198	**0.397**
	January 7, 2016	<100	<51	<260	<1.00	<1.00	<1.00	<3.00	**7.57**	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	April 29, 2016	-	<50	<250	-	-	-	-	3.27	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	August 1, 2016	-	<50	<250	-	-	-	-	**8.99**	-	-	-	-	<0.06	<0.06	<0.06
	December 22, 2016	-	<50	<250	-	-	-	-	**10.1**	-	-	<1	-	<0.06	<0.06	<0.06
MW3	June 8, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	**13.5**	<0.200	2.81	<0.100	<0.100	<0.100	34	<0.100
	September 26, 2014	<50.0	201	<100	<1.0	<1.0	<1.0	<1.0	**18.8**	<0.200	1.37	7.9	<0.100	<0.100	10.5	<0.100
	December 23, 2014	<50	<50	309	<1.0	<1.0	<1.0	<1.0	3.8	<0.200	<0.5	<0.100	<0.100	<0.100	0.565	<0.100
	March 16, 2015	<50	<100	312	<1.0	<1.0	<1.0	<2.0	4.55	<0.200	0.588	<1	<0.100	<0.100	12.1	<0.100
	July 31, 2015	<50.0	<49.6	321	<1.00	<1.00	<1.00	<1.00	**23.1**	<0.200	<0.500	<1.00	<0.100	<0.0997	0.874	<0.0997
	October 22, 2015	<50.0	<49.9	210	<1.00	<1.00	<1.00	<1.00	2.4	<0.200	<0.500	<1.00	<0.100	**0.208**	0.119	**0.282**
	January 7, 2016	<100	52	<250	<1.00	<1.00	<1.00	<3.00	1.72	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	April 29, 2016	-	<50	<250	-	-	-	-	1.61	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	August 1, 2016	-	<50	<250	-	-	-	-	**5.64**	-	-	-	-	<0.06	<0.06	<0.06

TABLE 3 GROUNDWATER ANALYTICAL RESULTS

Site: Seattle Maritime Academy, Seattle, Washington
Project No: 40535.163

Result ug/L (micrograms per liter)																
Monitoring Well Identification	Groundwater Monitoring Event	TPHs			VOCs				Metals					PAHS		
		Gx	Dx	Heavy Oil	Benzene	Toluene	Ethyl Benzene	Xylenes	arsenic	cadmium	chromium	lead	mercury	B(a)P	Naph	Carcinogenic PAHs
	December 22, 2016	-	<50	<250	-	-	-	-	**10**	-	-	<1	-	<0.06	0.28	<0.06
MW4	June 8, 2014	<50.0	<50.0	<100	<1.0	<1.0	<1.0	<1.0	**10.9**	<0.200	1.06	<0.100	<0.100	<0.100	<0.100	<0.100
	September 26, 2014	<50.0	198	<100	<1.0	<1.0	<1.0	<1.0	**17.9**	<0.200	0.755	<0.100	<0.100	<0.100	<0.100	0.027
	December 23, 2014	<50	<50	290	<1.0	<1.0	<1.0	<1.0	2.4	<0.200	<0.500	<1.00	<0.100	<0.100	<0.100	<0.100
	March 16, 2015	<50	<50	217	<1.0	<1.0	<1.0	<2.0	2.53	<0.200	<0.500	<1.00	<0.1	<0.100	<0.100	<0.100
	July 31, 2015	<50.0	<49.8	428	<1.00	<1.00	<1.00	<1.00	**5.94**	<0.200	0.582	<1.00	<0.100	<0.0997	<0.0997	<0.0997
	October 22, 2015	<50.0	<49.9	292	<1.00	<1.00	<1.00	<1.00	4.41	<0.200	0.528	<1.00	<0.100	<0.100	<0.100	<0.100
	January 7, 2016	<100	<50	<250	<1.00	<1.00	<1.00	<3.00	4.07	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	April 29, 2016	-	<50	<250	-	-	-	-	1.05	<1.00	<1.00	<1.00	<1.00	<0.06	<0.06	<0.06
	August 1, 2016	-	<50	<250	-	-	-	-	**6.18**	-	-	-	-	<0.06	<0.06	<0.06
	December 22, 2016	-	<50	<250	-	-	-	-	3.6	-	-	<1	-	-	-	-
Adopted Criteria	**MTCA Method A Cleanup Levels for Groundwater**	**800**	**500**	**500**	**5**	**1,000**	**700**	**1,000**	**5**	**5**	**50**	**15**	**2**	**0.1**	**160**	**0.1****

BOLD indicates above MTCA Method A Cleanup Levels for Groundwater

TPH - total petroleum hydrocarbons

Gx - gasoline range hydrocarbons

Dx - diesel range hydrocarbons

ug/L - micrograms per litre

<50 - less than the laboratory method reporting limit

ND - no detected above laboratory method reporting limit

VOCs - volatile organic compounds

TPH - total petroleum hydrocarbons

Naph - naphthalenes (naphthalene+ 1-methyl naphthalene + 2-methyl naphthalene)

B(a)P - benzo(a)pyrene

** Value for carcinogenic PAHs by toxicity equivalency methodology in WAC 173-340-708(8) and table 708.2

ATTACHMENT I

Well Construction Logs

PBS Engineering + Environmental
2517 Eastlake Ave. East
Suite 100
Seattle, Washington 98102
Phone: 206.233.9639
Fax: 866.727.0140

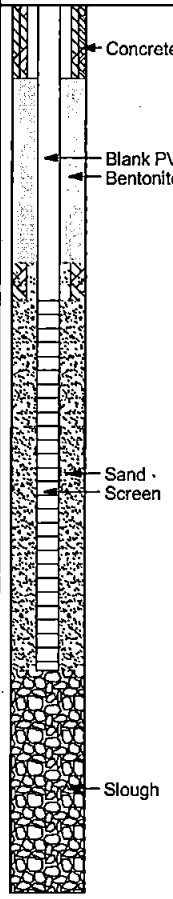
SEATTLE MARITIME ACADEMY
4455 SHILSHOLE AVE. NW
SEATTLE, WA

PBS PROJECT NUMBER:
40535.163

BORING MW-1

BORING MW-1 LOCATION:
(See Site Plan)

DEPTH FEET	MATERIAL DESCRIPTION	GROUND-WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL	RECOVERY (%)
0.0	Crushed rock		0.0	MW1-1		
	Dense, brown, silty SAND; damp (fill)					
2.0	Medium dense, brown, silty SAND (SM); damp, wood debris					25
4.0	No recovery		0.0	MW1-4		
6.0		5/30/14 ▽				0
8.0						
10.0						0
12.0	Final depth 12 feet bgs; groundwater encountered at 6 ft bgs while drilling Monitoring well installed					
14.0						
16.0						
18.0						
20.0						



BORING METHOD: Direct Push
DRILLED BY: Holocene Drilling
BORING BIT DIAMETER: 4-inch

LOGGED BY: K. Nogeire
COMPLETED: 5/30/14

BORING LOG-ENV CORE 40535.163_MW1-4_062714.GPJ DATATMPL.GDT PRINT DATE: 7/16/14 BBP

PBS Engineering + Environmental
2517 Eastlake Ave. East
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Seattle, Washington 98102
Phone: 206.233.9639
Fax: 866.727.0140

SEATTLE MARITIME ACADEMY
4455 SHILSHOLE AVE. NW
SEATTLE, WA

PBS PROJECT NUMBER:
40535.163

BORING MW-2

BORING MW-2 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND-WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Asphaltic concrete						Concrete
		Medium dense, green-brown, silty SAND with clay (SM); moist						Blank PVC
2.0							30	Bentonite
4.0			5/29/14 ▽	0.0	MW2-4			
6.0		Medium dense, green-brown, coarse SAND (SP); wet					30	Sand Screen
8.0		Final depth 8 feet bgs; groundwater encountered at 4.5 feet bgs while drilling Monitoring well installed						
10.0								
12.0								
14.0								
16.0								
18.0								
20.0								

BORING METHOD: Direct Push
DRILLED BY: Holocene Drilling
BORING BIT DIAMETER: 4-inch

LOGGED BY: K. Nogeire
COMPLETED: 5/29/14

BORING LOG-ENV CORE 40535.163 MW1-4 062714.GPJ DATATMPL.GDT PRINT DATE: 7/16/14:88P

PBS Engineering + Environmental
2517 Eastlake Ave. East
Suite 100
Seattle, Washington 98102
Phone: 206.233.9639
Fax: 866.727.0140

SEATTLE MARITIME ACADEMY
4455 SHILSHOLE AVE. NW
SEATTLE, WA

PBS PROJECT NUMBER:
40535.163

BORING MW-3

BORING MW-3 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND-WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Asphaltic concrete						Concrete
		Medium dense, green-brown, silty SAND with clay (SM); moist			MW3-1	■		Blank PVC
2.0							30	Bentonite
4.0		- coarse sand layer	5/29/14 ▽	1.0	MW3-4	■		
6.0							50	Sand Screen
		Very dense, pale gray, medium-grained SAND; wet						
8.0		Final depth 8 feet bgs; groundwater encountered at 4.5 feet bgs during drilling						Slough
10.0								
12.0								
14.0								
16.0								
18.0								
20.0								

BORING METHOD: Direct Push
DRILLED BY: Holocene Drilling
BORING BIT DIAMETER: 4-inch

LOGGED BY: K. Nogeire
COMPLETED: 5/29/14

BORING LOG-ENV CORE 40535.163 MW1-4 062714.GPJ DATATMPL.GDT PRINT DATE: 7/16/14 BBP

PBS Engineering + Environmental
2517 Eastlake Ave. East
Suite 100
Seattle, Washington 98102
Phone: 206.233.9639
Fax: 866.727.0140

SEATTLE MARITIME ACADEMY
4455 SHILSHOLE AVE. NW
SEATTLE, WA

PBS PROJECT NUMBER:
40535.163

BORING MW-4

BORING MW-4 LOCATION:
(See Site Plan)

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	GROUND-WATER	PID (PPM)	SAMPLE NUMBER	SAMPLE/ TEMPORARY WELL	RECOVERY (%)	COMMENTS/ WELL INSTALLATION
0.0		Asphaltic concrete					50	Concrete
		Crushed rock						Blank PVC
		Medium dense, green-brown, silty SAND with clay (SM); moist						Bentonite
2.0			5/29/14 ▽					
		- wood debris, organics		0.0	MW4-4		50	
4.0								
		Medium dense, green-brown, silty SAND with clay and trace gravel (SM); wet						Sand Screen
6.0								
8.0		Final depth 8 feet bgs; groundwater encountered at 3.5 feet bgs during drilling Monitoring well installed						Slough
10.0								
12.0								
14.0								
16.0								
18.0								
20.0								

BORING METHOD: Direct Push
DRILLED BY: Holocene Drilling
BORING BIT DIAMETER: 4-inch

LOGGED BY: K. Nogeire
COMPLETED: 5/29/14

BORING LOG-ENV CORE 40535.163 MW1-4 062714.GPJ DATATMPL.GDT PRINT DATE: 7/16/14:BBP

PBS	PBS Engineering and Environmental **GROUNDWATER SAMPLING FORM (YSI 556)**	**Project No:** 40535.163 **Project Name/ Location:** Seattle Maritime Academy 4455 Shilshole Avenue NW **Date:** December 22, 2016	
Initial DTW (feet bgs)	5.15	**Monitoring Well ID**	**MW1**
Screen Interval (feet bgs)	4 to 9	**Sample ID** (if not well ID)	
Well depth (feet bgs)	8.35	**QC Sample type:** _____	☒ Not collected ID_____ Time_____
Depth of pump/tubing inlet (feet bgs)	7		
Sampling method (describe pump or sampler)		**Field Personnel**	**MN**
Purge Rate (L/min)		**Weather Conditions**	Rainy, cold

WELL PURGING INFORMATION

Time ☐ elapsed ☐ actual	DTW (feet)	Temp. (C)	Specific conductivity ☐ mS/cm ☐ µS/cm	Dissolved oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged ☐ ltr ☐ gal
								Total Volume Purged	

FIELD OBSERVATIONS / NOTES (such as well head condition, groundwater color, sediment load, recovery, sheen, odor, equipment)

Well head in good condition.

Well was not sampled during this investigation.

Signature of Field Personnel: MN

PBS	PBS Engineering and Environmental **GROUNDWATER SAMPLING FORM (YSI 556)**	**Project No:** 40535.163 **Project Name/ Location:** Seattle Maritime Academy 4455 Shilshole Avenue NW **Date:** December 22, 2016	
Initial DTW (feet bgs)	4.31	**Monitoring Well ID**	**MW2**
Screen Interval (feet bgs)	3 to 8	**Sample ID** (if not well ID)	
Well depth (feet bgs)	7.98	**QC Sample type:** _____	☒ Not collected ID_____ Time_____
Depth of pump/tubing inlet (feet bgs)	6		
Sampling method (describe pump or sampler)	Low flow - peristaltic	**Field Personnel**	**MN**
Purge Rate (L/min)	0.33	**Weather Conditions**	Rainy, cold

WELL PURGING INFORMATION

Time ☐ elapsed ☒ actual	DTW (feet)	Temp. (C)	Specific conductivity ☒ mS/cm ☐ µS/cm	Dissolved oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged ☒ ltr ☐ gal
1100	4.35	22.4	1.34	8.64	6.59	-25.1	-	-	1
1104	4.35	11.2	1.34	0.49	6.70	-120.1	-	-	2
1108	4.35	11.2	1.35	0.40	6.70	-122.1	-	-	3
1112	4.35	11.2	1.34	0.30	6.72	-131.2	-	-	4
							Total Volume Purged		4

FIELD OBSERVATIONS / NOTES (such as well head condition, groundwater color, sediment load, recovery, sheen, odor, equipment)

Both screws were replaced during this monitoring event

Groundwater is clear, no sediment, moderate recovery, no sheen/odor.

Signature of Field Personnel: MN

PBS	PBS Engineering and Environmental **GROUNDWATER SAMPLING FORM (YSI 556)**	**Project No:** 40535.163 **Project Name/ Location:** Seattle Maritime Academy 4455 Shilshole Avenue NW **Date:** December 22, 2016	
Initial DTW (feet bgs)	3.91	**Monitoring Well ID**	**MW3**
Screen Interval (feet bgs)	2.5 to 7.5	**Sample ID** (if not well ID)	
Well depth (feet bgs)	7.5	**QC Sample type:** ____GW____	☐ Not collected ID: DUP_12.22.16
Depth of pump/tubing inlet (feet bgs)	5.5		
Sampling method (describe pump or sampler)	Low flow - peristaltic	**Field Personnel**	**MN**
Purge Rate (L/min)	-*	**Weather Conditions**	Rainy, cold

WELL PURGING INFORMATION

Time ☐ elapsed ☒ actual	DTW (feet)	Temp. (C)	Specific conductivity ☐ mS/cm ☒ µS/cm	Dissolved oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged ☒ ltr ☐ gal
1137	6.1	11.7	0.69	0.42	6.81	-123.4	-	-	1
1141	7.5	11.9	0.69	0.40	6.81	-125.6	-	-	2
1149	5.2	10.9	0.69	0.54	6.81	-135.8	-	-	3
1205	5.2	10.9	0.69	0.60	6.85	-130.2	-	-	4
								Total Volume Purged	**4**

FIELD OBSERVATIONS / NOTES (such as well head condition, groundwater color, sediment load, recovery, sheen, odor, equipment)

Well head in good condition.

Groundwater is clear with yellow tint, no sediment, slow recovery, no sheen/odor.

*** had to turn off pump between readings to allow groundwater levels to recover.**

Signature of Field Personnel: MN

PBS	PBS Engineering and Environmental **GROUNDWATER SAMPLING FORM (YSI 556)**	**Project No:** 40535.163 **Project Name/ Location:** Seattle Maritime Academy 4455 Shilshole Avenue NW **Date:** December 22, 2016	
Initial DTW (feet bgs)	2.23	**Monitoring Well ID**	**MW4**
Screen Interval (feet bgs)	2.5 to 7.5	**Sample ID** (if not well ID)	
Well depth (feet bgs)	7.50	**QC Sample type:** _____	☒ Not collected ID_____ Time_____
Depth of pump/tubing inlet (feet bgs)	5		
Sampling method (describe pump or sampler)	Low flow - peristaltic	**Field Personnel**	**MN**
Purge Rate (L/min)	0.24	**Weather Conditions**	Rainy, cold

WELL PURGING INFORMATION

Time ☐ elapsed ☒ actual	DTW (feet)	Temp. (C)	Specific conductivity ☒ mS/cm ☐ µS/cm	Dissolved oxygen (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Observations	Volume purged ☒ ltr ☐ gal
1237	2.6	10.4	0.601	0.30	6.53	-148.9	-	-	1
1243	2.8	10.5	0.622	0.22	6.50	-198.7	-	-	2
1248	2.9	10.4	0.630	0.20	6.50	-190.3	-	-	3
1254	3.0	10.4	0.649	0.20	6.50	-197.7	-	-	4
								Total Volume Purged	4

FIELD OBSERVATIONS / NOTES (such as well head condition, groundwater color, sediment load, recovery, sheen, odor, equipment)

Well head in good condition.

Groundwater is clear with yellow tint, no sediment, moderate recovery, no sheen/odor.

Signature of Field Personnel: MN

Steve Van Patten
Professional Land Surveying Services
Email: vanpatn@frontier.com Phone: 425 867-1715

Well Monitoring at 4455 Shilshole Avenue in Seattle, WA. June 9, 2014

WELL #	LATITUDE	LONGITUDE	ELEV. OF TOP CASING AT N. EDGE (ft.)	GROUND ELEV. AT N. EDGE WELL (ft.)
1	47-39-39.3719	122-22-28.2077	24.54	25.11
2	47-39-38.5289	122-22-30.7996	20.39	21.04
3	47-39-38.3442	122-22-29.2932	20.71	21.22
4	47-39-38.2505	122-22-26.8834	20.48	21.18

BM 7501 47-39-41 +/- 122-22-34 +/- 30.655 City of Seattle Bench Mark 7501 described as a 2" diameter brass cap marked "C OF SEATTLE 7501" set in East side of east bridge column of Ballard Bridge in the SE quadrant of the intersection of 15th Ave. NW and Shilshole Ave. NW.

TBM #1 47-39-39.8199 122-22-26.8605 25.57 Top rusty screw and Washer in concrete base of chain link fence post at SE corner of building at 4421 Shilshole.

Horizontal Datum is NAD 83(1991) / GRS 80.
Vertical Datum is NAVD88 per City of Seattle Bench Mark 7501.

Equipment and Accuracy: A Spectra FOCUS 30 3" total station was used for the vertical elevation work. A Spectra GPS system with centimeter accuracy was used for the horizontal Latitudes and Longitudes and a check on the vertical datum. Accuracy for the horizontal work is +/-0.05 feet with a 95% confidence level. Accuracy for the vertical work is +/- 0.01 feet.

Steve Van Patten
Professional Land Surveyor
7431 153RD Ct NE
Redmond, Washington 98052
Email: vanpatn@frontier.com
Phone: 425 867-1715

ATTACHMENT IV

Laboratory Reports
Chain-of-Custody Documentation

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

January 4, 2017

Ken Nogeire, Project Manager
PBS Engineering and Environmental, Inc.
2517 Eastlake Ave E, Suite 100
Seattle, WA 98102

Dear Mr Nogeire:

Included are the results from the testing of material submitted on December 22, 2016 from the SMA, PO 40535.163, F&BI 612354 project. There are 15 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
PBS0104R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on December 22, 2016 by Friedman & Bruya, Inc. from the PBS Engineering and Environmental SMA, PO 40535.163, F&BI 612354 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	PBS Engineering and Environmental
612354 -01	MW2
612354 -02	MW3
612354 -03	MW4
612354 -04	Dup_12-22-16

The 200.8 dissolved metals were filtered at Friedman and Bruya on December 22, 2016 at 13:51. The data were flagged accordingly.

All quality control requirements were acceptable.

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354
Date Extracted: 12/22/16
Date Analyzed: 12/29/16

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx
Sample Extracts Passed Through a Silica Gel Column Prior to Analysis
Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 47-140)
MW2 612354-01	<50	<250	102
MW3 612354-02	<50	<250	111
MW4 612354-03	<50	<250	92
Dup_12-22-16 612354-04	<50	<250	93
Method Blank 06-2672 MB	<50	<250	87

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354
Date Extracted: 12/22/16
Date Analyzed: 12/22/16

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 41-152)
MW2 612354-01	90 x	<250	114
MW3 612354-02	100 x	<250	115
MW4 612354-03	95 x	<250	112
Dup_12-22-16 612354-04	88 x	<250	105
Method Blank 06-2672 MB	<50	<250	98

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW2 f	Client:	PBS Engineering and Environmental
Date Received:	12/22/16	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/27/16	Lab ID:	612354-01
Date Analyzed:	12/27/16	Data File:	612354-01.056
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	10.1
Lead	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW3 f	Client:	PBS Engineering and Environmental
Date Received:	12/22/16	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/27/16	Lab ID:	612354-02
Date Analyzed:	12/27/16	Data File:	612354-02.058
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	10.0
Lead	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	MW4 f	Client:	PBS Engineering and Environmental
Date Received:	12/22/16	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/27/16	Lab ID:	612354-03
Date Analyzed:	12/27/16	Data File:	612354-03.059
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	3.60
Lead	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Dissolved Metals By EPA Method 200.8

Client ID:	Method Blank f	Client:	PBS Engineering and Environmental
Date Received:	NA	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/27/16	Lab ID:	I6-844 mb
Date Analyzed:	12/28/16	Data File:	I6-844 mb.046
Matrix:	Water	Instrument:	ICPMS2
Units:	ug/L (ppb)	Operator:	SP

Analyte:	Concentration ug/L (ppb)
Arsenic	<1
Lead	<1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW2	Client:	PBS Engineering and Environmental
Date Received:	12/22/16	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/22/16	Lab ID:	612354-01 1/2
Date Analyzed:	12/23/16	Data File:	122305.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	97	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.06
Acenaphthylene	<0.06
Acenaphthene	0.11
Fluorene	<0.06
Phenanthrene	<0.06
Anthracene	<0.06
Fluoranthene	<0.06
Pyrene	<0.06
Benz(a)anthracene	<0.06
Chrysene	<0.06
Benzo(a)pyrene	<0.06
Benzo(b)fluoranthene	<0.06
Benzo(k)fluoranthene	<0.06
Indeno(1,2,3-cd)pyrene	<0.06
Dibenz(a,h)anthracene	<0.06
Benzo(g,h,i)perylene	<0.06

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	MW3	Client:	PBS Engineering and Environmental
Date Received:	12/22/16	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/22/16	Lab ID:	612354-02 1/2
Date Analyzed:	12/23/16	Data File:	122306.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	160
Benzo(a)anthracene-d12	101	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	0.28
Acenaphthylene	<0.06
Acenaphthene	<0.06
Fluorene	<0.06
Phenanthrene	<0.06
Anthracene	<0.06
Fluoranthene	<0.06
Pyrene	<0.06
Benz(a)anthracene	<0.06
Chrysene	<0.06
Benzo(a)pyrene	<0.06
Benzo(b)fluoranthene	<0.06
Benzo(k)fluoranthene	<0.06
Indeno(1,2,3-cd)pyrene	<0.06
Dibenz(a,h)anthracene	<0.06
Benzo(g,h,i)perylene	<0.06

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	PBS Engineering and Environmental
Date Received:	Not Applicable	Project:	SMA, PO 40535.163, F&BI 612354
Date Extracted:	12/22/16	Lab ID:	06-2667 mb2
Date Analyzed:	12/23/16	Data File:	122303.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	92	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.03
Acenaphthylene	<0.03
Acenaphthene	<0.03
Fluorene	<0.03
Phenanthrene	<0.03
Anthracene	<0.03
Fluoranthene	<0.03
Pyrene	<0.03
Benz(a)anthracene	<0.03
Chrysene	<0.03
Benzo(a)pyrene	<0.03
Benzo(b)fluoranthene	<0.03
Benzo(k)fluoranthene	<0.03
Indeno(1,2,3-cd)pyrene	<0.03
Dibenz(a,h)anthracene	<0.03
Benzo(g,h,i)perylene	<0.03

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample Silica Gel

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	100	122	61-133	20

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	ug/L (ppb)	2,500	103	109	63-142	6

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR DISSOLVED METALS USING EPA METHOD 200.8

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Arsenic	ug/L (ppb)	10	98	102	85-115	4
Lead	ug/L (ppb)	10	105	104	85-115	1

Date of Report: 01/04/17
Date Received: 12/22/16
Project: SMA, PO 40535.163, F&BI 612354

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	86	91	67-116	6
Acenaphthylene	ug/L (ppb)	1	90	93	65-119	3
Acenaphthene	ug/L (ppb)	1	90	93	66-118	3
Fluorene	ug/L (ppb)	1	94	96	64-125	2
Phenanthrene	ug/L (ppb)	1	93	94	67-120	1
Anthracene	ug/L (ppb)	1	90	93	65-122	3
Fluoranthene	ug/L (ppb)	1	94	93	65-127	1
Pyrene	ug/L (ppb)	1	95	101	62-130	6
Benz(a)anthracene	ug/L (ppb)	1	96	97	60-118	1
Chrysene	ug/L (ppb)	1	95	97	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	1	91	96	55-135	5
Benzo(k)fluoranthene	ug/L (ppb)	1	92	95	62-125	3
Benzo(a)pyrene	ug/L (ppb)	1	88	90	58-127	2
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	87	82	36-142	6
Dibenz(a,h)anthracene	ug/L (ppb)	1	83	80	37-133	4
Benzo(g,h,i)perylene	ug/L (ppb)	1	82	79	34-135	4

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

612354

SAMPLE CHAIN OF CUSTODY

ME 12-22-16

D03 / AT2

Report To K. Nogeire

Company PBS

Address 2517 Eastlake Ave E #100

City, State, ZIP Seattle, WA 98102

Phone 509.572.8163 Email

SAMPLERS (Signature)

PROJECT NAME: SMA

PO #: 40535.163

REMARKS

INVOICE TO

Page # ____ of ____

TURNAROUND TIME
- ☒ Standard Turnaround
- ☐ RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	Dissolved Pb, arsenic	Dx w/SG			Notes
MW2	01 A-C	12/22/16	1112	GW	3		X					X	X	⊕			⊕ per KN/MN
MW3	02 T		1205		3		X					X	X	⊕			12/28/16
MW4	03 A-B		1254		2		X						X	⊕			MS.
DUP-12.22.16	04		—		1		X							⊕			

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	M. Nogeire	PBS	12/22/16	1324
Received by:	Michael Eckhl	FBrya	↓	L
Relinquished by:				
Received by:				

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3012 16th Avenue West
Seattle, WA 98119-2029
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